6.0 Mitigation Measures

6.0 MITIGATION MEASURES

Effective training in the Hawaii Range Complex (HRC) dictates that ship, submarine, and aircraft participants utilize their sensors and exercise weapons to their optimum capabilities as required by the mission. The Navy recognizes that such use has the potential to cause behavioral disruption of some marine mammal species in the vicinity of an exercise (as outlined in Chapter 4.0). Although any disruption of natural behavioral patterns is not likely to be to a point where such behavioral patterns are abandoned or significantly altered, this chapter presents the Navy's mitigation measures, outlining steps that would be implemented to protect marine mammals and Federally-listed species during operations. It should be noted that several of these mitigation measures align with standard operating procedures for unit level antisubmarine warfare (ASW) training since 2004. In addition, the Navy coordinated with the National Marine Fisheries Service (NMFS) to further develop measures for protection of marine mammals during the period of the National Defense Exemption, and those mitigations for mid-frequency active sonar are detailed in this section. This chapter also presents a discussion of other measures that have been considered and rejected because they either: (1) are not feasible; (2) present a safety concern; (3) provide no known or ambiguous protective benefit; or (4) impact the effectiveness of the required ASW training military readiness activity.

In addition, in order to make the findings necessary to issue the Marine Mammal Protection Act (MMPA) authorization, it may be necessary for NMFS to require additional mitigation or monitoring measures beyond those addressed in this Draft EIS/OEIS. These could include measures considered, but eliminated in this Draft EIS/OEIS, or as yet undeveloped measures. In addition to commenting on this Draft EIS/OEIS, the public will have an opportunity to provide information to NMFS through the MMPA process, both during the comment period following NMFS' Notice of Receipt of the application for a Letter of Authorization (LOA), and during the comment period following publication of the proposed rule. NMFS may propose additional mitigation or monitoring measures in the proposed rule. Any measures not considered in the Draft EIS/OEIS, but required through the MMPA process, would require evaluation in accordance with the National Environmental Policy Act. The final suite of measures developed as a result of the MMPA LOA process would be identified and analyzed in the Final EIS/OEIS.

6.1 MID-FREQUENCY ACTIVE SONAR OPERATIONS

6.1.1 GENERAL MARITIME MITIGATION MEASURES: PERSONNEL TRAINING

1. All lookouts onboard platforms involved in ASW training events will review the NMFS-approved Marine Species Awareness Training material prior to use of mid-frequency active sonar.

2. All Commanding Officers, Executive Officers, and officers standing watch on the Bridge will have reviewed the Marine Species Awareness Training material prior to a training event employing the use of mid-frequency active sonar.

3. Navy lookouts will undertake extensive training in order to qualify as a watchstander in accordance with the Lookout Training Handbook (Naval Educational Training [NAVEDTRA], 12968-B).

4. Lookout training will include on-the-job instruction under the supervision of a qualified, experienced watchstander. Following successful completion of this supervised training period, lookouts will complete the Personal Qualification Standard program, certifying that they have demonstrated the necessary skills (such as detection and reporting of partially submerged objects). This does not forbid personnel being trained as lookouts from being counted as those listed in previous measures so long as supervisors monitor their progress and performance.

5. Lookouts will be trained in the most effective means to ensure quick and effective communication within the command structure in order to facilitate implementation of mitigation measures if marine species are spotted.

6.1.2 GENERAL MARITIME MITIGATION MEASURES: LOOKOUT AND WATCHSTANDER RESPONSIBILITIES

1. On the bridge of surface ships, there will always be at least three people on watch whose duties include observing the water surface around the vessel.

2. All surface ships participating in ASW Exercises will, in addition to the three personnel on watch noted previously, have at all times during the exercise at least two additional personnel on watch as lookouts.

3. Personnel on lookout and officers on watch on the bridge will have at least one set of binoculars available for each person to aid in the detection of marine mammals.

4. On surface vessels equipped with mid-frequency active sonar, pedestal mounted “Big Eye” (20x110) binoculars will be present and in good working order to assist in the detection of marine mammals in the vicinity of the vessel.

5. Personnel on lookout will employ visual search procedures employing a scanning methodology in accordance with the Lookout Training Handbook (NAVEDTRA 12968-B).

6. After sunset and prior to sunrise, lookouts will employ Night Lookouts Techniques in accordance with the Lookout Training Handbook.

7. Personnel on lookout will be responsible for reporting all objects or anomalies sighted in the water (regardless of the distance from the vessel) to the Officer of the Deck, since any object or disturbance (e.g., trash, periscope, surface disturbance, discoloration) in the water may be indicative of a threat to the vessel and its crew or indicative of a marine species that may need to be avoided as warranted.

6.1.3 OPERATING PROCEDURES

1. A Letter of Instruction, Mitigation Measures Message, or Environmental Annex to the Operational Order will be issued prior to the exercise to further disseminate the personnel training requirement and general marine mammal mitigation measures.

2. Commanding Officers will make use of marine species detection cues and information to limit interaction with marine species to the maximum extent possible consistent with safety of the ship.

3. All personnel engaged in passive acoustic sonar operation (including aircraft, surface ships, or submarines) will monitor for marine mammal vocalizations and report the detection of any marine mammal to the appropriate watch station for dissemination and appropriate action.

4. During mid-frequency active sonar operations, personnel will utilize all available sensor and optical systems (such as night vision goggles) to aid in the detection of marine mammals.

5. Navy aircraft participating in exercises at sea will conduct and maintain, when operationally feasible and safe, surveillance for marine species of concern as long as it does not violate safety constraints or interfere with the accomplishment of primary operational duties.

6. Aircraft with deployed sonobuoys will use only the passive capability of sonobuoys when marine mammals are detected within 200 yards of the sonobuoy.

7. Marine mammal detections will be immediately reported to assigned Aircraft Control Unit for further dissemination to ships in the vicinity of the marine species as appropriate where it is reasonable to conclude that the course of the ship will likely result in a closing of the distance to the detected marine mammal.

8. Safety Zones—When marine mammals are detected by any means (aircraft, shipboard lookout, or acoustically) within 1,000 yards of the sonar dome (the bow), the ship or submarine will limit active transmission levels to at least 6 decibels (dB) below normal operating levels.

    (i) Ships and submarines will continue to limit maximum transmission levels by this 6-dB factor until the animal has been seen to leave the area, has not been detected for 30 minutes, or the vessel has transited more than 2,000 yards beyond the location of the last detection.

    (ii) Should a marine mammal be detected within or closing to inside 500 yards of the sonar dome, active sonar transmissions will be limited to at least 10 dB below the equipment's normal operating level. Ships and submarines will continue to limit maximum ping levels by this 10-dB factor until the animal has been seen to leave the area, has not been detected for 30 minutes, or the vessel has transited more than 2,000 yards beyond the location of the last detection.

    (iii) Should the marine mammal be detected within or closing to inside 200 yards of the sonar dome, active sonar transmissions will cease. Sonar will not resume until the animal has been seen to leave the area, has not been detected for 30 minutes, or the vessel has transited more than 2,000 yards beyond the location of the last detection.

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

(v) If the need for power-down should arise as detailed in "Safety Zones" above, the Navy shall follow the requirements as though they were operating at 235 dB—the normal operating level (i.e., the first power-down will be to 229 dB, regardless of at what level above 235 sonar was being operated).

9. Prior to start up or restart of active sonar, operators will check that the Safety Zone radius around the sound source is clear of marine mammals.

10. Sonar levels (generally)—Navy will operate sonar at the lowest practicable level, not to exceed 235 dB, except as required to meet tactical training objectives.

11. Helicopters shall observe/survey the vicinity of an ASW Operation for 10 minutes before the first deployment of active (dipping) sonar in the water.

12. Helicopters shall not dip their sonar within 200 yards of a marine mammal and shall cease pinging if a marine mammal closes within 200 yards after pinging has begun.

13. Submarine sonar operators will review detection indicators of close-aboard marine mammals prior to the commencement of ASW operations involving active mid-frequency sonar.

14. Increased vigilance during Major ASW Training Exercises with tactical active sonar when critical conditions are present.

    Based on lessons learned from strandings in Bahamas 2000, Madeiras 2000, Canaries 2002 and Spain 2006, beaked whales are of particular concern since they have been associated with mid-frequency active sonar operations. The Navy should avoid planning Major ASW Training Exercises with mid-frequency active sonar in areas where they will encounter conditions which, in their aggregate, may contribute to a marine mammal stranding event.

    The conditions to be considered during exercise planning include:

    (i) Areas of at least 1,000-meter depth near a shoreline where there is a rapid change in bathymetry on the order of 1,000-6,000 meters occurring across a relatively short horizontal distance (e.g., 5 nautical miles [nm]).

    (ii) Cases for which multiple ships or submarines (≥ 3) operating mid-frequency active sonar in the same area over extended periods of time (≥ 6 hours) in close proximity (≤ 10 nm apart).

    (iii) An area surrounded by land masses, separated by less than 35 nm and at least 10 nm in length, or an embayment, wherein operations involving multiple ships/subs (≥ 3) employing mid-frequency active sonar near land may produce sound directed

toward the channel or embayment that may cut off the lines of egress for marine mammals.

(iv) Though not as dominant a condition as bathymetric features, the historical presence of a significant surface duct (i.e., a mixed layer of constant water temperature extending from the sea surface to 100 or more feet [ft]).

If the Major Exercise must occur in an area where the above conditions exist in their aggregate, these conditions must be fully analyzed in environmental planning documentation. The Navy will increase vigilance by undertaking the following additional mitigation measure:

A dedicated aircraft (Navy asset or contracted aircraft) will undertake reconnaissance of the embayment or channel ahead of the exercise participants to detect marine mammals that may be in the area exposed to active sonar. Where practical, advance survey should occur within about 2 hours prior to mid-frequency active sonar use, and periodic surveillance should continue for the duration of the exercise. Any unusual conditions (e.g., presence of sensitive species, groups of species milling out of habitat, any stranded animals) shall be reported to the Office in Tactical Command, who should give consideration to delaying, suspending, or altering the exercise.

All safety zone power down requirements described above apply.

The post-exercise report must include specific reference to any event conducted in areas where the above conditions exist, with exact location and time/duration of the event, and noting results of surveys conducted.

