5 Mitigation

Gulf of Alaska Navy Training Activities
Draft Supplemental Environmental Impact Statement/ Overseas Environmental Impact Statement

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5.1 Introduction

This chapter describes the mitigation measures that the United States (U.S.) Department of the Navy (Navy) will implement to avoid or reduce potential impacts within the Temporary Maritime Activities Area (TMAA) from the Gulf of Alaska (GOA) Supplemental Environmental Impact Statement (SEIS)/Overseas Environmental Impact Statement (OEIS) Proposed Action. This chapter has been updated in its entirety since Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of the 2016 GOA Final SEIS/OEIS (U.S. Department of the Navy, 2016).

The Navy will also implement standard operating procedures specific to training activities conducted under the Proposed Action. In many cases, standard operating procedures provide a benefit to biological resources, some of which have high socioeconomic value in the TMAA. Standard operating procedures differ from mitigation measures because standard operating procedures are designed to provide for safety and mission success, whereas mitigation measures are designed specifically to avoid or reduce potential environmental impacts. An example of a standard operating procedure is that ships operated by or for the Navy have personnel assigned to stand watch at all times when underway. Watch personnel monitor their assigned sectors for any indication of danger to the ship and the personnel on board, such as a floating or partially submerged object or piece of debris, periscope, surfaced submarine, wisp of smoke, flash of light, or surface disturbance. The Navy also avoids known navigation hazards that appear on navigational charts, such as submerged wrecks and obstructions. As a standard collision avoidance procedure, watch personnel also monitor for marine mammals that have the potential to be in the direct path of the ship. The standard operating procedures to avoid collision hazards are designed for safety of the ship and the personnel on board. This is different from mitigation measures for vessel movement, which require vessels to maneuver to avoid marine mammals by specified distances to avoid or reduce the potential for physical disturbance and strike of marine mammals, as described in Section 5.3.4.1 (Vessel Movement). In this example, the benefit of the mitigation measure for vessel movement is additive to the benefit of the standard operating procedure for vessel safety. Standard operating procedures that apply to the Proposed Action and are generally consistent with those included in the 2016 GOA Final SEIS/OEIS are described in Chapter 5 (Standard Operating Procedures, Mitigation, and Monitoring) of that document. Standard operating procedures that apply to the Proposed Action and were not included in, or require a clarification from, the 2016 GOA Final SEIS/OEIS are discussed in Section 2.3.2 (Standard Operating Procedures) of this SEIS/OEIS.

5.1.1 Benefits of Mitigation

The Chapter 3 (Affected Environment and Environmental Consequences) environmental analyses indicate that certain acoustic, explosive, and physical disturbance and strike stressors have the potential to impact certain biological or cultural resources. The Navy developed mitigation measures that would be implemented under Alternative 1 for those stressors and considered the benefits of that mitigation in the environmental analyses in this SEIS/OEIS. In addition to analyzing mitigation measures pursuant to the National Environmental Policy Act (NEPA), the Navy designed its mitigation to achieve one or more benefits, such as the following:

- Effect the least practicable adverse impact on marine mammal species or stocks and their habitat, and have a negligible impact on marine mammal species and stocks (as required under the Marine Mammal Protection Act [MMPA]);

- Ensure that the Proposed Action does not jeopardize the continued existence of endangered or threatened species, or result in destruction or adverse modification of critical habitat (as required under the Endangered Species Act [ESA]);
- Avoid or minimize adverse effects on Essential Fish Habitat (as required under the Magnuson-Stevens Fishery Conservation and Management Act).

In addition to the benefits listed above, certain mitigation measures would also benefit other species in the TMAA, such as seabirds listed under the Migratory Bird Treaty Act.

5.1.2 Compliance Initiatives

To disseminate its mitigation requirements to the appropriate personnel and meet other compliance requirements for the MMPA and ESA, the Navy will continue using the Protective Measures Assessment Protocol and its ongoing monitoring and reporting initiatives, as described in the sections below.

5.1.2.1 Protective Measures Assessment Protocol

To disseminate requirements to the personnel who are required to implement mitigation during training activities, the Navy will continue inputting its mitigation measures into the Protective Measures Assessment Protocol and appropriate governing instructions. The Protective Measures Assessment Protocol is a software tool that serves as the Navy's comprehensive data source for at-sea mitigation. The software tool provides personnel with notification of the required mitigation measures and a visual display of the planned training activity location overlaid with relevant environmental data (e.g., mapped locations of live hard bottom). Navy policy requires applicable personnel to access the Protective Measures Assessment Protocol during the event planning process. This helps ensure that personnel receive mitigation instructions prior to the start of training activities and that mitigation is implemented appropriately.

5.1.2.2 Monitoring, Research, and Reporting Initiatives

Many of the Navy's monitoring programs, research programs, and reporting initiatives have been ongoing for more than a decade and will continue as a compliance requirement for the MMPA or ESA, or both. The Navy and National Marine Fisheries Service (NMFS) use the information contained within monitoring, research, activity, and incident reports when evaluating the effectiveness and practicality of mitigation and determining if adaptive adjustments to mitigation may be appropriate. These reports also facilitate better understanding of the biological resources that inhabit the TMAA and the potential impacts of the Proposed Action on those resources.

5.1.2.2.1 Marine Species Research and Monitoring Programs

Through its marine species research and monitoring programs, the Navy is one of the nation's largest sponsors of scientific research on and monitoring of marine species. Navy research programs focus on investments in basic and applied research that increase fundamental knowledge and advance naval technological capabilities. Navy monitoring programs focus on the potential impacts of military readiness activities on biological resources. For example, the Navy Living Marine Resources Program is sponsoring an ongoing study on hearing and estimated acoustic impacts in three species of auk, which will help the Navy refine its assessment of potential impacts from its activities on seabirds.

Other projects, such as those sponsored by the U.S. Navy's Marine Species Monitoring Program, primarily focus on marine mammals and sea turtles. Monitoring reports are available to the public on the U.S. Navy's Marine Species Monitoring webpage (https://www.navymarinespeciesmonitoring.us/). The Navy will post future reports online as they become available. Specific details regarding the content

of the reports will be coordinated with the appropriate agencies through the consultation and permitting processes. Additional information about the U.S. Navy's Marine Species Monitoring Program, including its adaptive management and strategic planning components, is provided in the sections below.

5.1.2.2.1.1 Adaptive Management

Adaptive management is an iterative process of decision-making that accounts for changes in the environment and scientific understanding over time through a system of monitoring and feedback. Within the natural resource management community, adaptive management involves ongoing, real-time learning and knowledge creation, both in a substantive sense and in terms of the adaptive process itself (Williams et al., 2009). Adaptive management focuses on learning and adapting, through partnerships of natural resource managers, scientists, and other stakeholders. Adaptive management helps managers maintain flexibility in their decisions and provides them the latitude to change direction to improve understanding of ecological systems and achieve management objectives. Taking action to improve progress toward desired outcomes is another function of adaptive management.

The Navy's adaptive management review process and reporting requirements serve as the basis for evaluating performance and compliance. The process involves technical review meetings and ongoing discussions between the Navy, NMFS, the Marine Mammal Commission, and other experts in the scientific community. An example of a revision to the compliance monitoring structure as a result of adaptive management is the development of the Strategic Planning Process, which is a planning tool for the selection and management of monitoring investments (U.S. Department of the Navy, 2013). Through adaptive management, the Strategic Planning Process has been incorporated into the Integrated Comprehensive Monitoring Program, which is described below.

5.1.2.2.1.2 Integrated Comprehensive Monitoring Program

The Navy developed an Integrated Comprehensive Monitoring Program to serve as the overarching framework for coordinating its marine species monitoring efforts and as a planning tool to focus its monitoring priorities pursuant to ESA and MMPA requirements (U.S. Department of the Navy, 2010). The purpose of the Integrated Comprehensive Monitoring Program is to coordinate monitoring efforts across regions and to allocate the most appropriate level and type of monitoring effort for each range complex based on a set of standardized objectives, regional expertise, and resource availability. The Integrated Comprehensive Monitoring Program does not identify specific field work or individual projects. It is designed to provide a flexible, scalable, and adaptable framework using adaptive management and the Strategic Planning Process to periodically assess progress and reevaluate objectives.

The Integrated Comprehensive Monitoring Program is evaluated through the adaptive management review process to (1) assess progress, (2) provide a matrix of goals and objectives, and (3) make recommendations for refinement and analysis of monitoring and mitigation techniques. This process includes conducting an annual adaptive management review meeting where the Navy and NMFS jointly consider the prior year's goals, project results, and related scientific advances to determine if monitoring plan modifications are warranted to address program goals more effectively. Modifications to the Integrated Comprehensive Monitoring Program that result from annual adaptive management review discussions are incorporated by an addendum or revision to the Integrated Comprehensive Monitoring Program as needed. The Integrated Comprehensive Monitoring Program will be routinely updated as the program evolves and progresses.

The Strategic Planning Process serves to guide the investment of resources to most efficiently address Integrated Comprehensive Monitoring Program objectives and intermediate scientific objectives. Navy-funded monitoring projects relating to the impact of Navy activities on protected marine species are designed to accomplish one or more of the following top-level goals, as described in the Integrated Comprehensive Monitoring Program charter:

- Increase the understanding of the likely occurrence of marine mammals and ESA-listed marine species in the vicinity of the action (e.g., presence, abundance, distribution, density).
- Increase the understanding of the nature, scope, or context of the likely exposure of marine mammals and ESA-listed marine species to any of the potential stressors associated with the action (e.g., acoustics, explosives, physical disturbance and strike of military expended materials) through a better understanding of one or more of the following: (1) the nature of the action and its surrounding environment (e.g., sound-source characterization, propagation, ambient noise levels), (2) the affected species (e.g., life history, dive patterns), (3) the likely co-occurrence of marine mammals and ESA-listed marine species with the action (in whole or part), and (4) 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).
- Increase the understanding of how individual marine mammals or ESA-listed marine species respond behaviorally or physiologically to the specific stressors associated with the action and in what context (e.g., at what distance or received level).
- Increase the understanding of how anticipated individual responses to individual stressors or anticipated combinations of stressors may impact either (1) the long-term fitness and survival of an individual; or (2) the population, species, or stock (e.g., through impacts on annual rates of recruitment or survival).
- Increase the understanding of the effectiveness of mitigation and monitoring.
- Improve the understanding and record of the manner in which the Navy complies with its Incidental Take Authorizations and Incidental Take Statements.
- Increase the probability of detecting marine mammals through improved technology or methods within mitigation zones to improve mitigation effectiveness and better achieve monitoring goals.

The Navy established a Scientific Advisory Group in 2011 with the initial task of evaluating current Navy monitoring approaches under the Integrated Comprehensive Monitoring Plan and existing MMPA Regulations and Letters of Authorization. The Scientific Advisory Group was also tasked with developing objective scientific recommendations that would form the basis for the Strategic Plan. While recommendations were fairly broad and not specifically prescriptive, the Scientific Advisory Group did provide specific programmatic recommendations that serve as guiding principles for the continued evolution of the Integrated Comprehensive Monitoring Program. Key recommendations included

- working within a conceptual framework of knowledge, from basic information on the occurrence of species within each range complex, to more specific matters of exposure, response, and consequences;
- facilitating collaboration among researchers in each region, with the intent to develop a coherent and synergistic regional monitoring and research effort;

- striving to move away from effort-based compliance metrics (e.g., completing a pre-determined amount of survey hours or days), with the intent to design and conduct monitoring projects according to scientific objectives rather than effort expended; and
- approaching the monitoring program holistically and selecting projects that offer the best opportunity to advance understanding of the issues, as opposed to establishing range-specific requirements.

5.1.2.2.1.3 Strategic Planning Process

The U.S. Navy's Marine Species Monitoring Program has evolved and improved as a result of adaptive management review and the Strategic Planning Process through changes that include

- recognizing the limitations of effort-based compliance metrics;
- developing a strategic approach to monitoring based on recommendations from the Scientific Advisory Group;
- shifting focus to projects based on scientific objectives that facilitate generation of statistically meaningful results upon which natural resources management decisions may be based;
- focusing on priority species or areas of interest as well as best opportunities to address specific monitoring objectives to maximize return on investment; and
- increasing transparency of the program and management standards, improving collaboration among participating researchers, and improving accessibility to monitoring data and results.

As a result of the changes outlined above due to the implementation of the Strategic Planning Process, the U.S. Navy's Marine Species Monitoring Program has undergone a transition. Intermediate scientific objectives now serve as the basis for developing and executing new monitoring projects across Navy training and testing areas in the Atlantic and Pacific Oceans. Implementation of the Strategic Planning Process involves coordination among fleets, system commands, Chief of Naval Operations Energy and Environmental Readiness Division, NMFS, and the Marine Mammal Commission with five primary steps:

1. **Identify overarching intermediate scientific objectives.** Through the adaptive management process, the Navy coordinates with NMFS and the Marine Mammal Commission to review and revise the list of intermediate scientific objectives that guide development of individual monitoring projects. Examples include addressing information gaps in species occurrence and density, evaluating behavioral responses of marine mammals to Navy activities, and developing tools and techniques for passive acoustic monitoring.
2. **Develop individual monitoring project concepts.** This step generally takes the form of soliciting input from the scientific community in terms of potential monitoring projects that address one or more of the intermediate scientific objectives. This can be accomplished through a variety of forums, including professional societies, regional scientific advisory groups, and contractor support.
3. **Evaluate, prioritize, and select monitoring projects.** Navy technical experts and program managers review and evaluate monitoring project concepts and develop a prioritized ranking. The goal of this step is to establish a suite of monitoring projects that address a cross-section of intermediate scientific objectives spread over a variety of range complexes.
4. **Execute and manage selected monitoring projects.** Individual projects are initiated through appropriate funding mechanisms and include clearly defined objectives and deliverables, such as data, reports, or publications.

5. **Report and evaluate progress and results.** Progress on individual monitoring projects is updated through the U.S. Navy's Marine Species Monitoring Program webpage as well as annual monitoring reports submitted to NMFS. Both internal review and discussions with NMFS through the adaptive management process are used to evaluate progress toward addressing the primary objectives of the Integrated Comprehensive Monitoring Program and serve to periodically recalibrate the focus of the monitoring program.

These steps serve three primary purposes: (1) to facilitate the Navy in developing specific projects addressing one or more intermediate scientific objectives; (2) to establish a more structured and collaborative framework for developing, evaluating, and selecting monitoring projects across areas where the Navy conducts military readiness activities; and (3) to maximize the opportunity for input and involvement across the research community, academia, and industry. This process is designed to integrate various elements, including

- Integrated Comprehensive Monitoring Program top-level goals,
- Scientific Advisory Group recommendations,
- integration of regional scientific expert input,
- ongoing adaptive management review dialog between NMFS and the Navy,
- lessons learned from past and future monitoring of Navy military readiness activities, and
- leveraging of research and lessons learned from other Navy-funded science programs.

The Strategic Planning Process will continue to shape the future of the U.S. Navy's Marine Species Monitoring Program and serve as the primary decision-making tool for guiding investments. Information on monitoring projects currently underway in the Atlantic and Pacific oceans, as well as results, reports, and publications, can be accessed through the U.S. Navy's Marine Species Monitoring Program webpage.

5.1.2.2.2 Training Activity Reports

The Navy developed a classified data repository known as the Sonar Positional Reporting System to maintain an internal record of underwater sound sources (e.g., active sonar) used during training. The Sonar Positional Reporting System facilitates reporting pursuant to the Navy's MMPA Regulations and Letters of Authorization. Using data from the Sonar Positional Reporting System and other relevant sources, the Navy will continue to provide the NMFS Office of Protected Resources with classified or unclassified (depending on the data) annual reports on the training activities that use underwater sound sources under the Proposed Action. In its annual training activity reports, the Navy will describe the level of training conducted during the reporting period. Unclassified annual training activity reports that have been submitted to NMFS can be found on the NMFS Office of Protected Resources and U.S. Navy's Marine Species Monitoring Program webpages.

5.1.2.2.3 Incident Reports

The Navy's mitigation measures and many of its standard operating procedures are designed to prevent incidents involving biological resources, such as aircraft strikes and vessel strikes. The Navy has been collecting data on such incidents (if they have occurred) for more than a decade and will continue doing so under the Proposed Action. To provide information on incidents involving biological and cultural resources, the Navy will submit reports to the appropriate management authorities as described below:

- **Bird Aircraft Strikes:** As described in Section 5.1.3 (Aircraft Safety) of the 2016 GOA Final SEIS/OEIS, bird strikes present an aviation safety risk for aircrews and aircraft. The Navy will report all aircraft strikes of birds per standard operating procedures.
- **Incidents Involving Marine Mammals, Sea Turtles, ESA-Listed Birds, and ESA-Listed Fish:** The Navy will notify the appropriate regulatory agency (e.g., NMFS, U.S. Fish and Wildlife Service [USFWS]) immediately or as soon as operational security considerations allow if it observes the following that is (or may be) attributable to Navy activities: (1) a vessel strike of a marine mammal or sea turtle during training; (2) a stranded, injured, or dead marine mammal or sea turtle during training; or (3) an injured or dead marine mammal, sea turtle, or ESA-listed bird or fish species during post-explosive event monitoring. The Navy will provide relevant information pertaining to the incident (e.g., vessel speed). Additional details on these incident reporting requirements will be included in the Notification and Reporting Plan, which will be publicly available on the NMFS Office of Protected Resources webpage. The Navy will continue to provide the appropriate personnel with training on marine species incidents and their associated reporting requirements to aid the data collection and reporting processes (see Section 5.3.1, Environmental Awareness and Education). Information on marine mammal strandings is included in the *Marine Mammal Strandings Associated with U.S. Navy Sonar Activities* technical report (U.S. Department of the Navy, 2017c).
- **Cultural Resources:** As described in Section 3.10 (Cultural Resources) of the 2016 GOA Final SEIS/OEIS, precise locations of submerged historic properties (e.g., historic shipwrecks, historic sunken aircraft) within the TMAA are not known. Should the Navy impact a newly discovered historic property, the Navy will commence consultation with the appropriate State Historic Preservation Officer or Tribal Historic Preservation Officer in accordance with 36 Code of Federal Regulations section 800.13(b)(3).

5.2 Mitigation Development Process

The Navy, in coordination with the appropriate regulatory agencies, developed its initial suite of mitigation measures for Phase I of environmental planning (2011–2016) and subsequently revised those mitigation measures for the 2016 GOA Final SEIS/OEIS in Phase II (2017–2022). For this SEIS/OEIS (which represents Phase III of environmental planning), the Navy is working collaboratively with the appropriate regulatory agencies, such as NMFS, to develop and refine its mitigation, which will be finalized through the consultation and permitting processes. The mitigation development process involves reanalyzing existing mitigation measures implemented under the 2016 GOA Final SEIS/OEIS and analyzing new potential mitigation options (e.g., mitigation recommendations received from Navy and NMFS scientists, other governmental agencies, the public, and non-governmental organizations during NEPA scoping, the Draft SEIS/OEIS public review, and the consultation and permitting processes). The Navy is conducting a detailed review and assessment of each potential mitigation measure individually and then all potential mitigation measures collectively to determine if, as a whole, mitigation will effectively avoid or reduce potential impacts from the Proposed Action and will be practical to implement. The Navy operational community (i.e., leadership from the aviation, surface, subsurface, and special warfare communities and training experts), environmental planners, and scientific experts provide input on the effectiveness and practicality of mitigation implementation. Navy Senior Leadership reviewed and approved all mitigation measures included in this SEIS/OEIS.

The Navy Record of Decision will document all mitigation measures the Navy will implement under the Proposed Action. The NMFS Record of Decision, MMPA Regulations and Letter of Authorization, ESA Biological Opinion, and other applicable consultation documents will include the mitigation measures

applicable to the resources for which the Navy has consulted. The suite of mitigation measures that will be included in the Final SEIS/OEIS will represent the maximum level of mitigation that is practical for the Navy to implement when balanced against impacts on safety, sustainability, and the ability to continue meeting mission requirements. Should the Navy require a change in how it implements mitigation based on national security concerns, evolving readiness requirements, or other factors (e.g., significant changes in the best available science), the Navy will engage the appropriate agencies and reevaluate its mitigation through adaptive management or the appropriate consultations. The Navy's adaptive management approach is discussed in Section 5.1.2.2.1.1 (Adaptive Management). This approach has been coordinated with NMFS and will be included in the MMPA Regulations and Letter of Authorization.

Mitigation measures that the Navy will implement under the Proposed Action are organized into two categories: procedural mitigation measures and mitigation areas. The sections below provide definitions of mitigation terminology, background information pertinent to the mitigation development process, and information about the mitigation effectiveness and practicality criteria. Section 5.5 (Mitigation Measures Considered but Eliminated) contains information on measures that did not meet the appropriate balance between being both effective as well as practical to implement, and therefore will not be implemented under the Proposed Action.

5.2.1 Procedural Mitigation Development

Procedural mitigation is mitigation that the Navy will implement whenever and wherever training activities involving applicable acoustic, explosive, and physical disturbance and strike stressors take place within the TMAA. Procedural mitigation generally involves (1) the use of one or more trained Lookouts to observe for specific biological resources within a mitigation zone, (2) requirements for Lookouts to immediately communicate sightings of specific biological resources to the appropriate watch station for information dissemination, and (3) requirements for the watch station to implement mitigation until a pre-activity commencement or during-activity recommencement condition has been met.

