Pre-Final
ENVIRONMENTAL ASSESSMENT

UNIVERSITY OF HAWAIʻI (UH) MARINE CENTER AND HAWAIʻI UNDERSEA RESEARCH LABORATORY (HURL) VESSEL ENTRY PERMITS

Papahānaumokuākea Marine National Monument
Hawaiʻi

National Oceanic and Atmospheric Administration
National Ocean Service, National Marine Sanctuary Program

September 2007

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EXECUTIVE SUMMARY

This Environmental Assessment was prepared in accordance with the National Environmental Policy Act of 1969 (42 United States Code §4321, *et seq*.), as implemented by the Council on Environmental Quality regulations (40 Code of Federal Regulations Parts 1500-1508), and National Oceanic and Atmospheric Administration (NOAA) Administrative Order (NAO) 216-6, which describes NOAA policies, requirements, and procedures implementing NEPA.

The National Oceanic and Atmospheric Administration (NOAA) proposes to issue two permits; one to the University of Hawai‘i (UH) Marine Center and one to the Hawai‘i Undersea Research Laboratory (HURL) allowing vessels to enter Papahānaumokuākea Marine National Monument (PMNM) to support a wide range of marine research projects approved by the PMNM co-trustees. The UH Marine Center research vessel Ka‘imikai-o-Kanaloa would provide transportation for research teams working on permitted projects within PMNM. Researchers aboard this vessel would also have access to HURL submersibles and a remote operated vehicle for underwater work.

Research in the NWHI helps the PMNM co-Trustees and the public gain a better understanding of the biology and ecosystems of the Northwestern Hawaiian Islands (NWHI), which is crucial for the best management practices of the PMNM. Use of research ships and accessory vessels facilitates access to deep areas of the ocean that would not be visible or accessible otherwise. This access is essential to conducting valuable research.

The Proposed Action would not result in significant impacts on the following resource categories: terrestrial biological resources, soils and topography, land use, traffic, air quality and ambient noise, visual resources, natural hazards, and utilities and other infrastructure. With Best Management Practices (BMP), the Proposed Action would not result in significant impacts to marine biological resources, physical conditions, marine traffic, solid waste and cultural resources. The Proposed Action would not create environmental health and safety risks that may disproportionately affect children and minority or disadvantaged populations, and would not result in cumulative impacts to any environmental resource category. A condition on the permit covered by this EA would be a controlled research assessment of the potential environmental impact of these punches, inclusive of field measurements of their persistence in the ocean environment. This data would be used to assess potential cumulative impacts of future research vessel entry into the PMNM. NOAA has determined that the Proposed Action would not have reasonably foreseeable direct or indirect effects on any coastal use or resource of the State’s coastal zone.

NOAA anticipates a Finding of No Significant Impact (FONSI).

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PRE-FINAL ENVIRONMENTAL ASSESSMENT
UH MARINE CENTER AND HURL VESSEL ENTRY PERMITS
PAPAHĀNAUMOKUĀKEA MARINE NATIONAL MONUMENT, HAWAIʻI

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ACRONYMS AND ABBREVIATIONS

BMP	Best Management Practice
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
FONSI	Finding of No Significant Impact
FR	Federal Register
Ft	feet
HAR	Hawai‘i Administrative Record
HDOH	Hawai‘i Department of Health
HURL	Hawai‘i Undersea Research Laboratory
KOK	Ka‘imikai-o-Kanaloa
lbs	pounds
LORAN	Long Range Navigation
m	meter(s)
m^2	square meter(s)
MHI	Main Hawaiian Islands
NAAQS	National Ambient Air Quality Standards
NAO	National Oceanic and Atmospheric Administration, Administrative Order
NEPA	National Environmental Policy Act
nm	nautical miles
NOAA	National Oceanic and Atmospheric Administration
NWHI	Northwestern Hawaiian Islands
PCBs	polychlorinated biphenyls
PMNM	Papahānaumokuākea Marine National Monument
R/V	research vessel
ROV	remote operated vehicle
SOEST	School of Ocean and Earth Science and Technology
SPA	Special Preservation Area
sub	submersible
UH	University of Hawai‘i
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service

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1.0 PURPOSE AND NEED FOR ACTION

1.1 Summary of Proposed Action

The National Oceanic and Atmospheric Administration (NOAA) proposes to issue two permits; one to the University of Hawai‘i (UH) Marine Center and one to the Hawai‘i Undersea Research Laboratory (HURL) allowing vessels to enter Papahānaumokuākea Marine National Monument (PMNM) to support research projects in the Northwestern Hawaiian Islands (NWHI). The vessels would be permitted to enter but not anchor within the PMNM except in emergency situations.

1.2 Purpose and Need

The purpose of the Proposed Action is to issue two PMNM entry permits to UH Marine Center and HURL facilities to support a wide range of marine research projects approved by the PMNM co-Trustees. The UH Marine Center research vessel (R/V) Ka‘imikai-o-Kanaloa (KOK) would provide transportation for research teams working on permitted projects within PMNM. Researchers aboard this vessel would also have access to HURL submersibles (subs) and a remote operated vehicle (ROV) for underwater work.

Research in the NWHI helps the PMNM co-Trustees and the public gain a better understanding of the biology and ecosystems of the NWHI, which is crucial for the best management of the PMNM. Use of research ships and accessory vessels facilitates access to deep areas of the ocean that would not be visible or accessible otherwise. This access is essential to conducting valuable research.

1.3 Background

1.3.1 UH Marine Center and Hawai‘i Undersea Research Laboratory

The UH Marine Center maintains and operates three state-owned vessels: the R/V Kilo Moana, the R/V Klaus Wyrtki, and the KOK. Only the KOK would be permitted to enter PMNM.

HURL was established by NOAA and the UH to study deep water marine processes in the Pacific Ocean. HURL builds its research program through an annual request for proposals. Projects are selected through peer review and by a scientific advisory panel. In addition, HURL accepts funded requests from private, state, or federal agencies and participates in international collaborative research projects in the Pacific.

Undersea research offers a great opportunity for new discovery. The current focus of HURL's Pacific-wide research projects is on deep-sea geology and ecosystems, and potential global climatic influences. Future projects may include research on the geology and biology of emerging and subsiding islands, marine product and fishery assessments, and processes of submarine mineral accumulations on seamounts, volcanoes, and islands.

1.3.2 Papahānaumokuākea Marine National Monument

President George W. Bush established the PMNM on June 15, 2006, to protect the resources of the NWHI. The purposes and management regime for the Monument, as well as restrictions and prohibitions regarding activities in PMNM, are set forth in the Proclamation 8031 (71 Federal Register 36443, June 26, 2006) (Proclamation).