6.1.4 COORDINATION AND REPORTING

1. The Navy will coordinate with the local NMFS Stranding Coordinator for any unusual marine mammal behavior and any stranding, beached live/dead or floating marine mammals that may occur at any time during or within 24 hours after completion of mid-frequency active sonar use associated with ASW training activities.

2. The Navy will submit a report to the Office of Protected Resources, NMFS, within 120 days of the completion of a Major Exercise. This report must contain a discussion of the nature of the effects, if observed, based on both modeled results of real-time events and sightings of marine mammals.

3. If a stranding occurs during an ASW Exercise, NMFS and the Navy will coordinate to determine if mid-frequency active sonar should be temporarily discontinued while the facts surrounding the stranding are collected.

6.1.5 ALTERNATIVE MITIGATION MEASURES CONSIDERED BUT ELIMINATED

In addition to the mitigation measures identified above, the Navy also analyzed and eliminated from primary consideration several other mitigation measures. This analysis was based on application of factors that are used by NMFS for evaluating least practicable adverse impact for military readiness activities. As a component of their determination of least practicable adverse

impact, NMFS must consult with the Department of Defense on the following factors when issuing an MMPA authorization: personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity. Alternative mitigation measures considered by Navy included:

- Using non-Navy personnel onboard Navy vessels to provide surveillance of ASW or other exercise events.
  - Security clearance issues would have to be overcome to allow non-Navy observers onboard exercise participants.
  - Use of non-Navy observers is not necessary given that Navy lookouts are extensively trained in spotting items at or near the water surface. Navy lookouts receive more hours of training, and utilize their skills more frequently, than many third party trained personnel.
  - Use of Navy lookouts is the most effective means to ensure quick and effective communication within the command structure and facilitate implementation of mitigation measures if marine species are spotted. A critical skill set of effective Navy training is communication. Navy lookouts are trained to act swiftly and decisively to ensure that information is passed to the appropriate supervisory personnel.
  - Navy and NMFS have not developed the necessary lengthy and detailed procedures that would be required to facilitate the integration of information from non-Navy observers into the command structure.
  - Some training events will span one or more 24-hour period with operations underway continuously in that timeframe. It is not feasible to maintain non-Navy surveillance of these operations given the number of non-Navy observers that would be required onboard.
  - Surface ships having active mid-frequency sonar have limited berthing capacity. Exercise planning includes careful consideration of this limited capacity in the placement of exercise controllers, data collection personnel, and Afloat Training Group personnel on ships involved in the exercise. Inclusion of non-Navy observers onboard these ships would require that in some cases, there would be no additional berthing space for essential Navy personnel required to fully evaluate and efficiently use the training opportunity to accomplish the exercise objectives.
- Visual monitoring or surveillance using non-Navy observers from non-military aircraft or vessels to survey before, during, and after exercise events.
  - Use of non-Navy observers in the air or on civilian vessels compromises security due to the requirement to provide advance notification of specific times/locations of Navy platforms (this information is Classified).
  - The areas where training events will mainly occur (the representative areas modeled) cover approximately 170,000 square nautical miles. Contiguous ASW events may cover many hundreds of square miles. The number of civilian ships and/or aircraft required to monitor the area of these events would be considerable. It is, thus, not feasible to survey or monitor the large exercise areas in the time required to ensure these areas are devoid of marine mammals. In addition, marine mammals may move into or out of an area, if surveyed before an event, or an animal could move into an area after an exercise took place.

Given that there are no adequate controls to account for these or other possibilities and there are no identified research objectives, there is no utility to performing either a before or an after-the-event survey of an exercise area.

  - Survey during an event raises safety issues with multiple, slow civilian aircraft operating in the same airspace as military aircraft engaged in combat training activities. In addition, most of the training events take place far from land, limiting both the time available for civilian aircraft to be in the exercise area and presenting a concern should aircraft mechanical problems arise.
  - Scheduling civilian vessels or aircraft to coincide with training events would impact training effectiveness since exercise event timetables cannot be precisely fixed and are instead based on the free-flow development of tactical situations. Waiting for civilian aircraft or vessels to complete surveys, refuel, or be on station would slow the unceasing progress of the exercise and impact the effectiveness of the military readiness activity.
  - The vast majority of HRC training events involve a Navy aerial asset with crews specifically training to hone their detection of objects in the water. The capability of sighting from both surface and aerial platforms provides excellent survey capabilities using the Navy's existing exercise assets.
  - Multiple events may occur simultaneously in areas at opposite ends of the HRC and then continue for up to 96 hours. There are not enough qualified third-party personnel to accomplish the monitoring task.
  - There is no identified research design, sampling procedures, or purpose for any survey or monitoring effort.

- Seasonal, problematic complex/steep bathymetry, or habitat avoidance.
  - The habitat requirements for most of the marine mammals in the Hawaiian Islands are unknown. Accordingly, there is no information available on possible alternative exercise locations or environmental factors that would otherwise be less important to marine mammals in the Hawaiian Islands. In addition, exercise locations were very carefully chosen by exercise planners based on training requirements and the ability of ships and submarines to operate safely. Moving the exercise events to alternative locations would impact the effectiveness of the training and has no known utility.
- Using active sonar with output levels as low as possible consistent with mission requirements and use of active sonar only when necessary.
  - Operators of sonar equipment are always cognizant of the environmental variables affecting sound propagation. In this regard the sonar equipment power levels are always set consistent with mission requirements.
  - Active sonar is only used when required by the mission since it has the potential to alert opposing forces to the sonar platform's presence. Passive sonar and all other sensors are used in concert with active sonar to the maximum extent practical when available and when required by the mission.
- Suspending the exercise at night, periods of low visibility, and in high sea-states when marine mammals are not readily visible.
  - It is imperative that the Navy be able to operate at night, in periods of low visibility, and in high sea-states. The Navy must train as we are expected to

fight, and adopting this prohibition would eliminate this critical military readiness requirement.

- Scaling down the exercise to meet core aims.
  - Training exercises are always constrained by the availability of funding, resources, personnel, and equipment with the result being they are always scaled down to meet only the core requirements.
- Limiting the active sonar event locations.
  - Areas where events are scheduled to occur are carefully chosen to provide for the safety of operations and to allow for the realistic tactical development of the exercise scenario. Otherwise limiting the exercise to a few areas would adversely impact the effectiveness of the training.
  - Limiting the exercise areas would concentrate all sonar use, resulting in unnecessarily prolonged and intensive sound levels vice the more transient exposures predicted by the current planning that makes use of multiple exercise areas.
- Passive Acoustic Monitoring.
  - As noted in the preceding section, passive detection capabilities are used to the maximum extent practicable consistent with the mission requirements to alert exercise participants to the presence of marine mammals in an event location.
- Using ramp-up to attempt to clear an area prior to the conduct of exercises.
  - Ramp-up procedures involving slowly increasing the sound in the water to necessary levels, have been utilized in other non-Department of Defense activities. Ramp-up procedures are not a viable alternative for training exercises, as the ramp-up would alert opponents to the participants' presence and not allow the Navy to train, thus adversely impacting the effectiveness of the military readiness activity.
  - Ramp-up for sonar as a mitigation measure is also an unproven technique. The implicit assumption is that animals would have an avoidance response to the low power sonar and would move away from the sound and exercise area; however, there is no data to indicate this assumption is correct. Given there is no data to indicate that this is even minimally effective and because ramp-up would have an impact on the effectiveness of the military readiness activity, it was eliminated from further consideration.
- Reporting marine mammal sightings to augment scientific data collection.
  - Ships, submarines, aircraft, and personnel engaged in training events are intensively employed throughout the duration of the exercise. Their primary duty is accomplishment of the exercise goals, and they should not be burdened with additional duties, unrelated to that task. Any additional workload assigned that is unrelated to their primary duty would adversely impact the effectiveness of the military readiness activity they are undertaking.
- Use of new technology (e.g., unmanned reconnaissance aircraft, underwater gliders, instrumented ranges) to enhance monitoring of marine animals.
  - Although the Navy does work with many new technologies, they are very expensive and limited in availability. The Navy is currently investigating the use

of the instrumented range at the Pacific Missile Range Facility (PMRF) to collect information on marine mammals.

- Use of larger and more protective shut down zones

  The current power down and shut down zones are based on modeling of the source output level, propagation and transmission characteristics of sonar.

6.1.6 CONSERVATION MEASURES

The Navy will continue to fund ongoing marine mammal research in the field of acoustic responses and population dynamics, abundance, and density. Results of conservation efforts by the Navy in other locations will also be used to support efforts in the HRC. The Navy is coordinating long-term monitoring/studies of marine mammals on various established ranges and operating areas.

The Navy is implementing a long-term monitoring program of marine mammal populations including abundance and distribution in the HRC, including evaluation of trends and response to anthropogenic sound sources. The Navy will continue its internal Navy marine mammal research and the Navy's contribution to university/external research to improve the state of the science regarding marine species biology and acoustic effects. In addition, the Navy will continue to share data with NMFS and inform NMFS on current research and development efforts.

The Navy has contracted with a consortium of researchers from Duke University, University of North Carolina at Wilmington, University of St. Andrews, and the NMFS Northeast Fisheries Science Center to conduct a pilot study analysis and develop a proposed survey and monitoring plan that lays out the recommended approach for surveys (aerial/shipboard, frequency, spatial extent, etc.) and data analysis (standard line-transect, spatial modeling, etc.) necessary to establish a baseline of protected species distribution and abundance and monitor for changes that might be attributed to ASW operations on the Atlantic Fleet Undersea Warfare Training Range, Southern California, and Hawaiian range areas.

6.2 UNDERWATER DETONATIONS

To ensure protection of marine mammals and sea turtles during underwater detonation training and Mining Operations, the operating area must be determined to be clear of marine mammals and sea turtles prior to detonation. Implementation of the following mitigation measures continue to ensure that marine mammals would not be exposed to temporary threshold shift (TTS), PTS, or injury from physical contact with training mine shapes during Major Exercises.