Procedural mitigation primarily involves Lookouts observing for marine mammals and sea turtles. For some activities, Lookouts may also be required to observe for additional biological resources, such as ESA-listed seabirds or floating vegetation. For example, the Navy implements procedural mitigation for several activities that have the potential to overlap the range of ESA-listed short-tailed albatross. In this chapter, the term "floating vegetation" refers specifically to floating concentrations of detached kelp paddies. Floating vegetation can be an indicator of potential marine mammal or sea turtle presence because marine mammals and sea turtles have been known to seek shelter in, feed on, or feed among them. The Navy observes for these additional biological resources prior to the initial start or during the conduct of certain activities to offer an additional layer of protection for marine mammals and sea turtles. While on watch, Lookouts employ visual search techniques, including a combination of naked-eye scanning and the use of hand-held binoculars or high-powered binoculars mounted on a ship deck, depending on the observation platform. After sunset and prior to sunrise, Lookouts and other Navy watch personnel employ night visual search techniques, which could include the use of night vision devices.

To consider the benefits of procedural mitigation to marine mammals and sea turtles within the MMPA and ESA impact estimates, the Navy conservatively factored mitigation effectiveness into its quantitative analysis process, as described in the technical report titled *Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase III Training and Testing*

(U.S. Department of the Navy, 2018). The Navy's quantitative analysis assumes that Lookouts will not be 100 percent effective at detecting all individual marine mammals and sea turtles within the mitigation zones for each activity. This is due to the inherent limitations of observing marine species and because the likelihood of sighting individual animals is largely dependent on observation conditions (e.g., time of day, sea state, mitigation zone size, observation platform) and animal behavior (e.g., the amount of time an animal spends at the surface of the water). This is particularly true for sea turtles, small marine mammals, and marine mammals that display cryptic behaviors (e.g., surfacing to breathe with only a small portion of their body visible from the surface). Throughout Section 5.3 (Procedural Mitigation to be Implemented), discussions about the likelihood that a Lookout would observe a marine mammal or sea turtle pertain specifically to animals that are available to be observed (i.e., on, above, or just below the water's surface). The benefits of procedural mitigation measures for species that were not included in the quantitative analysis process (e.g., birds) are discussed qualitatively.

Data inputs for assessing and developing procedural mitigation included operational data described in Section 5.2.3 (Practicality of Implementation), the best available science discussed in Chapter 3 (Affected Environment and Environmental Consequences), published literature, data on marine mammal and sea turtle impact ranges obtained through acoustic modeling, data on bird hearing, marine species monitoring and density data, and the most recent guidance from NMFS and the USFWS. Background information on the data that were used to develop the ranges to effect is provided in Section 3.7 (Sea Turtles), Section 3.8 (Marine Mammals), and Section 3.9 (Birds). Additional activity or stressor-specific details, such as the level of effect to which a procedural mitigation measure is expected to mitigate and if a measure has been modified from the 2016 GOA Final SEIS/OEIS, is provided throughout Section 5.3 (Procedural Mitigation to be Implemented).

5.2.1.1 Lookouts

Lookouts perform similar duties as the standard watch personnel described in Section 5.1.2 (Vessel Safety) of the 2016 GOA Final SEIS/OEIS, such as personnel on the bridge watch team and personnel stationed for man-overboard precautions. Lookouts are designated the responsibility of helping meet the Navy's mitigation requirements by visually observing mitigation zones. The number of Lookouts designated for each training activity is dependent upon the number of personnel involved in the activity (i.e., manning restrictions) and the number and type of assets available (i.e., equipment and space restrictions).

Depending on the activity, a Lookout may be positioned on a ship (i.e., surface ships and surfaced submarines), on a small boat (e.g., a rigid-hull inflatable boat), or in an aircraft. Certain platforms, such as aircraft and small boats, have manning or space restrictions; therefore, the Lookout on these platforms is typically an existing member of the aircraft or boat crew who is responsible for other essential tasks (e.g., a pilot or Naval Flight Officer who is also responsible for navigation). Some platforms are minimally manned and are therefore either physically unable to accommodate more than one Lookout or divert personnel from mission-essential tasks, including safe and secure operation of propulsion, weapons, and damage control systems that ensure safety of the ship and the personnel on board. The number of Lookouts specified for each activity in Section 5.3 (Procedural Mitigation to be Implemented) represents the maximum number of Lookouts that can be designated for those activities without requiring additional personnel or reassigning duties. The "maximum" number of Lookouts is equivalent to the required number of Lookouts; therefore, the Navy would not use fewer Lookouts than what is specified in each mitigation table. The Navy is unable to position Lookouts on unmanned surface vehicles, unmanned aerial systems, unmanned underwater vehicles, and submerged submarines, or

have Lookouts observe during activities that use systems deployed from or towed by unmanned platforms, except in limited circumstances when escort vehicles are already participating in the activity.

When Lookouts are positioned in a fixed-wing aircraft or rotary-wing aircraft (i.e., helicopter), mission requirements determine the flight parameters (altitude, flight path, and speed) for that aircraft. For example, most fixed-wing aircraft sorties occur above 3,000 feet (ft.). Similarly, when Lookouts are positioned on a vessel, mission requirements determine the operational parameters (course and speed) for that vessel.

The Navy's passive acoustic devices (e.g., remote acoustic sensors, expendable sonobuoys, passive acoustic sensors on submarines) can complement visual observations for marine mammals when passive acoustic assets are already participating in an activity. The passive acoustic devices can detect vocalizing marine mammals within the frequency bands already being monitored by Navy personnel. Marine mammal detections from passive acoustic devices can alert Lookouts to possible marine mammal presence in the vicinity. Lookouts can use the information from passive acoustic detections to assist their visual observations of the mitigation zone. Based on the number and type of passive acoustic devices that are typically used, passive acoustic detections do not provide range or bearing to a detected animal in order to determine its location or confirm its presence in a mitigation zone. Therefore, it is not practical for the Navy to implement mitigation in response to passive acoustic detections alone (i.e., without a visual sighting of an animal within the mitigation zone). Additional information about passive acoustic devices is provided in Section 5.5.3 (Active and Passive Acoustic Monitoring Devices).

5.2.1.2 Mitigation Zones

Mitigation zones are areas at the surface of the water within which applicable training activities will be ceased, powered down, or modified to protect specific biological resources from an auditory injury (permanent threshold shift [PTS]), non-auditory injury (from impulsive sources), or direct strike (e.g., vessel strike) to the maximum extent practicable. Mitigation zones are measured as the radius from a stressor. Implementation of procedural mitigation is most effective when mitigation zones are appropriately sized to be realistically observed during typical training activity conditions.

The Navy customized its mitigation zone sizes and mitigation requirements for each applicable training activity category or stressor. The Navy developed each mitigation zone to be the largest area that (1) Lookouts can reasonably be expected to observe during typical activity conditions (i.e., most environmentally protective); and (2) the Navy can commit to implementing mitigation without impacting safety, sustainability, or the ability to meet mission requirements. The Navy designed the mitigation zones for most acoustic and explosive stressors according to its source bins. As described in Section 3.0.4.1 (Acoustic Sources), sonars and other transducers are grouped into classes that share an attribute, such as frequency range or purpose of use. Classes are further sorted by bins based on the frequency or bandwidth, source level, and when warranted, the application in which the source would be used. As described in Section 3.0.4.2 (Explosive Stressors), explosives are binned by net explosive weight. Mitigation does not pertain to stressors that do not have the potential to impact biological resources (e.g., *de minimis* acoustic and explosive sources that do not have the potential to impact marine mammals).

Discussions throughout Section 5.3 (Procedural Mitigation to be Implemented) about the level of effect that will likely be mitigated for marine mammals and sea turtles are based on a comparison of the mitigation zone size to the predicted impact ranges for the applicable source bins with the longest

average ranges to PTS. These conservative discussions represent the worst-case scenario for each activity category or stressor. The mitigation zones will oftentimes cover all or a larger portion of the predicted average ranges to PTS for other comparatively smaller sources with shorter impact ranges (e.g., sonar sources used at a lower source level, explosives in a smaller bin). The discussions are primarily focused on how the mitigation zone sizes compare to the ranges to PTS; however, depending on the activity category or stressor, the mitigation zones are oftentimes large enough to also mitigate within a portion of the ranges to temporary threshold shift (TTS). Temporary Threshold Shift is a threshold shift that is recoverable. Background information on PTS, TTS, and marine mammal and sea turtle hearing groups is presented in the U.S. Department of the Navy (2017a) technical report titled *Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase III)*.

5.2.1.3 Procedural Mitigation Implementation

The Navy takes several courses of action in response to a sighting of an applicable biological resource in a mitigation zone. First, a Lookout will communicate the sighting to the appropriate watch station. Next, the watch station will implement the prescribed mitigation, such as delaying the initial start of an activity, powering down sonar, ceasing an explosive detonation, or maneuvering a vessel. If floating vegetation is observed in the mitigation zone prior to the initial start of an activity, the activity will either be relocated to an area where floating vegetation is not observed in concentrations, or the initial start of the activity will be delayed until the mitigation zone is clear of floating vegetation concentrations. There are no requirements to cease activities if vegetation floats into the mitigation zone after activities commence. For sightings of marine mammals, sea turtles, and seabirds within a mitigation zone prior to the initial start of or during applicable activities, the Navy will continue mitigating until one of the five conditions listed below has been met. The conditions are designed to allow a sighted animal to leave the mitigation zone before the initial start of an activity or before an activity resumes.

- The animal is observed exiting the mitigation zone;
- The animal is thought to have exited the mitigation zone based on a determination of its course, speed, and movement relative to the stressor source;
- The mitigation zone has been clear from any additional sightings for a specific wait period;
- For mobile activities, the stressor source has transited or has been relocated a distance equal to double that of the mitigation zone size beyond the location of the last sighting; or
- For activities using hull-mounted sonar, the ship concludes that dolphins are deliberately closing in on the ship to ride the ship's bow wave and are therefore out of the main transmission axis of the sonar (and there are no other marine mammal sightings within the mitigation zone).

To supplement the implementation of procedural mitigation, the Navy has agreed to undertake reporting initiatives for certain activities or resources based on previous consultations with NMFS and the USFWS, as summarized in Section 5.1.2.2 (Monitoring, Research, and Reporting Initiatives) and detailed where applicable in Section 5.3 (Procedural Mitigation to be Implemented).

5.2.2 Mitigation Area Development

Mitigation areas are geographic locations within the TMAA where the Navy will implement additional mitigation measures (i.e., geographic mitigation, in addition to procedural mitigation). The Navy completed an assessment of the TMAA to develop mitigation areas for the Proposed Action. The Navy reanalyzed existing mitigation areas implemented under the 2016 GOA Final SEIS/OEIS and assessed habitats suggested through comments received during NEPA scoping or identified internally by the Navy. The Navy will also assess mitigation recommendations received through public comments on this

SEIS/OEIS, and mitigation identified by regulatory agencies during the consultation and permitting processes. The Navy's initial biological effectiveness and operational assessments of mitigation areas developed for this SEIS/OEIS are presented in Section 5.4 (Geographic Mitigation to be Implemented).

Mitigation areas are designed to help avoid or reduce potential impacts in key areas of importance. Therefore, the mitigation benefit is discussed qualitatively in terms of the context of impact avoidance or reduction. The Navy considered a mitigation area to be effective if it meets the following criteria:

- **The mitigation area is a key area of biological or ecological importance:** The best available science suggests that the mitigation area is particularly important to one or more species or resources for a biologically important life process (e.g., foraging, migration, reproduction) or ecological function; and
- **The mitigation will result in an avoidance or reduction of impacts:** Implementing the mitigation will likely avoid or reduce potential impacts on (1) species, stocks, or populations of marine mammals based on data regarding their seasonality, density, and behavior; or (2) other biological resources based on their distribution and physical properties. Furthermore, implementing the mitigation will not shift or transfer adverse effects from one species to another (e.g., to a more vulnerable or sensitive species).

5.2.3 Practicality of Implementation

Mitigation measures are expected to have some degree of impact on the training activities that implement them (e.g., modifying where and when activities occur, ceasing an activity in response to a sighting). The Navy is able to accept a certain level of impact on its military readiness activities because of the benefit that mitigation measures provide for avoiding or reducing potential impacts on biological resources. The Navy's focus during mitigation assessment and development is that mitigation measures must meet the appropriate balance between being both effective as well as practical to implement. To evaluate practicality, the Navy operational community conducted an extensive and comprehensive assessment to determine how and to what degree potential mitigation measures would be compatible with planning, scheduling, and conducting training activities under the Proposed Action in order to meet the Navy's Title 10 requirements.

5.2.3.1 Assessment Criteria

The purpose and need of the Proposed Action is to ensure that the Navy meets its mission to maintain, train, and equip combat-ready naval forces capable of winning wars, deterring aggression, and maintaining freedom of the seas. The Navy is statutorily mandated to protect U.S. national security by being ready, at all times, to effectively prosecute war and defend the nation by conducting operations at sea, as outlined in Title 10 section 8062 of the United States Code. The Navy's mission is achieved in part by conducting training within the TMAA in accordance with established military readiness requirements. Training requirements have been developed through many years of iteration and adaptation and are designed to ensure that Sailors achieve the levels of readiness needed to properly respond to the multitude of contingencies they may face during military missions and combat operations. Activities are planned and scheduled in accordance with the Optimized Fleet Response Plan, which details instructions on manning distribution, range scheduling, operational requirements, maintenance and modernization plans, quality of work and life for personnel, achieving training capabilities, and meeting strategic readiness objectives.

To achieve the highest skill proficiency possible, the Navy conducts activities in a variety of realistic tactical oceanographic and environmental conditions. Such conditions include variations in bathymetry,

topography, surface fronts, and sea surface temperatures. Training activities must be as realistic as possible to provide the experiences and stressors necessary to successfully execute all required military missions and combat operations. Degraded training would result in units being unqualified to conduct the range of military operations required by operational Commanders. The inability of such Commanders to meet national security objectives would result in not only the increased risk to life, but also the degradation of national security.

As described in Chapter 2 (Description of Proposed Action and Alternatives), the Navy requires access to sea space and airspace throughout the TMAA, including large-scale open ocean areas of the high seas. Each area plays a critical role in the Navy's ability to plan, schedule, and effectively execute military readiness activities. The locations where training occur must be situated in a way that allows the Navy to complete its activities without physical or logistical obstructions. The Navy requires extensive sea space so that individual training activities can occur at sufficient distances so they do not interfere with one another. Some training activities require continuous access to large and unobstructed areas, consisting potentially of tens or thousands of square miles. This provides personnel the ability to develop competence and confidence in their capabilities across multiple types of weapons and sensors, and the ability to train to communicate and operate in a coordinated fashion as required during military missions and combat operations. For example, some training exercises may require large areas of the open ocean for realistic and safe anti-submarine warfare training. The Navy also requires large areas of sea space because it trains in a manner to avoid observation by potential adversaries. Modern sensing technologies make training on a large scale without observation more difficult. A foreign military's continual observation of U.S. Navy training in predictable geographic areas and timeframes would enable foreign nations to gather intelligence and subsequently develop techniques, tactics, and procedures to potentially and effectively counter U.S. naval operations. Other activities may be conducted on a smaller and more localized scale, with training at discrete locations that are critical to certain aspects of military readiness.

The locations for training activities are selected to maximize efficiency while supporting specific mission and safety requirements, deconflict sea space and airspace, and minimize the time personnel must spend away from home. Training locations are typically selected based on their proximity to homeports, home bases, associated training ranges, air squadrons, and existing infrastructure to reduce travel time and associated costs. Activities involving the use of rotary-wing aircraft typically occur in proximity to shore or refueling stations due to fuel restrictions and safety requirements.

During its assessment to determine how and to what degree the implementation of mitigation would be compatible with meeting the purpose and need of the Proposed Action, the Navy considered a mitigation measure to be practical to implement if it met all criteria discussed below:

- **Implementing the mitigation is safe:** Mitigation measures must not increase safety risks to Navy personnel and equipment, or to the public. When assessing whether implementing a mitigation measure would be safe, the Navy factored in the potential for increased pilot fatigue; accelerated fatigue-life of aircraft; typical fuel restrictions of participating aircraft; locations of refueling stations; proximity to aircraft emergency landing fields, critical medical facilities, and search and rescue resources; space restrictions of the observation platforms; the ability to de-conflict platforms and activities to ensure that training activities do not impact each other; and the ability to avoid interaction with non-Navy sea space and airspace uses, such as established commercial air traffic routes, commercial vessel shipping lanes, and areas used for energy exploration or alternative energy development. Other safety considerations included

identifying if mitigation measures would reasonably allow Lookouts to safely and effectively maintain situational awareness while observing the mitigation zones during typical activity conditions, or if the mitigation would increase the safety risk for personnel. For example, the safety risk would increase if Lookouts were required to direct their attention away from essential mission requirements.

- **Implementing the mitigation is sustainable:** One of the primary factors that the Navy incorporates into the planning and scheduling of its training activities is the amount and type of available resources, such as funding, personnel, and equipment. Mitigation measures must be sustainable over the life of the Proposed Action, meaning that they will not require the use of resources in excess of what is available. When assessing whether implementing a mitigation measure would be sustainable, the Navy considered if the measure would require excessive time on station or time away from homeport for Navy personnel, require the use of additional personnel (i.e., manpower) or equipment (e.g., adding a small boat to serve as an additional observation platform), or result in additional operational costs (e.g., increased fuel consumption, equipment maintenance, or acquisition of new equipment).
- **Implementing the mitigation allows the Navy to continue meeting its mission requirements:** The Navy considered if each individual measure and the iterative and cumulative impact of all potential measures would be within the Navy's legal authority to implement. The Navy also considered if mitigation would modify training activities in a way that would prevent individual activities from meeting their mission objectives and if mitigation would prevent the Navy from meeting its national security requirements or statutorily-mandated Title 10 requirements, such as by
    - impacting training realism or preventing ready access to ranges or training areas (which would reduce realism and present sea space and airspace conflicts);
    - impacting the ability for Sailors to train and become proficient in using sensors and weapon systems as would be required in areas analogous to where the military operates or causing an erosion of capabilities or reduction in perishable skills (which would result in a significant risk to personnel or equipment safety during military missions and combat operations);
    - impacting the ability for units to meet their individual training and certification requirements (which would impact the ability to deploy with the required level of readiness necessary to accomplish any tasking by Combatant Commanders);
    - impacting the ability to certify forces to deploy to meet national security tasking (which would limit the flexibility of Combatant Commanders and warfighters to project power, engage in multi-national operations, and conduct the full range of naval warfighting capabilities in support of national security interests);
    - requiring the Navy to provide advance notification of specific times and locations of Navy platforms, such as platforms using active sonar (which would present national security concerns); and
    - reducing the Navy's ability to be ready, maintain deployment schedules, or respond to national emergencies or emerging national security challenges (which would present national security concerns).

5.2.3.2 Factors Affecting Practicality

Two of the factors that influenced whether procedural mitigation measures met the practicality criteria were the number of times mitigation measures would likely be implemented and the duration over

which the activity would likely be ceased due to mitigation implementation. The number of times mitigation would likely be implemented is largely dependent on the size of the mitigation zone. As a mitigation zone size increases, the area of observation increases by an order of magnitude. This is because mitigation zones are measured as the radius (r) from a stressor but apply to circular area (A) around that stressor ($A = \pi * r^2$, where π is a constant that is approximately equal to 3.14). For example, a 100-yard (yd.) mitigation zone is equivalent to an area of 31,416 square yd. A 200 yd. mitigation zone is equivalent to an area of 125,664 square yd. Therefore, increasing a mitigation zone from 100 yd. to 200 yd. (i.e., doubling the mitigation zone radius) would quadruple the mitigation zone area (the area over which mitigation must be implemented). Similarly, increasing a mitigation zone from 1,000 yd. to 4,000 yd. (i.e., quadrupling the mitigation zone radius) would increase the mitigation zone area by a factor of 16. Increasing the area over which mitigation must be implemented consequently increases the number of times mitigation would likely be implemented during that activity.

The duration over which mitigation is implemented can differ considerably depending on the mitigation zone size, number of animal sightings, behavioral state of animals sighted (e.g., travelling at a fast pace on course to exit the mitigation zone, milling slowly in the center of the mitigation zone), and which pre-activity commencement or during-activity recommencement condition is met before the activity can commence or resume after each sighting. The duration of mitigation implementation typically equates to the amount of time the training activity will be extended. The impact that extending the length of an activity has on safety, sustainability, and the Navy's ability to accomplish the activity's intended objectives varies by activity. This is one reason why the Navy tailors its mitigation zone sizes and mitigation requirements by activity category or stressor and the platforms involved.

As described in Section 5.2.1 (Procedural Mitigation Development), the Navy will mitigate for each applicable sighting and will continue mitigating until one of five conditions has been met. In some instances, such as if an animal dives underwater after a sighting, it may not be possible for a Lookout to visually verify if the animal has exited the mitigation zone. The Navy cannot delay or cease activities indefinitely for the purpose of mitigation due to impacts on safety, sustainability, and the Navy's ability to continue meeting its mission requirements. To account for this, one of the pre-activity commencement and during-activity recommencement conditions is an established post-sighting wait period of 30 minutes or 10 minutes, based on the platforms involved. Wait periods are designed to allow animals the maximum amount of time practical to resurface (i.e., become available to be observed by a Lookout) before activities resume. When developing the length of its wait periods, the Navy factored in the assumption that mitigation may need to be implemented more than once. For example, an activity may need to be delayed or ceased for more than one 30-minute or 10-minute period.