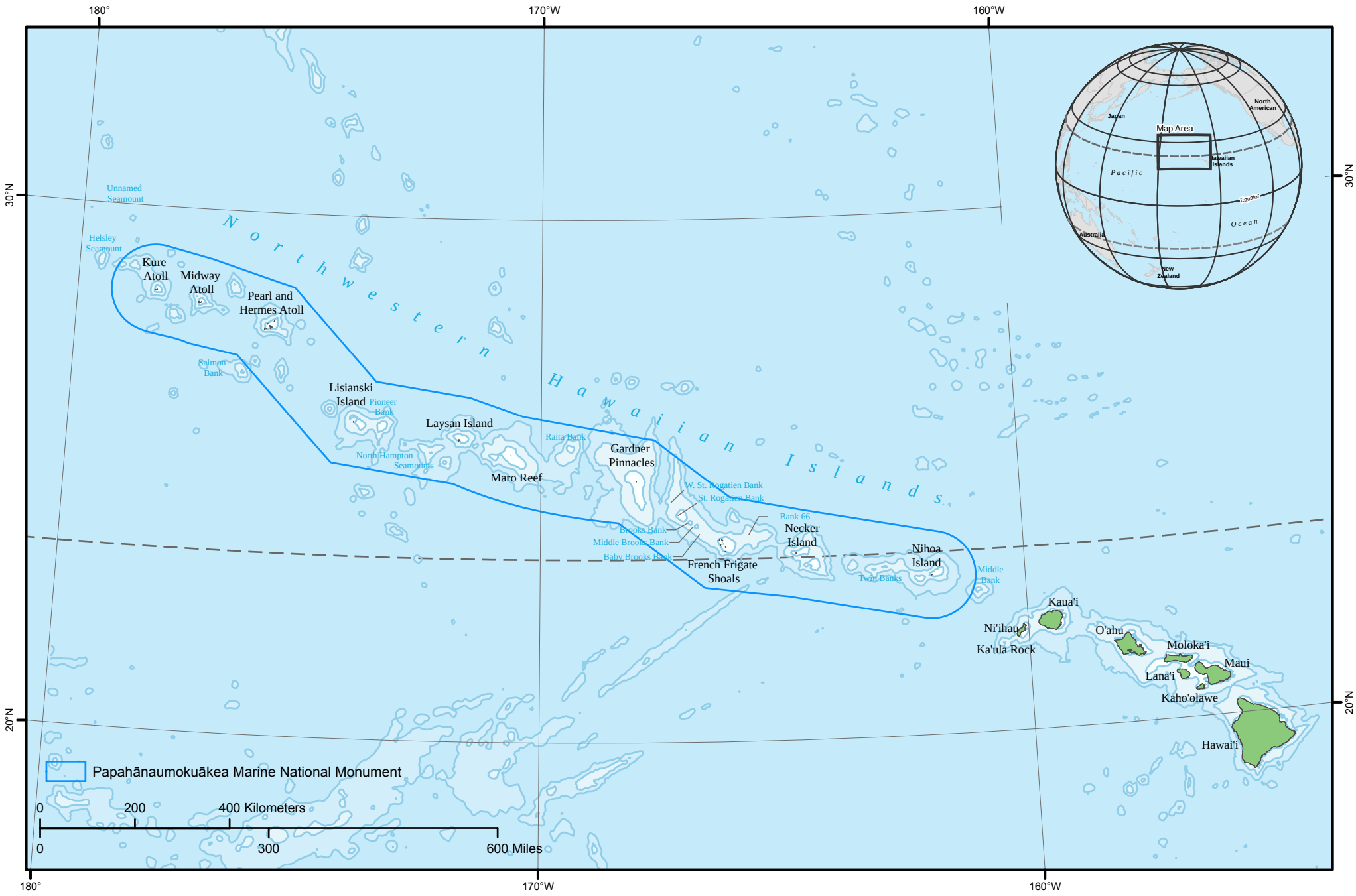

Figure 1-1
Papahānaumokuākea Marine National Monument

The Secretary of Commerce, through NOAA, has primary responsibility regarding the management of the marine areas of the PMNM, in consultation with the Secretary of the Interior. The Secretary of the Interior, through the U.S. Fish and Wildlife Service (USFWS), has sole responsibility for the areas of PMNM, in consultation with the Secretary of Commerce, that overlay the Midway Atoll National Wildlife Refuge, the Battle of Midway National Memorial, and the Hawaiian Islands National Wildlife Refuge. Nothing in the Proclamation diminishes or enlarges the jurisdiction of the State of Hawai‘i, which has primary responsibility for managing the State waters of PMNM and primary responsibility for the Kure Atoll portion of the Kure Atoll State Seabird Sanctuary.

The mission of the PMNM:

- prohibit unauthorized access;
- provide for carefully regulated education and scientific activities;
- preserve access for Native Hawaiian cultural activities;
- enhance visitor access at Midway;
- phase out commercial fishing; and
- ban other types of resource extraction and dumping of waste.

Activities within the PMNM are subject to permit approval by the PMNM co-Trustees (NOAA, USFWS, and the State of Hawai‘i). All Federal permits including PMNM permits are subject to National Environmental Policy Act (NEPA) compliance. Proposed Actions that impact State jurisdiction may also be subject to State of Hawai‘i, Hawai‘i Revised Statutes 343 environmental review. Permit categories are:

- Research designed to further understanding of Monument resources and qualities;
- Education;
- Conservation and management;
- Native Hawaiian practices;
- Recreation (Midway only); and
- Special ocean use.

According to NOAA’s Administrative Order (NAO) 216-6, certain activities require an EA before a permit can be granted. These are:

- activities that have unknown or unique environmental consequences, including but not limited to the placement of artificial reefs;
- activities that have never before been conducted in the particular Sanctuary or habitat type for which the application is made and could possible result in permanent or long-term adverse impacts;
- activities that are controversial in nature or are of a heightened public concern as determined by the manager, the Director, or by the NOAA NEPA coordinator; and
- activities that are likely to result in adverse impacts to any species protected under the Endangered Species Act or Marine Mammal Protection Act as determined through consultation with either the USFWS or the National Marine Fisheries Service, as appropriate.

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2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVE

2.1 Introduction

This chapter presents a discussion of the Proposed Action, No Action Alternative, and a summary of environmental effects. The Proposed Action and the No Action Alternative are analyzed in terms of how well they meet the purpose and need of the project, as described in Chapter 1.

2.2 Description of Proposed Action and Alternative

2.2.1 Proposed Action

NOAA proposes to issue a PMNM entry permit to the UH Marine Center and HURL facilities to support research projects in the NWHI (Figure 2-1). Facilities include the KOK, two deep-diving subs (Pisces IV and Pisces V), and an ROV (RCV-150) (Table 2-1). The KOK would be permitted to enter but not anchor within the PMNM except in emergency situations. The KOK home port is Honolulu Harbor at Pier 45. The subs are housed and maintained at Makai Pier, in Waimanalo on the windward side of O'ahu.

The Ka'imikai-o-Kanaloa

The UH Marine Center operates the State-owned R/V KOK. On average, the KOK accommodates 30 personnel, with a maximum of 32. Aside from traditional berthing and living spaces, the KOK has wet and dry laboratory space, a rock lab, a clean room, and a dark room. It is ballasted with fresh potable water from the dock in Honolulu. There are no ballast water exchanges at sea.

Vessel anchoring has the potential to impact the ecosystem depending upon many factors, such as the size of the ship and anchor system, weather conditions, and the location and vicinity of the anchorage relative to sensitive ecosystems (e.g. coral reefs). Anchors and chains can destroy coral and live rock, directly affecting fishes and benthic organisms and their habitat. In accordance with PMNM regulations, the KOK would not drop anchor within the PMNM except in emergency situations. Even in emergency situations, efforts are made to drop anchor in specially designated areas that are relatively free of coral.

During these cruises, the permit may allow sustenance fishing, defined as "fishing for bottomfish or pelagic species in which all catch is consumed within the PMNM, and that is incidental to an activity permitted under this part" if requested on the permit application. Each vessel that is permitted to sustenance fish must fill out a sustenance fishing data sheet (attached), to track species caught, location, and number of fish taken.

The KOK is dry docked every two years and the bottom and sides are cleaned using a high pressure water system to remove dirt and growth on the hull. The bottom is then repainted with an anti-fouling paint, which is approved by the U.S. Environmental Protection Agency (EPA) and retards marine growth and preserves the bottom surface. The hull is painted with a marine paint for protection in the salt water environment. The last time KOK was dry-docked was May 2005.