6.2.1 DEMOLITION AND SHIP MINE COUNTERMEASURES OPERATIONS (UP TO 20 POUNDS)

6.2.1.1 EXCLUSION ZONES

All Mine Warfare and Mine Countermeasures Operations involving the use of explosive charges must include exclusion zones for marine mammals and sea turtles to prevent physical and/or

acoustic effects to those species. These exclusion zones shall extend in a 700-yard arc radius around the detonation site.

6.2.1.2 PRE-EXERCISE SURVEYS

For Demolition and Ship Mine Countermeasures Operations, pre-exercise survey shall be conducted within 30 minutes prior to the commencement of the scheduled explosive event. The survey may be conducted from the surface, by divers, and/or from the air, and personnel shall be alert to the presence of any marine mammal or sea turtle. Should such an animal be present within the survey area, the exercise shall be paused until the animal voluntarily leaves the area.

6.2.1.3 POST-EXERCISE SURVEYS

Surveys within the same radius shall also be conducted within 30 minutes after the completion of the explosive event.

6.2.1.4 REPORTING

Any evidence of a marine mammal or sea turtle that may have been injured or killed by the action shall be reported immediately to Commander, Pacific Fleet and Commander, Navy Region Southwest, Environmental Director.

6.2.1.5 MINING OPERATIONS

Mining Operations involve aerial drops of inert training shapes on floating targets. Aircrews are scored for their ability to accurately hit the target. Although this operation does not involve live ordnance, marine mammals have the potential to be injured if they are in the immediate vicinity of a floating target; therefore, the safety zone shall be clear of marine mammals and sea turtles around the target location. Pre- and post-surveys and reporting requirements outlined for underwater detonations shall be implemented during Mining Operations. To the maximum extent feasible, the Navy shall retrieve inert mine shapes dropped during Mining Operations.

6.2.2 SINK EXERCISE, GUNNERY EXERCISE, MISSILE EXERCISE AND BOMBING EXERCISE

The selection of sites suitable for Sink Exercises (SINKEXs) involves a balance of operational suitability, requirements established under the Marine Protection, Research and Sanctuaries Act (MPRSA) permit granted to the Navy (40 Code of Federal Regulations 229.2), and the identification of areas with a low likelihood of encountering Endangered Species Act (ESA) listed species. To meet operational suitability criteria, locations must be within a reasonable distance of the target vessels' originating location. The locations should also be close to active military bases to allow participating assets access to shore facilities. For safety purposes, these locations should also be in areas that are not generally used by non-military air or watercraft. The MPRSA permit requires vessels to be sunk in waters which are at least 1,000 fathoms (3,000 meters) deep and at least 50 nm from land.

In general, most listed species prefer areas with strong bathymetric gradients and oceanographic fronts for significant biological activity such as feeding and reproduction. Typical locations include the continental shelf and shelf-edge.

Although the siting of the location for the exercise is not regulated by a permit, the range clearance procedures used for Gunnery Exercise (GUNEX), Missile Exercise (MISSILEX), and Bombing Exercise (BOMBEX) are the same as those described below for a SINKEX.

6.2.2.1 MITIGATION PLAN

The Navy has developed range clearance procedures to maximize the probability of sighting any ships or protected species in the vicinity of an exercise, which are as follows:

1. All weapons firing would be conducted during the period 1 hour after official sunrise to 30 minutes before official sunset.
2. Extensive range clearance operations would be conducted in the hours prior to commencement of the exercise, ensuring that no shipping is located within the hazard range of the longest-range weapon being fired for that event.
3. Prior to conducting the exercise, remotely sensed sea surface temperature maps would be reviewed. SINKEX and ASM Operations would not be conducted within areas where strong temperature discontinuities are present, thereby indicating the existence of oceanographic fronts. These areas would be avoided because concentrations of some listed species, or their prey, are known to be associated with these oceanographic features.
4. An exclusion zone with a radius of 1.0 nm would be established around each target. This exclusion zone is based on calculations using a 990-pound (lb) H6 net explosive weight high explosive source detonated 5 feet (ft) below the surface of the water, which yields a distance of 0.85 nm (cold season) and 0.89 nm (warm season) beyond which the received level is below the 182 decibels (dB) re: 1 micropascal squared-seconds (μPa^2-s) threshold established for the *WINSTON S. CHURCHILL* (DDG 81) shock trials (U.S. Navy, 2001). An additional buffer of 0.5 nm would be added to account for errors, target drift, and animal movements. Additionally, a safety zone, which extends from the exclusion zone at 1.0 nm out an additional 0.5 nm, would be surveyed. Together, the zones extend out 2 nm from the target.
5. A series of surveillance over-flights would be conducted within the exclusion and the safety zones, prior to and during the exercise, when feasible. Survey protocol would be as follows:
    a. Overflights within the exclusion zone would be conducted in a manner that optimizes the surface area of the water observed. This may be accomplished through the use of the Navy's Search and Rescue Tactical Aid, which provides the best search altitude, ground speed, and track spacing for the discovery of small, possibly dark objects in the water based on the environmental conditions of the day. These environmental conditions include the angle of sun inclination, amount of daylight, cloud cover, visibility, and sea state.
    b. All visual surveillance activities would be conducted by Navy personnel trained in visual surveillance. At least one member of the mitigation team would have completed the Navy's marine mammal training program for lookouts.
    c. In addition to the overflights, the exclusion zone would be monitored by passive acoustic means, when assets are available. This passive acoustic monitoring would be maintained throughout the exercise. Potential assets include sonobuoys, which can be utilized to detect any vocalizing marine mammals

(particularly sperm whales) in the vicinity of the exercise. The sonobuoys would be re-seeded as necessary throughout the exercise. Additionally, passive sonar onboard submarines may be utilized to detect any vocalizing marine mammals in the area. The Officer Conducting the Exercise (OCE) would be informed of any aural detection of marine mammals and would include this information in the determination of when it is safe to commence the exercise.

d. On each day of the exercise, aerial surveillance of the exclusion and safety zones would commence 2 hours prior to the first firing.

e. The results of all visual, aerial, and acoustic searches would be reported immediately to the OCE. No weapons launches or firing would commence until the OCE declares the safety and exclusion zones free of marine mammals and threatened and endangered species.

f. If a protected species observed within the exclusion zone is diving, firing would be delayed until the animal is re-sighted outside the exclusion zone, or 30 minutes have elapsed. After 30 minutes, if the animal has not been re-sighted it would be assumed to have left the exclusion zone. This is based on a typical dive time of 30 minutes for traveling listed species of concern. The OCE would determine if the listed species is in danger of being adversely affected by commencement of the exercise.

g. During breaks in the exercise of 30 minutes or more, the exclusion zone would again be surveyed for any protected species. If protected species are sighted within the exclusion zone, the OCE would be notified, and the procedure described above would be followed.

h. Upon sinking of the vessel, a final surveillance of the exclusion zone would be monitored for 2 hours, or until sunset, to verify that no listed species were harmed.

6. Aerial surveillance would be conducted using helicopters or other aircraft based on necessity and availability. The Navy has several types of aircraft capable of performing this task; however, not all types are available for every exercise. For each exercise, the available asset best suited for identifying objects on and near the surface of the ocean would be used. These aircraft would be capable of flying at the slow safe speeds necessary to enable viewing of marine vertebrates with unobstructed, or minimally obstructed, downward and outward visibility. The exclusion and safety zone surveys may be cancelled in the event that a mechanical problem, emergency search and rescue, or other similar and unexpected event preempts the use of one of the aircraft onsite for the exercise.

7. Every attempt would be made to conduct the exercise in sea states that are ideal for marine mammal sighting, Beaufort Sea State 3 or less. In the event of a 4 or above, survey efforts would be increased within the zones. This would be accomplished through the use of an additional aircraft, if available, and conducting tight search patterns.

8. The exercise would not be conducted unless the exclusion zone could be adequately monitored visually.

9. In the unlikely event that any listed species are observed to be harmed in the area, a detailed description of the animal would be taken, the location noted, and if possible, photos taken. This information would be provided to National Oceanic and

Atmospheric Administration (NOAA) Fisheries via the Navy's regional environmental coordinator for purposes of identification.

10. An after action report detailing the exercise's time line, the time the surveys commenced and terminated, amount, and types of all ordnance expended, and the results of survey efforts for each event would be submitted to NOAA Fisheries.

6.3 CONDITIONS ASSOCIATED WITH THE BIOLOGICAL OPINION

The Navy will comply with the reasonable and prudent measures and terms and conditions issued by NMFS in their Biological Opinion for HRC training operations. In particular, the terms and conditions specify a monitoring program and process for feedback to NMFS following the completion of each exercise event.

6.4 COMPARISON OF ENDANGERED SPECIES RECOVERY PLANS

Recovery plans are developed by the U.S. Fish and Wildlife Service and NMFS to help guide actions that promote the recovery of threatened and endangered species to the point that they may be down-listed and eventually de-listed. Where de-listing may not be reasonably possible given population size or habitat constraints, stopping the decline of the species and establishing a stable population may be interim goals. Recovery plans in general discuss the current status of the species or population, threats to their continued existence, and actions to promote recovery. In many instances one of the primary recovery needs is information on population size and distribution and other basic information such as sex ratios, birth rate/fecundity, recruitment, mortality, hearing sensitivity, and sound production.

Twenty-seven recovery plans for endangered or threatened species have been completed, drafted or are undergoing revision by NMFS. Of these, 10 recovery plans cover species evaluated in this Draft Environmental Impact Statement (EIS) / Overseas EIS (OEIS): blue whales (*Balaenoptera musculus*), fin whales (*B. physalus*), humpback whales (*Megaptera novaeangliae*), sperm whales (*Physeter macrocephalus*), Hawaiian monk seals (*Monachus schauinslandi*), green turtles (*Chelonia mydas*), hawksbill turtles (*Eretmochelys imbricata*), loggerhead turtles (*Caretta caretta*), olive ridley turtles (*Lepidochelys olivacea*), and leatherback turtles (*Dermochelys coriacea*). Many of these plans are out of date and are in need of revision

With respect to this Draft EIS/OEIS, a review of the applicable recovery plans found that many plans identified in-water effects such as anthropogenic sound or underwater detonations and ship strikes as possible threats to recovery. In some cases all anthropogenic sources were lumped together and in others military and civilian sources were broken out separately.