The Navy assigns a 30-minute wait period to activities conducted from vessels and that involve aircraft that are not typically fuel constrained (e.g., maritime patrol aircraft). A 30-minute period covers the average dive times of most marine mammals and a portion of the dive times of sea turtles and deep-diving marine mammals (i.e., sperm whales, dwarf and pygmy sperm whales [Kogia whales], and beaked whales) (U.S. Department of the Navy, 2017b). The Navy determined that a 30-minute wait period is the maximum wait time that is practical to implement during activities involving vessels and aircraft that are not typically fuel constrained to allow the activities to continue meeting their intended objectives. Implementing a longer wait period (such as 45 minutes or 60 minutes to cover the average dive times of sea turtles and additional marine mammal species) would be impractical to implement. Activities are scheduled to occur at specific locations within specific timeframes based on range scheduling and for sea space deconfliction. Increasing the wait period, and consequently the amount of time activities

would need to be delayed or extended in order to accomplish their intended objectives, would impact activity realism or cause sea space conflicts in a way that could impact the Navy's ability to continue meeting its mission requirements. For example, delaying an explosive activity for multiple wait periods could result in personnel not being able to detonate an explosive before the participating platforms are required to depart the range due to range scheduling; therefore, the activity would not accomplish its intended objectives.

The Navy assigns a 10-minute wait period to activities involving aircraft that are typically fuel constrained (e.g., rotary-wing aircraft, fighter aircraft). A 10-minute period covers a portion, but not the average, dive times of marine mammals and sea turtles (U.S. Department of the Navy, 2017b). The Navy determined that a 10-minute wait period is the maximum wait time that is practical to implement during activities involving aircraft that are typically fuel constrained. Increasing the wait period, and consequently the amount of time the training activity would need to be extended in order to accomplish its intended objective, would require aircraft to depart the activity area to refuel in order to safely complete the event. If the wait period was implemented multiple times, the aircraft would be required to depart the activity area to refuel multiple times. Refueling events would vary in duration, depending on the activity location and proximity to the nearest refueling station. Multiple refueling events would generally be expected to extend the length of the activity by two to five times or more. This would impact activity realism, could cause air space or sea space conflicts in a way that could impact the Navy's ability to continue meeting its mission requirements, would decrease the ability for Lookouts to safely and effectively maintain situational awareness of the activity area, and would increase safety risks due to increased pilot fatigue and accelerated fatigue-life of aircraft. For example, delaying an Anti-Submarine Warfare Tracking Exercise – Helicopter activity for multiple wait periods could result in personnel not being able to effectively search for, detect, classify, localize, and track a simulated threat submarine before the rotary-wing aircraft is required to depart the range due to range scheduling; therefore, the activity would not accomplish its intended objectives.

Factors that influenced whether a mitigation area measure met the practicality criteria included the historical use and projected future use of geographic locations for training activities under the Proposed Action, and the relative importance of each location. The frequency that an area is used for training does not necessarily equate to that area's level of importance for meeting an individual activity objective, or collectively, the Navy's mission requirements. While frequently used areas can be essential to one or more types of military readiness activities, some infrequently used areas are critical for a particular training exercise.

5.3 Procedural Mitigation to be Implemented

The first procedural mitigation measure (Section 5.3.1, Environmental Awareness and Education) is designed to aid Lookouts and other personnel with observation, environmental compliance, and reporting responsibilities. The remaining procedural mitigation measures are organized by stressor type and training activity category.

5.3.1 Environmental Awareness and Education

The Navy will continue to implement procedural mitigation to provide environmental awareness and education to the appropriate personnel to aid visual observation, environmental compliance, and reporting responsibilities, as outlined in Table 5.3-1.

The Navy requires Lookouts and other personnel to complete their assigned environmental compliance responsibilities (e.g., mitigation, reporting requirements) before, during, and after training activities.

Marine Species Awareness Training was first developed in 2007 and has since undergone numerous updates to ensure that the content remains current, with the most recent product approved by NMFS and released by the Navy in 2014. In 2014, the Navy developed a series of educational training modules, known as the Afloat Environmental Compliance Training program, to ensure Navywide compliance with environmental requirements. The Afloat Environmental Compliance Training program, including the updated Marine Species Awareness Training, helps Navy personnel from the most junior Sailors to Commanding Officers gain a better understanding of their personal environmental compliance roles and responsibilities. Additional information on the Protective Measures Assessment Protocol is provided in Section 5.1.2.1 (Protective Measures Assessment Protocol), and additional information on training activity and incident reports is provided in Section 5.1.2.2 (Monitoring, Research, and Reporting Initiatives).

Table 5.3-1: Environmental Awareness and Education

Procedural Mitigation Description
Stressor or Activity • All training activities, as applicable
Resource Protection Focus • Marine mammals • Sea turtles • Birds
Mitigation Requirements • Appropriate personnel (including civilian personnel) involved in mitigation and training activity reporting under the Proposed Action will 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 the U.S. Navy Afloat Environmental Compliance Training Series.** The introductory module provides information on environmental laws (e.g., Endangered Species Act, Marine Mammal Protection Act) and the corresponding responsibilities that are relevant to Navy training activities. The material explains why environmental compliance is important in supporting the Navy's commitment to environmental stewardship. – **Marine Species Awareness Training.** All bridge watch personnel, Commanding Officers, Executive Officers, maritime patrol aircraft aircrews, anti-submarine warfare 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. – **U.S. Navy 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 software tool. – **U.S. Navy 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.

From an operational perspective, the interactive web-based format of the U.S. Navy Afloat Environmental Compliance Training Series is ideal for providing engaging and educational content that is cost effective and convenient to access by personnel who oftentimes face rotating job assignments. The U.S. Navy Afloat Environmental Compliance Training Series has resulted in an improvement in the quality and accuracy of training activity reports, incident reports, and Sonar Positional Reporting System reports submitted by Navy operators. Improved reporting quality indicates that the U.S. Navy Afloat Environmental Compliance Training Series is helping to facilitate Navywide environmental compliance as intended.

Lookouts and members of the operational community have demonstrated enhanced knowledge and understanding of the Navy's environmental compliance responsibilities since the development of the U.S. Navy Afloat Environmental Compliance Training Series. For example, it is likely that the implementation of the Marine Species Awareness Training starting in 2007, and the additional U.S. Navy Afloat Environmental Compliance Training Series modules starting in 2014, potentially helped contribute to a Navywide reduction in vessel strikes of marine mammals in areas where the Navy trains. This indicates that the environmental awareness and education program is helping to improve the effectiveness of mitigation implementation.

5.3.2 Acoustic Stressors

The Navy will implement procedural mitigation to avoid or reduce potential impacts on biological resources from the acoustic stressors discussed in the sections below. In addition to procedural mitigation, the Navy will implement mitigation for acoustic stressors within mitigation areas, as described in Section 5.4 (Geographic Mitigation to be Implemented).

5.3.2.1 Active Sonar

The Navy will continue to implement procedural mitigation to avoid or reduce potential impacts on marine mammals and sea turtles from active sonar, as outlined in Table 5.3-2. In the 2016 GOA Final SEIS/OEIS, the Navy's active sonar mitigation zones were based on associated average ranges to PTS for marine mammals. When developing this SEIS/OEIS, the Navy analyzed the potential for increasing the sizes of these mitigation zones. The Navy determined that the current mitigation zones for active sonar are the largest areas within which it is practical to implement mitigation; therefore, it will continue implementing these same mitigation zones under the Proposed Action. The Navy is clarifying in the table that it will require observation of the mitigation zone prior to the initial start of the activity to ensure the area is clear of applicable biological resources. The Navy has always verified that the mitigation zone is visually clear prior to conducting active sonar activities and is more clearly capturing this current practice in the mitigation measures for this activity. The Navy will follow the incident reporting procedures outlined in Section 5.1.2.2.3 (Incident Reports) if an incident is detected at any time during the event.

The mitigation zone sizes and proximity to the observation platforms will result in a high likelihood that Lookouts will be able to detect marine mammals and sea turtles throughout the mitigation zones. Observing for floating vegetation will further help avoid or reduce potential impacts on marine mammals and sea turtles within the mitigation zones.

Table 5.3-2: Procedural Mitigation for Active Sonar

Procedural Mitigation Description
Stressor or Activity • Mid-frequency active sonar and high-frequency active sonar – For vessel-based active sonar activities, mitigation applies only to sources that are positively controlled and deployed from manned surface vessels (e.g., sonar sources towed from manned surface platforms). – For aircraft-based active sonar activities, mitigation applies only to sources that are positively controlled and deployed from manned aircraft that do not operate at high altitudes (e.g., rotary-wing aircraft). Mitigation does not apply to active sonar sources deployed from unmanned aerial systems or aircraft operating at high altitudes (e.g., maritime patrol aircraft).
Resource Protection Focus • Marine mammals • Sea turtles (only for sources <2 kHz)
Number of Lookouts and Observation Platform • Hull-mounted sources: – 1 Lookout: Platforms with space or manning restrictions while underway (at the forward part of a small boat or ship) and platforms using active sonar while moored or at anchor – 2 Lookouts: Platforms without space or manning restrictions while underway (at the forward part of the ship) • Sources that are not hull-mounted: – 1 Lookout on the ship or aircraft conducting the activity
Mitigation Requirements • Mitigation zones: – 1,000 yd. power down, 500 yd. power down, and 200 yd. shut down for hull-mounted mid-frequency active sonar – 200 yd. shut down for mid-frequency active sonar sources that are not hull-mounted and high-frequency active sonar • Prior to the initial start of the activity (e.g., when maneuvering on station): – Observe the mitigation zone for floating vegetation; if observed, relocate or delay the start until the mitigation zone is clear. – Observe the mitigation zone for marine mammals and sea turtles; if observed, relocate or delay the start of active sonar transmission. • During the activity: – Hull-mounted mid-frequency active sonar: Observe the mitigation zone for marine mammals and sea turtles (for sources <2 kHz); power down active sonar transmission by 6 dB if a marine mammal or sea turtle is observed within 1,000 yd. of the sonar source; power down an additional 4 dB (10 dB total) if a marine mammal or sea turtle is observed within 500 yd.; cease transmission if a marine mammal or sea turtle is observed within 200 yd. – Mid-frequency active sonar sources that are not hull-mounted and high-frequency active sonar: Observe the mitigation zone for marine mammals and sea turtles (for sources <2 kHz); cease transmission if a marine mammal or sea turtle is observed within 200 yd. of the sonar source. • Commencement/recommencement conditions after a marine mammal or sea turtle sighting before or during the activity: – The Navy will allow a sighted marine mammal or sea turtle to leave the mitigation zone 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) until one of the following conditions has been met: (1) the animal is observed exiting the mitigation zone; (2) the animal is thought to have exited the mitigation zone based on a determination of its course, speed, and movement relative to the sonar source; (3) the mitigation zone has been clear from any additional sightings for 10 minutes for aircraft-deployed sonar sources or 30 minutes for vessel-deployed sonar sources; (4) for mobile activities, the active sonar source has transited a distance equal to double that of the mitigation zone size beyond the location of the last sighting; or (5) for activities using hull-mounted sonar, the Lookout concludes that dolphins are deliberately closing in on the ship to ride the ship's bow wave, and are therefore out of the main transmission axis of the sonar (and there are no other marine mammal sightings within the mitigation zone).

Section 3.8.3.1.2 (Impacts from Sonar and Other Transducers) of this SEIS/OEIS provides a full analysis of the potential impacts of sonar on marine mammals and includes the impact ranges for various source bins. For all active sonar sources used under the Proposed Action, bin MF1 has the longest predicted ranges to PTS. For the highest source level in bin MF1, the 1,000 yd. and 500 yd. power down mitigation zones and 200 yd. shut down mitigation zone extend beyond the average ranges to PTS for marine mammals. The ranges to PTS for the 200 yd. shut down mitigation zone were calculated based on full power transmissions and do not consider that the impact ranges would be reduced if the 1,000 yd. and 500 yd. power down mitigation measures are implemented in response to a marine mammal sighting in those mitigation zones. If an animal is first sighted in the 1,000 yd. or 500 yd. power down mitigation zone, the source level reduction would shorten the ranges to PTS, and the 200 yd. shut down mitigation would then extend even further beyond the average ranges to PTS for all marine mammal hearing groups. The active sonar mitigation zones also extend beyond the average ranges to TTS for Otariids and into a portion of the average ranges to TTS for all other marine mammal hearing groups; therefore, mitigation will help avoid or reduce the potential for some exposure to higher levels of TTS. Active sonar sources that fall within lower source bins or are used at lower source levels have shorter impact ranges than those discussed above; therefore, the mitigation zones will extend further beyond or into the average ranges to PTS and TTS for these sources. The 30-minute wait period for vessel-deployed sources will cover the average dive times of most marine mammal species that occur in the TMAA, and a portion of the dive times of deep-diving species (e.g., sperm whales). The 10-minute wait period for aircraft-deployed sources will cover a portion, but not the average, of the dive times of marine mammals.

Due to sea turtle hearing capabilities, the mitigation only applies to sea turtles during the use of sources below 2 kilohertz. The range to auditory effects for most active sonar sources in sea turtle hearing range is zero meters. Impact ranges are longer (i.e., up to tens of meters) for active sonars with higher source levels. The mitigation zones for active sonar extend beyond the ranges to PTS and TTS for sea turtles; therefore, mitigation will help avoid or reduce the potential for exposure to these effects for sea turtles.

The Navy currently uses, and will continue to use, computer simulation to augment training whenever possible. Simulators and synthetic training are critical elements that provide early skill repetition and enhance teamwork; however, they cannot replicate the complexity and stresses faced by Sailors during military missions and combat operations to which the Navy trains under the Proposed Action (e.g., anti-submarine warfare training using hull-mounted mid-frequency active sonar). Training with active sonar is essential to national security. Active sonar is the only reliable technology for detecting and tracking potential enemy diesel-electric submarines. The ability to effectively operate active sonar is a highly perishable skill that must be repeatedly practiced during realistic training. Naval forces must train in the same mode and manner in which they conduct military missions and combat operations. Anti-submarine warfare training typically involves the periodic use of active sonar to develop the "tactical picture," or an understanding of the battle space (e.g., area searched or unsearched, identifying false contacts, and understanding the water conditions). This can take from several hours to multiple days and typically occurs over vast areas with varying physical and oceanographic conditions (e.g., bathymetry, topography, surface fronts, and variations in sea surface temperature). Sonar operators train to avoid or reduce interference and sound-reducing clutter from varying ocean floor topographies and environmental conditions, practice coordinating their efforts with other sonar operators in a strike group, develop skill proficiency in detecting and tracking submarines and other threats, and practice the focused endurance vital to effectively working as a team in shifts around the clock until the conclusion of the event.

As described previously, the mitigation zones developed for this SEIS/OEIS are based on the largest areas within which it is practical for the Navy to implement mitigation during training within the TMAA. Increasing the mitigation zone sizes would result in a larger area over which active sonar would need to be powered down or shut down in response to a sighting, and therefore would likely increase the number of times that these mitigation measures would be implemented. This would extend the length of the activity, significantly diminish event realism, and prevent activities from meeting their intended objectives. It would also create fundamental differences between how active sonar would be used in training and how active sonar should be used during military missions and combat operations. For example, additional active sonar power downs or shut downs would prevent sonar operators from developing and maintaining awareness of the tactical picture during training events. Without realistic training in conditions analogous to military missions and combat operations, sonar operators cannot become proficient in effectively operating active sonar. Sonar operators, vessel crews, and aircrews would be expected to operate active sonar during military missions and combat operations in a manner inconsistent with how they were trained.

During integrated training, multiple vessels and aircraft may participate in an exercise using different warfare components simultaneously. Degrading the value of one training element results in a degradation of the training value of the other training elements. Degrading the value of training would cause a reduction in perishable skills and diminished operational capability, which would significantly impact military readiness. Each of these factors would ultimately impact the ability for units to meet their individual training and certification requirements and the Navy's ability to certify forces to safely deploy to meet national security tasking. Diminishing proficiency or eroding active sonar capabilities would present a significant risk to personnel safety during military missions and combat operations and would impact the ability to deploy with the required level of readiness necessary to accomplish any tasking by Combatant Commanders.

For activities that involve aircraft (e.g., activities involving rotary-wing aircraft that use dipping sonar or sonobuoys to locate submarines or submarine targets), extending the length of the activity would require aircraft to depart the area to refuel. If multiple refueling events were required, the length of the activity would be extended by two to five times or more, which would decrease the ability for Lookouts to safely and effectively maintain situational awareness of the activity area and increase safety risks due to increased pilot fatigue and accelerated fatigue-life of aircraft. Extending the length of the activity would also result in additional operational costs due to increased fuel consumption. Increasing the mitigation zone sizes would not result in a substantial reduction of injurious impacts because, as described above, the mitigation zones extend beyond the average ranges to PTS for sea turtles and marine mammals.

In summary, the operational community determined that implementing procedural mitigation for active sonar beyond what is detailed in Table 5.3-2 would be incompatible with the practicality assessment criteria for safety, sustainability, and mission requirements.

5.3.2.2 Weapon Firing Noise

The Navy will continue to implement procedural mitigation to avoid or reduce potential impacts from weapon firing noise, as outlined in Table 5.3-3.

Table 5.3-3: Procedural Mitigation for Weapon Firing Noise

Procedural Mitigation Description
Stressor or Activity • Weapon firing noise associated with large-caliber gunnery activities
Resource Protection Focus • Marine mammals • Sea turtles • Seabirds (short-tailed albatross)
Number of Lookouts and Observation Platform • 1 Lookout positioned on the ship conducting the firing – Depending on the activity, the Lookout could be the same one described in Section 5.3.3.1 (Explosive Large-Caliber Projectiles) or Section 5.3.4.3 (Small-, Medium-, and Large-Caliber Non-Explosive Practice Munitions)
Mitigation Requirements • Mitigation zone: – 30° on either side of the firing line out to 70 yd. from the muzzle of the weapon being fired • Prior to the initial start of the activity: – Observe the mitigation zone for floating vegetation; if observed, relocate or delay the start until the mitigation zone is clear. – Observe the mitigation zone for marine mammals, sea turtles, and seabirds; if observed, relocate or delay the start of weapon firing. • During the activity: – Observe the mitigation zone for marine mammals, sea turtles, and seabirds; if observed, cease weapon firing. • Commencement/recommencement conditions after a marine mammal, sea turtle, or seabird sighting before or during the activity: – The Navy will allow a sighted marine mammal, sea turtle, or seabird to leave the mitigation zone prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing weapon firing) until one of the following conditions has been met: (1) the animal is observed exiting the mitigation zone; (2) the animal is thought to have exited the mitigation zone based on a determination of its course, speed, and movement relative to the firing ship; (3) the mitigation zone has been clear from any additional sightings for 30 minutes; or (4) for mobile activities, the firing ship has transited a distance equal to double that of the mitigation zone size beyond the location of the last sighting.

In the 2016 GOA Final SEIS/OEIS, the weapon firing noise mitigation zone for marine mammals and sea turtles was based on the associated average ranges to PTS. When developing this SEIS/OEIS, the Navy analyzed the potential for increasing mitigation for this stressor. The Navy determined that the current mitigation zone is the largest area within which it is practical to implement mitigation for this activity; therefore, it will continue implementing the same mitigation zone size under the Proposed Action. The Navy identified an opportunity to develop new weapon firing noise mitigation for seabirds in the TMAA. The Navy will implement a weapon firing noise mitigation zone for seabirds consistent with the mitigation zone used for similar activities in the Northwest Training and Testing SEIS/OEIS to enhance protection of the ESA-listed short-albatross under the Proposed Action.

The Navy is clarifying in the table that it will require observation of the mitigation zone prior to the initial start of the activity to ensure the area is clear of applicable biological resources. The Navy has always verified that the mitigation zone is visually clear prior to conducting weapon firing activities and is more clearly capturing this current practice in the mitigation measures for this activity. The Navy will follow the incident reporting procedures outlined in Section 5.1.2.2.3 (Incident Reports) if an incident is detected at any time during the event.

The small mitigation zone size and proximity to the observation platform will result in a high likelihood that Lookouts will be able to detect marine mammals, sea turtles, and seabirds throughout the

mitigation zone. Section 3.9.3.1.5 (Impacts from Weapon Noise) provides a full analysis of the potential impacts of weapon noise on birds. Due to the difficulty of differentiating bird species, the Navy will implement mitigation for all seabird species for weapon noise during large-caliber weapon firing. Although there is a low likelihood that short-tailed albatross will occur in locations where the Navy conducts large-caliber gunnery activities, the mitigation will help the Navy further avoid or reduce potential impacts (e.g., startle response) on ESA-listed birds and other seabird species that occur in the TMAA.

Section 3.8.3.1.5 (Impacts from Weapon Noise) of this SEIS/OEIS and Section 3.7.2.2 (Approach to Analysis) of the 2011 GOA Final SEIS/OEIS provide an analysis of the potential impacts of weapon noise on marine mammals and sea turtles, respectively. Underwater sounds from large-caliber weapon firing activities would be strongest just below the surface and directly under the firing point. Any sound that enters the water only does so within a narrow cone below the firing point or path of the projectile. The mitigation zone extends beyond the distance to which marine mammals and sea turtles would likely experience PTS or TTS from weapon firing noise; therefore, mitigation will help avoid or reduce the potential for exposure to these impacts. Observing for floating vegetation will further help avoid or reduce potential impacts on marine mammals and sea turtles within the mitigation zone.