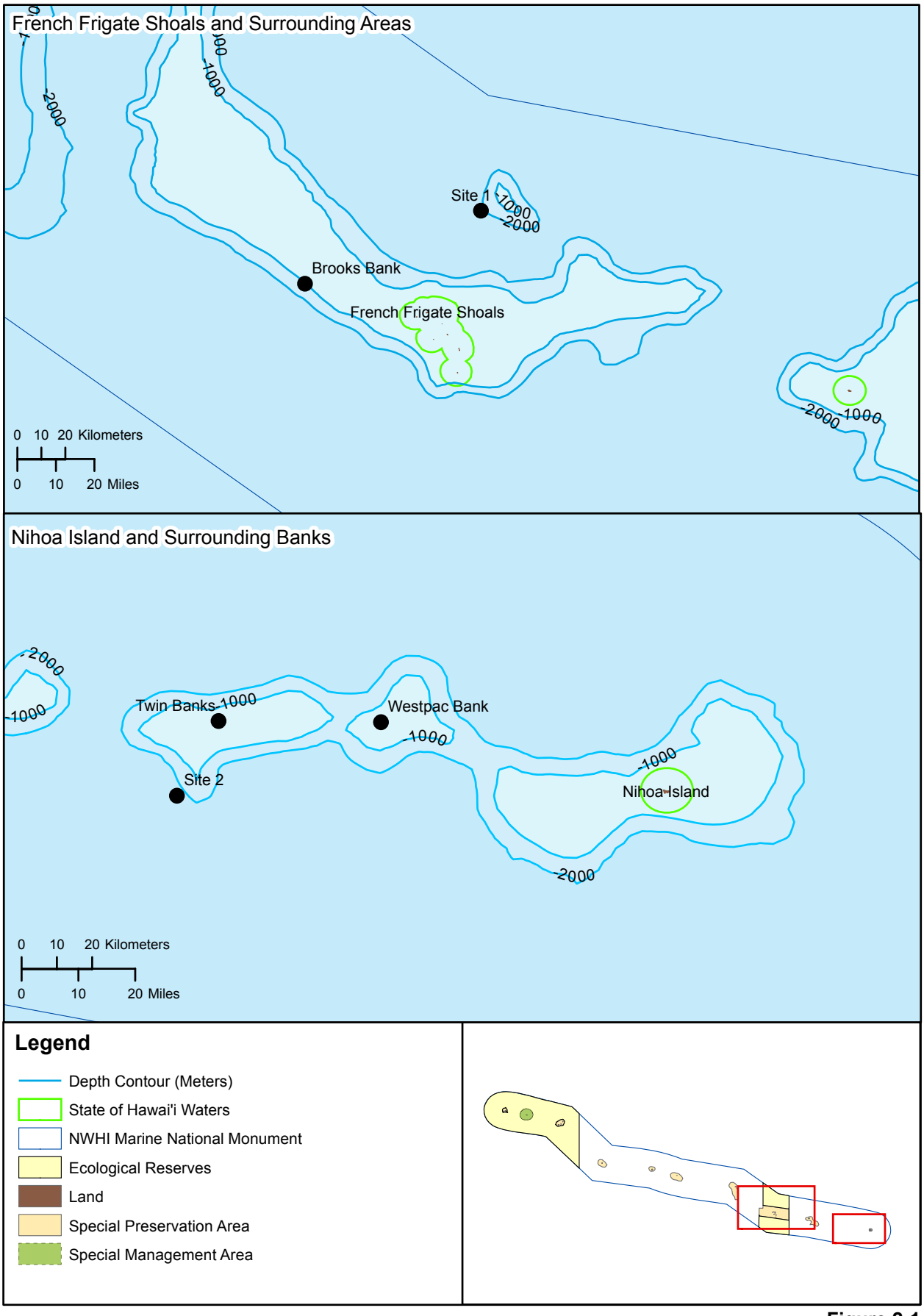


Figure 2-1
Project Location

Table 2-1 UH and HURL Facility Specifications

Facility	Specifications	
Ka'imikai O Kanaloa	Built: 1979 (Modified 1993) Ownership: State of Hawai'i Length: 223 ft Beam: 38 ft Draft: 13 ft 6 in Gross Tonnage: 259 Displacement: 1,961 tons Speed: Cruising 10 knots; Full 11 knots; Minimum 1 knot Range: 15,000 nautical miles (nm) (60 days) Fuel Capacity: 101, 000 gallons* Endurance: 50 days (food and fresh water)	
Pisces IV	Length: 20 ft Width: 10 ft 6 in Height: 11 ft Weight: 13 tons Crew: 1 Pilot 2 Observers Life Support: 140 hours for 3 people Max. Operating Depth: 6,500 ft (1981 meters) Power: 2 lead-acid battery systems Duration: 7 - 10 hours Buoyancy Control: seawater, high-pressure air and droppable descent/ascent weights.	
Pisces V	Length: 20' Width: 10' 6" Height: 11' Weight: 13 tons Crew: 1 Pilot 2 Observers Life Support: 140 hours for 3 people Max. Operating Depth: 6,280 ft. (1914 meters) Power: 2 lead-acid battery systems Duration: 7 - 10 hours Buoyancy Control: seawater, high-pressure air and droppable descent/ascent weights.	
RCV-150	Length: 52" Width: 47" Height: 43" Buoyancy in water: 15 lb Weight in air: 1,215 lb Max. Operating Depth: 3,000 ft. (914 meters) Power: 880 VAC via umbilical Operators: 2 Duration: limited by operator endurance. Propulsion: four 10" diameter thrusters, two horizontal, two vertical Speed: 1.5 knots forward, 0.5 knot vertical (approximate)	

Source: HURL, 2007
*Note: The fuel capacity differs from the source specifications sheet because some of the fuel tanks have been converted to water tanks since the specifications were initially posted. S. Winslow, personal communication via email, School of Ocean and Earth Science and Technology (SOEST), August 30.

In between dry-dockings, divers regularly scrub the bottom and propellers to remove marine growth and reduce drag. The bottom and propellers were last cleaned by divers on 12 Aug 2006 and the propellers were cleaned again on 12 June 2007. The bottom and propellers would be cleaned again by divers in September 2007 in preparation for the cruise to the NWHI.

The KOK has a Redfox Marine Sanitation Device, which uses aerobic bacteria to break down the waste material from the ships sewage system. The Redfox discharges into the grey water holding tank. The KOK can retain sewage and grey water on board for an average of 2 days before the holding tank reaches capacity and grey water must be discharged. All sewage would be treated and the grey water retained until at a minimum of 3 nm from all PMNM Special Preservation Area (SPA) boundaries (Figure 2-1).

The ship would carry up to 101,000 gallons of diesel fuel and up to 1,000 gallons of lubrication oil, ten 16-ounce cans of WD-40 and 20 gallons of an EPA approved solvent. These are kept in the designated holding tanks located in the engine room. Used oil is stored in a designated labeled drum until return to port. HURL typically generates about one gallon of used oil per dive day. Excess oils from maintenance and repairs are cleaned up with cloth rags and/or oil absorbent pads. Used rags are stored in designated, labeled bins until return to port. The ship also carries approximately 40 gallons of paint and paint thinners are stored in a large box on deck. Waste and excess paint is retained on board until the ship returns to port for proper disposal.

The ship would also carry about 75 gallons spare hydraulic fluid for the ROV. The hydraulic charge cart adjacent to the ROV A-frame/winch holds about 20 gallons, and the remainder is stored in 5-gallon containers on the half deck below the hangar. The A-frame/winch power pack is located in the hangar and has a capacity of about 40 gallons of hydraulic fluid. An additional 20 gallons of spare hydraulic fluid for the A-frame/winch is stored in 5-gallon containers on the half deck below the hangar. Maintenance crews also keep small amounts of lubricants and solvents which are necessary for the proper operation and maintenance of the ROV in the Tracking room.

Although an oil spill at sea is unlikely, the crew would address the spill in accordance with the KOK Shipboard Oil Pollution Emergency Plan as approved by the U.S. Coast Guard (USCG). A Non-Tank Vessel Response Plan has also been submitted to the USCG. In the case of a hazardous material spill, the crew would follow procedures described in the KOK Safety Management Manual.

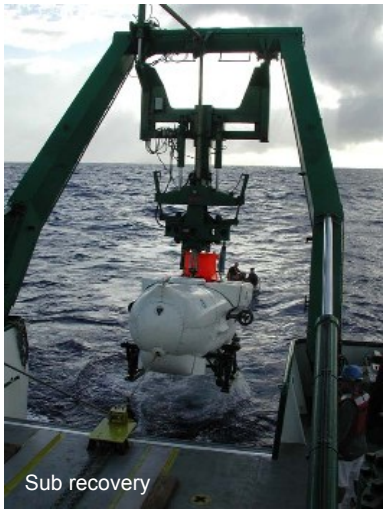
The KOK Safety Management Manual also addresses solid waste management. Degradable waste that is ground would be discharged overboard at a minimum distance of 3 nm from SPA boundaries, and degradable waste that is not ground would be discharge at a minimum distance of 12 nautical miles from SPA boundaries. Any degradable waste that may remain floating for some time, would be discharged at a minimum distance of 25 nm from SPA boundaries. All plastics are retained on board until the vessel returns to port. Laboratory waste is also retained on board until it can be properly disposed of at home port.

The KOK is equipped with a SeaBeam 3012 multibeam sonar bathymetric system. The system is only turned on during mapping projects. The SeaBeam system uses active sonar to map the depth and contours of the sea floor (bathymetry). The system sends a focused pulse of sound (ping) straight down and listens for the reflected echo off of the sea floor. The amount of time it takes for the noise to be sent, reflected, and received is converted into a depth measurement. Power, amplitude, pulse width, and ping rate vary depending on the depths of the ocean in the

area being mapped. The SeaBeam uses a frequency of 12 kilohertz and a maximum power of 30 kilowatts for deep ocean mapping pinging every 1-25 seconds. This type of sonar is different from Low-Frequency Active Sonar used by the U.S. Navy which uses a frequency range of 100-1,000 hertz (Federation of American Scientists, 2007).

Pisces IV & Pisces V

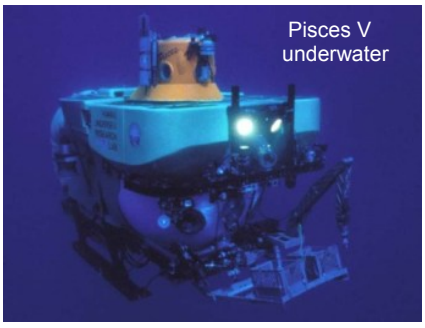
The Pisces subs can do a maximum of 60 dives per year in PMNM; however the actual average has been about 40 dives per year. Typically, on a 30-day cruise there are 3 science groups and each group gets between 3-9 dives. Most of the sub work occurs in the aphotic zone beneath the photocline where light does not penetrate.