Based on modeling results in this Draft EIS/OEIS, fin whales, sei whales, humpback whales, sperm whales and Hawaiian monk seals may be exposed to acoustic energy that could result in TTS or behavioral modification. Due to the lack of density data for blue whales and North

Pacific right whales (*Eubalaena japonicus*)* they were not included in the acoustic effects exposure model. There are few sightings for these two species in the Hawaiian Islands area and they are not expected to be exposed to mid-frequency active sonar.

For the five species of sea turtles potentially occurring within the HRC, available information suggests that sea turtles are likely not able to hear mid-frequency sounds (2.6 kilohertz [kHz] and 3.3 kHz) in the range produced by active tactical sonars.

The following sections outline the applicable threats identified in each plan and the mitigation measures adopted by the Navy for the actions covered by this Draft EIS/OEIS.

6.4.1 RECOVERY PLAN FOR THE BLUE WHALE (*Balaenoptera musculus*)—(1998)

Anthropogenic noise was discussed under Habitat Degradation (p.16) and focused on the low-frequency sound transmitted during the Acoustic Thermometry of Ocean Climate (ATOC) experiment conducted in the mid-1990s. Whales observed during the trials were found to be distributed nominally further from the source when it was active than when it was not. No other changes in behavior or distribution were observed. ATOC and the North Pacific Acoustic Laboratory are not being considered in this Draft EIS/OEIS.

Under Military Operations Surveillance Towed Array Sensor System (SURTASS) Low Frequency Active (LFA) and ship shock trials were used to illustrate potential effects. However, neither observed nor potential effects were discussed. Detection of two blue whales in the vicinity of the ship shock trial resulted in the relocation of the trial to an area 9 miles from the whales. Scientific research intended to determine whether exposure to low frequency sounds elicited disturbance reactions from feeding blue or fin whales was conducted in 1997. In 19 focal animal observations (4 blue whales and 15 fin whales), no overt behavioral responses were observed. No changes in whale distribution could be related to LFA operations; whale distributions closely tracked the distribution of food. One preliminary analysis of whale sounds detections indicated a slight decrease in whale calling activity during LFA operations, but this was not confirmed by a second analysis. SURTASS LFA is not being considered in this Draft EIS/OEIS.

Military vessel traffic was cited as contributory to the overall issue of vessel traffic and ship strikes.

Mitigation Measures—Except for potential ship strikes none of the threats listed above for blue whales is applicable to training activities within the HRC. Potential ship strikes would be mitigated by the use of trained observers aboard ASW platforms, vessels associated with SINKEX, and vessels used for mine countermeasures and demolition training and observers aboard aircraft when available. Based on available sighting data and the mitigation measures outlined in this chapter, it is unlikely that blue whales would be subject to vessel strikes within the HRC, thus fulfilling Recovery Action 4.2, Identify and implement methods to reduce ship collisions with blue whales.

* There is no current or draft recovery plan for North Pacific right whales.

6.4.2 DRAFT RECOVERY PLAN FOR THE FIN WHALE (*Balaenoptera physalus*)—(2006)

Ship Strikes (p. I-25) was a source of mortality for fin whales off the U.S. west coast from 1990 through 2005.

Although recent military activities (G.9 Military Operations, p. I-28) in the North Pacific are not known to have had impacts on fin whales, there was concern that due to "…the large scale and diverse nature of military activities in this ocean basin …there is always potential for disturbing, injuring, or killing these and other whales."

As noted above for blue whales, the issue of SURTASS LFA was also raised for fin whales.

Mitigation Measures—The effect of SURTASS LFA on fin whales is not applicable to training activities within the HRC. Potential ship strikes would be mitigated by the use of trained observers aboard ASW platforms, vessels associated with SINKEX, and vessels used for mine countermeasures and demolition training and observers aboard aircraft when available. Based on available sighting data and the mitigation measures outlined Section 6.1, it is unlikely that fin whales would be subject to vessel strikes within the HRC, thus addressing Recovery Action 6.3 - Identify and implement measures to reduce the frequency and severity of ship collisions and gear interactions with fin whales. The use of tactical active sonars within the HRC would be governed by the mitigation measures outlined in Section 6.1, which include the requirement for trained observers, aircraft surveillance when available, the use of passive listening devices, safety zones, sonar power limit requirements, and consideration of bathymetry and oceanographic conditions. These mitigation measures address Recovery Action 7.2, Implement appropriate measures to reduce the exposure of fin whales to human-generated noise judged to be potentially detrimental.

6.4.3 FINAL RECOVERY PLAN FOR THE HUMPBACK WHALE (*Megaptera novaeangliae*)—(1991)

Although not explicitly identified in Section C - Collisions with Ships (p. 26), Navy ships should be included as part of the overall level of vessel traffic in Hawaiian waters which is identified as a potential impact.

In Section D. Acoustic Disturbance, 1. Noise from ships, boats and aircraft, Noise in general was identified as a potential adverse impact to humpback whales. At the time it was speculated that different vessel types and sizes had different acoustic effects depending on their signatures. In addition noise from military airplanes and other exercises were identified as possible sources of disturbance. The following statements from the Plan have been overcome by events but are provided for historical context. "In Hawaii, aerial exercises are executed from Hickam Air Force Base, Kaneohe Marine Corps Air Station, and Barbers Point Naval Air Station on Oahu. The major impact of tactical military aircraft is their use of Kahoolawe Island as a target. Concerns about the effect of military activities on humpback whales were addressed in a consultation between the U.S. Navy and NMFS regarding the use of Kahoolawe as a target island in 1979." Kahoolawe has not been used as a target island since 1990. "Herman et al. (1980) suggested that humpback whales arriving in Hawaiian waters may be disturbed by military aircraft flying low over portions of the Auau Channel between the Islands of Hawaii and

Maui. Other ordnance ranges in humpback wintering areas are Kaula Island, Hawaii; Vieques, Puerto Rico; and Farallon de Medinilla, Commonwealth of the Northern Mariana Islands." While there may have been some impact from the cumulative noise sources of vessels and aircraft the effect seems to have been minimal given the current recovery of the Hawaiian population of humpback whales and their growth in numbers over the past 30 years.

Mitigation Measures—Ship strike was identified as a potential threat, but ship strike mitigation was not explicitly noted in the Plan. For activities covered by this Draft EIS/OEIS, potential ship strikes would be mitigated by the use of trained observers aboard ASW platforms, vessels associated with SINKEX, and vessels used for mine countermeasures and demolition training and observers aboard aircraft when available. With respect to underwater noise (Recovery Objective 1.31 11 Reduce disturbance from human-produced underwater noise in Hawaiian waters and in other important habitats when humpback whales are present), the use of tactical active sonars within the HRC would be governed by the mitigation measures outlined in Section 6.1. These include the requirement for trained observers, aircraft surveillance when available, the use of passive listening devices, safety zones, sonar power limit requirements, and consideration of bathymetry and oceanographic conditions. In addition, activities involving explosives or live fire will require trained observers aboard weapons platforms, vessels associated with SINKEX, and vessels used for mine countermeasures and demolition training and observers aboard aircraft when available. Consideration of bottom topography, oceanographic conditions, and species habitat preferences will also be considered.

6.4.4 DRAFT RECOVERY PLAN FOR THE SPERM WHALE (*Physeter macrocephalus*)—(2006)

Potential threats identified in Sections G.2. and G.8. discussed anthropogenic sounds and in particular pingers, sonars, and vessel noise (cavitation).

Section G.2. Anthropogenic Noise (p. I-26) "…Sperm whales are known to respond, often dramatically, to unfamiliar noise. Whales exposed to the sounds of pingers used in calibration systems to locate hydrophone arrays temporarily fell silent (Watkins and Schevill 1975). This response to sounds in the frequency range of 6-13 kHz was interpreted as one of listening, rather than of fear. A stronger response was observed in sperm whales exposed to the intense sonar signaling and ship propeller noise from military operations in the Caribbean Sea during the U.S. invasion of Grenada in 1983. The whales fell silent, changed their activities, scattered, and moved away from the sound sources (Watkins et al. 1985). They also showed longer-term responses by becoming quieter and seemingly more wary of a research vessel that had visited the same area in previous years (Watkins et al. 1985).

There is currently no evidence of long-term changes in behavior or distribution as a result of occasional exposure to pulsed acoustic stimuli."

6.4.4.1 G.8 MILITARY OPERATIONS (P.I-32)

"…Sperm whales are potentially affected by military operations in a number of ways. They can be struck by vessels and disturbed by sonar and other anthropogenic noise. In addition, their deep diving and large size make sperm whales potential false targets in submarine warfare (or target practice). Evidence suggests that strandings of another deep-diving, pelagic toothed whale, Cuvier's beaked whale (*Ziphius cavirostris*) is related to tests of Navy mid-range sonar

and possibly LFA sonar in Greece, the Bahamas, and the Canary Islands (Frantizis, 1998; Anon., 2001; Jepson et al., 2003; NOAA and U.S. Department of the Navy, 2001; Freitas, 2004; Fernandez, 2004; Fernandez et al., 2005). The extremely loud signals (maximum output 230 decibels re 1 micropascal [µPa]) are in the frequency range of 250-3,000 hertz (Frantzis, 1998), which is well within the likely range of sperm whale hearing. Similarly, mid-frequency sonar (e.g., U.S. Navy 53C) can produce equally loud sounds at frequencies of 2,000-8,000 hertz (Evans and England 2001), which are also likely to be heard by sperm whales. Clicks produced by sperm whales (and presumably heard by them) are in the range of < 100 hertz to as high as 30 kHz, often with most of the energy in the 2 to 4 kHz range (Watkins 1980). There have been no sperm whale strandings attributed to Navy sonar. However, the large scale and diverse nature of military activities in large ocean basins indicates that there is always potential for disturbing, injuring, or killing these and other whales."

The applicable recovery action is found under Recovery Actions 7.0. Determine and Minimize Any Detrimental Effects of Anthropogenic Noise in the Oceans (p. IV-2).

7.1 Support ongoing and additional studies to evaluate the effects of sound on sperm whales.

7.2 Implement appropriate regulations on sound-production activities which are found to be potentially detrimental to sperm whales, until otherwise demonstrated.