As described previously, the mitigation zone developed for this SEIS/OEIS is based on the largest area within which it is practical for the Navy to implement mitigation for this activity. Increasing the mitigation zone would result in a larger area over which weapon firing would need to be ceased in response to a sighting, and therefore would likely increase the number of times weapon firing would be ceased. However, increasing the mitigation zone size would not result in a substantial reduction of injurious impacts because the mitigation zone extends beyond the average ranges to PTS for sea turtles and marine mammals.

Large-caliber gunnery training activities may involve a single ship firing or may be conducted as part of a larger exercise involving multiple ships. Surface ship crews learn to track targets (e.g., with radar), engage targets, practice defensive marksmanship, and coordinate their efforts within the context of larger activities. Increasing the number of times that the Navy must cease weapon firing during training would decrease realism and impact the ability for Navy Sailors to train and become proficient in using large-caliber guns as required during military missions and combat operations. For example, additional ceasing of the activity would reduce the crew's ability to react to changes in the tactical situation or respond to an incoming threat, which could result in a delay to the ship's training schedule. When training is undertaken in the context of a coordinated exercise involving multiple ships, degrading the value of one of the training elements results in a degradation of the training value of the other training elements. These factors would ultimately impact the ability for units to meet their individual training and certification requirements, and the Navy's ability to certify forces to deploy to meet national security tasking.

In summary, the operational community determined that implementing procedural mitigation for weapon firing noise beyond what is detailed in Table 5.3-3 would be incompatible with the practicality assessment criteria for safety and mission requirements.

5.3.3 Explosive Stressors

The Navy will implement procedural mitigation to avoid or reduce potential impacts on biological resources from the explosives discussed in the sections below. Section 3.8.3.2 (Explosive Stressors) of this SEIS/OEIS, Section 3.7.2.2 (Explosive Stressors) of the 2011 GOA Final SEIS/OEIS, and Section 3.9.3.2

(Explosive Stressors) provide a full analysis of the potential impacts of explosives on marine mammals, sea turtles, and seabirds, respectively, including predicted impact ranges. In addition to procedural mitigation, the Navy will implement mitigation for explosives within mitigation areas, as described in Section 5.4 (Geographic Mitigation to be Implemented).

5.3.3.1 Explosive Medium-Caliber and Large-Caliber Projectiles

The Navy will continue to implement procedural mitigation to avoid or reduce potential impacts from explosive gunnery activities, as outlined in Table 5.3-4. In the 2016 GOA Final SEIS/OEIS, explosive gunnery activity mitigation zones for marine mammals and sea turtles were based on net explosive weight and the associate average ranges to PTS. When developing this SEIS/OEIS, the Navy analyzed the potential for increasing the size of these mitigation zones. The Navy identified an opportunity to increase the marine mammal and sea turtle mitigation zone sizes by 400 yd. for surface-to-surface activities to enhance protections to the maximum extent practicable. These increases are reflected in Table 5.3-4. The marine mammal and sea turtle mitigation zones for explosive medium-caliber and large-caliber projectiles are now based on the largest areas within which it is practical to implement mitigation.

The Navy also identified an opportunity to develop new mitigation for seabirds during explosive medium-caliber gunnery activities. The Navy will implement a 200 yd. mitigation zone for seabirds, consistent with the mitigation zone developed with USFWS guidance for similar activities in the Northwest Training and Testing SEIS/OEIS to enhance protection of the ESA-listed short-albatross under the Proposed Action. Due to the difficulty of differentiating bird species, the Navy will implement mitigation for all seabird species during explosive medium-caliber weapon firing. Although there is a low likelihood that short-tailed albatross will be exposed to explosive medium-caliber gunnery activities in the TMAA, the mitigation will help the Navy further avoid or reduce potential impacts on this ESA-listed bird species, as well as other seabird species that occur in the TMAA. The Navy will not implement mitigation for seabirds during explosive large-caliber gunnery events because Lookouts would not be effective at detecting seabirds from the distant firing location, even with the use of high-powered binoculars.

The Navy is clarifying in the table that it will require observation of the mitigation zone prior to the initial start of the activity to ensure the area is clear of applicable biological resources. The Navy has always verified that the mitigation zone is visually clear prior to conducting explosive activities and is more clearly capturing this current practice in the mitigation measures for this activity. The Navy developed a new mitigation measure requiring the Lookout to observe the mitigation zone after completion of the activity. In accordance with the 2016 GOA Final SEIS/OEIS consultation requirements, the Navy currently conducts post-activity observations for some, but not all explosive activities. When developing this SEIS/OEIS, the Navy determined that it could expand this requirement to other explosive activities for enhanced consistency and to help determine if any resources were injured during explosive events, when practical. The Navy is also adding a requirement that additional platforms already participating in the activity will support observing the mitigation zone before, during, and after the activity while performing their regular duties. When available, having additional personnel support observations of the mitigation zone will help increase the likelihood of detecting biological resources. The Navy will follow the incident reporting procedures outlined in Section 5.1.2.2.3 (Incident Reports) if an incident is detected at any time during the event, including during the post-activity observations.

Table 5.3-4: Procedural Mitigation for Explosive Medium-Caliber and Large-Caliber Projectiles

Procedural Mitigation Description
Stressor or Activity • Gunnery activities using explosive medium-caliber and large-caliber projectiles – Mitigation applies to activities using a surface target
Resource Protection Focus • Marine mammals • Sea turtles • Seabirds (short-tailed albatross)
Number of Lookouts and Observation Platform • 1 Lookout on the vessel or aircraft conducting the activity – For activities using explosive large-caliber projectiles, depending on the activity, the Lookout could be the same as the one described in Section 5.3.2.2 (Weapon Firing Noise) • If additional platforms are participating in the activity, personnel positioned in those assets (e.g., safety observers, evaluators) will support observing the mitigation zone for applicable biological resources while performing their regular duties.
Mitigation Requirements • Mitigation zones: – 200 yd. (for seabirds, marine mammals, and sea turtles) around the intended impact location for air-to-surface activities using explosive medium-caliber projectiles – 200 yd. (for seabirds) and 600 yd. (for marine mammals and sea turtles) around the intended impact location for surface-to-surface activities using explosive medium-caliber projectiles – 1,000 yd. (for marine mammals and sea turtles) around the intended impact location for surface-to-surface activities using explosive large-caliber projectiles • Prior to the initial start of the activity (e.g., when maneuvering on station): – Observe the mitigation zone for floating vegetation; if observed, relocate or delay the start until the mitigation zone is clear. – Observe the mitigation zone for marine mammals, sea turtles, and seabirds (as applicable); if observed, relocate or delay the start of firing. • During the activity: – Observe the mitigation zone for marine mammals, sea turtles, and seabirds (as applicable); if observed, cease firing. • Commencement/recommencement conditions after a marine mammal, sea turtle, or seabird sighting (as applicable) before or during the activity: – The Navy will allow a sighted marine mammal, sea turtle, or seabird to leave the mitigation zone prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing firing) until one of the following conditions has been met: (1) the animal is observed exiting the mitigation zone; (2) the animal is thought to have exited the mitigation zone based on a determination of its course, speed, and movement relative to the intended impact location; (3) the mitigation zone has been clear from any additional sightings for 10 min. for aircraft-based firing or 30 minutes for vessel-based firing; or (4) for activities using mobile targets, the intended impact location has transited a distance equal to double that of the mitigation zone size beyond the location of the last sighting. • After completion of the activity (e.g., prior to maneuvering off station): – When practical (e.g., when platforms are not constrained by fuel restrictions or mission-essential follow-on commitments), observe the vicinity of where detonations occurred; if any injured or dead marine mammals or Endangered Species Act-listed species are observed, follow established incident reporting procedures. – If additional platforms are supporting this activity (e.g., providing range clearance), these assets will assist in the visual observation of the area where detonations occurred.

Large-caliber gunnery activities involve vessels firing projectiles at targets located up to 6 nautical miles (NM) down range. Medium-caliber gunnery activities involve vessels or aircraft firing projectiles at targets located up to 4,000 yd. down range, although typically much closer. As described in Section 5.2.1 (Procedural Mitigation Development), certain platforms, such as the small boats and aircraft used during

explosive medium-caliber gunnery exercises, have manning or space restrictions; therefore, the Lookout for these activities is typically an existing member of the aircraft or boat crew who is responsible for other essential tasks (e.g., navigation). Due to their relatively lower vantage point, Lookouts on vessels (during medium-caliber or large-caliber gunnery exercises) will be more likely to detect large visual cues (e.g., whale blows, breaching whales) than individual marine mammals, cryptic marine mammal species, and sea turtles when observing around targets located at the furthest firing distances. The Navy will implement larger mitigation zones for large-caliber gunnery activities than for medium-caliber gunnery activities due to the nature of how the activities are conducted. For example, large-caliber gunnery activities are conducted from surface combatants, so Lookouts can observe a larger mitigation zone because they typically have access to high-powered binoculars mounted on the ship deck. This will enable observation of the distant mitigation zone in combination with hand-held binoculars and naked-eye scanning. Lookouts in aircraft (during medium-caliber gunnery exercises), have a relatively higher vantage point for observing the mitigation zones but will still be more likely to detect individual marine mammals and sea turtles when observing mitigation zones located close to the firing platform than at the furthest firing distances.

The mitigation applies only to activities using surface targets. Most airborne targets are recoverable aerial drones that are not intended to be hit by ordnance. Given the speed of the projectiles and mobile target, and the long ranges that projectiles typically travel, it is not possible to definitively predict or to effectively observe where the projectile fragments will fall. For gunnery activities using explosive medium-caliber and large-caliber projectiles, the potential military expended material fall zone can only be predicted within thousands of yards, which can be up to 6 NM from the firing location. These areas are too large to be effectively observed for marine species with the number of personnel and platforms available for this activity. The potential risk to marine mammals and sea turtles during events using airborne targets is limited to the animal being directly struck by falling military expended materials. There is no potential for direct impact from the explosives because the detonations occur in air. Based on the extremely low potential for projectile fragments to co-occur in space and time with a marine mammal or sea turtle at or near the surface of the water, the potential for a direct strike is negligible; therefore, mitigation for gunnery activities using airborne targets would not be effective at avoiding or reducing potential impacts on marine mammals and sea turtles.

Bin E5 (e.g., 5 in. large-caliber projectiles) has the longest predicted impact ranges for explosive projectiles used in the TMAA. The 1,000 yd. and 600 yd. mitigation zones extend beyond the ranges to 50 percent non-auditory injury and 50 percent mortality for sea turtles and marine mammals for bin E5. The mitigation zones extend into a portion of the average ranges to PTS for high-frequency cetaceans and beyond the average ranges to PTS for sea turtles and other marine mammal hearing groups for bin E5. The mitigation zones also extend beyond or into a portion of the average ranges to TTS for sea turtles and marine mammals. Therefore, depending on the species, mitigation will help avoid or reduce all or a portion of the potential for exposure to mortality, non-auditory injury, PTS, and higher levels of TTS for the largest explosives in bin E5. Explosives in smaller source bins (e.g., 40-millimeter medium-caliber projectiles in Bin E2) have shorter predicted impact ranges; therefore, the mitigation zones will extend further beyond or cover a greater portion of the impact ranges for these explosives.

As described previously, the mitigation zones developed for this SEIS/OEIS are based on the largest areas within which it is practical for the Navy to implement mitigation for marine mammals and sea turtles. It is not practical to increase these mitigation zones because observations within the margin of increase would be unsafe and ineffective. One of the mission-essential safety protocols for explosive

gunnery activities is a requirement for event participants (including the Lookout) to maintain focus on the activity area to ensure safety of Navy personnel and equipment, and the public. For example, when air-to-surface medium-caliber gunnery exercises involve fighter aircraft descending on a target, or rotary-wing aircraft flying a racetrack pattern and descending on a target using a forward-tilted firing angle, maintaining attention on the activity area is paramount to aircraft safety. The typical activity areas for medium-caliber and large-caliber gunnery activities coincide with the applicable mitigation zones; therefore, the Lookout can safely and effectively observe the mitigation zones for biological resources while simultaneously maintaining focus on the activity area. However, if the mitigation zone sizes increased, the Lookout would need to redirect attention to observe beyond the activity area. This would not meet the safety criteria since personnel would be required to direct attention away from mission requirements. Alternatively, the Navy would need to add personnel to serve as additional Lookouts on the existing observation platforms or allocate additional platforms to the activity to observe for biological resources. These actions would not be safe or sustainable due to an exceedance of manpower, resource, and space restrictions for these activities. Similarly, positioning platforms closer to the intended impact location would increase safety risks related to proximity to the detonation location and path of the explosive projectile.

Increasing the mitigation zone sizes would result in larger areas over which detonations would need to be ceased in response to a sighting, and therefore would likely increase the number of times firing would be ceased and would extend the length of the activity. These impacts would significantly diminish event realism in a way that would prevent activities from meeting their intended objectives. For example, the Navy must train its gun crews to coordinate with other participating platforms (e.g., small boats launching a target, other firing platforms), locate and engage surface targets (e.g., high speed maneuverable surface targets), and practice precise defensive marksmanship to disable threats.

Depending on the type of target being used, additional stopping of the activity could result in the target needing to be recovered and relaunched, which would cause a significant loss of training time. For activities that involve aircraft, extending the length of the activity would require aircraft to depart the area to refuel. If multiple refueling events were required, the length of the activity would be extended by two to five times or more, which would decrease the ability for Lookouts to safely and effectively maintain situational awareness of the activity area and increase safety risks due to increased pilot fatigue and accelerated fatigue-life of aircraft. These types of impacts would reduce the number of opportunities that gun crews have to fire on the target and cause significant delays to the training schedule. Therefore, an increase in mitigation would impede the ability for gun crews to train and become proficient in using their weapons as required during military missions and combat operations and would prevent units from meeting their individual training and certification requirements (which would prevent them from deploying with the required level of readiness necessary to accomplish their missions). Extending the length of the activity would also result in additional operational costs due to increased fuel consumption.

In summary, the operational community determined that implementing procedural mitigation for explosive medium-caliber and large-caliber projectiles beyond what is detailed in Table 5.3-4 would be incompatible with the practicality assessment criteria for safety, sustainability, and mission requirements.

5.3.3.2 Explosive Bombs

The Navy will continue to implement procedural mitigation to avoid or reduce potential impacts on marine mammals and sea turtles from explosive bombs, as outlined in Table 5.3-5.

Table 5.3-5: Procedural Mitigation for Explosive Bombs

Procedural Mitigation Description
Stressor or Activity • Explosive bombs
Resource Protection Focus • Marine mammals • Sea turtles
Number of Lookouts and Observation Platform • 1 Lookout positioned in the aircraft conducting the activity • If additional platforms are participating in the activity, personnel positioned in those assets (e.g., safety observers, evaluators) will support observing the mitigation zone for applicable biological resources while performing their regular duties.
Mitigation Requirements • Mitigation zone: – 2,500 yd. around the intended target • Prior to the initial start of the activity (e.g., when arriving on station): – Observe the mitigation zone for floating vegetation; if observed, relocate or delay the start until the mitigation zone is clear. – Observe the mitigation zone for marine mammals and sea turtles; if observed, relocate or delay the start of bomb deployment. • During the activity (e.g., during target approach): – Observe the mitigation zone for marine mammals and sea turtles; if observed, cease bomb deployment. • Commencement/recommencement conditions after a marine mammal or sea turtle sighting before or during the activity: – The Navy will allow a sighted marine mammal or sea turtle to leave the mitigation zone prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing bomb deployment) until one of the following conditions has been met: (1) the animal is observed exiting the mitigation zone; (2) the animal is thought to have exited the mitigation zone based on a determination of its course, speed, and movement relative to the intended target; (3) the mitigation zone has been clear from any additional sightings for 10 minutes; or (4) for activities using mobile targets, the intended target has transited a distance equal to double that of the mitigation zone size beyond the location of the last sighting. • After completion of the activity (e.g., prior to maneuvering off station): – When practical (e.g., when platforms are not constrained by fuel restrictions or mission-essential follow-on commitments), observe the vicinity of where detonations occurred; if any injured or dead marine mammals or ESA-listed species are observed, follow established incident reporting procedures. – If additional platforms are supporting this activity (e.g., providing range clearance), these assets will assist in the visual observation of the area where detonations occurred.

In the 2016 GOA Final SEIS/OEIS, the explosive bombing mitigation zone was based on net explosive weight and the associated average ranges to PTS for marine mammals. When developing this SEIS/OEIS, the Navy analyzed the potential for increasing the size of this mitigation zone. The Navy determined that the current mitigation zone for explosive bombs is the largest area within which it is practical to implement mitigation for this activity; therefore, it will continue implementing this same mitigation zone under the Proposed Action.

The Navy is clarifying in the table that it will require observation of the mitigation zone prior to the initial start of the activity to ensure the area is clear of applicable biological resources. The Navy has always verified that the mitigation zone is visually clear prior to conducting explosive activities and is more clearly capturing this current practice in the mitigation measures for this activity. The Navy developed a new mitigation measure requiring the Lookout to observe the mitigation zone after completion of this activity. In accordance with the 2016 GOA Final SEIS/OEIS consultation requirements, the Navy currently

conducts post-activity observations for some, but not all explosive activities. When developing this SEIS/OEIS, the Navy determined that it could expand this requirement to other explosive activities for enhanced consistency and to help determine if any resources were injured during explosive events, when practical. The Navy is also adding a requirement that additional platforms already participating in the activity will support observing the mitigation zone before, during, and after the activity while performing their regular duties. Typically, when aircraft are firing explosive munitions there are additional observation aircraft, multiple aircraft firing munitions, or other safety aircraft in the vicinity. When available, having additional personnel support observations of the mitigation zone will help increase the likelihood of detecting biological resources. The Navy will follow the incident reporting procedures outlined in Section 5.1.2.2.3 (Incident Reports) if an incident is detected at any time during the event, including during the post-activity observations.

Bombing exercises involve an aircraft deploying munitions at a surface target located beneath the firing platform. During target approach, aircraft maintain a relatively steady altitude of approximately 1,500 ft. Lookouts, by necessity for safety and mission success, primarily focus their attention on the water surface surrounding the intended detonation location (i.e., the mitigation zone). Being positioned in an aircraft gives the Lookout a good vantage point for observing marine mammals and sea turtles throughout the mitigation zone. Observing for floating vegetation will further help avoid or reduce potential impacts on marine mammals and sea turtles within the mitigation zone.

Bin E12 (e.g., 2,000-pound bomb) has the longest predicted impact ranges for explosive bombs used in the TMAA. The 2,500 yd. mitigation zone extends beyond the ranges to 50 percent non-auditory injury and 50 percent mortality for sea turtles and marine mammals. The mitigation zone extends into a portion of the average range to PTS for high-frequency cetaceans and beyond the average ranges to PTS for other marine mammal hearing groups and sea turtles. The mitigation zone also extends beyond or into a portion of the average ranges to TTS for marine mammals and sea turtles. Therefore, depending on the species, mitigation will help avoid or reduce all or a portion of the potential for exposure to mortality, non-auditory injury, PTS, and higher levels of TTS for the largest bombs in bin E12. Smaller bombs in bin E12 have shorter predicted impact ranges; therefore, the mitigation zone will extend further beyond or cover a greater portion of the impact ranges for these explosives.

As described previously, the mitigation zone developed for this SEIS/OEIS is based on the largest area within which it is practical for the Navy to implement mitigation. It is not practical to increase this mitigation zone because observations within the margin of increase would be unsafe and ineffective unless the Navy allocated additional platforms to the activity to observe for biological resources. The use of additional personnel and aircraft would be unsustainable due to increased operational costs and an exceedance of the available manpower and resources for this activity. Adding aircraft to observe the mitigation zone could result in airspace conflicts with the event participants. This would either require the aircraft participating in the activity to modify their flight plans (which would reduce activity realism) or force the observing aircraft to position itself a safe distance away from the activity area (which would decrease observation effectiveness). Adding vessels to observe the mitigation zone would increase safety risks due to the presence of observation vessels within the vicinity of the intended explosive bomb detonation location.

Increasing the mitigation zone would result in a larger area over which explosive bomb deployment would need to be ceased in response to a sighting, and therefore would likely increase the number of times explosive bombing activities would be ceased and would extend the length of the activity. These impacts would significantly diminish event realism in a way that would prevent the activity from meeting

its intended objectives. For example, critical components of a Bombing Exercise Air-to-Surface training activity are the assembly, loading, delivery, and assessment of an explosive bomb. The activity requires focused situational awareness of the activity area and continuous coordination between multiple training components. The training exercise starts with ground personnel, who must practice the building and loading of explosive munitions. Training includes the safe handling of explosive material, configuring munitions to precise specifications, and loading munitions onto aircraft. Aircrew must then identify a target and safely deliver fused munitions, discern if the bomb was assembled correctly, and determine bomb damage assessments based on how and where the explosive detonated. Extending the length of the activity would require aircraft to depart the area to refuel. If the firing aircraft departed the activity area to refuel, aircrew would lose the ability to maintain situational awareness of the activity area, effectively coordinate with other participating platforms, and complete all training components as required during military missions and combat operations. If multiple refueling events were required, the activity length would be extended by two to five times or more, which would cause a significant loss of training time and would increase safety risks due to increased pilot fatigue and accelerated fatigue-life of aircraft. This would reduce the number of opportunities that aircrews have to approach targets and deploy bombs, which would cause a significant delay to the training schedule. Therefore, an increase in mitigation would impede the ability for aircrews to train and become proficient in using their weapons. This would prevent units from meeting their individual training and certification requirements and deploying with the required level of readiness necessary to accomplish their missions. Extending the length of the activity would also result in additional operational costs due to increased fuel consumption.