Sub recovery

The subs would use steel washer punches for ballast. The punches are made of uncoated low-carbon steel, and washed before use. To land on the sea floor, the sub pilot drops one round of weights, and when the sub is ready to return to the surface, the pilot drops a second round of weights. In total, the sub would drop approximately 300-400 pounds (lbs) of washer punches per dive (150-200 per round). A 5-gallon bucket of washer punches weighs about 100 lbs. Sub operators would avoid sensitive areas when landing and dropping weights. All ballast would be dropped in the aphotic zone. The decay rate of steel in seawater varies depending on the type of steel. It would take approximately 5 years for a 10 millimeter-thick piece of steel to corrode in seawater. Actual corrosion rate depends on the salinity, oxygen availability, and temperature of the water (National Association of Corrosion Engineers, 1984).

Up to 100 pounds of seawater may be pumped out or flooded into the hard ballast tanks of the subs, depending on the ballasting needs encountered. Under certain conditions, high pressure air may be used to increase the buoyancy of a sub during the ascent at the end of a dive mission. The soft ballast tanks are open to the environment to avoid rupture due to rapidly expanding air near the surface. The surplus ballast air is released into the surrounding water.

The operator would perform pre-dive and post-dive maintenance checks on the subs. During these checks, all hydraulic and pressure compensating systems are examined for leaks and potential problems. Any oil leak found on these systems must be addressed prior to the next dive mission to ensure proper operation of the subs and thus the safety of observers and crew. No solvents or fuels are used to operate the subs. Silicone-based lubricants are used to treat the seals within pressure proof systems on the subs.


Pisces V underwater

All electrical and hydraulic systems on the subs are sealed to the environment as intrusion of seawater into any part of these components must be avoided to ensure the safety of observers and crew. All power generation is electrical. The battery systems emit a small amount of hydrogen gas which is released through check valves to avoid pressure build up inside the battery pods.

The subs would be launched in the morning in clean condition and remain immersed in seawater during the day. Every evening, the sub is recovered and rinsed with fresh water to remove residual seawater from the subs, which causes corrosion and crystallization issues.

Remote Operated Vehicle

The ROV system consists of the vehicle and launching garage, a winch/A-frame unit, and the associated power and control consoles. The system has been upgraded from the original design to incorporate fiber optic data transmission. The ROV is ballasted with syntactic foam and attached lead blocks. Both types of ballast are fixed to the vehicle. No liquid ballast is used. The compact hydrodynamic design and neutrally buoyant tether cable allow close up inspections with a high degree of maneuverability. The vehicle can operate to depths of 914 m (3,000 ft). Color video and a single manipulator are standard equipment on the RCV-150. The investigator can record video and vehicle data (depth, heading, etc.) and can verbally annotate the recording in real time. Other equipment may be adapted for use on the ROV.

In preparation for any research cruise, the maintenance crews would wash the ROV with fresh water and Simple Green™ prior to departure and again following any maintenance onboard the KOK. While at sea, operators would rinse the ROV with fresh water on board the KOK after each dive.

2.2.2 No Action Alternative

The No Action Alternative would not meet the purpose and need of the Proposed Action. No additional scientific information would be collected and no new knowledge on NWHI ecology would be gained. Although the No Action Alternative does not meet the project's purpose and need, it has been carried forward for analysis because the Council on Environmental Quality (CEQ) regulations require consideration of the No Action Alternative.

2.3 Environmental Effects of the Proposed Action and Alternative

Preliminary project screening indicated that the Proposed Action would not affect many of the resources typically addressed in NEPA impact documents. These resources are described briefly in Chapter 3.0, Affected Environment, and not carried through the impact analysis. The dismissed resource categories include: terrestrial biological resources, soils and topography, land use, noise, visual resources, natural hazards, and utilities and other infrastructure. The resource categories that are relevant to the Proposed Action are marine biological resources, physical conditions, solid waste, marine traffic, and cultural resources.

Table 2-2 summarizes the environmental effects of the Proposed Action and the No Action Alternative. This information is a summary of Chapter 4.0, Environmental Consequences.

Table 2-2 Summary of Anticipated Environmental Effects of the Proposed Action and No Action Alternative

Resource Category	Proposed Action	No Action Alternative
Terrestrial Biological Resources, Soils and Topography, Land Use, Noise, Visual Resources, Natural Hazards, and Utilities and Other Infrastructure.	No significant adverse impact anticipated.	No impact.
Marine Biological Resources	No significant adverse impact to marine biological resources is anticipated with implementation of Best Management Practices (BMPs). If any marine mammals (e.g., endangered monk seals) or sea turtles are observed, or enter the project area at any time, in-water work would be stopped until they leave the area.	No impact.
Physical Conditions (Air Quality, Water Quality, Hazardous and Regulated Materials)	No significant adverse impact to air quality, water quality, or hazardous materials is anticipated with implementation of BMPs.	No impact.
Solid Waste	No significant adverse impact to solid waste.	No impact.
Marine Traffic	No significant adverse impact to marine traffic anticipated with implementation of BMPs.	No impact.
Cultural Resources	No significant adverse impact to cultural resources is anticipated. If any indication of a culturally or historically significant site is found during project, work would be halted until the proper authorities can be notified.	No impact.

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3.0 AFFECTED ENVIRONMENT

3.1 Overview

This chapter describes the environmental setting and baseline conditions of the environmental resources within and adjacent to the project location. The Proposed Action has potential to impact marine biological resources, physical conditions, solid waste and marine debris, marine traffic, and cultural resources. These resource categories are described here and carried through the impact analysis presented in Chapter 4.0. Preliminary project screening indicated that the Proposed Action would not affect many of the resources typically addressed in NEPA impact documents. These resources are described here, but not carried through the impact analysis.

Terrestrial biological resources, soils and topography, land use – There are no terrestrial or coastal components to the Proposed Action and no impacts to terrestrial biological resources are anticipated.

Soils and topography – There are no terrestrial or coastal components to the Proposed Action and no impacts to soils and topography are anticipated.

Land Use – There are no terrestrial or coastal components to the Proposed Action and no impacts to land use are anticipated.

Noise – No impacts to ambient noise are anticipated as a result of the Proposed Action, except for minor boat motor noise.

Traffic – There are no terrestrial components to the Proposed Action and no impacts to traffic are anticipated.

Visual resources – There are no surface or land-based components to the Proposed Action that would impact the aesthetics at the PMNM.

Natural hazards – The project will not impact or be impacted by the potential in PMNM for flooding, erosion, seismic activity, lava flows or hurricanes.

Utilities and other infrastructure – The Proposed Action would not result in permanent utilities or infrastructure in the PMNM.

These resources would not be impacted by the No Action Alternative.

3.2 Marine Biological Resources

PMNM encompasses a vast and remote chain of islands that is a part of the Hawaiian archipelago, including emergent and submerged lands and waters within a radius of approximately 50 nm from the islands. PMNM extends approximately 1,200 miles and includes islands, coral atolls, seamounts, banks, and shoals. PMNM includes State of Hawai‘i waters and submerged lands, including the NWHI State Marine Refuge and Kure Atoll Wildlife Sanctuary. PMNM also includes Midway Atoll National Wildlife Refuge/Battle of Midway National Memorial, Hawaiian Islands National Wildlife Refuge, and the NWHI Coral Reef Ecosystem Reserve.

3.2.1 The Northwestern Hawaiian Islands

The NWHI can be characterized as a large marine ecosystem exposed to a wide range of oceanographic conditions and environmental and anthropogenic stressors. Submerged geomorphologic features, including reef, slope, bank, and seamount habitats, support a diverse range of shallow and deepwater marine life. Small islands and islets provide critical breeding grounds and nesting sites for endangered, threatened, and rare species that forage throughout the coral reef, deepwater, and pelagic marine ecosystems encompassing the NWHI.

The descriptions of the physical environment that follow are summarized from Volume II of the *Draft Environmental Impact Statement (EIS) and Management Plan for the NWHI Proposed National Marine Sanctuary* (NOAA, 2006).

Nihoa Island

Nihoa Island is located about 155 miles northwest of Kaua‘i in the Main Hawaiian Islands (MHI). Nihoa, roughly 150 land acres, is the largest emergent volcanic island in the NWHI. The island’s two peaks and steep sea cliffs are clearly visible from a distance. The northern edge is a steep cliff made up of successive layers of lava through which numerous volcanic extrusions (dikes) are visible. Nihoa’s surrounding submerged coral reef habitat totals approximately 142,000 acres. Nihoa’s seabird colony boasts one of the largest populations of Tristam’s storm-petrel, Bulwer’s petrel and blue-grey noddies in the Hawaiian Islands and possibly in the world.

Necker Island (Mokumanamana)

Necker Island is a dry volcanic island shaped like a fishhook and includes about 45 acres of land. Necker is also known by the Hawaiian name Mokumanamana, and is spiritually significant in the Native Hawaiian culture. Geologists believe it was once as large as O‘ahu. Now Mokumanamana’s high point is only 365 feet above the sea. Wave erosion has reduced the rest to a submerged shelf about 40 miles long and 15 miles wide. While this shelf holds more than 380,000 acres of coral reef habitat, severe waves and currents in the exposed areas inhibit coral growth.