Mitigation Measures—would be implemented as listed in Section 6.1 to mitigate the use of tactical active sonars within the HRC. These include the requirement for trained observers, aircraft surveillance when available, the use of passive listening devices, safety zones, sonar power limit requirements, and consideration of bathymetry and oceanographic conditions. In addition, activities involving explosives or live fire will require trained observers aboard weapons platforms, vessels associated with SINKEX, and vessels used for mine countermeasures and demolition training and observers aboard aircraft when available. For SINKEX and Air-to-Surface Missile Exercises (A-S MISSILEX), an exclusion zone of 1.0 nm and an additional safety zone of 0.5 nm would be required. Consideration of bottom topography, oceanographic conditions, and species habitat preferences will also be considered.

These mitigation measures will further the recovery goals of this Plan even though no specific actions were identified in the Plan.

The Navy has and will continue to support as appropriate research that will help evaluate the effects of sound on sperm whales. While not under its purview, the Navy has complied with applicable laws and regulations regarding sound in the oceans to the extent practicable and in compliance with national defense requirements.

6.4.5 RECOVERY PLAN FOR THE HAWAIIAN MONK SEAL (*Monachus schauinslandi*)—(DRAFT REVISION 2006)

No specific threats to monk seals from activities associated with the HRC were identified in the Plan.

Mitigation Measures—would be implemented as listed in Section 6.1 to mitigate the use of tactical active sonars within the HRC. These include the requirement for trained observers, aircraft surveillance when available, the use of passive listening devices, safety zones, sonar power limit requirements, and consideration of bathymetry and oceanographic conditions. In addition, activities involving explosives or live fire will require trained observers aboard weapons platforms, vessels associated with SINKEX, and vessels used for mine countermeasures and demolition training and observers aboard aircraft when available. For SINKEX and A-S MISSILEX an exclusion zone of 1.0 nm and an additional safety zone of 0.5 nm would be required. Consideration of bottom topography, oceanographic conditions, and species habitat preferences will also be considered.

These mitigation measures will further the recovery goals of this Plan even though no specific actions were identified in the Plan.

6.4.6 RECOVERY PLAN FOR THE U.S. PACIFIC POPULATIONS OF THE GREEN TURTLE (*Chelonia mydas*)—(1998)

Construction Blasting (p. 45) was identified as a threat to sea turtles, but not as a current threat in Hawaii. The following narrative did not explicitly identify Navy activities associated with the HRC as having a potential effect.

"Blasting can injure or kill sea turtles in the immediate area. The use of dynamite to construct or maintain harbors, break up reef and rock formations for improved offshore access, etc. can decimate coral reefs, eliminating food and refuge for sea turtles. Some types of dynamiting have minimal impact to marine life, such as placing explosive in pre-drilled holes (drilling and shooting) prior to detonation. This is the standard practice to secure armor rock. (see Recovery – Section 2.2.7)"

In Section 2.2.7 under Recovery, the following actions were identified:

"Prevent the degradation or destruction of reefs by dynamite fishing and construction blasting. Blasting of any nature physically damages reefs and may kill turtles. It must be monitored and/or restricted."

Mitigation Measures—Mitigation measures for sea turtles from underwater demolitions are listed in Section 6.2, Underwater Detonations. In general during underwater explosives training and mining operations, the operating area must be determined to be clear of marine mammals and sea turtles prior to detonation. For demolition and ship mine countermeasures operations charge size is limited to 20 lb and exclusion zones are established to prevent physical and/or acoustic effects. Pre exercise surveys are conducted by surface vessels, divers, and aircraft

(when available) to alert operators of any protected species within the exclusion zone. If a sea turtle or marine mammal is observed, the exercise is postponed until the animal voluntarily leaves the area. Bottom topography is selected to minimize any potential damage to reef structures or other hard substrate that include turtle resting habitat or foraging areas (e.g. patches of sandy bottom substrate away from coral reef structures).

In addition, activities involving explosives or live fire will require trained observers aboard weapons platforms, vessels associated with SINKEX, and vessels used for mine countermeasures and demolition training and observers aboard aircraft when available. For SINKEX and A-S MISSILEX, an exclusion zone of 1.0 nm and an additional safety zone of 0.5 nm would be required.

In the event that green turtles are observed within the operating area the use of tactical active sonars within the HRC would be governed by the mitigation measures outlined in Section 6.1, which include the requirement for trained observers, aircraft surveillance when available, the use of passive listening devices, safety zones, sonar power limit requirements, and consideration of bathymetry and oceanographic conditions. These measures would minimize any potential auditory effects to green turtles that may be found within the HRC operating areas.

These mitigation measures address Recovery section 2.2.7 and the Implementation Schedule on p. 83.

6.4.7 RECOVERY PLAN FOR U.S. PACIFIC POPULATIONS OF THE HAWKSBILL TURTLE (*Eretmochelys imbricata*)—(1998)

No specific threats or applicable recovery actions were identified for the Navy with respect to activities described in the HRC Draft EIS/OEIS.

Mitigation Measures—Although no specific threats or recovery actions were ascribed to Navy activities within the HRC in the Recovery Plan the following measures further the recovery goals of the Plan. In the event that hawksbill turtles are observed within the operating area the use of tactical active sonars within the HRC would be governed by the mitigation measures outlined in Section 6.1, which include the requirement for trained observers, aircraft surveillance when available, the use of passive listening devices, safety zones, sonar power limit requirements, and consideration of bathymetry and oceanographic conditions. These measures would minimize any potential auditory effects to hawksbill turtles that may be found within the HRC operating areas.

In addition, activities involving explosives or live fire will require trained observers aboard weapons platforms, vessels associated with SINKEX, and vessels used for mine countermeasures and demolition training and observers aboard aircraft when available. For SINKEX and A-S MISSILEX, an exclusion zone of 1.0 nm and an additional safety zone of 0.5 nm would be required.

6.4.8 RECOVERY PLAN FOR U.S. PACIFIC POPULATIONS OF THE LOGGERHEAD TURTLE (*Caretta caretta)*—(1998)

There is no known nesting of loggerhead turtles in Hawaii according to the Recovery Plan. Nearly all observations of loggerheads now come from incidental catch records associated with pelagic longline fishing originating from Hawaiian ports. No specific threats or applicable recovery actions were identified for the Navy with respect to activities described in this Draft EIS/OEIS.

Mitigation Measures—Although no specific threats or recovery actions were ascribed to Navy activities within the HRC in the Recovery Plan the following measures further the recovery goals of the Plan. In the event that loggerhead turtles are observed within the operating area the use of tactical active sonars within the HRC would be governed by the mitigation measures outlined in Section 6.1, which include the requirement for trained observers, aircraft surveillance when available, the use of passive listening devices, safety zones, sonar power limit requirements, and consideration of bathymetry and oceanographic conditions. These measures would minimize any potential auditory effects to loggerhead turtles that may be found within the HRC operating areas.

In addition, activities involving explosives or live fire will require trained observers aboard weapons platforms, vessels associated with SINKEX, and vessels used for mine countermeasures and demolition training and observers aboard aircraft when available. For SINKEX and A-S MISSILEX, an exclusion zone of 1.0 nm and an additional safety zone of 0.5 nm would be required.

6.4.9 RECOVERY PLAN FOR U.S. PACIFIC POPULATIONS OF THE OLIVE RIDLEY TURTLE (*Lepidochelys olivacea*)—(1998)

No specific threats or applicable recovery actions were identified for the Navy with respect to activities described in this Draft EIS/OEIS.

In the Hawaiian Islands, a single nesting was recorded along Paia Bay, Maui in September 1985; however, there was no successful hatching associated with this event (Balazs and Hau, 1986; National Ocean Service, 2001). Since there are no other known nesting records for the central Pacific Ocean, the above nesting attempt should be considered an anomaly (National Marine Fisheries Service and U.S. Fish and Wildlife Service, 1998e). Olive ridleys are frequently captured by pelagic longline fishermen in deep, offshore waters of the HRC, especially during spring and summer. Inside the 55-fathom isobath, olive ridley occurrence in the HRC is rare year round.

Mitigation Measures—Although no specific threats or recovery actions were ascribed to Navy activities within the HRC in the Recovery Plan the following measures further the recovery goals of the Plan. In the event that olive ridley turtles are observed within the operating area the use of tactical active sonars within the HRC would be governed by the mitigation measures outlined in Chapter 6.1 which include the requirement for trained observers, aircraft surveillance when

available, the use of passive listening devices, safety zones, sonar power limit requirements, and consideration of bathymetry and oceanographic conditions. These measures would minimize any potential auditory effects to olive ridley turtles that may be found within the HRC operating areas.

In addition, activities involving explosives or live fire will require trained observers aboard weapons platforms, vessels associated with SINKEX, and vessels used for mine countermeasures and demolition training and observers aboard aircraft when available. For SINKEX and A-S MISSILEX, an exclusion zone of 1.0 nm and an additional safety zone of 0.5 nm would be required.

6.4.10 RECOVERY PLAN FOR U.S. POPULATIONS OF THE LEATHERBACK TURTLE (*Dermochelys coriacea*)—(1998)

No specific threats or applicable recovery actions were identified for the Navy with respect to activities described in this Draft EIS/OEIS.

Satellite-tracking studies, a lack of Hawaiian stranding records, and occasional incidental captures of the species in the Hawaii-based longline fishery indicate that deep, oceanic waters are the most preferred habitats of leatherback turtles in the central Pacific Ocean. As a result, the area of year-round primary occurrence for the leatherback turtle encompasses all HRC waters beyond the 55-fathom isobath. Inshore of the 55-fathom isobath is the area of rare leatherback occurrence. This area is also the same year round. Leatherbacks were not sighted during any of the aerial surveys for which data were collected, all of which took place over waters lying close to the Hawaiian shoreline.

Mitigation Measures—Although no specific threats or recovery actions were ascribed to Navy activities within the HRC in the Recovery Plan the following measures further the recovery goals of the Plan. In the event that leatherback turtles are observed within the operating area the use of tactical active sonars within the HRC would be governed by the mitigation measures outlined in Section 6.1, which include the requirement for trained observers, aircraft surveillance when available, the use of passive listening devices, safety zones, sonar power limit requirements, and consideration of bathymetry and oceanographic conditions. These measures would minimize any potential auditory effects to leatherback turtles that may be found within the HRC operating areas.