In summary, the operational community determined that implementing procedural mitigation for explosive bombs beyond what is detailed in Table 5.3-5 would be incompatible with the practicality assessment criteria for safety, sustainability, and mission requirements.

5.3.4 Physical Disturbance and Strike Stressors

The Navy will implement procedural mitigation to avoid or reduce potential impacts on biological resources from the physical disturbance and strike stressors or activities discussed in the sections below. Section 3.8.2.2 (Approach to Analysis), Section 3.7.2.2 (Approach to Analysis), and Section 3.9.2.3 (Approach to Analysis) of the 2011 GOA Final EIS/OEIS (U.S. Department of the Navy, 2011) provide analyses of the potential impacts of physical disturbance and strikes on marine mammals, sea turtles, and seabirds, respectively.

5.3.4.1 Vessel Movement

The Navy will continue to implement procedural mitigation to avoid or reduce the potential for vessel strikes of marine mammals and sea turtles, as outlined in Table 5.3-6.

Table 5.3-6: Procedural Mitigation for Vessel Movement

Procedural Mitigation Description
Stressor or Activity • Vessel movement – The mitigation will not be applied if (1) the vessel's safety is threatened, (2) the vessel is restricted in its ability to maneuver (e.g., during launching and recovery of aircraft or landing craft, during towing activities, when mooring), (3) the vessel is submerged or operated autonomously, or (4) when impractical based on mission requirements (e.g., during Vessel Visit, Board, Search, and Seizure activities as military personnel from ships or aircraft board suspect vessels).
Resource Protection Focus • Marine mammals • Sea turtles
Number of Lookouts and Observation Platform • 1 Lookout on the vessel that is underway
Mitigation Requirements • Mitigation zones: – 500 yd. around whales – 200 yd. around other marine mammals (except bow-riding dolphins) – Within the vicinity of sea turtles • During the activity: – When underway, observe the mitigation zone for marine mammals and sea turtles; if observed, maneuver to maintain distance. • Additional requirements: – If a marine mammal or sea turtle vessel strike occurs, the Navy will follow established incident reporting procedures.

The procedural mitigation measures for vessel movement are a continuation from the 2016 GOA Final SEIS/OEIS for marine mammals based on the largest area within which it is practical for the Navy to implement mitigation and guidance from NMFS for vessel strike avoidance. The Navy has always avoided vessel strikes of sea turtles, but is newly capturing that mitigation in this SEIS/OEIS. Although the Navy is unable to position Lookouts on unmanned vessels, as a standard operating procedure, some vessels that operate autonomously have embedded sensors that aid in avoidance of large objects. The embedded sensors may help those unmanned vessels avoid vessel strikes of marine mammals.
A mitigation zone size is not specified for sea turtles to allow flexibility based on vessel type and mission requirements. The small mitigation zone sizes and proximity to the observation platform will result in a high likelihood that Lookouts will be able to detect marine mammals and sea turtles throughout the mitigation zones while vessels are underway.

As discussed in Section 5.3.1 (Environmental Awareness and Education), it is likely that the implementation of the Marine Species Awareness Training starting in 2007, and the additional U.S. Navy Afloat Environmental Compliance Training Series modules starting in 2014, potentially helped contributed to a Navy wide reduction of vessel strikes of marine mammals across areas where the Navy conducts military readiness activities. The Navy is able to detect if a whale is struck due to the diligence of standard watch personnel and Lookouts stationed specifically to observe for marine mammals while a vessel is underway. In the unlikely event that a vessel strike of a marine mammal occurs, the Navy will notify the appropriate regulatory agency immediately or as soon as operational security considerations allow per the established incident reporting procedures described in Section 5.1.2.2.3 (Incident Reports). The Navy's incident reports include relevant information pertaining to the incident, including but not limited to vessel speed.

As described in Section 5.1.2 (Vessel Safety) of the 2016 GOA Final SEIS/OEIS, Navy vessels are required to operate in accordance with applicable navigation rules. Applicable rules include the Inland Navigation Rules (33 Code of Federal Regulations 83) and International Regulations for Preventing Collisions at Sea (72 COLREGS), which were formalized in the Convention on the International Regulations for Preventing Collisions at Sea, 1972. These rules require that vessels proceed at a safe speed so proper and effective action can be taken to avoid collision and so vessels can be stopped within a distance appropriate to the prevailing circumstances and conditions. In addition to complying with navigation requirements, Navy ships transit at speeds that are optimal for fuel conservation, to maintain ship schedules, and to meet mission requirements. Vessel captains use the totality of the circumstances to ensure the vessel is traveling at appropriate speeds in accordance with navigation rules. Depending on the circumstances, this may involve adjusting speeds during periods of reduced visibility or in certain locations.

Navy vessel operators need to train to proficiently operate vessels as they would during military missions and combat operations, including being able to react to changing tactical situations and evaluate system capabilities. For example, during training activities involving flight operations from an aircraft carrier, the vessel must maintain a certain wind speed over the deck to launch or recover aircraft. Depending on wind conditions, the aircraft carrier itself must travel at a certain speed to generate the wind required to launch or recover aircraft. Implementing vessel speed restrictions would increase safety risks for Navy personnel and equipment and the public during the training event and would reduce skill proficiency in a way that would increase safety risks during military missions and combat operations. Furthermore, vessel speed restrictions would not allow the Navy to continue meeting its training requirements due to diminished realism of training exercises.

In summary, the operational community determined that implementing procedural mitigation for vessel movements beyond what is detailed in Table 5.3-6 would be incompatible with the practicality assessment criteria for safety, sustainability, and mission requirements.

5.3.4.2 Towed In-Water Devices

The Navy will continue to implement procedural mitigation to avoid or reduce the potential for strike of marine mammals and sea turtles from towed in-water devices, as outlined in Table 5.3-7. Vessels involved in towing in-water devices will implement the mitigation described in Section 5.3.4.1 (Vessel Movement), in addition to the mitigation outlined in Table 5.3-7.

The mitigation zones for towed in-water devices are a continuation from the 2016 GOA Final SEIS/OEIS based on the largest area within which it is practical for the Navy to implement mitigation. The Navy has always avoided sea turtles when towing in-water devices, but is newly capturing that mitigation in this SEIS/OEIS. A mitigation zone size is not specified for sea turtles to allow flexibility based on towing platform type and mission requirements. The small mitigation zone sizes and proximity to the observation platform will result in a high likelihood that Lookouts will be able to detect marine mammals and sea turtles throughout the mitigation zones.

Table 5.3-7: Procedural Mitigation for Towed In-Water Devices

Procedural Mitigation Description
Stressor or Activity • Towed in-water devices – Mitigation applies to devices towed from a manned surface platform or manned aircraft, or when a manned support craft is already participating in an activity involving in-water devices being towed by unmanned platforms – The mitigation will not be applied if the safety of the towing platform or in-water device is threatened
Resource Protection Focus • Marine mammals • Sea turtles
Number of Lookouts and Observation Platform • 1 Lookout positioned on the towing platform or support craft
Mitigation Requirements • Mitigation zones: – 250 yd. around marine mammals – Within the vicinity of sea turtles • During the activity (i.e., when towing an in-water device) – Observe the mitigation zone for marine mammals and sea turtles; if observed, maneuver to maintain distance.

Mission and safety requirements determine the operational parameters (e.g., course) for in-water device towing platforms. Towed-in water devices must be towed at certain speeds and water depths for stability, which are controlled in part by the towing platform's speed and directional movements. Because these devices are towed and not self-propelled, they generally have limited maneuverability and are not able to make immediate course corrections. For example, a high degree of pilot skill is required when rotary-wing aircraft are deploying in-water devices, safely towing them at relatively low speeds and altitudes, and recovering them. The aircraft can safely alter course to shift the route of the towed device in response to a sighted marine mammal or sea turtle up to a certain extent (i.e., up to the size of the mitigation zone) while still maintaining the parameters needed for stable towing. However, the aircraft would be unable to further alter its course to more drastically course-correct the towed device without decreasing towing stability, which would have implications for safety of personnel and equipment.

In summary, the operational community determined that implementing procedural mitigation for towed in-water devices beyond what is detailed in Table 5.3-7 would be incompatible with the practicality assessment criteria for safety.

5.3.4.3 Small-, Medium-, and Large-Caliber Non-Explosive Practice Munitions

The Navy will continue to implement procedural mitigation to avoid or reduce the potential for strike from small-, medium-, and large-caliber non-explosive practice munitions, as outlined in Table 5.3-8. The mitigation is a continuation from the 2016 GOA Final SEIS/OEIS for marine mammals and sea turtles. The mitigation zone is conservatively designed to be several times larger than the impact footprint for large-caliber non-explosive practice munitions, which are the largest projectiles used for these activities. Small-caliber and medium-caliber non-explosive practice munitions have smaller impact footprints than large-caliber non-explosive practice munitions; therefore, the mitigation zone will extend even further beyond the impact footprints for these smaller projectiles.

Table 5.3-8: Procedural Mitigation for Small-, Medium-, and Large-Caliber Non-Explosive Practice Munitions

Procedural Mitigation Description
Stressor or Activity • Gunnery activities using small-, medium-, and large-caliber non-explosive practice munitions – Mitigation applies to activities using a surface target
Resource Protection Focus • Marine mammals • Sea turtles • Seabirds (short-tailed albatross)
Number of Lookouts and Observation Platform • 1 Lookout positioned on the platform conducting the activity – Depending on the activity, the Lookout could be the same as the one described in Section 5.3.2.2 (Weapon Firing Noise)
Mitigation Requirements • Mitigation zone: – 200 yd. around the intended impact location • Prior to the initial start of the activity (e.g., when maneuvering on station): – Observe the mitigation zone for floating vegetation; if observed, relocate or delay the start until the mitigation zone is clear. – Observe the mitigation zone for marine mammals and sea turtles (small-, medium-, and large-caliber activities) and seabirds (small- and medium-caliber activities); if observed, relocate or delay the start of firing. • During the activity: – Observe the mitigation zone for marine mammals and sea turtles (small-, medium-, and large-caliber activities) and seabirds (small- and medium-caliber activities); if observed, cease firing. • Commencement/recommencement conditions after a marine mammal, sea turtle, or seabird sighting before or during the activity: – The Navy will allow a sighted marine mammal, sea turtle, or seabird to leave the mitigation zone prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing firing) until one of the following conditions has been met: (1) the animal is observed exiting the mitigation zone; (2) the animal is thought to have exited the mitigation zone based on a determination of its course, speed, and movement relative to the intended impact location; (3) the mitigation zone has been clear from any additional sightings for 10 minutes for aircraft-based firing or 30 minutes for vessel-based firing; or (4) for activities using a mobile target, the intended impact location has transited a distance equal to double that of the mitigation zone size beyond the location of the last sighting.

When developing this SEIS/OEIS, the Navy identified an opportunity to develop new mitigation for seabirds during non-explosive small- and medium-caliber gunnery activities. This new mitigation for seabirds is consistent with mitigation zone developed with USFWS guidance for similar activities in the Northwest Training and Testing SEIS/OEIS to enhance protection of the ESA-listed short-albatross under the Proposed Action. Due to the difficulty of differentiating bird species, the Navy will implement mitigation for all seabird species during small- and medium-caliber non-explosive gunnery activities. Although there is a low likelihood that short-tailed albatross will be exposed to these activities in the TMAA, the mitigation will help the Navy further avoid or reduce potential impacts on this ESA-listed bird species, as well as other seabird species that occur in the TMAA. The Navy will not implement mitigation for seabirds during non-explosive large-caliber gunnery events because Lookouts would not be effective at detecting seabirds from the distant firing location, even with the use of high-powered binoculars.

Large-caliber gunnery activities involve vessels firing projectiles at a target located up to 6 NM down range. Small- and medium-caliber gunnery activities involve vessels or aircraft firing projectiles at targets

located up to 4,000 yd. down range, although typically much closer. Lookouts will have a better likelihood of detecting marine mammals and sea turtles when observing mitigation zones around targets located close to the firing platform. When observing activities that use a target located far from the firing platform, Lookouts will be more likely to detect large visual cues (e.g., whale blows or large pods of dolphins) than individual marine mammals, cryptic marine mammal species, and sea turtles. Observing for floating vegetation will further help avoid or reduce potential impacts on marine mammals and sea turtles within the mitigation zone. Positioning additional observers closer to the targets would increase safety risks because these platforms would be located in the vicinity of an intended impact location or in the path of a projectile.

5.3.4.4 Non-Explosive Bombs

The Navy will continue to implement procedural mitigation to avoid or reduce the potential for strike of marine mammals and sea turtles from non-explosive bombs, as outlined in Table 5.3-9.

Table 5.3-9: Procedural Mitigation for Non-Explosive Bombs

Procedural Mitigation Description
Stressor or Activity • Non-explosive bombs
Resource Protection Focus • Marine mammals • Sea turtles
Number of Lookouts and Observation Platform • 1 Lookout positioned in an aircraft
Mitigation Requirements • Mitigation zone: – 1,000 yd. around the intended target • Prior to the initial start of the activity (e.g., when arriving on station): – Observe the mitigation zone for floating vegetation; if observed, relocate or delay the start until the mitigation zone is clear. – Observe the mitigation zone for marine mammals and sea turtles; if observed, relocate or delay the start of bomb deployment. • During the activity (e.g., during approach of the target or intended minefield location): – Observe the mitigation zone for marine mammals and sea turtles; if observed, cease bomb deployment. • Commencement/recommencement conditions after a marine mammal or sea turtle sighting prior to or during the activity: – The Navy will allow a sighted marine mammal or sea turtle to leave the mitigation zone prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing bomb deployment) until one of the following conditions has been met: (1) the animal is observed exiting the mitigation zone; (2) the animal is thought to have exited the mitigation zone based on a determination of its course, speed, and movement relative to the intended target or minefield location; (3) the mitigation zone has been clear from any additional sightings for 10 minutes; or (4) for activities using mobile targets, the intended target has transited a distance equal to double that of the mitigation zone size beyond the location of the last sighting.

The mitigation zone for non-explosive bombs is conservatively designed to be several times larger than the impact footprint for the largest non-explosive bomb used for these activities. Smaller non-explosive bombs have smaller impact footprints than the largest non-explosive bomb used for these activities; therefore, the mitigation zone will extend even further beyond the impact footprints for these smaller military expended materials. Activities involving non-explosive bombing involve aircraft deploying munitions from a relatively steady altitude of approximately 1,500 ft. at a surface target or in an

intended minefield located beneath the aircraft. Due to the mitigation zone size, proximity to the observation platform, and the good vantage point from an aircraft, Lookouts will be able to observe the entire mitigation zone during approach of the target or intended minefield location. Observing for floating vegetation will further help avoid or reduce potential impacts on marine mammals and sea turtles within the mitigation zone.

5.4 Geographic Mitigation to be Implemented

As described in Table 5.4-1 and shown in Figure 5.4-1, the Navy developed mitigation areas in the TMAA to avoid or reduce potential impacts on marine mammals and fishery resources from active sonar, explosives, and physical disturbance and strike stressors in particularly important habitat areas. Consistent with the definition provided in Section 3.0.4.2 (Explosive Stressors), within this section, the term "in-water explosives" refers specifically to detonations occurring in air at a height of 33 ft. (10 meters [m]) or less above the water surface, and detonations occurring directly on the water surface, both of which were modeled to detonate at a depth of 0.3 ft. (0.1 m) below the water surface.

Table 5.4-1: Mitigation Areas

Mitigation Area Description
Stressor or Activity • Sonar • Explosives • Physical disturbance and strikes
Resource Protection Focus • Marine mammals • Fishery resources
Mitigation Requirements[1] • **North Pacific Right Whale Mitigation Area** – From June 1 to September 30 within the North Pacific Right Whale Mitigation Area, the Navy will not use surface ship hull-mounted MF1 mid-frequency active sonar or in-water explosives during training. • **Portlock Bank Mitigation Area** – The Navy will not use in-water explosives in the Portlock Bank Mitigation Area during training. • **Temporary Maritime Activities Area** – The Temporary Maritime Activities Area boundaries will continue to be located outside of the 1993 NMFS-designated Steller sea lion critical habitat. – The Navy will issue annual seasonal awareness notification messages to alert ships and aircraft operating within the TMAA to the possible presence of increased concentrations of gray whales in their migration habitat from April 1 to August 31 and humpback whales on the continental shelf from June 1 to September 30. To maintain safety of navigation and to avoid interactions with gray whales and humpback whales, the Navy will instruct vessels to remain vigilant to the presence of large whales that may be vulnerable to vessel strikes or potential impacts from training activities. Platforms will use the information from the awareness notification messages to assist their visual observation of applicable mitigation zones during training activities and to aid in the implementation of procedural mitigation.

[1] Should national security present a requirement to conduct training prohibited by the mitigation requirements specified in this table, naval units will obtain permission from the appropriate designated Command authority prior to commencement of the activity. The Navy will provide NMFS with advance notification and include relevant information about the event (e.g., sonar hours, in-water explosives use) in its annual activity reports to NMFS.

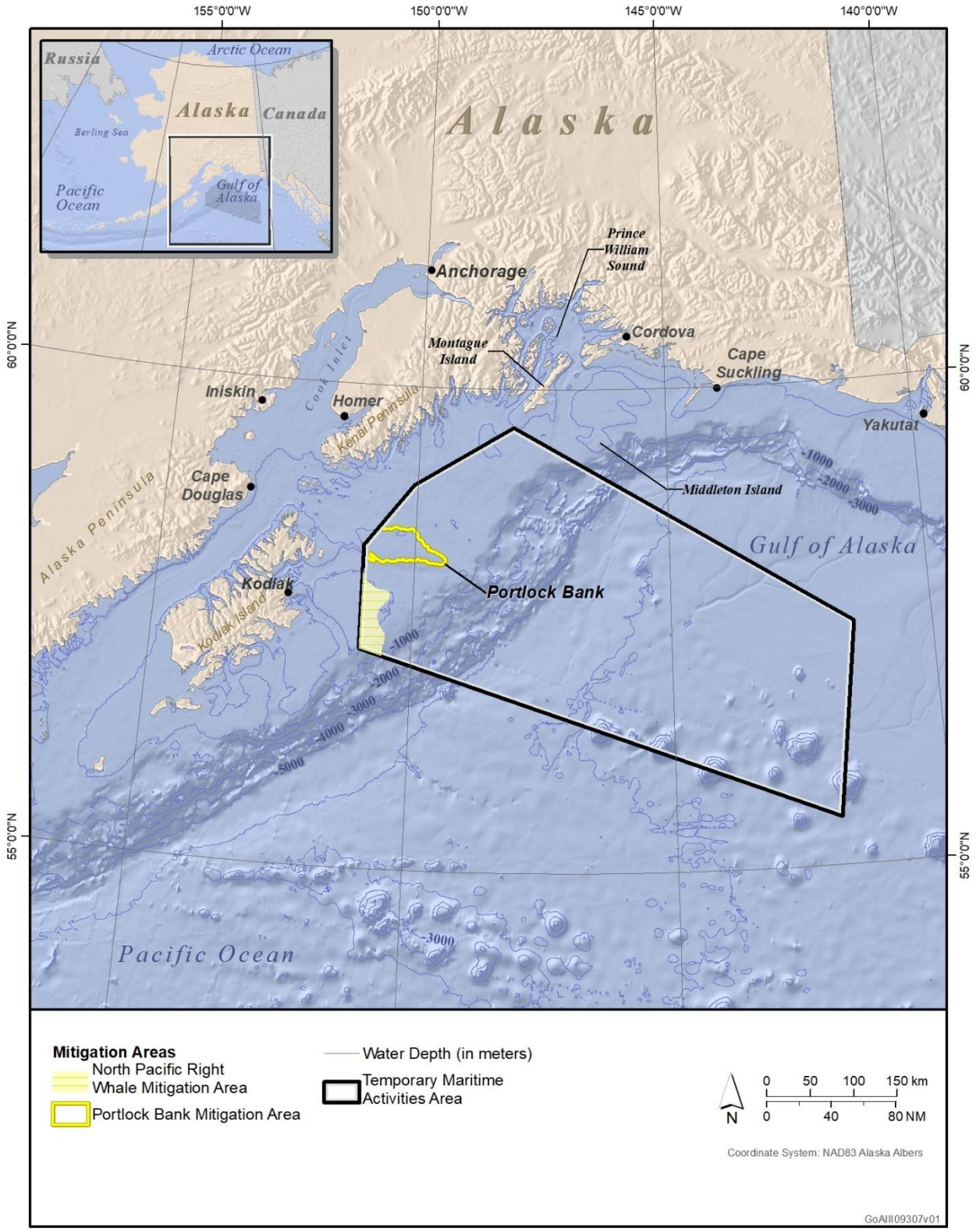

Figure 5.4-1: Mitigation Areas

5.4.1 Resource Descriptions for the Habitats Considered

Key marine species habitat areas identified within the TMAA that were considered for mitigation include biologically important areas identified by Ferguson et al. (2015) for North Pacific right whale feeding and gray whale migration, NMFS-proposed critical habitat for humpback whales, and a fishery area important for Native Alaska tribes. Discussion of one key habitat located adjacent to the TMAA, NMFS-designated critical habitat for Steller sea lions, is also included in this section because as described in Section 5.4.1.4 (Steller Sea Lions), the critical habitat would have been located within the TMAA absent mitigation to modify the TMAA boundaries. These habitat areas are described in the sections below and shown in Figure 5.4-2. The purpose of developing mitigation areas is to avoid or reduce potential impacts on key areas of biological or ecological importance; therefore, not all marine species or areas with known marine species occurrence are discussed in the sections below. For example, although blue whales have been detected seasonally in the GOA, the best available science does not indicate that any particular area within the TMAA serves as a key area of biological importance for this species.