French Frigate Shoals (Kānemiloha‘i)

French Frigate Shoals, the largest atoll in the chain, forms an 29 km long crescent-shaped atoll and consists of only 27 hectares of total emergent land and approximately 9,308 hectares of coral reef habitat. The lagoon contains two exposed volcanic pinnacles and 12 low, sandy islets. French Frigate Shoals is home to the largest breeding colony of the endangered Hawaiian monk seal and supports nesting sites for 90 percent of Hawai‘i’s green sea turtle population. The shoals also have the largest diversity of breeding seabirds (18 species) in the NWHI.

Gardner Pinnacles (Pūhāhonu)

Gardner Pinnacles consists of two volcanic peaks. Bird guano gives t peaks a frosted appearance and indicates their importance as a roosting site and breeding habitat for 12 species of sub-tropical seabirds. In scale, these pinnacles are small, the larger reaching

only 180 feet and about 590 feet in diameter. About 600,000 acres of coral reef habitat, most of which is in waters deeper than 60 feet, surround the pinnacles.

Maro Reef (Koʻanakoʻa)

Maro Reef is a largely submerged open atoll with less than one acre of emergent land. At very low tide, only a small coral rubble outcrop of a former island is believed to break above the surface. The shallow water reef ecosystem covers nearly half a million acres and is the largest coral reef in the NWHI. It is one of the chain's most ecologically rich with 95 percent coral cover in some areas, one of the highest observed in the NWHI. Maro has intricate "reticulated" reef crests, patch reefs and surrounding lagoons. Deepwater channels with irregular bottoms cut between shallow reef structures. Maro's outermost reefs absorb the energy of swells that travel toward the inner lagoon. The innermost area lies within reticulated reefs and aggregated patch reefs and has the characteristics of a true lagoon, with little influence from large ocean swells. Because of Maro's structural complexity, the shallow reef is poorly charted and it has been largely unexplored.

Laysan Island (Kauō)

Laysan is the second largest island in the NWHI chain, with about 915 acres of land. It is surrounded by approximately 100,000 acres of coral reef. Most of the reef area at Laysan is in deeper waters with a small, shallow water reef area in a bay off the southwest side of the island. Laysan is well vegetated aside from its sandy dunes and has a 100-acre hypersaline lake (one of only five natural lakes in Hawaiʻi). About two million birds nest here – boobies, frigatebirds, terns, shearwaters, noddies, albatrosses, as well as endangered Laysan ducks and finches.

Lisianski Island (Papaʻāpoho)

Lisianski Island, the second largest NWHI atoll, at over 12 miles across, is a low sand and coral island and includes 400 acres of land. This 20 million-year-old island's highest point stands at 40 feet. Lisianski is part of a large, open atoll, and lies at the northern end of a large reef bank, Neva Shoal which is estimated to be close to 290,000 acres. The coral cover around the island totals 310,000 acres.

Pearl and Hermes Atoll (Holoikauaua)

Pearl and Hermes Atoll is a large atoll with several small islets forming about 80 acres of land and almost 300,000 acres of coral reef habitat. The atoll extends over 20 miles across and 12 miles wide. Pearl and Hermes Reef is a true atoll, fringed with shoals, permanent and ephemeral sandy islets. The islets provide important dry land respites for seals, turtles, and birds in need of rest, protection from predators, or nesting grounds. The islets are periodically washed over when winter storms pass through the area.

Midway Atoll (Pihemanu)

Midway Atoll consists of three small, sandy islets totaling 1,540 acres and a large, elliptical barrier reef measuring approximately five miles in diameter. The atoll is surrounded by about 88,500 acres of coral reefs. Numerous patch reefs dot the lagoon. Also known as the "Midway Islands," Midway originated as a volcano approximately 27 million years ago. In 1965, the U.S. Geological Survey took core samples and hit the solid basaltic rock 180 feet

beneath Sand Island and 1,240 feet beneath the northern reef. Despite being heavily used by humans, Midway boasts the largest nesting colonies of both Laysan and black-footed albatrosses in the world.

Kure Atoll (Mokupāpapa)

Kure Atoll is located at the northern extent of coral reef development. The atoll is nearly circular with a six-mile diameter enclosing nearly 200 acres of emergent land. The outer reef nearly forms a circle around the lagoon except for passages to the southwest. The only permanent land in the atoll is crescent-shaped Green Island, located near the fringing reef in the southeastern part of the lagoon. Almost 80,000 acres of coral reef habitat are found there.

Banks and Seamounts

There are approximately 30 submerged banks in the NWHI. Surrounding French Frigate Shoals is a series of submerged banks. An unnamed bank is located just to the east. To the west are South East Brooks Bank, St. Rogatien Bank, and another unnamed bank. Raita Bank is just west of Gardner Pinnacles. The crest or top of Raita Bank is about 60 feet from the ocean surface. Pioneer Bank is only 22 nm from Neva Shoals, and the features combine to form a major coral reef ecosystem rich in biodiversity and with a variety of marine habitats. Bank areas provide extensive habitat for bottomfish and a few are known to provide foraging habitat for endangered Hawaiian monk seals. Large precious corals, such as gold, pink and black corals, are also found in the deep waters of the banks. Unlike shallow reef corals, which are able to harness sunlight as an energy source due to photosynthesizing symbiotic dinoflagellates in their tissues, deep-water precious corals live in near-total darkness and are completely dependent upon capturing plankton with their tentacles from the water column.

3.2.2 Coral Reefs

A total of 57 stony coral species are known in the shallow waters of the NWHI, of which 17 endemic species account for 37 to 53 percent of the relative abundance of stony corals surveyed on each reef in the NWHI (Friedlander et al. 2005). Seven species of coral (sp. *Acropora)* have been documented in the central NWHI despite their near absence from the MHI. Coral cover varies significantly across the NWHI. Most regions have low coral cover with the exception of Maro Reef and Lisianski Island having comparatively high coral cover. Despite their high latitudes, more species of coral have been reported for the NWHI (52) than the MHI (48) (Friedlander et al. 2005).

Shallow water coral reef habitat harbors a diversity of macro algae. Currently, a total of 355 algal species have been recorded from coral reef habitats of the NWHI. The NWHI contain a large number of Indo-Pacific algal species not found in the MHI, such as the green calcareous alga (*Halimeda velasquezii*). Unlike the MHI where alien species and invasive algae have overgrown many coral reefs, the reefs of the NWHI are largely free of alien algae.

3.2.3 Bottomfish

Descriptions of bottomfish habitats in the NWHI indicate that the distribution and abundance of bottomfish are patchy and appear to be associated with with cavities or current patterns

that attracts their prey (Kelly et al. 2004). The commercial bottomfish industry targets onaga (*Etelis coruscans*), ehu (*E. carbunculus*), opakapaka (*Pristipomoides filamentosus*), kalekale (*P. sieboldii*), lehi (*Aphareus rutilans*), gindai (*P. zonatus*) and hapuupuu (*Epinephelus quernus*). Additional species of Hawaii bottomfish that are federally regulated include uku (*Aprion virescens*), white ulua (*Caranx ignobilis*), black ulua (*C. lugubris*), butaguchi (*Pseudocaranx dentex*), taape (*Lutjanus kasmira*), yellow tail kalekale (*Pristipomoides auricilla*) and kahala (*Seriola dumerili*). These species together are collectively known as the Bottomfish Management Unit Species (Hawaii Bottomfish Fishery 2007).

3.2.4 Seabirds

Seabird colonies in the NWHI constitute one of the largest and most important assemblages of seabirds in the world, with approximately 14 million birds representing 20 breeding species (Naughton and Flint 2004). Birds that live at sea and migratory birds are also part of the ecosystem. The NWHI contain over 95 percent of the world's black-footed and Laysan albatrosses. The greatest threats to seabirds in the NWHI are introduced mammals and other invasive species, fishery interactions, contaminants, oil pollution, and climate change.

3.2.5 Marine Mammals

A total of 24 different species of marine mammals have been recorded by research cruises within the U.S. Exclusive Economic Zone in waters surrounding the NWHI and are afforded protection under the Marine Mammal Protection Act (Barlow 2003). Marine mammals observed in the NWHI include; whales, dolphins, and Hawaiian monk seals. Use of acoustics (i.e. sound waves) is a important tool for marine mammals in communication, locating prey, and navigation.