In addition, activities involving explosives or live fire will require trained observers aboard weapons platforms, vessels associated with SINKEX, and vessels used for mine countermeasures and demolition training and observers aboard aircraft when available. For SINKEX and A-S MISSILEX, an exclusion zone of 1.0 nm and an additional safety zone of 0.5 nm would be required.

6.4.11 MARINE MAMMAL EXERCISE MONITORING PLAN

The Navy is developing a general monitoring plan that can be used for different exercises in a variety of areas. Depending on the type of exercise and the area where it is conducted, the operators can choose the appropriate monitoring elements from this plan.

The U.S. Navy is developing a monitoring program whose study design provides the power to estimate:

a. The number of fin whales, humpback whales, sei whales, and sperm whales that are exposed to mid-frequency sonar at received levels equal to or greater than 173 dB and 190 dB during ASW Exercises;

b. The behavioral or other observable responses of any of these whales that are exposed to mid-frequency sonar at these received levels;

c. The effectiveness of the Navy's entire suite of mitigation measures at avoiding exposing any of these whales to mid-frequency sonar; and

d The effectiveness of the different measures contained in the Navy's suite of mitigation measures at avoiding exposing any of these whales to mid-frequency sonar.

This monitoring plan is being developed to meet the requirements of the Proposed Action's Biological Opinion and to supplement a long-term monitoring plan, which is also under development. It is understood that the monitoring plan will likely require further revision in an iterative process as the methodology is refined based on the data that is returned. The following are the specific elements that make up the monitoring plan:

U.S. Navy Lookout Watchstander Reports

The U.S. Navy will use its onboard lookout watchstanders as observers on Navy vessels conducting mid-frequency active sonar operations. This process is in accordance with the measures outlined in the DoD National Defense Exemption from Requirements of the Marine Mammal Protection Act for Certain DoD Military Readiness Activities That Employ Mid-Frequency Active Sonar or Improved Extended Echo Ranging Sonobuoy, 23 January 2007 (NDE), and the U.S. Navy mitigation measures as outlined in the Undersea Warfare Exercise (USWEX) and Composite Unit Training Exercise/Joint Task Force Exercise (COMPTUEX/JTFEX) environmental Assessments/Overseas Environmental Assessments.

The U.S. Navy believes that that due to their proximity to the sighting (i.e., on the mid-frequency active sonar ship), these reports represent the best source of sighting data when correlated to concurrent mid-frequency active sonar use. Furthermore, given the depth of individual training, supervision, and permanent presence during sonar operations, non-sonar events, and transits, the U.S. Navy believes that current lookout watchstander reporting represents the best available information source that directly answers questions as to marine mammal presence or absence on our ranges concurrent with naval ship presence, and potential response or non-response to mid-frequency active sonar. Up to five dedicated watchstanders, on duty 24/7 during an At Sea Exercise, report all marine mammal sightings observed regardless of whether sonar was operational. While species level of detail is still broad, certain species groups are easy to identify (dolphins, pinnipeds, whales). Standard Navy Operating Procedures as applied in an exercise specific Letter of Instruction to participants and serves as a governing factor in both exercise specific observation reporting, and mid-frequency active sonar mitigation.

Included would be a validation of the watchstander's ability to detect and accurately determine the distance of marine mammals encountered during training exercises.

Strategic Anti-Submarine Warfare (ASW) Aerial Sighting Reports

Strategic ASW assets used during some USWEX, COMPTUEX, and JTFEXs include the P-3C Orion Maritime Patrol Aircraft. These planes are often equipped with advanced optical sensors and may occasionally report geo-referenced marine mammal sightings. As part of this monitoring plan, these reports when made in context of an exercise will be collected and added as additional sighting information to exercise After Action reports. While the U.S. Navy acknowledges that species level detail and proximity to mid-frequency active sonar following exposure may not be available, this information will serve as additional data points on marine mammal occurrence within the operating area associated with ASW events.

U.S. Navy Imagery Teams/Sensors Observations

Most U.S. Navy ships have a collateral duty team whose task is to respond to sightings of high valued targets and collect digital imagery for intelligence collection purposes. For this plan, the Navy proposes to test the fly-away nature of these teams to respond to select marine mammal sightings made specifically during mid-frequency active sonar use (i.e., large whales with potential of ESA status, blue, fin, humpback, sei, and sperm whales. The goal would be to take imagery of animals sighted within any of the mitigation zones (200, 500, or 1,000 yards) when mid-frequency active sonar is being used or secured, and forward these to U.S. Navy or Navy Contract or marine biologists for species identification, and eventual relations to initial watchstander report.

Given a moving vessel, moving animals, and the response time need for these teams to deploy imagery gear, it is unknown if imagery can be collected in a timely manner or will contain sufficient level of detail to enable exact species identification. Review of imagery will be conducted and reports on quality and success or failure in species identification.

U.S. Navy Range Passive Acoustic Monitoring

The U.S. Navy will use the underwater acoustic arrays at two facilities to collect marine mammal vocalizations in support of the exercise monitoring plan.

Two Pacific Navy Ranges, the PMRF and SOAR, are equipped with instrumented underwater hydrophone arrays allowing for acoustic data to be collected from large inshore and offshore areas. Hydrophones vary in acoustic response so they can be used to capture both broad band and high frequency recordings on the range. However, in order not to capture classified source signatures, the U.S. Navy will only collect data before and after exercises for validation of species present, and to note if there are statistically different changes to vocalization rates. For species with known acoustic signatures (blue, fin, humpback, and sperm whales), analysis may provide an index of abundance and records of animal movements. Data that are collected one day before and one day after the sonar operations may provide important information not apparent through other methods.

It should be noted, these underwater instrumented ranges represent only a small area of the overall HRC and Southern California (SOCAL) ocean and exercise areas, so data collected can only be associated with events specifically scheduled on these ranges.

Procedures for collecting acoustic data at the PMRF range are already in place with 2 days per month of recordings being saved. These recording times will be aligned with pending USWEX events at PMRF.

Third Party Visual Observations from U.S. Navy Platforms During Exercises

An independent observer will be deployed from either a mid-frequency active sonar or non-mid-frequency active sonar platform on a very limited proof-of-concept experiment. The goal of this monitoring element would be to augment Navy lookout reports during mid-frequency active sonar operation with detailed species level identification, biological response observations, and supplementary imagery taken by the attached biologists. If species level identification of ESA-listed species can be made successfully during this event, it would add weight of evidence to discussions about mid-frequency active sonar effects or lack of effects on ESA listed species.

Of all of the U.S. Navy's proposed monitoring elements, this one will be the most difficult to consistently execute.

Berthing space on almost all mid-frequency active sonar ships, especially during USWEX, COMPTUEX, or JTFEX is very limited, so embarking an observer is not currently proposed for mid-frequency active sonar ships during Major Exercises. With exercise lengths of 1 to 3 weeks, and given limited at sea transfer, this option would mean that even if berthing is available, a biologist would have to depart with the ship as it leaves port and stay the duration of the exercise. At best, berthing on non-mid-frequency active sonar (i.e., carrier and amphibious assault ships) may be possible, but distance from mid-frequency active sonar operations may not provide the quality data desired.

Third Party Visual Observations from U.S. Navy Platforms During Unit Level Training Exercises

There may be potential for adding civilian biologist or survey teams to a vessel engage in single ship, unit-level training (DDG class ships, CG class ships) as a proof-of-concept demonstration. An independent observer will be deployed from either a mid-frequency active sonar or non- mid-frequency active sonar platform. The goal of this monitoring element would be to augment Navy lookout reports during mid-frequency active sonar operation with detailed species level identification, biological response observations, and supplementary imagery taken by the attached biologists.

Third Party Surface Vessel or Aerial Surveys Pre- and Post-Exercise

If a sufficient geographic area for ASW events can be identified, another monitoring element to augment this plan is to conduct third party surface vessel or aerial surveys either before or immediately after the exercise.

Ship based surveys will conduct standard NMFS-protocol surveys of selected areas prior to an exercise in order to assess likely species composition encountered by exercise participants (Barlow et al., 2003). The survey could set a baseline standard of existing conditions, although within the different range areas variations of marine mammal occurrence can be anticipated due to subtle, small scale changes in oceanographic conditions and prey availability.

Aerial surveys will be conducted with a twin engine aircraft due to range, safety, and on-station time. Aircraft can cover a larger area more quickly than an observation vessel and could be used to search for potentially injured, dead, stranded animals on shore or in coastal shallow waters after an exercise.

Methodology to Evaluate the Effectiveness of the Additional Program Elements Not Included in the NDE

The U.S. Navy will evaluate the effectiveness of its program elements to assess the reliability its observations and the data gathered using these program elements. The data will be evaluated for:

- Ease of implementation
  - Were operators able to implement these elements effectively?
  - What were the implementation impacts on the operators (e.g., are there any national security impacts)?
- Cost of implementation
  - Is the effectiveness of the element equivalent to the cost of obtaining the data (e.g., cost benefit analysis)?
- Quality of data obtained
  - Did the elements obtain identification of species and detect animals that were exposed?
  - Were techniques beyond ones required in the NDE able to detect additional marine mammal exposure beyond the methods used in the NDE?

6.4.11.1 ADDITIONAL MARINE MAMMAL RESEARCH SOURCES

There are other potential marine mammal data providers in addition to the U.S. Navy that will be investigated for collaboration with this Exercise Marine Monitoring Plan. The goal is to leverage ongoing NMFS permitted studies, academic research and surveys, and new U.S. Navy detection technologies that may be of use as data augments to this plan.

Regional and Academic Research Programs

Within Hawaii and SOCAL, NMFS permitted marine mammal surveys, acoustic monitoring, and animal tagging is being conducted or planned for the next 2 years.

Tagging, for instance, is an important research tool for directly determining marine mammal movement, diving behavior, swim parameters (velocity, direction of travel, foraging depth), as well as potentially recording anthropogenic sound level exposure for an animal. Tagging typically allows for longer-term monitoring of individuals than visual and acoustic monitoring can provide.

In conjunction with other scientists and NMFS, the U.S. Navy will explore integrating tagging and additional survey results into the Exercise Monitoring Plan if data is available in areas associated with Navy operations.