5.4.1.1 North Pacific Right Whales

North Pacific right whales, which are listed under the ESA as endangered, are one of the world's rarest marine mammals (Wade et al., 2011). The species is distributed in the North Pacific Ocean from subpolar to temperate waters. Any individual in the TMAA would be from the Eastern North Pacific stock. The range of the Eastern North Pacific stock includes the Gulf of Alaska and Bering Sea, which are used for feeding in the summer months. North Pacific right whales primarily feed on zooplankton, including copepods and euphausiids. The location of winter breeding and calving areas is unknown (Muto et al., 2019).

One area that overlaps the southwest corner of the TMAA was identified by Ferguson et al. (2015) as biologically important North Pacific right whale feeding habitat from June to September. The feeding area was substantiated through vessel and aerial surveys, passive acoustic monitoring, fecal samples, historic whaling records, and expert judgment. Sightings and acoustic detections of North Pacific right whales in the Gulf of Alaska since the cessation of whaling have been extremely rare (Muto et al., 2019). Observations of this species have typically been made around the Barnabus Trough area (which is located just south of the TMAA) in association with dense concentrations of zooplankton (Wade et al., 2011). The U.S. Navy's Marine Species Monitoring Program sponsored a visual line-transect and passive acoustic monitoring survey of the TMAA and surrounding waters in summer 2013, known as the Gulf of Alaska Line-Transect Survey, or GOALS-II (Rone et al., 2014). Rone et al. (2014) acoustically detected North Pacific right whales outside of the TMAA in Barnabus Trough and did not visually observe the species within or outside of the TMAA. Similarly, during a 2015 Navy-sponsored survey in a portion of the TMAA and other waters in the Gulf of Alaska, NMFS and its scientific collaborators acoustically detected North Pacific right whales in Barnabus Trough, but did not make any visual observations (Rone et al., 2017). No North Pacific right whale detections were made during the most recent passive acoustic monitoring survey of the TMAA from 2015 to 2017 (Rice et al., 2018).

In summary, North Pacific right whale observations are rare within the TMAA. Historical records indicate that feeding within the TMAA could potentially occur within the biologically important area identified by Ferguson et al. (2015). Due to the species' extremely low population numbers and endangered status, the identified habitat area can be considered particularly important to North Pacific right whales relative to other locations in the TMAA, even though the occurrence of detections is rare. For additional information about North Pacific right whales and their habitat use and geographic range, see Section 3.8.2.2 (North Pacific Right Whale [*Eubalaena japonica*]) of this SEIS/OEIS.

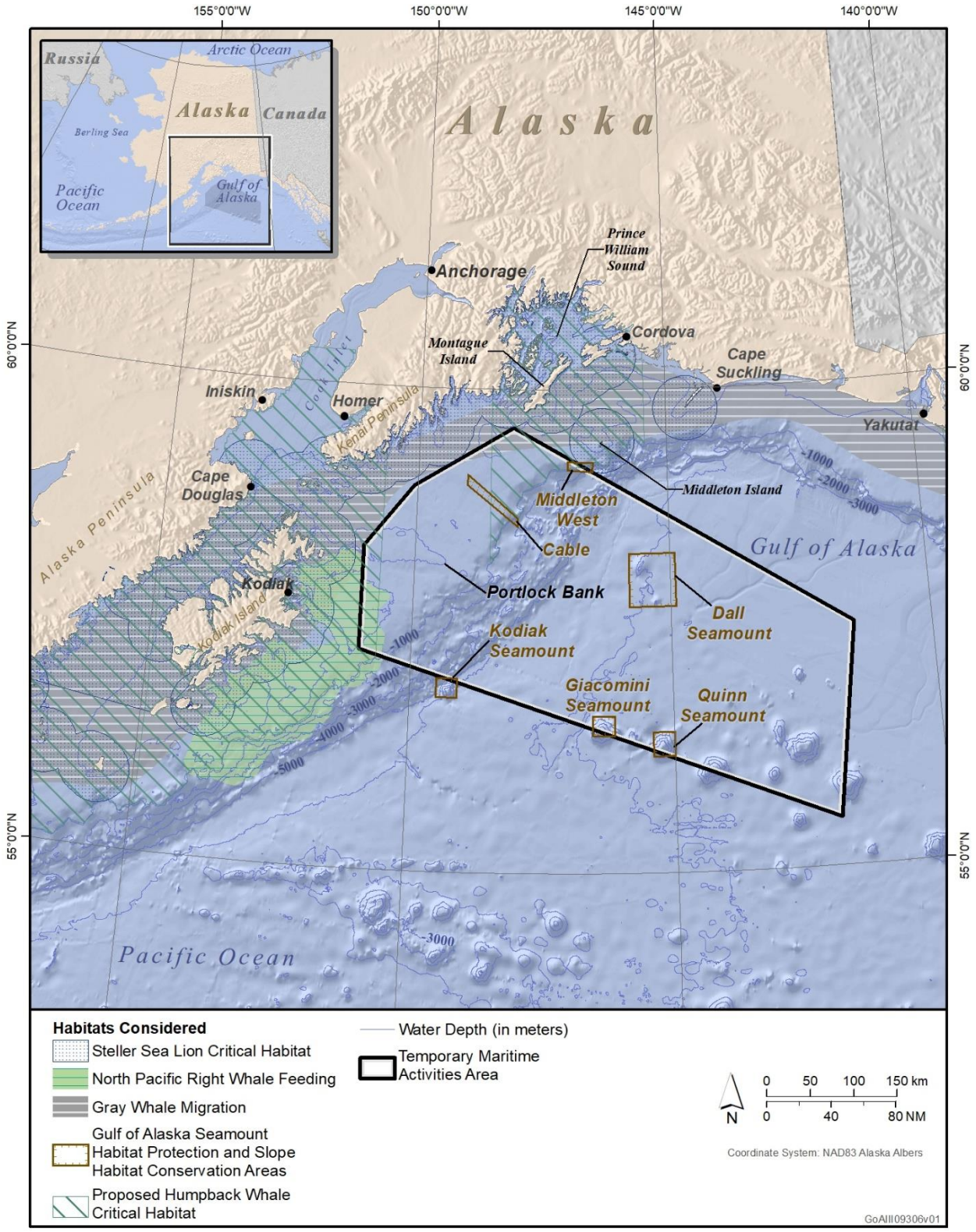

Figure 5.4-2: Habitats Considered

5.4.1.2 Humpback Whales

Humpback whales are distributed worldwide in all major oceans and most seas. They are most abundant in high-latitude feeding grounds during the summer, and in tropical and subtropical breeding habitats during the winter (Barlow et al., 2011; Bettridge et al., 2015; Calambokidis et al., 2017a; Calambokidis et al., 2010; Keen et al., 2018; Wade et al., 2016). Humpback whales are typically most abundant in shelf and slope waters less than 2,000 m deep, are often associated with areas of high productivity (Becker et al., 2010; Becker et al., 2012; Forney et al., 2012). As described in 84 Federal Register (FR) 54354, feeding areas primarily occur in cooler waters along the continental shelf and shelf break at shallow (i.e., less than 10 m) to moderate water depths (i.e., 50–200 m), and along the continental slope (Green et al., 1992). Humpback whale feeding areas are associated with productive oceanographic features (e.g., upwelling) and bathymetric features (e.g., canyons) that concentrate prey species (84 FR 54354). Individual humpback whales display high levels of site fidelity to their foraging locations.

As described in Section 3.8.2.3.1 (Status and Management), in 2019, NMFS proposed critical habitat for the Western North Pacific Distinct Population Segment and Mexico Distinct Population Segment of humpback whales in feeding areas that overlap the TMAA (84 FR 54354). Prey species for humpback whales in Alaska includes euphausiids, capelin, Pacific herring, Atka mackerel, juvenile walleye pollock, Pacific cod, mysids, amphipods, shrimp, and various other species of fish. The boundary of the proposed critical habitat was drawn to include areas where humpback whale aggregations have been documented feeding with a high degree of site fidelity further offshore Kodiak Island and Prince Willian Sound (Witteveen & Wynne, 2017). Passive acoustic monitoring studies (Debich et al., 2013; Debich et al., 2014a; Rice et al., 2015; Rice et al., 2018) have documented the presence of humpback whales year round in the TMAA, with a primary occurrence in the summer in locations (i.e., June through September) where prey species concentrate on the shelf (Burrows et al., 2016; Matta & Baker, 2020; McGowan et al., 2019; Moran et al., 2015; Straley et al., 2017).

The proposed critical habitat overlaps waters in and around Portlock Bank, an area known to have high productivity that may be particularly important for feeding. For example, in 2003, a humpback whale calf and its mother were observed feeding in Portlock Bank for at least 30 days (84 FR 54354). The proposed critical habitat also overlaps areas identified by Ferguson et al. (2015) as biologically important humpback whale feeding habitat located entirely outside of the TMAA off Kodiak Island and in Prince William Sound. The Kodiak Island biologically important area was identified for July through September, and the Prince William Sound area was identified for September through December. The biologically important area boundaries were based on vessel or aerial survey data, prey consumption studies, and photo-identification (Ferguson et al., 2015).

In summary, humpback whales feed in habitats in the North Pacific, both within and outside of the TMAA. Within the TMAA, the best available science indicates that foraging occurs primarily within the critical habitat proposed by NMFS in 2019; therefore, that habitat can be considered particularly important to humpback whales in the summer (i.e., June through September) relative to other locations in the TMAA (during the applicable months when the Proposed Action would occur). For additional information about humpback whales and their habitat use and geographic range, see Section 3.8.2.3 (Humpback Whale [*Megaptera novaeangliae*]) of this SEIS/OEIS.

5.4.1.3 Gray Whales

Gray whales from the Western North Pacific population, which is listed under the ESA as endangered, have been known to transit through offshore waters of the Gulf of Alaska (Carretta et al., 2017); however, their migration paths are not well defined (Ferguson et al., 2015; Muto et al., 2019).

As described in Section 3.8.2.8.1 (Status and Management), there are a few hundred gray whales that feed along the Pacific coast, known as the Pacific Coast Feeding Group (Calambokidis et al., 2002; Calambokidis et al., 2017b; Carretta et al., 2017; Mate et al., 2013; Weller et al., 2013). The Pacific Coast Feeding Group is a subpopulation of the Eastern North Pacific gray whale population. The majority of the Eastern North Pacific population of gray whales, which is not ESA-listed, migrates annually through the nearshore waters off western North America between winter breeding grounds off Mexico and summer feeding grounds from California to the Arctic (Calambokidis et al., 2015), including feeding areas off Kodiak Island (Gosho et al., 2011). Prey species for gray whales in these areas include amphipods, worms, bivalves, euphausiids, and crustaceans (Coyle et al., 2007; Moore et al., 2007).

As described in Section 3.8.2.8.3 (Distribution), gray whale occurrence in the TMAA is expected to be seasonal, with their highest likelihood of occurring being between June and August. Gray whale call detections are most common on the continental shelf (Rice et al., 2015; Rice et al., 2018; Wiggins et al., 2017). Because Eastern North Pacific population of gray whales has been studied so extensively, their migration patterns are relatively well-defined. One area identified by Ferguson et al. (2015) as biologically important gray whale migration habitat overlaps the TMAA at its northernmost corner and southwestern edge. The migration area was substantiated through vessel and aerial surveys, passive acoustic monitoring, genetic sampling, and expert judgment. In the Gulf of Alaska, southbound migration occurs from November to January (outside of the Proposed Action timeframe), while northbound migration occurs from March to May (partially overlapping the Proposed Action timeframe). There is little geographical overlap of the migration habitat with the TMAA boundaries, as shown in Figure 5.4-2. Overlap of migration timing with the potential timing of the Proposed Action would occur in April and May. Recent passive acoustic monitoring studies infrequently detected migrating gray whales in the TMAA along the continental slope and at Quinn Seamount (Rice et al., 2018).

In summary, Eastern North Pacific gray whales migrate through habitats throughout the Arctic and western coast of North America, both within and outside of the TMAA. Within the TMAA, the best available science indicates that migration occurs primarily within the biologically important area identified by Ferguson et al. (2015) in April and May, and that gray whales could be seasonally concentrated on the continental shelf between June and August; therefore, these habitats can be considered particularly important to gray whales from April through August relative to other locations or seasons in the TMAA. For additional information about gray whales and their habitat use and geographic range, see Section 3.8.2.8 (Gray Whale [*Eschrichtius robustus*]) of this SEIS/OEIS.

5.4.1.4 Steller Sea Lions

Steller sea lions live in cold temperate to subarctic waters along the North Pacific Rim from northern Japan to California (Loughlin et al., 1984). Individuals from the Western Distinct Population Segment, which is listed as endangered under the ESA, and Eastern Distinct Population Segment, which was delisted under the ESA in 2013, may occur in the TMAA. Steller sea lions display high site fidelity during the breeding season from May to July. Outside of the breeding season, individuals disperse widely in search of prey, which consists primarily of fish (Muto et al., 2018).

National Marine Fisheries Service-designated critical habitat for the Western Distinct Population Segment (which was designated in 1993) is situated along the Aleutian Islands and Western Alaska (58 FR 45269). The critical habitat encompasses terrestrial habitats and the surrounding nearshore waters that Steller sea lions use for foraging, haul-out sites, and rookeries for reproduction (pupping and mating). The critical habitat is located adjacent to the TMAA, but would have otherwise overlapped a portion of the training area, absent mitigation to modify the TMAA boundaries as described in Table 5.4-1 and Section 5.4.2.4 (Temporary Maritime Activities Area). In the Gulf of Alaska, foraging habitat is primarily inshore of the TMAA in shallower, more nearshore continental shelf waters (ranging from approximately 4.3 to 13 NM offshore). Additionally, there is a secondary occurrence inshore of the 1,000 m isobath, and a rare occurrence seaward of the 1,000 m isobath (Lander et al., 2011).

In summary, Steller sea lions use terrestrial and nearshore habitats along the North Pacific Rim for reproduction and foraging. Individuals from the Western Distinct Population Segment and Eastern Distinct Population of Steller sea lions could be present within the TMAA; however, the best available science indicates that reproduction and foraging occur primarily within the critical habitat areas designated by NMFS and located outside of the TMAA. For additional information about Stellar sea lions and their habitat use and geographic range, see Section 3.8.2.17 (Steller Sea Lion [*Eumetopias jubatus*]) of this SEIS/OEIS.

5.4.1.5 Fisheries Habitats

As described in Section 3.6 (Fish) of the 2016 GOA Final SEIS/OEIS, Habitat Areas of Particular Concern are a subset of Essential Fish Habitat. These Marine Protected Areas are known to provide particularly important ecological functions for fish and other important fishery resources. The North Pacific Fishery Management Council is the regional fishery management council responsible for managing groundfish fisheries (i.e., cod, flatfish, mackerel, Pollock, sablefish, and rockfish) in federal waters (i.e., 3–200 NM offshore) of the Bering Sea and Gulf of Alaska. The North Pacific Fishery Management Council established several Habitat Areas of Particular Concern that are within or partially overlapping the TMAA, including the following Gulf of Alaska Seamount Habitat Protection Areas and Gulf of Alaska Slope Habitat Conservation Areas: (1) Dall Seamount, (2) Giacomini Seamount, (3) Quinn Seamount, (4) Kodiak Seamount, (5) Cable, and (6) Middleton Island West. These areas support high biomass of groundfishes due to their high productivity, variable currents, clear waters, and unique seafloor topography (Rogers, 1994). These areas also provide important habitat for deep-sea coral communities, benthic fauna, and a wide variety of invertebrates. Fishery resources in the Gulf of Alaska are of particular importance to Alaska Native tribes and the economies of Alaska and the rest of the United States.

The waters off Kodiak Island (including Portlock Bank), are also known for having high productivity that supports important fishery resources for Alaska Native tribes. As described in the 2011 GOA Final EIS/OEIS, the benthos of the TMAA-portion of Portlock Bank was surveyed in water depths from 50 to 750 m. The seafloor is generally flat and covered with small boulders, cobble, and gravel. The most common epifauna were crinoids, small nonburrowing sea anemones, glass sponges, stylasterid corals, and brittlestars. The ecosystem in this area supports a strong trophic system from plankton, invertebrates, and small fish to higher-level predators, such as large fish, birds, and marine mammals. Portlock bank is associated with high densities of zooplankton in the summer, likely due to the oceanographic currents and the presence of deep gullies that help move water masses onto the shelf (Wang, 2007). Waters off Kodiak Island also support summer aggregations of fish species, such as arrowtooth flounder, capelin, and pollock (Knoth & Foy, 2008; Ormseth et al., 2017). Fishery resources

in Portlock Bank are important to Native Alaska tribes, including the Native Village of Afognak and the Sun'aq Tribe of Kodiak.

Due to their high rates of productivity, some oceanographic features (e.g., seamounts) have also been associated with the presence of marine mammal species. For example, blue whales, fin whales, minke whales, killer whales, Baird's beaked whales, Cuvier's beaked whales, and Stejneger's beaked whales were detected near Quinn Canyon during a 2013–2014 passive acoustic monitoring study in the TMAA (Debich et al., 2014b). As described in Section 5.4.1.3 (Gray Whales), recent passive acoustic monitoring studies infrequently detected migrating gray whales in the TMAA along the continental slope and at Quinn Seamount (Rice et al., 2018). Although marine mammals have been detected near some seamounts in the TMAA, the best available science does not indicate that seamounts in the TMAA are particularly important to any marine mammal species for foraging, migration, or reproduction. For example, during a summer 2013 visual and passive acoustic survey of the entire TMAA, beaked whale passive acoustic detections were just as frequent over deep water abyssal plain areas of the TMAA as compared to slopes and seamounts (Rone et al., 2014).

In summary, the best available science indicates that Habitat Areas of Particular Concern and Portlock Bank constitute particularly important habitats and fishery resources for Alaska Native tribes and commercial fisheries within the TMAA. For additional information about fisheries, socioeconomic resources, and cultural resources, see Section 3.6 (Fishes) of this SEIS/OEIS, and Section 3.10 (Cultural Resources) and Section 3.12 (Socioeconomics) of the 2016 GOA SEIS/OEIS. For additional information on Marine Protected Areas within the TMAA, such as areas designed to restrict commercial or recreational fishing, see Section 6.1.1 (Marine Protected Areas).

5.4.2 Biological Effectiveness Assessment

Mitigation areas in the TMAA will help the Navy avoid or reduce potential impacts on one or more marine species in key areas of biological or ecological importance, as discussed in the sections below.

5.4.2.1 North Pacific Right Whale Mitigation Area

Mitigation within the North Pacific Right Whale Mitigation Area is a continuation from the 2016 GOA Final SEIS/OEIS. The Navy developed the mitigation area to encompass the portion of the biologically important habitat identified by Ferguson et al. (2015) for North Pacific right whale feeding that overlaps the TMAA. The potential occurrence of North Pacific right whales in the TMAA is expected to be rare due to the species' extremely low population numbers; however, mitigation requirements to not use surface ship hull-mounted MF1 mid-frequency active sonar or in-water explosives in the mitigation area seasonally will help the Navy further avoid or reduce the already low potential for impacts to occur within this endangered species' feeding habitat. The Navy will implement the mitigation from June 1 to September 30, which fully corresponds with the North Pacific right whale feeding period in this area.

The mitigation will also help avoid or reduce potential impacts on fishery resources that inhabit the mitigation area. As described in Section 5.4.1.5 (Fisheries Habitats), the productive waters off Kodiak Island support a strong trophic system from plankton, invertebrates, and small fish to higher-level predators, such as large fish, birds, and marine mammals.

5.4.2.2 Portlock Bank Mitigation Area

Mitigation within the Portlock Bank Mitigation Area is a continuation from the 2016 GOA Final SEIS/OEIS. The Navy developed the mitigation area to encompass the portion of Portlock Bank that overlaps the TMAA. Mitigation requirements to not use in-water explosives in the mitigation area will

help the Navy avoid or reduce potential impacts on fishery resources for Native Alaska tribes. The mitigation will also help avoid or reduce potential impacts on marine mammals that forage in the highly productive waters of Portlock Bank, including humpback whales (84 FR 54354).

5.4.2.3 Temporary Maritime Activities Area

Mitigation to conduct the Proposed Action outside of Steller sea lion critical habitat is a continuation from the 2016 GOA Final SEIS/OEIS. To accomplish this mitigation, the Navy adjusted the boundaries of the TMAA so it is situated outside of the Steller sea lion critical habitat designated by NMFS in 1993 (58 FR 45269). This will help the Navy avoid the potential for Steller sea lions from the Western Distinct Population Segment to be exposed to active sonar and explosives within their critical habitat for reproduction and foraging.