3.2.6 Endangered Species

Under the Endangered Species Act of 1972, endangered species are those in danger of extinction. Threatened species are those likely to become an endangered species within the foreseeable future. Twenty-three species of plants and animals known to occur in the NWHI are listed under the Endangered Species Act (see Table 3-1). Of those listed species that occur in the marine ecosystem, the Hawaiian monk seal and the green sea turtle are discussed further as the NWHI serve as an important breeding ground for these species.

Hawaiian Green Turtle (*Chelonia mydas*)

Green sea turtles have been protected under the Endangered Species Act since 1978. Over 90 percent of all sub-adult and adult green turtles found throughout Hawai‘i come from the NWHI. After more than 25 years of having protected nesting and foraging habitats in the Hawaiian Archipelago, the Hawaiian green sea turtle stock is recovering. Green turtle nesting sites occur at Pearl and Hermes Atoll, Lisianski Island, Maro Reef, and French Frigate Shoals. French Frigate Shoals is the primary nesting site for green turtles, accounting for 400 nesting sites or 90 percent of all nesting within the Hawaiian Archipelago (NOAA 2006).

Table 3-1 Federally Threatened or Endangered Marine Species Observed in the NWHI.

Common Name	Scientific Name	Status
MARINE MAMMALS		
Hawaiian monk seal	*Monachus schauinslandi*	Endangered
Humpback whale	*Megaptera novaeangliae*	Endangered
Sperm whale	*Physeter macrocephalus*	Endangered
Blue whale	*Balaenoptera musculus*	Endangered
Fin whale	*B. physalus*	Endangered
Sei whale	*B. borealis*	Endangered
North Pacific right whale	*Eubalaena japonica*	Endangered
MARINE TURTLES		
Olive ridley turtle	*Lepidochelys olivacea*	Endangered
Leatherback turtle	*Dermochelys coriacea*	Endangered
Loggerhead turtle	*Caretta caretta*	Endangered
Hawksbill turtle	*Eretmochelys imbricata*	Endangered
Green turtle	*Chelonia mydas*	Threatened
SEABIRDS		
Short-tailed albatross	*Phoebastria*	Endangered

Source: (as citied in NOAA, 2006)

3.2.7 Alien Species

Marine alien species can be defined as aquatic organisms that have been intentionally or unintentionally introduced into new ecosystems resulting in negative ecological, economic, or human health impacts. A total of 12 marine alien invertebrate, fish, and algal species has been recorded in the NWHI (see Table 3-2). Alien species may be introduced unintentionally by vessels, marine debris, aquaculture, or intentionally, as in the case of some species of groupers and snappers, and algal species.

Table 3-2 Marine Alien Species in the Northwestern Hawaiian Islands.

Common Name	Species	Taxa	Native Range	Present Status in NWHI	Mechanism of Introduction
-	*Acanthophora spicifera*	Algae	Indo-Pacific	Established (MID)	Fouling on ship hulls (hypothesized)
-	*Hypnea musciformis*	Algae	Unknown; Cosmopolitan	Not Established; in drift only (MAR)	Intentional introduction to MIH (documented)
Orange striped sea anemone	*Diadumene lineata*	Anemone	Asia	Unknown; on derelict net only (PHR)	Derelict fishing net debris (documented)
Christmas tree hydroid	*Pennaria disticha*	Hydroid	Unknown; Cosmopolitan	Established (PHR, LAY, LIS, KUR, MID)	Fouling on ship hulls (hypothesized)
-	*Balanus reticulatus*	Barnacle	Atlantic	Established (FFS)	Fouling on ship hulls (hypothesized)
-	*Balanus venustus*	Barnacle	Atlantic and Caribbean	Not Established; on vessel hull only (MID)	Fouling on ship hulls (documented)
Caribbean barnacle	*Chthamalus proteus*	Barnacle	Caribbean	Established (MID)	Fouling on ship hulls (hypothesized)
Bushy bryozoan	*Amathia distans*	Bryozoan	Unknown; Cosmopolitan	Established (MID)	Fouling on ship hulls (hypothesized)
Branching bryozoan	*Schizoporella errata*	Bryozoan	Unknown; Cosmopolitan	Established (MID)	Fouling on ship hulls (hypothesized)
Bluestripe Seaperch	*Lutjanus kasmira*	Fish	Indo-Pacific	Established (NIH, NEC, FFS, MAR, LAY, and MID)	Intentional introduction to MHI (documented)
Blue Dot Grouper	*Cephalopholis argus*	Fish	Indo-Pacific	Established (NIH, NEC, FFS)	Intentional introduction to Main Hawaiian Islands (documented)

Common Name	Species	Taxa	Native Range	Present Status in NWHI	Mechanism of Introduction
Blacktail Snapper	*Lutjanus fulvus*	Fish	Indo-Pacific	Established (NIH and FFS)	Intentional introduction to Main Hawaiian Islands (documented)

Source: (as citied in NOAA, 2006)
Notes:
KUR - Kure Atoll
LAY - Laysan Island
LIS - Lisianski Island
FFS - French Frigate Shoals
NIH – Nihoa
NEC - Necker
MAR - Maro
MID - Midway
PHR - Pearl and Hermes

3.3 Physical Conditions

Air Quality

The State of Hawai'i monitors ambient air for attainment with the National Ambient Air Quality Standards (NAAQS) and State of Hawai'i Ambient Air Quality Standards. Data on air quality in the state is collected from 16 monitoring stations through the Main Hawaiian Islands, however no monitoring stations are located in the NWHI. The nearest monitoring station to the NWHI is located in Lihue, Kaua'i. Based on air quality data collected and published by the State of Hawai'i Department of Health (HDOH) for 2006, the State of Hawai'i was in attainment for all NAAQS and state standards (HDOH 2006).

Water Quality

Hawai'i's water quality standards (Chapter 11-54 HAR) are broadly based to protect both terrestrial (groundwater and surface waters) and marine waters. They consist of basic standards applicable to all waters, specific numerical standards for many toxic substances, and specific numerical standards for a number of classes of state waters. Due to their remote location and low level of human activities, the waters of the NWHI are relatively pristine.

Hazardous and Regulated Materials

Past uses of the NWHI have left a legacy of contamination on many of the atolls. The NWHI has hosted an array of polluting human activities including guano mining, fishing camps, USCG Long Range Navigation (LORAN) stations, U.S. Navy airfields and bases, and various military missions.

Contamination at all these sites includes offshore debris such as batteries (lead and mercury), transformers, capacitors, and barrels. Uncharacterized, unlined landfills remain on in the NWHI. Specific known areas of contamination are the following:

- Kure Atoll and French Frigate Shoals both have point sources of polychlorinated biphenyls (PCBs) due to former USCG LORAN stations. While the USCG has

mounted clean-up actions at both sites, contamination remains and is found in island soils and in nearshore sediments and biota.

- French Frigate Shoals and Pearl and Hermes Atoll were used for WWII seaplane refueling operations. This activity is suspected to have been a source of petroleum contamination in soil.
- Midway Atoll was the site of a U.S. Navy airfield. Before transfer to the Department of the Interior in 1996, the naval installation was part of the Base Realignment and Closure that identified and cleaned up numerous contaminated sites throughout the atoll. Contamination identified and remediated included petroleum in the groundwater and nearshore waters, pesticides in the soil, PCBs in soil, groundwater, and nearshore sediments and biota, metals such as lead and arsenic in soil and nearshore waters, and unlined, uncharacterized landfills. While most of the known areas were remediated, several areas warrant continued monitoring for potential releases. Since closure, the Navy has returned on several occasions for further remediation.
- Plutonium from the aboveground nuclear tests in the 1960s at Johnston Atoll has been detected in corals at French Frigate Shoals.

3.4 Solid Waste

Marine pollution can be defined as the direct or indirect introduction by humans, of substances or energy to the marine environment resulting in deleterious effects such as hazards to the health of marine life and humans, hindrance of marine activities, and impaired water quality. Marine pollution may originate from land-based or sea-based human activities in the form of point-source discharges or non-point source runoff.

Marine debris is a form of marine pollution that may originate from sea-based activities, such as shipping and fishing or from land-based activities that discharge pollutants in surface water runoff. Marine debris, including derelict fishing gear, cargo nets, bottles, military flares, and barrels of hazardous materials, continues to wash ashore on all the NWHI causing potential localized adverse impacts. Seabirds often ingest smaller debris while foraging, impacting survival rates.

3.5 Marine Traffic

Per monument regulations, all domestic-flagged vessels either a) entering PMNM under permit, or b) passing through PMNM without interruption (not dropping anchor or stopping) are required to provide notification of entry and exit . Approximately 52 vessels have provided notice of entry/exit since the monument was established in August 2006. However, 52 vessels is likely an underestimate of all the vessels that transit through PMNM. Due to the size and remoteness of PMNM there is no accurate data on the frequency and number of vessels going into the monument (H. Johnson, personal communication via email, PMNM, Aug 31, 2007). The range of vessel types include 20- to 60-foot fishing and recreational vessels, 150- to 250-foot research vessels, 500- to 700-foot passenger cruise ships and freighters, 700- to 1000-foot tankers as well as Coast Guard, military and international ships of all sizes and types.