U.S. Navy Funded Research and Development Technologies

New research and development technologies in marine mammal research may be considered in the future (late fiscal year (FY) 07 and FY 08), but given the relatively recent nature of some technology, it is unknown at this time what value-added data will be available to supplement exercise specific monitoring reports. Information from research and development technologies may, however, generate relevant biological information about marine mammal distribution and by inference impacts, or lack of impacts, from mid-frequency sonar operations. Examples include deployment of Autonomous Recording Packages to determine presence/absence of vocalizing marine mammals, and application of various Office of Naval Research funded marine mammal detection technologies if found to be mature enough for at-sea use (e.g. autonomous underwater gliders, surface radar detection of marine mammals, etc.).

6.4.12 LONG-TERM MARINE MAMMAL MONITORING PLAN

The Navy is developing a long-term monitoring plan to determine behavioral and population level changes to marine mammals within Navy ranges. This plan will continue or initiate studies of abundance, distribution, habitat utilization, etc. for sensitive species of concern using visual surveys, passive and acoustic monitoring, radar and data logging tags (satellite or radio linked to record data on acoustics, diving and foraging behavior, and movements). The plan will determine the geographic and temporal extent of key habitats and comprehensive baseline information to account for natural perturbations such as El Niño events. The plan will use observational data and baseline information to determine spatial and temporal extent of reactions to Navy operations, or indirect effects from changes in prey availability and distribution.

A suite of monitoring techniques has been used to mitigate and monitor the effects of anthropogenic activities including underwater sounds on marine mammals throughout the world (Barlow and Gisiner, 2006). Each type of monitoring technique has advantages and disadvantages, from both a logistical and biological perspective. By using a combination of several techniques, the detection, localizing, and observations of marine mammals can be maximized. Given that the effectiveness of these monitoring techniques is largely unknown, the components of the monitoring plan that are implemented will be chosen based on effectiveness, practicality, impact to operations, and funding.

Survey Modeling

To determine if the effects of Navy activities on marine mammal populations can be detected over an extended period (i.e., 5 years), the movements and surveys of different species groups of large marine fauna within the region of interest were simulated. The simulations are individual-based, and they modelled the movements of the animals at daily intervals. Because cetacean response to acoustic trials is to a large degree unknown, simulations included several levels of response which are considered extreme. If no effect could be detected under these extreme scenarios then no effect would be detectable under less extreme scenarios. Modelling will help determine the level of effort needed to detect long term population trends.

The simulations involved:

1. Simulating the populations of interest. This included simulating the distribution, abundance and dynamics of the population and simulating the animals' response to acoustic activity.

2. Simulating the observation process (data gathering by aerial or vessel based line transect survey).

3. Analyzing the observed data.

Vessel-based Surveys

Vessel-based surveys are the primary method for marine species monitoring. Surveys may also focus on a particular type of habitat or areas suspected to be used or regularly used by priority species.

Standard line-transect surveys are adaptable to weather conditions, nature, and location of monitoring area, presence/absence of priority species, etc. They generally follow established standard line-transect protocols designed to obtain marine mammal density and distribution data (Barlow, 2003).

During the surveys, the scientific team can collect general observations following scan sampling protocol including general behavior (i.e., behavioral state), any conspicuous individual behaviors (e.g., breach, tail slap, porpoising, etc.), orientation/direction of travel, estimated speed of movement, etc. These data would be collected during surveys without breaking from course. Thus, the accuracy and type of information collected will depend on the distance to the observed animals and is limited by the brevity of the observation time while in transit.

During surveys of marine mammals, oceanographic data (e.g., sea surface temperature, chlorophyll *a*, etc.) and prey abundance and distribution data would be collected to assess other environmental factors that may affect marine mammal abundance and distribution.

Observers

A total of four visual observers will be aboard the vessel, three "on effort" at any given time. One of the three on-effort observers shall also act as the recorder and primarily observe with unaided eye. Each person will rotate through the observer and recorder positions and will spend less than 2 hours on observation at a time. The two main observers will be located on the port and starboard sides of the flying bridge or observation deck with the recorder between them. During line transect surveys, each observer will be responsible for the area from dead ahead through an arc of 90 degrees to the observer's side and have an unobstructed view. During focal observations, observations would be conducted 360^{o} around the survey vessel.

Aerial Surveys

Aerial surveys can be used before and after exercises to monitor animal distribution, occurrence, focal, and scan behavior/orientation relative to exercise and related activities, etc. For safety reasons, aerial surveys may not be used in the exercise area during operations.

Aerial surveys would be conducted with a twin engine aircraft with good range otherwise it will be limited by the distance out to exercise area and time it can remain on station. A larger aircraft with greater range and safety (e.g., Twin Otter) could be used to conduct transect and focal observations in far offshore areas such as Navigator Seamounts. Aircraft can cover a larger area more quickly than an observation vessel.

Aircraft could be used to search for potentially injured, dead, stranded animals on shore and/or coastal shallow waters during and after exercise. Any observations conducted from aircraft during the exercise must be well outside the operations footprint.

Limitations of aircraft are: (1) the amount of time they can remain in the exercise area compared to a ship, (2) they cannot be used for night-time observations, and (3) they are limited by the potentially long distances to the exercise areas. As well, the survey speed results in missing a large proportion of long-diving animals (e.g., beaked whales, sperm whales), and species mis-identification is more of a problem due to the large distance between the observers and the animals, as well as the speed of the survey platform.

6.4.12.1 PHOTO IDENTIFICATION

Photo identification (ID) is important to address longer-term aspects of the marine mammal abundance in the Hawaii Operating Area (OPAREA). Photo ID can assess whether identified animals remain and survive/persist in an OPAREA, reproduce, etc. With the exception of the seasonal humpback, photo ID can be problematic with long-ranging species. However, recent studies by McSweeney et al. (2007) indicate some long-term year-round residency patterns of some beaked whales in the Hawaiian Islands, as well as pilot whales, false killer whales, pygmy killer whales, etc. Comparison of photographs of the identifying marks on dorsal fins or tail flukes, rake marks, scars etc will be use to assess residency or re-sighting of individual animals (McSweeney et al., 2007).

Towed Hydrophone Arrays

Passive acoustic monitoring for cetaceans requires the ability to identify species as well as differentiate and track individual animals. Current software systems may work for the vocalizations of a limited number of species or to varying degrees of accuracy and computational efficiency. A hydrophone array is towed from the boat and can detect and localize marine mammals that vocalize. The ability of the array to detect marine mammals will depend on the speed of the boat, length of the array and the frequency range of the hydrophones. The array would need to detect vocalizations in the range of very low frequency for baleen whales (< 1,000 Hz; McDonald and Fox, 1999; Mellinger and Clark, 2003) to relatively high frequency for odontocetes such as sperm whales (up to 30 kHz; Watkins, 1980). The use of two simultaneously deployed arrays can also allow more accurate localization and determination of diving patterns.

Use of Navy Instrumented Acoustic Range

Two Pacific Navy Ranges, PMRF and SOAR, are equipped with instrumented underwater hydrophone arrays allowing for acoustic data to be collected from large inshore and offshore areas. Hydrophones vary in acoustic response so they can be used to capture both broad and high frequency recordings on the range. However, in order not to capture classified source signatures, the U.S. Navy will only collect data before and after exercises for validation of species present, and to note if there are statistically different changes to vocalization rates. For species with known acoustic signatures (blue, fin, humpback, and sperm whales), analysis may provide an index of abundance and records of animal movements. Data that are collected one day before and one day after the sonar operations may provide important information not apparent through other methods.

It should be noted, these underwater instrumented ranges represent only a small area of the overall HRC and SOCAL ocean and exercise areas, so data collected can only be associated with events specifically scheduled on these ranges.

Procedures for collecting acoustic data at the PMRF range are already in place with 2 days per month of recordings being saved.

Behavioral Monitoring

Knowledge of the factors determining behavioral responses of marine mammals to E&P sound sources would provide important information for the risk assessment process for operations in sensitive areas. Data could be used for example to assist with identifying sensitive species, and planning mitigation strategies for critical habitat areas.

Changes in animal distribution, distances traveled, and foraging behavior in response to Navy sound sources compared to habitat range and natural variability would provide data needed to assess biological significance of animal avoidance/displacement reactions. Data could be used to enhance the predictive capabilities of sound exposure models by defining animal movement in response to sound sources. Animal movements could be monitored in specified geographical regions of interest using visual observations of marine mammal observers, telemetry/tagging methods, and fixed passive acoustic monitoring systems. Geographic and temporal extent of behaviors to Navy operations (e.g. sonar, underwater detonations, shipping) could be determined. In order to determine and quantify a significant response, it will also be necessary to establish baseline and natural variation. Behavioral reaction to sound exposure, including movements associated with key activities and habitat abandonment, could be measured. Indirect impacts on prey distribution could include tracking the movements of fish, squid etc in response to sound sources at different levels. Foraging success could be quantified. Impacts on breeding including reproductive animals moving out of critical area, decreased vocalization used in breeding behavior, dispersal of spawning events, stock recruitment or relative reproduction in following years could be determined.

Tagging of Species

Tagging is an important tool for directly determining the movement and diving behavior of cetaceans. Sensors can be used that detect swim velocity, direction of travel, foraging and record the sound level to which the animal is exposed. From position and movement data residency patterns and habitat use can be determined. In association with other techniques (biopsies, passive acoustic monitoring, photo ID, mark recapture) information of population structure can be determined.

Tagging typically allows for longer-term monitoring of individuals than visual and acoustic monitoring. Longer-term monitoring is important for assessing survival, fitness, long-term effects, resident populations, etc. (Photo ID also important for this aspect, to assess whether identified animals stay and survive/persist in an exercise area). Several types of tags utilizing satellite or very high frequency tracking, the ability to record sound and various sensors to record the animals behavior or environmental parameters.