The Navy developed new mitigation that is included in this SEIS/OEIS to issue seasonal awareness notification messages to alert ships and aircraft operating within the TMAA to the possible presence of increased concentrations of gray whales in their migration habitat from April 1 to August 31 and humpback whales on the continental shelf from June 1 to September 30. This mitigation will further help avoid or reduce potential impacts from vessel strikes and training activities on gray whales and humpback whales within the TMAA, which overlaps the biologically important gray whale migration habitat identified by Ferguson et al. (2015) and the NMFS-proposed critical habitat for humpback whale feeding.

5.4.3 Operational Assessment

The Navy conducts training activities in the TMAA because it provides valuable access to sea space and airspace conditions analogous to areas where the Navy operates or may need to operate in the future. The unique and complex bathymetric and oceanographic environment in the TMAA presents a challenging anti-submarine warfare training opportunity. The complexity of the sea bottom, the input of freshwater into the sea, and the areas of upwelling and ocean currents combine in the TMAA like in no other training area in the Pacific Ocean. The location of the TMAA affords aircraft from Navy carrier strike groups supporting joint exercises with the Air Force ability to reach inland established Air Force and Army instrumented land ranges where they conduct air-to-air ground training. The location of the TMAA also allows appropriate distance limitations to support Air Force aircraft reaching the TMAA without needing to refuel to conduct training at sea with the carrier strike group. Therefore, the TMAA as currently sited is dependent on these location-specific factors to satisfy criteria for safety, practicality, and mission requirements.

Navy training schedules are based on national tasking, the number and duration of training cycles identified in the Optimized Fleet Response Plan and various training plans. Navy vessels and aviation squadrons have a limited amount of time available for training. The Navy must factor in variables such as maintenance and weather when scheduling event locations and timing. Training in the TMAA is largely scheduled to accommodate weather conditions for safety of personnel and to achieve optimum operational parameters. Storms and high sea states in the Gulf of Alaska can create challenges for surface ship training between November and March. In part as a result of these conditions, annual joint training activities are scheduled during the summer months from April to October. When scheduling activities between April through October, the Navy considers the need to minimize sea space and airspace conflicts throughout the TMAA. For example, the Navy schedules training to minimize conflicts between its own activities and with consideration for public safety (e.g., safe distances from recreational boating activities). Restrictions on the level and number of training activities and associated sound

source or ordnance use (e.g., annual sonar hours or explosives use) would be impractical because such limitations would not allow the Navy to continue meeting its mission requirements.

The Navy selects training locations in the TMAA to allow for the realistic tactical development of the myriad training scenarios Navy units are required to complete to be mission effective. Certain activities require large areas of open ocean for realistic and safe training. As described in Section 5.2.3 (Practicality of Implementation), the Navy requires extensive sea space so that individual training activities can occur at sufficient distances so they do not interfere with one another, and so that Navy units can train to communicate and operate in a coordinated fashion over tens or hundreds of square miles, as required during military missions and combat operations. Other activities may be conducted on a smaller and more localized scale, with training at discrete locations that are critical to certain aspects of military readiness. For example, the northwest and southwest corners of the TMAA are important for several events, including Maritime Interdiction Training. During Maritime Interdiction Training, the Navy interacts with participating contracted commercial vessels homeported in GOA ports (e.g., Kodiak, Homer); therefore, conducting these activities in proximity to existing ports and facilities is essential for safety and mission success. Requiring this activity to be conducted in other locations, such as further offshore, would increase safety risks for the types of vessels involved. Increasing transit distances would result in additional fuel consumption and expenditures, which could serve as a limiting factor for Navy surface units whose available underway times are constrained by fuel expenses. It would also reduce training opportunities during a platform's limited available timeframes (i.e., increased time spent transiting to more distant training areas results in decreased time available for training).

Activities using mid-frequency active sonar and explosives typically take place a certain distance away from operating area boundaries to allow for sea space deconfliction and training realism. For example, The Navy does not typically conduct anti-submarine warfare training along the TMAA boundaries because doing so would limit the ability for naval units to tactically consider the adjacent sea space and airspace outside of the TMAA. The southwest portion of the TMAA experiences relatively high levels of commercial and recreational vessel and aircraft traffic, which presents sea space and airspace conflicts. For these reasons, it is practical for the Navy to not conduct surface ship hull-mounted MF1 mid-frequency active sonar or use in-water explosives in the North Pacific Right Whale Mitigation Area, and to not use explosives in the Portlock Bank Mitigation Area, both of which are located in the southwest portion of the TMAA.

Restrictions beyond what is identified in Table 5.4-1 regarding the locations of training near seamounts or within Marine Protected Areas (e.g., Habitat Areas of Particular Concern) would be impractical to implement for the types of activities conducted under the Proposed Action. Such mitigation would encroach upon the Navy's primary training waterspace, which would preclude ready access to training areas and the necessary environmental and oceanographic conditions that replicate military mission and combat conditions. This would have a significant impact on the ability for units to meet their individual training and certification requirements (impacting the ability to deploy with the required level of readiness necessary to accomplish their missions), to certify forces to deploy to meet national security tasking (limiting the flexibility of Combatant Commanders and warfighters to project power, engage in multi-national operations, and conduct the full range of naval warfighting capability in support of national security interests). Furthermore, as described in Section 5.4.1.5 (Fisheries Habitats), although marine mammals have been detected near some seamounts in the TMAA, the best available science does not indicate that the seamounts or Marine Protected Areas within the TMAA are particularly important to any marine mammal species for foraging, migration, or reproduction; therefore, avoiding

explosives or active sonar within these areas would likely not effectively avoid potential impacts on marine mammal species or stocks in the TMAA. Additional information about why such mitigation would not be effective at avoiding or reducing potential impacts on marine species is provided in Section 5.5.2 (Explosives).

As described in Section 5.3.2.1 (Active Sonar) and Section 5.5.1 (Active Sonar), the Navy needs to maintain access to sea space with the unique, challenging, and diverse environmental and oceanographic features (e.g., bathymetry, topography, surface fronts, and variations in sea surface temperature) analogous to military mission and combat conditions to achieve the highest skill proficiency possible. Training with active sonar in varying ocean floor topographies, such as near seamounts, is essential to national security. Active sonar is the only reliable technology for detecting and tracking potential enemy diesel-electric submarines. Daily fluctuations in training schedules and objectives could mean that, on any given day, vessels or aircraft may depend on discrete locations of the TMAA for discrete purposes. The Navy requires flexibility in the timing of its use of active sonar and explosives in order to meet individual training schedules. In June and July, there are approximately 19 hours of daylight per day in the TMAA; therefore, there are naturally fewer hours of available nighttime to be used for sonar training. Due to the already limited timeframe of when the Proposed Action can occur in the TMAA based on weather conditions (April through October), time-of-day restrictions or further seasonal restrictions on the use of active sonar or explosives based on marine species occurrence, fishery seasons, or other factors (e.g., avoiding all activities during the spring months, requiring training activities to be conducted in the winter) would significantly restrict logistical flexibility for planning and carrying out the Proposed Action. Such mitigation would prevent the Navy from being able to successfully complete its mission requirements within the necessary timeframes.

5.5 Mitigation Measures Considered but Eliminated

As described in Section 5.2 (Mitigation Development Process), the Navy conducted a detailed review and assessment of each potential mitigation measure individually and then all potential mitigation measures collectively to determine if, as a whole, the mitigation will be effective at avoiding or reducing potential impacts and practical to implement. The operational community determined that implementing mitigation beyond what is detailed in Section 5.3 (Procedural Mitigation to be Implemented) and Section 5.4 (Geographic Mitigation to be Implemented) would be incompatible with the practicality assessment criteria for safety, sustainability, and mission requirements. Information about why implementing additional mitigation measures for active sonar, explosives, active and passive acoustic monitoring devices, thermal detection systems, third-party observers, foreign navy mitigation, and reporting requirements would be impractical is provided in the sections below and in Section 5.4 (Geographic Mitigation to be Implemented).

When analyzing all potential mitigation measures collectively, the operational community determined that adopting certain mitigation measures would result in the unacceptable limitation of the Navy's utilization of sea space and airspace required to effectively support training of naval forces in the TMAA. Certain measures would restrict or prohibit Navy training throughout most of the TMAA except in very narrow circumstances. For example, blanket limitations or restrictions on the level, number, or timing (seasonal or time of day) of training activities within certain discrete or broad-scale areas of water would prevent the Navy from accessing the locations necessary to meet the purpose and need of the Proposed Action. As described in Section 5.2.3 (Practicality of Implementation), the Navy requires extensive sea space so that individual training activities can occur at sufficient distances such that these activities do not interfere with one another, and so that Navy units can train to communicate and operate in a

coordinated fashion over tens or hundreds of square miles, as required during military missions and combat operations. The Navy also needs to maintain access to sea space with the unique, challenging, and diverse environmental and oceanographic features (e.g., bathymetry, topography, surface fronts, and variations in sea surface temperature) analogous to military mission and combat conditions to achieve the highest skill proficiency possible. The iterative and cumulative impact of all potential mitigation measures the Navy assessed would deny national command authorities the flexibility to respond to national security challenges and effectively accomplish the training necessary for deployment. For example, additional limitations on the use of active sonar would require the Navy to shift its training activities to alternative locations, which would preclude ready access to the necessary environmental and oceanographic conditions that replicate military mission and combat conditions. This would have significant impacts on safety, sustainability, and the ability to meet mission requirements within limited available timeframes.

Threats to national security are constantly evolving. The Navy requires the ability to adapt training to meet these emerging threats. Restricting access to broad-scale areas of water would impact the ability for Navy training to evolve as threats evolve. Eliminating opportunities for the Navy to train in a myriad of at-sea conditions would put U.S. forces at a tactical disadvantage during military missions and combat operations. This would also present a risk to national security if potential adversaries were to be alerted to the environmental conditions within which the U.S. Navy is prohibited from training. Restricting large areas of ocean or other smaller areas that are critical to Navy training would make training and concealment much more difficult and would adversely impact the Navy's ability to perform its statutory mission.

5.5.1 Active Sonar

When assessing and developing mitigation, the Navy considered reducing active sonar training hours, modifying active sonar sound sources, implementing time-of-day restrictions and restrictions during surface ducting conditions, replacing active sonar training with synthetic activities (e.g., computer simulated training), and implementing active sonar ramp-up procedures. The Navy determined that it would be practical to implement certain restrictions on the use of active sonar in the TMAA, as detailed in Section 5.3.2.1 (Active Sonar) and Section 5.4 (Geographic Mitigation to be Implemented). As discussed in Chapter 2 (Description of Proposed Action and Alternatives), Section 5.2.3 (Practicality of Implementation), Section 5.4 (Geographic Mitigation to be Implemented), and Appendix A (Navy Activities Descriptions), training activities are planned and scheduled based on numerous factors and data inputs, such as compliance with the Optimized Fleet Response Plan. Information on why training with active sonar is essential to national security is presented in Section 5.3.2.1 (Active Sonar). The Navy uses active sonar during military readiness activities only when it is essential to training missions since active sonar has the potential to alert opposing forces to the operating platform's presence. Passive sonar and other available sensors are used in concert with active sonar to the maximum extent practicable.

The Navy currently uses, and will continue to use, computer simulation to augment training whenever possible. As discussed in Section 1.4.1 (Why the Navy Trains), simulators and synthetic training are critical elements that provide early skill repetition and enhance teamwork; however, they cannot replicate the complexity and stresses faced by Sailors during military missions and combat operations to which the Navy trains under the Proposed Action (e.g., anti-submarine warfare training using hull-mounted mid-frequency active sonar). Just as a pilot would not be ready to fly solo after simulator training, operational Commanders cannot allow military personnel to engage in military missions and

combat operations based merely on simulator training. Sonar operators must train to effectively handle bottom bounce and sound passing through changing currents, eddies, and across changes in ocean temperature, pressure, salinity, depth, and in surface ducting conditions.

Although the majority of sonar use occurs during the day, the Navy has a nighttime training requirement for some active sonar systems, Training in both good visibility (e.g., daylight, favorable weather conditions) and low visibility (e.g., nighttime, inclement weather conditions) is vital because environmental differences between day and night and varying weather conditions affect sound propagation and the detection capabilities of sonar. Temperature layers that move up and down in the water column and ambient noise levels can vary significantly between night and day. This affects sound propagation and could affect how sonar systems function and are operated.

Submarines may hide in the higher ambient noise levels of surface ducts. Surface ducting occurs when water conditions, such as temperature layers and lack of wave action, result in little sound energy penetrating beyond a narrow layer near the surface of the water. Avoiding surface ducting conditions would be impractical because ocean conditions contributing to surface ducting change frequently, and surface ducts can be of varying duration. Surface ducting can also lack uniformity and may or may not extend over a large geographic area, making it difficult to determine where to reduce power and for what periods. Submarines have long been known to take advantage of the phenomena associated with surface ducting to avoid being detected by sonar. When surface ducting occurs, active sonar becomes more useful near the surface but less useful at greater depths. As noted by the U.S. Supreme Court in *Winter v. Natural Resources Defense Council Inc.*, 555 U.S. 7 (2008), because surface ducting conditions occur relatively rarely and are unpredictable, it is especially important for the Navy to be able to train under these conditions when they occur. Training with active sonar in these conditions is a critical component of military readiness because sonar operators need to learn how sonar transmissions are altered due to surface ducting, how submarines may take advantage of them, and how to operate sonar effectively under these conditions. Reducing power, shutting down active sonar based on environmental conditions, or implementing other sonar modification techniques (e.g., sound shielding) as a mitigation would affect a Commander's ability to develop the tactical picture. It would also prevent sonar operators from training in conditions analogous to those faced during military missions and combat operations, such as during periods of low visibility.

Active sonar signals are designed explicitly to provide optimum performance at detecting underwater objects (e.g., submarines) in a variety of acoustic environments. The Navy assessed the potential for implementing active sonar signal modification as mitigation. At this time, the science on the differences in potential impacts of up or down sweeps of the sonar signal (e.g., different behavioral reactions) is extremely limited and requires further development. If future studies indicate that modifying active sonar signals (i.e., up or down sweeps) could be an effective mitigation approach, then the Navy will investigate if and how the mitigation would affect the sonar's performance.

Active sonar equipment power levels are set consistent with mission requirements. Active sonar ramp-up procedures are used during seismic surveys and some foreign navy sonar activities. Ramping up involves slowly increasing sound levels over a certain length of time until the optimal source level is reached. The intent of ramping up a sound source is to alert marine mammals with a low sound level to deter them from the area and avoid higher levels of sound exposure. The best available science does not suggest that ramp-up would be an effective mitigation tool for U.S. Navy active sonar training activities under the Proposed Action. Wensveen et al. (2017) found that active sonar ramp-up was not an effective method for reducing impacts on humpback whales because most whales did not display strong

behavioral avoidance to the sonar signals. The study suggested that sonar ramp-up could potentially be more effective for other more behaviorally responsive species but would likely also depend on the context of exposure. For example, ramp-up would be less effective if animals have a strong motivation not to move away from their current location, such as when foraging. Dunlop et al. (2016) and von Benda-Beckmann et al. (2014) found that implementing ramp-up as a mitigation may be effective for some activities in some situations. Additionally, von Benda-Beckmann et al. (2014) found that the main factors limiting ramp-up effectiveness for a typical anti-submarine warfare activity are a high source level, a moving sonar source, and long silences between consecutive sonar transmissions. Based on the source levels, vessel speeds, and sonar transmission intervals that will be used during typical active sonar activities under the Proposed Action, the Navy has determined that ramp-up would be an ineffective mitigation measure for the active sonar activities analyzed in this SEIS/OEIS.

Implementing active sonar ramp-up procedures during training under the Proposed Action would not be representative of military mission and combat conditions and would significantly impact training realism. For example, during an anti-submarine warfare exercise using active sonar, ramp-ups have the potential to alert opponents (e.g., target submarines) to the transmitting vessel's presence. This would defeat the purpose of the training by allowing the target submarine to detect the searching unit and take evasive measures, thereby denying the sonar operator the opportunity to learn how to locate the submarine. Reducing realism in training impedes the ability for Navy Sailors to train and become proficient in using active sonar, erodes capabilities, and reduces perishable skills. These impacts would result in a significant risk to personnel safety during military missions and combat operations and would prevent units from meeting their individual training and certification requirements. Therefore, implementing additional mitigation that would reduce training realism would ultimately prevent units from deploying with the required level of readiness necessary to accomplish their missions and impede the Navy's ability to certify forces to deploy to meet national security tasking.

5.5.2 Explosives

When assessing and developing mitigation for the Proposed Action, which no longer includes a Sinking Exercise or other underwater detonations, the Navy considered reducing the number and size of explosives and limiting the locations and time of day of explosive training in the TMAA. The Navy determined that it would be practical to implement certain restrictions on the use of explosives, as detailed in Section 5.3.3 (Explosive Stressors) and Section 5.4 (Geographic Mitigation to be Implemented). As discussed in Chapter 2 (Description of Proposed Action and Alternatives), Section 5.2.3 (Practicality of Implementation), Section 5.4 (Geographic Mitigation to be Implemented), and Appendix A (Navy Activities Descriptions), the locations and timing of the training activities that use explosives vary throughout the TMAA based on range scheduling, mission requirements, and standard operating procedures for safety and mission success.

Activities that involve explosive ordnance are inherently different from those that involve non-explosive practice munitions. For example, critical components of an explosive Bombing Exercise Air-to-Surface include the assembly, loading, delivery, and assessment of the explosive bomb. The explosive bombing training exercise starts with ground personnel, who must practice the building and loading of explosive munitions. Training includes the safe handling of explosive material, configuring munitions to precise specifications, and the loading of munitions onto aircraft. Aircrew must then identify a target and safely deliver fused munitions, discern if the bomb was assembled correctly, and determine bomb damage assessments based on how and where the explosive detonated. An air-to-surface bombing exercise using non-explosive practice munitions can train aircrews on valuable skills to locate and accurately

deliver munitions on a target; however, it cannot effectively replicate the critical components of an explosive activity in terms of assembly, loading, delivery, and assessment of an explosive bomb. Reducing the number and size of explosives or diminishing activity realism by implementing time of day or geographic restrictions for additional explosive training activities would impede the ability for Navy Sailors to train and become proficient in using explosive weapons systems (which would result in a significant risk to personnel safety during military missions and combat operations), and would ultimately prevent units from meeting their individual training and certification requirements (which would prevent them from deploying with the required level of readiness necessary to accomplish their missions) and impede the Navy's ability to certify forces to deploy to meet national security tasking.

The 2016 GOA Final SEIS/OEIS included mitigation to not conduct Sinking Exercises within Habitat Areas of Particular Concern within the TMAA, including the GOA Seamount Habitat Protection Areas and GOA Slope Habitat Conservation Areas. Because Sinking Exercises will not be conducted under the Proposed Action of this SEIS/OEIS, mitigation for that activity within Habitat Areas of Particular Concern is no longer needed and has not been included in this chapter. As described in Section 5.4.1.5 (Fisheries Habitats), the North Pacific Fishery Management Council established several Habitat Areas of Particular Concern that support high biomass of groundfishes within the TMAA. Certain types of fishing activities are prohibited or restricted within the Habitat Areas of Particular Concern, including fishing with bottom-contact gear such as longlines, trawls, and pots. The protected areas were designated to support sustainable fisheries management by preventing impacts from groundfish fishery practices that are known to directly result in degradation of seafloor habitats. The 2016 GOA Final SEIS/OEIS Sinking Exercise mitigation requirements had been designed to help the Navy avoid physical disturbance and strike impacts on fishery resources associated with important seafloor habitats, consistent with the intent of the fishery management regulations (i.e., to avoid degradation of seafloor habitats from activities designed to deliberately make contact with the seafloor). During a Sinking Exercise, ship, aircraft, and submarine crews attack with coordinated tactics and deliver a variety of explosive ordnance to deliberately sink a seaborne target. The target is typically a decommissioned ship that has been made environmentally safe for sinking according to U.S. Environmental Protection Agency standards. Because the event involves firing a variety of munitions from multiple weapons systems at a stationary target, Sinking Exercises would result in a higher concentration of expended projectiles relative to other training activities that are smaller in scale and more transient or dispersed in nature. Additionally, Sinking Exercises result in a large target (a ship hulk) deliberately sinking to the seafloor, which differs from other types of training activities that use comparatively small targets or recoverable targets. Requiring other training activities (e.g., explosive bombing exercises) to implement the mitigation developed specific to Sinking Exercises would not effectively avoid or reduce potential impacts on seafloor habitats and their associated fishery resources due to the already low potential for impacts to occur from those activities.