NOAA regulates a range of activities in PMNM, including commercial fishing. Commercial bottomfishing has been conducted in the NWHI for the past 60 years. Bottomfish are found concentrated on the steep slopes of deepwater banks of the NWHI. Eight bottomfishing vessels are currently permitted to enter the PMNM for commercial fishing for bottomfish and

other associated pelagic species. Fishing may continue in PMNM for up to 5 years (until June 15, 2011) when the fishery will be closed (H. Johnson, personal communication via email, PMNM, June 4, 2007).

With the exception of a few small boats at Midway Atoll and Tern Island, no vessels have home ports in the NWHI. Therefore, almost all marine traffic in the waters surrounding the NWHI chain is from transiting merchant vessels, research vessels and fishing vessels; with cruise ships, USCG ships, and recreational boats visiting less frequently. An estimated 50 vessels pass through the Exclusive Economic Zone surrounding the NWHI each day (NOAA 2006).

3.6 Cultural Resources

The cultural significance of the PMNM is summarized below from Volume II of the *Draft Environmental Impact Statement (EIS) and Management Plan for the NWHI Proposed National Marine Sanctuary* (NOAA, 2006).

3.6.1 Native Hawaiian Significance

In Hawaiian traditions, the NWHI are considered a sacred place, a region of primordial darkness from which life springs and spirits return after death. Much of the information about the NWHI has been passed down in oral and written histories, genealogies, songs, dance, and archaeological resources. Through these sources, Native Hawaiians are able to recount the travels of seafaring ancestors between the NWHI and the MHI. More recent ethnological studies highlight the continuity of Native Hawaiian traditional practices and histories in the NWHI.

Nihoa and Mokumanamana Islands are recognized as culturally and historically significant and are listed on the National and State Register of Historic Places and protected by the USFWS in accordance with the National Wildlife Refuge System Administration Act of 1966, as amended. Archaeological surveys on Nihoa and Mokumanamana have documented numerous archaeological sites and cultural material. Nihoa Island, where there is significant soil development, hosts no less than 88 cultural sites, including ceremonial, residential, and agricultural features, from Hawaiians who inhabited the island for 700 years (until 1700 A.D.). On Mokumanamana, there are 52 recorded cultural sites, including ceremonial and temporary habitation features. The 33 heiau (ceremonial sites) that dot the island's spine suggest that the island was visited by Native Hawaiians for spiritual and possibly navigational purposes. Several archaeological surveys have collected cultural artifacts from both of these islands and are now stored in the Bernice Pauahi Bishop Museum and the University of Hawai'i Archaeological Laboratory. The range in types of cultural artifacts stored in these collections is testimony to the various uses these islands and the surrounding oceans served for Native Hawaiians.

In recent years, Native Hawaiian cultural practitioners voyaged to the NWHI to honor their ancestors and perpetuate traditional practices. In 1997, Hui Mālama i Nā Kūpuna o Hawai'i Nei repatriated sets of human remains to Nihoa and Mokumanana that were collected by archaeologists in the 1924-25 Bishop Museum Tanager Expeditions. In 2003, a cultural protocol group, Nā Kup'eu Paemoku, traveled to Nihoa on the voyaging canoe Hōkūle'a to conduct traditional ceremonies. In 2004, Hōkūle'a sailed over 1,200 miles to the most distant end of the island chain to visit Kure Atoll as part of a statewide educational initiative called "Navigating Change." In 2005, Nā Kupu'eu Paemoku sailed to Mokumanamana to

conduct protocol ceremonies on the longest day of the year, June 21 ─ the Summer Solstice.

3.6.2 Maritime Heritage Significance

In addition to the rich Native Hawaiian cultural setting, maritime activities following Western contact with the Hawaiian Islands have left behind the historical and archaeological traces of a unique past. Currently, there are over 60 known ship losses and/or confirmed sites among the NWHI, the earliest loss dating back to 1818. This, combined with 67 known aircraft crashes, gives a total of over 120 potential maritime heritage resource sites. Many of these resources reflect the distinct phases of historical activities in the remote atolls.

As American and British whalers first made passage from Hawai‘i to the seas near Japan in 1820, they encountered the low and uncharted atolls of the NWHI. At times the treacherous nature of navigation in the region gave rise to the Western names of the islands and atolls as we know them today. Pearl and Hermes Atoll is named for the twin wrecks of the British whalers *Pearl* and *Hermes* lost in 1822. Laysan was reportedly discovered by the American whale ship Lyra prior to 1828. The history of American whaling is a significant part of our national maritime heritage and is a topic that encompasses historic voyages and seafaring traditions set on a global stage as these voyages had political, economic and cultural impacts. As a nation we were intimately involved in the whaling industry in important and complex ways. There are 10 known whaling shipwrecks in the NWHI. Three of these have been located (American whaler Parker, and British whalers Pearl and Hermes) and their archaeological assessment is underway. Whaling vessel wreck sites from the early 19th century are quite rare, and the study and preservation of heritage resources is an important concern. The NWHI provide a unique glimpse into our maritime past.

Despite being slowly integrated into navigational charts, the NWHI remained an area of low and inconspicuous reefs and atolls for many years, frequented by shipwrecks and castaways. Russian and French ships of discovery transited the NWHI, and sometimes found themselves upon the sharp coral reefs. Nineteenth century Japanese junks of the Tokugawa Shogunate period, drifting away from their home islands and into the Pacific, were reportedly washed onto the sands of the atolls. Hawaiian schooners and local fishing sampans voyaged into the archipelago, many not to return. Marine salvage expeditions based out of the MHI profited from the area, although existing records of their cruising activities are scarce. These types of sites have the potential to yield information about early historic period voyages in the Pacific and about the seafaring traditions of many cultures.

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4.0 ENVIRONMENTAL CONSEQUENCES

4.1 Overview

This chapter evaluates the potential environmental consequences to environmental resources with implementation of the Proposed Action and the No Action Alternative.

4.2 Proposed Action

4.2.1 Marine Biological Resources

Under the Proposed Action, sub operators would implement BMPs to minimize any potential environmental impacts to marine biological resources during underwater work, such as avoiding deepwater corals while dropping ballast. Sub operators would select ballast drop sites where corals are not present. In accordance with PMNM regulations, the KOK would not drop anchor within PMNM except in emergency situations. Even in emergency situations, efforts are made to drop anchor in specially designated areas relatively free of coral.

Bottomfish are also highly mobile and would likely avoid the area during in-water activities. Sustenance fishing would only involve trolling during transits, would take a minimal number of fish, and would have negligible impact on bottomfish populations.

There is no research that indicates the type of sonar that the KOK operates is harmful to marine mammals. On previous research cruises, spinner dolphins have been seen riding the bow waves both while the sonar was in operation and while it was not in operation (J. Smith, personal communication via phone, SOEST, August 30).

Threatened monk seals and sea turtles may be seen during proposed activities. However, any in-water work would be preceded by a visual scan of the adjacent areas for these endangered species. If any are observed, or enter the project area at any time, in-water work would be stopped until they leave the area.

Ballast water discharged from ships is a leading pathway for the introduction and spread of aquatic nuisance species. In response to national concern regarding these species, the National Invasive Species Act of 1996 was enacted which reauthorized and amended the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990. The KOK would use fresh potable water for ballast. In addition, a careful washing regimen for the KOK, subs and ROV would be followed to avoid the spread of invasive species. With proper attention to these guidelines, the Proposed Action would not introduce or contribute to the spread of alien species.

By following all established guidelines and BMPs, the Proposed Action would not affect marine biological resources.

4.2.2 Physical Conditions

Air Quality

Under the Proposed Action, the air emissions from the KOK diesel engine would slightly increase the current emissions within the PMNM, however it would not change the

attainment status within the PMNM. The subs are battery-power and there are almost no emissions under normal operating conditions. Therefore, no significant adverse impacts to air quality would occur as a result of the Proposed Action.

Water Quality

Under the Proposed Action, the steel ballast dropped would slowly dissolve, adding iron to the water. The environment where the ballast is likely to be dropped is iron-limited (J. Wiltshire, personal communication via email, SOEST, September 10, 2007). The sub would drop 150-200 lbs on the initial dive and another 150-200 lbs on the return ascent. Because the subs are submerged 7-10 hours, the subs would likely drop these two rounds of ballast in different areas. Most of the sub work occurs in deeper water below the photocline, and all ballast would be dropped in the aphotic zone. The steel ballast and added nutrients would be spread over a large area. The additional iron in the water resulting from the ballast punches dissolving could be beneficial to biota and due to the low light environment the ballast release would not cause phytoplankton blooms.