Tagging cetaceans for long periods of time (e.g., > months) is problematic due to attachment issues. Long-duration (e.g., > 1 to 2 months) tags on small cetaceans can typically only be

deployed by capturing animals. Long-duration (e.g., > 1 to 2 months) tags on large cetaceans can be deployed using sub-dermal tags, with the majority of the tag body below the surface of the skin with only the antenna exposed, to reduce drag. Medium-duration tags (e.g., 1 to 8 weeks) that provide location-only data have been remotely deployed on mid-size cetaceans, including Cuvier's beaked whales and Blainville's beaked whales (Baird et al., 2007). It is not currently possible to deploy medium-term or long-term tags on mid-size cetaceans that provide more than location-only data. Incorporating sensors that record acoustics or behavior (e.g., dive depths) is not possible on medium-term or long-term tags due to the increase in size (and thus drag), as well as transmission limitations of data to satellites. Acoustic recording time depth recorders would be the preferred tag as these can record received sound levels the tagged animal was exposed to as well as the animal's own vocalizations or those of conspecifics, depth, time, location, orientation, etc. Tagging would be problematic with long-ranging species that may migrate out of the Hawaiian Islands area, but recent studies indicate some long-term, year-long residency patterns of some beaked whales in the Hawaiian islands, as well as pilot whales, false killer whales, spinner dolphins, pygmy killer whales (McSweeney et al., 2007).

6.5 KAUAI

The following sections provide mitigation measures to minimize the potential for impacts to onshore species.

6.5.1 BIOLOGICAL RESOURCES

In accordance with the mitigation measures adopted for PMRF's Enhanced Capability EIS (U.S. Department of the Navy, 1998a), night lighting is shielded to the extent practical to minimize its potential effect on night-flying birds (Newell's shearwater and petrels) and Hawaiian hoary bats.

Mitigation measures to minimize the potential for introductions of seed or other plant parts (propagules) of exotic species include:

- Minimizing the amount of seed or propagules of non-native plant species introduced to the islands through continued efforts to remove seed and soil from all vehicles (including contractor vehicles) coming to the island by pressure washing on the mainland, and stepped up efforts to ensure that imported construction materials such as sand, gravel, aggregate, or road base material are weed free.
- Regular monitoring and treatment to detect and eliminate establishing exotic species, focusing on areas where equipment and construction materials come ashore and areas within which there is movement of equipment and personnel and soil disturbance which favor the spread and establishment of invasive species (e.g., along roadsides, and disturbed areas).
- Effective measures to foster the reestablishment of native vegetation in areas where non-native vegetation is present.
- Prohibiting living plant materials to be brought to the islands from the mainland (in order to avoid introduction of inappropriate genetic strains of native plants or exotic species, including weeds, insects and invertebrates)

Pacific Missile Range Facility Enhanced Capability Biological Assessment

The following recommendations were established in 1998 after an informal consultation with NMFS on the enhanced capabilities of PMRF:

- If whales or monk seals are observed during prelaunch safety clearance activities, the launch should be delayed until monk seals and whales are clear of the launch safety zones.
- Surveys should be conducted of beach areas on PMRF/Main Base and on Niihau for sea turtle nests prior to amphibious landings and other activities that may affect sandy beaches. This will allow locational shifts in the landings to reduce the potential for effects to Hawaiian monk seals and green turtles.
- There is little data on monk seal abundance and distribution at Niihau. PMRF should work with the owners of Niihau Ranch to develop Hawaiian monk seal and green turtle monitoring programs so that appropriate management measures can be implemented by the owners and residents if necessary. Training on census techniques and provision of data forms for participants could be provided by the NMFS. Contingent on approval from the land owners, NMFS could also provide analysis and interpretations of the census and observational data for the owners and residents.
- Studies to investigate the behavioral and physiological responses of large whales and listed sea turtles to high intensity sound of all frequencies should be sponsored and/or funded by the Navy, possibly through the office of Naval Research. This will provide better information on which to evaluate this and future projects.

6.5.1.1 KAULA

Pursuant to a previous Section 7 Consultation and Biological Opinion (National Oceanic and Atmospheric Administration, 2007), the Navy agreed to mitigations that reduce or eliminate any potential impacts to humpback whales. No live fire is used. Mitigations agreed to include seasonal use during periods when humpback whales are not present, surveying the waters off Kaula to ensure that no whales are present, and limiting the impact area to the southern tip of the island. These mitigation measures are also used for other marine species including Hawaiian monk seals and sea turtles.

6.5.2 CULTURAL RESOURCES

Mitigation measures to reduce and/or eliminate any potential adverse effects on known or unidentified historic properties from ongoing and future missile operations have been developed and are presented in the PMRF Integrated Cultural Resources Management Plan (International Archaeological Resources Institute, Inc., 2005). These include:

- Avoiding operations and construction in areas where cultural resources are known to exist
- Monitoring all ground-disturbing activities and construction in medium and high sensitivity archaeological areas

- Briefing personnel working in culturally sensitive areas, including providing information on Federal laws protecting cultural resources
- Spraying water on vegetation within the immediate area of the launch vehicle prior to launch. In the event that vegetation ignites as a result of launches, fire suppression personnel are instructed to use an open spray nozzle whenever possible to minimize erosion damage (such as to sand dunes) and prevent destruction of cultural resources.
- If extensive burning of dune vegetation occurs, conducting post-burn archaeological surveys in consultation with the Hawaii State Historic Preservation Office and Navy archaeologist
- Implementing data recovery/research and documentation program if cultural resources are discovered as a result of normal training, operation, and base operations activities.

6.5.3 HEALTH AND SAFETY

To protect people from injury from either nominal launches or accidents, two primary mitigation measures are in place: flight termination and clearance of specified regions. Clearance areas include the Ground Hazard Area for land areas, Ship Exclusion Zones for ocean areas, and Restricted Airspace and Altitude Reservations for airspace. In addition, launch times and trajectories are cleared with United States Space Command to prevent impacts upon satellites (both manned and unmanned); this process is called Collision Avoidance. For some missions, no flight termination system is needed. This occurs when the vehicle properties are such that all potential debris from accidents is contained within the hazard area. Procedures include the use of use of clearance zones, restricting landings to specific areas of the beach, publication of training overlays that identify the landing routes and any restricted areas, and designating a lookout to watch for other vessels.

6.6 OAHU

Oahu Army Training Lands (Makua Military Reservation, Kahuku Training Area, Dillingham Military Reservation)

Many critically endangered plants with very low numbers remaining in the wild occur on Army training lands. Large-scale ecosystem protection is mainly done by fencing and invasive plant control in Management Units. Management includes extensive consultation with USFWS and ongoing surveys to determine current status. Mitigation measures include:

1. Controlling threats
2. Improving conditions for recruitment
3. Propagation
4. Reintroduction
5. Development of Implementation Plans that outline required mitigations to offset training risks and to stabilize the targeted plant and animal populations
6. Preparation and implementation of a Wildland Fire Management Plan.

Table 6.6-1 provides a list of training guidelines that are applicable to all Oahu Training Areas.

Table 6.6-1. Training Guidelines for Resource Protection—All Oahu Training Areas

APPLIES TO	
The following list of actions and limitations applies to all Oahu training areas. Additional limitations are imposed in the Sensitive Ecological and Cultural Resource Areas.	
AUTHORITY	
Enforcement of the following rules is under the authority of the Directorate of Plans, Training, Mobilization and Security, Range and Training Support Division.	
REQUIRED ACTIONS	
Access	Before entering a training area, troops must clean all vehicles, equipment, personal gear, shoes, and clothing.
Fire	All fires must be reported immediately.
	In case of fire, troops will stop training operations and begin fighting the fire.
	Troops will continue to fight the fire until released by the Fire Department.
Water	All aviation or other training area fuels or chemicals and other potentially toxic and polluting substances must be handled and stored to avoid spills and fires.
LIMITATIONS FOR SENSITIVE ECOLOGICAL AND CULTURAL RESOURCE AREAS	
Access	No troops may go beyond signs or fences marking the presence of rare or endangered plants and animals or archaeological sites.
Bivouacking	No bivouacking within 3,280 feet of posted signs marking the presence of rare or endangered native plants and animals or restoration projects.
	No training units larger than platoon size (more than 30 troops) may bivouac outside of reusable bivouac sites provided with portable or fixed latrines.
	No open fires.
	No burying or leaving trash.
	No food preparation.
	No refueling operations.
	No cutting, clearing, or disturbing of vegetation. This includes mosses, grasses, shrubs, bushes, and trees.
Maneuvers	No vehicle traffic off existing roads.
	No use of rocks from rock piles or walls for training purposes.
	No establishment or new vehicle tracks.
	No digging, including entrenchment and foxholes, except in areas specifically designated by Range Control.
	Dillingham Military Reservation and Kahuku Training Area: No pyrotechnic or incendiary training devices except during the wet season (October to April) OR outside areas designed to control fire.
	No new placement of barbed wire or concertina wire near signs marking the presence of sensitive ecological areas or fences.
	Dillingham Military Reservation and Kahuku Training Area: No use of live fire or tracer ammunition.
	No road, trail, or firebreak clearing without permission form Range Control.
	No grading or construction of buildings or other permanent structures without permission from Range Control.

Source: U.S. Department of the Navy, 2002a

6.7 MAUI

Measures applicable to hull-mounted surface and submarine active sonar operating in the Maui offshore area would follow the mitigation measures presented in Section 6.1.

6.8 HAWAII

6.8.1 POHAKULOA TRAINING AREA

According to the *Rare Plants of Pohakuloa Training Area Hawaii* (Shaw, 1997), military activities, other than fire, have little impact on the rare plants on the installation. Occasionally, a rare plant might be crushed by foot or vehicle. Dust created by traffic could negatively impact a rare species if it is growing near a road. Also, only about 4 percent of the installation outside of the impact area had been disturbed by military activities. Most of the disturbance occurs in fixed artillery firing points, bivouac sites, and firing ranges. Many of the rare species inhabit remote areas of Pohakuloa Training Area with little or no chance of being disturbed by military training activities. Reducing the risk of military impacts on the rare plants can be accomplished easily by locating training activities away from areas with sensitive species, fencing to enclose sensitive species for protection from ungulates, fire and fuel corridors, fire breaks, additional surveys for threatened and endangered species, and continued sensitive plant propagation efforts.

The following restrictions from the Pohakuloa Training Area External Standard Operating Procedures are applicable to all training areas on the installation:

- All off-road driving is prohibited.
- All fenced areas are off-limits.
- All lava tubes and sinkholes are off-limits.
- Digging is only permitted in previously disturbed areas.