5.5.3 Active and Passive Acoustic Monitoring Devices

When assessing and developing mitigation, the Navy considered using active and passive acoustic monitoring devices as procedural mitigation. During Surveillance Towed Array Sensor System low-frequency active sonar (which is not part of the Proposed Action), the Navy uses a specially-designed adjunct high-frequency marine mammal monitoring active sonar known as "HF/M3" to mitigate potential impacts. HF/M3 can only be towed at slow speeds and operates like a fish finder used by commercial and recreational fishermen. Installing the HF/M3 adjunct system on the tactical sonar ships used under the Proposed Action would have implications for safety and mission

requirements due to impacts on speed and maneuverability. Furthermore, installing the system would significantly increase costs associated with designing, building, installing, maintaining, and manning the equipment. The Navy will not install the HF/M3 system or other adjunct marine mammal monitoring devices as mitigation under the Proposed Action. However, Navy assets with passive acoustic monitoring capabilities that are already participating in an activity will continue to monitor for marine mammals, as described in Section 5.2.1 (Procedural Mitigation Development) and Section 5.3 (Procedural Mitigation to be Implemented). Significant manpower and logistical constraints make constructing and maintaining additional passive acoustic monitoring systems for each training activity under the Proposed Action impractical. For example, the Navy does not have available manpower or resources to allocate additional aircraft for the purpose of deploying, monitoring, and retrieving passive acoustic monitoring equipment during a bombing exercise. All platforms participating in explosive bombing exercises (e.g., firing aircraft, safety aircraft) must focus on situational awareness of the activity area and continuous coordination between multiple training components for safety and mission success. Diverting platforms with passive acoustic monitoring capabilities to monitor training events would impact their ability to meet their mission requirements and would reduce the service life of those systems.

The Navy is continuing to improve its capabilities to use range instrumentation to aid in the passive acoustic detection of marine mammals. For example, at the Southern California Offshore Range, the Pacific Missile Range Facility off Kauai, Hawaii, and the Atlantic Undersea Test and Evaluation Center in the Bahamas, the Navy can monitor instrumented ranges in real-time or through data recorded by hydrophones. The Navy has sponsored numerous studies that have produced meaningful results on marine mammal occurrence, distribution, and behavior on these ranges through the U.S. Navy's Marine Species Monitoring Program. For information on the U.S. Navy's Marine Species Monitoring Program, see Section 5.1.2.2.1 (Marine Species Research and Monitoring Programs).

Although the Navy's instrumented ranges are helping to facilitate a better understanding of the species that are present in those areas, instrumented ranges were not developed for the purpose of mitigation, and therefore do not have the capabilities to be used effectively for mitigation. To develop an estimated position for an individual marine mammal, the animal's vocalizations must be detected on at least three hydrophones. The vocalizations must be loud enough to provide the required signal to noise ratio on those hydrophones. The hydrophones must have the required bandwidth and dynamic range to capture that signal. Detection capabilities are generally degraded under noisy conditions (such as high sea state) that affect signal to noise ratio. The ability to detect and develop an estimated position for marine mammals on the Navy's instrumented ranges depends of numerous factors, such as behavioral state (e.g., only vocalizing animals can be detected), species (e.g., species vocalize at varying rates, call types, and source levels), animal location relative to the passive acoustic receivers (hydrophones), and location on the range. The Navy's hydrophones cannot track the real-time locations of individual animals with dispersed and directional vocalizations with the level of precision needed for effective mitigation. Even marine mammals that have been vocalizing for extended periods of time have been known to stop vocalizing for hours at a time, which would prevent the Navy from obtaining or maintaining an accurate estimate of that animal's location. In addition, the Navy does not currently have the capability to perform data processing for large baleen whales in real-time. Determining if an animal is located within a mitigation zone within the timeframes required for mitigation would be prohibited by the amount of time it takes to process the data.

If a vocalizing animal is detected on only one or two hydrophones, estimating its location is not possible, and the location of the animal would be assigned generally within the detection radius around each hydrophone. The detection radius of a hydrophone is typically much larger than the mitigation zone for the activities conducted on instrumented ranges. The Navy does not have a way to verify if that vocalizing animal is located within the mitigation zone or at a location down range. Mitigating for passive acoustic detections based on unknown animal locations would essentially increase the mitigation zone sizes for each activity to that of the hydrophone detection radius. Increasing the mitigation zone sizes beyond what is described for each activity is impractical for the reasons described throughout Section 5.3 (Procedural Mitigation to be Implemented).

In summary, although the Navy is continuing to improve its capabilities to use range instrumentation to aid in the passive acoustic detection of marine mammals, at this time it would not be effective or practical for the Navy to monitor instrumented ranges for real-time mitigation or to construct additional instrumented ranges as a tool to aid in the implementation of mitigation.

5.5.4 Thermal Detection Systems and Unmanned Aerial Vehicles

When assessing and developing mitigation, the Navy considered using thermal detection systems and other technologies (e.g., autonomous platforms such as unmanned aerial vehicles, X-band radar) as procedural mitigation. The use of X-band radar instruments for marine mammal monitoring is a new field of study. A preliminary pilot experiment in the Mediterranean Sea indicated that X-band radar instruments, which allow for continuous observation of the sea surface within a certain range from the radar antenna, were able to detect bottlenose dolphins during optimal weather and sea state conditions (Mingozzi et al., 2020). Detections by radar were generally limited by conditions such as waves, which did not allow for the correct identification of small targets, and rain, which masked the radar signal reflection and reduced the ability to detect targets. The pilot experiment used a manual approach to observe for and validate radar detections; however, future technological developments could potentially allow for automated marine mammal observation using X-band radar (Mingozzi et al., 2020).

Thermal detection technology is designed to allow observers to detect the difference in temperature between a surfaced marine mammal (i.e., the body or blow of a whale) and the environment (i.e., the water and air). Thermal detection systems can be effective at detecting some types of marine mammals in a limited range of marine environmental conditions. Technologies are advancing but continue to be limited by their: (1) reduced performance in certain environmental conditions, (2) ability to detect certain animal characteristics and behaviors, (3) low sensor resolution and narrow fields of view, and (4) high cost and low lifecycle (Boebel, 2017; Zitterbart et al., 2013). Current thermal detection systems have proven more effective at perceiving thermal anomalies as distance to the observer decreases (Zitterbart et al., 2020), and at detecting large whale blows than the bodies of small animals, particularly at a distance (Zitterbart et al., 2013). Zitterbart et al. (2020) found that certain cues, such as those caused by the displacement of relatively large amounts of water (e.g., whale breaches) were less affected by distance than other cues (e.g., whale blows) that showed a linear decay related to the effects of wind on thermal perceptibility. The study also found that the maximum thermal perceptibility distance ranged from <1–10 kilometers, depending on factors such as cue type, species, and observation location.

The effectiveness of current technologies has not been demonstrated for small marine mammals. Thermal detection systems exhibit varying degrees of false positive detections (i.e., incorrect notifications) due in part to their low sensor resolution and reduced performance in certain

environmental conditions. False positive detections may incorrectly identify other features (e.g., birds, waves, boats) as marine mammals. Zitterbart et al. (2013) reported a false positive rate approaching one incorrect notification per four minutes of observation. Zitterbart et al. (2020) reported maximum false positive rates of > 50 or 30 per hour, depending on observation location.

Thermal detection systems are generally thought to be most effective in detecting large, short-diving marine mammals in cold environments where there is a large temperature differential between an animal's temperature and the environment (Verfuss et al., 2018). Two studies that examined the effectiveness of thermal detection systems for marine mammal observations are Zitterbart et al. (2013), which tested a thermal detection system and automatic algorithm in polar waters between 34 and 50 degrees Fahrenheit, and a Navy-funded study in subtropical and tropical waters. Zitterbart et al. (2013) found that current technologies have limitations regarding temperature and survey conditions (e.g., rain, fog, sea state, glare, ambient brightness), for which further effectiveness studies are required. The Office of Naval Research Marine Mammals and Biology program funded a project (2013–2018) to test the thermal limits of infrared-based automatic whale detection technology. That project focused on capturing whale spouts at two different locations featuring subtropical and tropical water temperatures, optimizing detector/classifier performance on the collected data, and testing system performance by comparing system detections with concurrent visual observations. Results indicated that thermal detection systems in subtropical and tropical waters can be a valuable addition to marine mammal surveys within a certain distance from the observation platform (e.g., during seismic surveys, vessel movements), but they have challenges associated with false positive detections of waves and birds (Boebel, 2017).

The Navy has also been investigating the use of thermal detection systems with automated marine mammal detection algorithms for future mitigation during training and testing, including on autonomous platforms. For example, the Defense Advanced Research Projects Agency funded six initial studies to test and evaluate infrared-based thermal detection technologies and algorithms to automatically detect marine mammals on an unmanned surface vehicle. Based on the outcome of these initial studies, the Navy is pursuing additional follow-on research efforts.

Thermal detection systems are currently used by some specialized U.S. Air Force aircraft for marine mammal mitigation. These systems are specifically designed for and integrated into Air Force aircraft and cannot be added to Navy aircraft. Only certain Navy aircraft have specialized infrared capabilities, and these capabilities are only for fine-scale targeting within a narrow field of view. The only thermal imagery sensors aboard Navy surface ships are associated with specific weapons systems, and these sensors are not available on all vessels. These sensors are typically used only in select training events, have a limited lifespan before requiring expensive replacement, and are not optimized for marine mammal observations within the Navy's mitigation zones. For example, as described in Section 5.3.3.1 (Explosive Medium-Caliber and Large-Caliber Projectiles), Lookouts are required to observe a 1,000 yd. mitigation zone around the intended impact location during explosive large-caliber gunnery activities. In addition to observing for marine mammals, one of the activity's mission-essential requirements is for event participants, including Lookouts, to maintain focus on the mitigation zone to ensure the safety of Navy personnel and equipment and the public. Lookouts would not be able to observe the 1,000 yd. mitigation zone using the Navy's thermal imagery sensors due to their narrow fields of view and technological design specific to fine-scale targeting. Such observations would be ineffective for marine mammals and would prevent Lookouts from effectively maintaining focus on the activity area and implementing mission-essential safety protocols.

The effectiveness of even the most advanced commercially available thermal detection systems with technological designs specific to marine mammal observations is highly dependent on environmental conditions, animal characteristics, and animal behaviors (Zitterbart et al., 2013). High false positive rates of thermal detection systems could result in the Navy implementing mitigation for features incorrectly identified as marine mammals. Increasing the instances of mitigation implementation based on incorrectly identified features would have significant impacts on the ability for military readiness activities to accomplish their intended objectives, without providing any mitigation benefit to the species. In addition, thermal detection systems are designed to detect marine mammals and do not have the capability to detect other resources for which the Navy is required to implement mitigation. Requiring Lookouts to use thermal detection systems could potentially prevent them from detecting and mitigating for sea turtles.

Verfuss et al. (2018) determined that based on the science of current thermal detection system technologies, the combined performance of two or more observation methods would improve detection probability for real-time monitoring of marine mammals. Similarly, during a study conducted offshore Atlantic Canada, Smith et al. (2020) found that overall marine mammal detection rates increased when complementary methods (marine mammal observers, infrared cameras, and passive acoustic monitoring) were used. A combination of techniques balances the benefits and limitations of each method, particularly in conditions such as high sea state and low-visibility. As discussed in Section 5.3 (Procedural Mitigation to be Implemented), the Navy's procedural mitigation measures include the maximum number of Lookouts the Navy can assign to each activity based on available manpower and resources, combined with the use of passive acoustic monitoring when those assets are already participating in an activity. It would be impractical to add personnel to serve as additional Lookouts for the sole purpose of thermal detection system use under the Proposed Action because the Navy does not have available manpower to add Lookouts to use thermal detection systems in tandem with existing Lookouts who are using traditional observation techniques.

In summary, thermal detection systems have not been sufficiently studied both in terms of their effectiveness and compatibility with Navy military readiness activities. The Navy plans to continue researching thermal detection systems to determine their effectiveness and compatibility with Navy applications. If the technology matures to the state where thermal detection is determined to be an effective mitigation tool during military readiness activities, the Navy will assess the practicality of using the technology during applicable events and retrofitting its observation platforms with thermal detection devices. The assessment will include an evaluation of the budget and acquisition process (including costs associated with designing, building, installing, maintaining, and manning equipment that is expensive and has a relatively short lifecycle before key system components need replacing); logistical and physical considerations for device installment, repair, and replacement (e.g., conducting engineering studies to ensure there is no electronic or power interference with existing shipboard systems); manpower and resource considerations for training personnel to effectively operate the equipment; and considerations of potential security and classification issues. New system integration on Navy assets can entail up to 5–10 years of effort to account for acquisition, engineering studies, and development and execution of systems training. The Navy will provide information to NMFS about the status and findings of Navy-funded thermal detection studies and any associated practicality assessments at the annual adaptive management meetings. Information about the Navy's adaptive management program is included in Section 5.1.2.2.1.1 (Adaptive Management).

5.5.5 Third-Party Observers

When assessing and developing mitigation, the Navy considered using third-party observers during training to aid in the implementation of procedural mitigation. The use of third-party observers to conduct pre- or post-activity biological resource observations would be an ineffective mitigation because marine mammals would likely move into or out of the activity area, and mitigation must be implemented at the time the activity is taking place.

There are significant manpower and logistical constraints that make using third-party observers for every training activity under the Proposed Action impractical. Training activities often occur simultaneously and in various locations in the TMAA, some of which last for days or weeks at a time. Having third-party observers embark on Navy vessels or aircraft would result in safety and security clearance issues. Training event planning includes careful consideration of capacity limitations when placing personnel on participating aircraft and vessels. The Navy is unable to add third-party observers on a ship or substitute a Navy Lookout with a third-party observer without causing a berthing shortage or exceedance of other space limitations, or impacting the ability for Lookouts to complete their other mission-essential duties. The use of third-party observers also presents national security concerns due to the requirement to provide advance notification of specific times and locations of Navy platform movements and activities (e.g., vessels using active sonar).

Reliance on the availability of third-party personnel for mitigation would be impractical because training activity timetables oftentimes cannot be precisely fixed and are instead based on the free-flow development of tactical situations. Waiting for third-party aircraft or vessels to complete surveys, refuel, or transit on station would extend the length of the activity in a way that would diminish realism and delay training schedules. Hiring third-party civilian vessels or aircraft to observe Navy training activities would also be unsustainable due to the significant associated costs. Because many training activities take place offshore, the amount of time observers would spend on station would be limited due to aircraft fuel restrictions. Fuel restrictions and distance from shore would increase safety risks should mechanical problems arise. The presence of civilian aircraft or vessels in the vicinity of training activities would present increased safety risks due to airspace conflicts and proximity to explosives.

5.5.6 Foreign Navy Mitigation

When assessing and developing mitigation, the Navy considered adopting the mitigation measures implemented by foreign navies. Mitigation measures are carefully developed for and assessed by each individual navy based on the potential impacts of their activities on the biological resources that live in their study areas, and the practicality of mitigation implementation based on their training mission requirements and the resources available for mitigation. The U.S. Navy's readiness considerations differ from those of foreign navies based on each navy's strategic reach, global mission, country-specific legal requirements, and geographic considerations. Most non-U.S. navies do not possess an integrated strike group and do not have integrated training requirements. The U.S. Navy's training is built around the integrated warfare concept and is based on the U.S. Navy's capabilities, the threats faced, the operating environment, and the overall mission. For this reason, not all measures developed for foreign navies would be effective at reducing impacts of U.S. Navy training, or practical to implement by the U.S. Navy (and vice versa). For example, some navies implement active sonar ramp-up as mitigation for marine mammals; however, as described in Section 5.5.1 (Active Sonar), the U.S. Navy determined that active sonar ramp-up would be an ineffective mitigation measure for training activities under the Proposed Action and would be impractical to implement because it would significantly impact training realism.

The U.S. Navy will implement mitigation measures that have been determined to be effective at avoiding or reducing impacts from the Proposed Action and practical to implement by the U.S. Navy. Many of these measures are the same as, or comparable to, those implemented by foreign navies. For example, most navies implement some form of procedural mitigation to cease certain activities if a marine mammal is observed in a mitigation zone (Dolman et al., 2009). Some navies also implement geographic mitigation to restrict activities within particularly important marine mammal breeding, feeding, or migration habitats. The U.S. Navy will implement several mitigation measures and environmental compliance initiatives that are not implemented by foreign navies. For example, as discussed in Section 5.1.2.2 (Monitoring, Research, and Reporting Initiatives), the U.S. Navy will continue to sponsor scientific monitoring and research and comply with stringent reporting requirements.

5.5.7 Reporting Requirements

When assessing and developing mitigation, the Navy considered increasing its reporting requirements, such as additional reporting of vessel speeds and marine species observations. As discussed in Section 5.1.2.2 (Monitoring, Research, and Reporting Initiatives), the Navy developed its reporting requirements in conjunction with NMFS to be consistent with mission requirements and balance the usefulness of the information to be collected with the practicality of collecting it. The Navy's training activity reports and incident reports are designed to verify implementation of mitigation; comply with current permits, authorizations, and consultation requirements; and improve future environmental analyses. In the unlikely event that a vessel strike of a marine mammal should occur, the Navy would provide NMFS with relevant information pertaining to the incident, including but not limited to vessel speed.

Additional reporting would be ineffective as mitigation because it would not result in modifications to training activities or further avoidance or reductions of potential impacts. For example, additional reporting of vessel speed data would not result in modifications to vessel speeds (e.g., speed restrictions) or reduce the already low potential for vessel strikes of marine mammals for the reasons described in Section 5.3.4.1 (Vessel Movement). Lookouts are not trained to make species-specific identification and would not be able to provide detailed scientific data if more detailed marine species observation reports were to be required. Furthermore, the Navy does not currently maintain a record management system to collect, archive, analyze, and report every marine species observation or all vessel speed data for every training activity and all vessel movements. For example, the speed of Navy vessels can fluctuate an unlimited number of times during training events. Developing and implementing a record management system of this magnitude would be unduly cost prohibitive and place a significant administrative burden on vessel operators and activity participants. Burdening operational Commanders, vessel operators, and event participations with requirements to complete additional administrative reporting would distract them from preparing a ready force and focusing on mission-essential tasks. Additional reporting requirements would draw event participants' attention away from the complex tactical tasks they are primarily obligated to perform, such as driving a warship or engaging in a gunnery event, which would adversely impact personnel safety, public health and safety, and the effectiveness of training.

5.6 Mitigation Summary

Table 5.6-1 provides a general summary of mitigation measures the Navy will implement under Alternative 1 of the Proposed Action. For detailed requirements, see Section 5.3 (Procedural Mitigation to be Implemented) and Section 5.4 (Geographic Mitigation to be Implemented). The mitigation zones in the table apply to marine mammals and sea turtles unless specified otherwise.

Table 5.6-1: Summary of Mitigation Requirements in the Temporary Maritime Activities Area

Stressor, Activity, or Mitigation Category	*Summary of Procedural Mitigation Requirements Wherever Activities Occur*		*Mitigation Areas and Summary of Geographic Mitigation Requirements*			*Species Protection Focus*				*Summary of New Mitigation Added Since the 2016 GOA Final SEIS/OEIS*
	Number of Lookouts	*Mitigation Zone Size or Other Requirement*	*North Pacific Right Whale Mitigation Area*	*Portlock Bank Mitigation Area*	*Temporary Maritime Activities Area*	*Marine Mammals*	*Sea Turtles*	*Seabirds*	*Fishery Resources*	
Other	—	—	—	—	• Remain out of Steller sea lion CH	X	—	—	—	—
Environmental Awareness and Education	—	• Applicable personnel take assigned Afloat Environmental Compliance Training modules	—	—	• Seasonal awareness messages	X	X	X	—	• Seasonal awareness messages
Active Sonar	1 or 2, source dependent	• 1,000 yd. and 500 yd. power downs, and 200 yd. shut down for HM MFAS • 200 yd. shut down for MFAS, non-HM and HFAS	• No HM MF1	—	—	X	X	—	—	—
Weapon Firing Noise	1	• 30° on sides of firing line out to 70 yd. from the weapon muzzle	—	—	—	X	X	X	—	• Seabird mitigation
Explosive Med-Cal and Lg-Cal Projectiles	1	• 200 yd. (A-S med-cal: seabirds, marine mammals, sea turtles) • 200 yd. (S-S med-cal: seabirds) and 600 yd. (marine mammals, sea turtles) • 1,000 yd. (S-S lg-cal: marine mammals, sea turtles)	• No in-water explosives	• No in-water explosives	—	X	X	X	X	• Seabird mitigation • Increased marine mammal and sea turtle mitigation zones • Post-event observations • Additional participants support Lookout observations
Explosive Bombs	1	• 2,500 yd.	• No in-water explosives	• No in-water explosives	—	X	X	—	X	• Post-event observations • Additional participants support Lookout observations
Vessel Movement	1	• 500 yd. (whales) • 200 yd. (other marine mammals) • Vicinity (sea turtles)	—	—	—	X	X	—	—	• Sea turtle mitigation
Towed In-Water Devices	1	• 250 yd. (marine mammals) • Vicinity (sea turtles)	—	—	—	X	X	—	—	• Sea turtle mitigation
Sm-, Med-, Lg-Cal Non-Explosive Practice Munitions	1	• 200 yd. for sm-, med-, and lg-cal (marine mammals, sea turtles) and for sm- and med-cal (seabirds)	—	—	—	X	X	X	—	• Seabird mitigation
Non-Explosive Bombs	1	• 1,000 yd.	—	—	—	X	X	—	—	—

Notes: — = No mitigation or mitigation is not applicable, X = Mitigation is applicable, CH = critical habitat, GOA = Gulf of Alaska, HFAS = high-frequency active sonar, HM = hull-mounted, Lg-cal = large-caliber, Med-cal = medium-caliber, MFAS = mid-frequency active sonar, NEW = net explosive weight, NM = nautical miles, OEIS = Overseas Environmental Impact Statement, Sm-cal = small-caliber, SEIS = Supplemental Environmental Impact Statement, yd. = yard

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