Marine vessels and activities can introduce specific hazards to water quality through sewage or grey water discharge. Sewage discharge can contain bacteria or viruses, or medical wastes that may cause disease in humans and wildlife or affect the ecosystem by increasing nutrient load. Grey water is wastewater from sinks, showers, laundry and galleys. It can contain a number of pollutants such as suspended solids, ammonia, nitrogen, phosphates, heavy metals and detergents. All sewage would be treated and the grey water retained until a minimum of three nm from SPA boundaries.

Bilge water can contain fuel, oil, and wastewater from engines and machinery that collects in the bottom of the ship's hull as a result of routine operations, spills and leaks. Regulations for the PMNM, prohibit discharging or depositing any material into PMNM that could injure any resource. Exceptions were made to discharges incidental to vessel operation, such as deck wash, approved marine sanitation devices effluent, cooling water, and engine exhausts.

With these BMPs, the Proposed Action would not significantly degrade the water quality within PMNM; therefore, no significant impacts to water quality would occur as a result of the Proposed Action.

Hazardous and Regulated Materials

In the event of an oil or toxic chemical spill, vessel crew would follow all established procedures detailed in the USCG approved Shipboard Oil Pollution Emergency Plan and Safety Management Manual. With these BMPs, the Proposed Action would not create additional hazardous materials within PMNM; therefore, no significant impacts would occur as a result of the Proposed Action.

4.2.3 Marine Traffic

Under the Proposed Action, the KOK would undertake 1 research cruise per year. The existing marine traffic is minimal and the additional research cruise would not significantly increase traffic within PMNM; therefore, no significant impacts to marine traffic would occur as a result of the Proposed Action. Other possible impacts associated with marine vessels such as vessel discharges and oil spills are evaluated in Section 4.2.2 Physical Conditions.

4.2.4 Solid Waste

Under the Proposed Action, degradable waste would be discharged a minimum of 12 nm from the shore. Degradable waste that might float would be discharged at least 25 nm from the shore. All laboratory wastes and plastics would be retained on board and properly disposed at home port. With these BMPs, the KOK would not discharge significant amounts of solid waste within PMNM.

Under the Proposed Action, the subs would drop 300-400 lbs of steel as ballast per dive. With an average of 40 dives per year, the total amount of steel washer punchings dropped as ballast per year would be 12,000-16,000 lbs (6-8 tons). The steel punches would not be recovered and represents a potential adverse impact on PMNM as solid waste. The steel that would be used as ballast under the Proposed Action would have less adverse impact than the traditional lead shot ballast because it dissolves faster and does not release lead into the environment. The steel washer punchings are relatively thin with a high surface area which minimizes the time it takes to corrode. During previous visits, anecdotal evidence is that the punchings dissolve within 2 years (J. Wiltshire, personal communication via email, SOEST, September 10, 2007). The rapid corrosive rate of the ballast material, the small punch size and resultant increased surface area exposed to salt water, and anecdotal observations of researchers visiting areas of prior ballast releases suggest that the punches would not persist in the environment more than 2 years. Therefore, no significant impacts to solid waste would occur as a result of the Proposed Action.

4.2.5 Cultural Resources

Under the Proposed Action, the actual locations of underwater work would be determined by the individual research projects. These underwater areas are unlikely to contain culturally or historically significant sites. However, as a BMP, if any indication of a culturally or historically significant site is found during project activities, work would be halted until the proper authorities can be notified. The Proposed Action is temporary in nature and would not significantly impact historic or cultural resources, nor interfere with traditional Hawaiian practices.

4.3 No Action Alternative

4.3.1 Marine Biological Resources

Under the No Action Alternative, the Proposed Action would not take place. The existing marine biological resources at PMNM would not change; therefore, no significant impacts would occur as a result of the No Action Alternative.

4.3.2 Physical Conditions

Under the No Action Alternative, the Proposed Action would not take place. The existing conditions at PMNM would not change; therefore, no significant impacts would occur as a result of the No Action Alternative.

4.3.3 Marine Traffic

Under the No Action Alternative, the Proposed Action would not take place. The existing conditions at PMNM would not change; therefore, no significant impacts would occur as a result of the No Action Alternative.

4.3.4 Solid Waste

Under the No Action Alternative, the Proposed Action would not take place. The existing conditions at PMNM would not change; therefore, no significant impacts would occur as a result of the No Action Alternative.

4.3.5 Cultural Resources

Under the No Action Alternative, the Proposed Action would not take place. The existing cultural resources and Native Hawaiian uses at PMNM would not change; therefore, no significant impacts would occur as a result of the No Action Alternative.

4.4 Cumulative Impacts

Cumulative impacts to environmental resources result from incremental effects of the Proposed Action evaluated in conjunction with the effects of other government and private past, present and reasonably foreseeable actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time.

Vessels that could potentially contribute to cumulative impacts with the Proposed Action are summarized in Table 4-1. In the past, roughly fifteen research cruises are conducted in the NWHI each year. These other research cruises or other vessels entering PMNM would overlap the area of interest associated with the Proposed Action, however those projects occur at different times. NOAA is preparing a Monument Research Plan and associated EA for PMNM. This document will determine the level of future research activities in the PNMN. Because this decision has not yet been made, the contribution of future actions to cumulative impacts are unclear. No significant adverse marine biological, physical conditions, solid waste, marine traffic or cultural impacts are anticipated as a result of the Proposed Action. Assuming the other vessels entering the PNMN adhere to the BMPs summarized in this EA, no significant adverse cumulative impact is anticipated.

4.4.1 Marine Biological Resources

No significant adverse marine biological impacts are anticipated as a result of the Proposed Action. Live specimens will be collected by some research teams on the KOK and other research vessels. The cumulative impacts of the research projects would be addressed in the specific research permit EA or in the pending Research Management Plan and EA. The level of permitted specimen collection will be managed to acceptable levels, well below levels of significant adverse impact.

4.4.2 Physical Conditions

No significant adverse impacts to existing physical conditions are anticipated as a result of the Proposed Action; therefore, the Proposed Action would not result in cumulative impacts.

4.4.3 Solid Waste

The Proposed Action may result in significant adverse impacts to solid waste by contributing the amount of marine debris in the NWHI. Based on anecdotal observations by researchers returning to the sites of previous ballast releases, the steel ballast does not persist in the environment more than 2 years. The actual decay rate in the NWHI is unknown. A condition on the permit covered by this EA would be a controlled research assessment of the potential environmental impact of these punches, inclusive of field measurements of their persistence in the ocean environment. This data would be used to assess potential cumulative impacts of future research vessel entry into the PMNM. In addition, other research projects have been permitted to conduct research that included leaving anchors on the sea floor. The Research Management Plan for PMNM and associated EA will determine the level of future research activities in the PNMN.

4.4.4 Marine Traffic

No significant adverse impacts to marine traffic are anticipated as a result of the Proposed Action; therefore, the Proposed Action would not result in cumulative impacts.

4.4.5 Cultural Resources

No significant adverse cultural impacts are anticipated as a result of the Proposed Action; therefore, the Proposed Action would not result in cumulative impacts.

Table 4-1 Relevant Projects within PMNM

Project Name	Time Frame	Status	Purpose, Scope, and Location
Mapping and Bottom Camera Operations (J. Miller)	Oct 2006	Categorically Excluded Per NOAA guidelines.	The Proposed Action is to deploy baited camera rigs at 50-450 m depths. Non-recoverable concrete blocks were used to anchor the rigs. A total maximum of 60 rigs were deployed at Nihoa Island, Brooks Bank, Middle Bank, St. Rogatien Bank, and W. St. Rogatien Bank.
Deep Sea Camera (J. Drazen)	July 2007 aboard the Hi‘ialakai.	FONSI	The Proposed Action is to issue a research permit to deploy 15-20 cameras and baited traps, anchored with old chain links, near Nihoa, Lisianski, and Laysan Islands, and Pearl and Hermes Atoll at depths between 1,000 to 4,000 m. The iron anchors would be left on site.
Research Cruise	July 2007 aboard the Hi‘ialakai.	Categorically Excluded Per NOAA guidelines.	This research cruise into the PMNM included research projects on coral, coral disease, reef habitat, reef fishes, reef invertebrates, benthic habitats, predator tagging and education. The locations for these projects were French Frigate Shoals and Pearl and Hermes Atoll.

Project Name	Time Frame	Status	Purpose, Scope, and Location
Commercial Fishing Vessels	Fishery will be closed June 15, 2011		Eight bottomfishing vessels are currently permitted to enter the PMNM for commercial fishing for bottomfish and other associated pelagic species.
Future research cruises			The PMNM co-Trustees are anticipating allowing 8-10 research cruises entry into the monument in 2008.

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APPENDIX A

PUBLIC COMMENTS

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