National Park Service
U.S. Department of the Interior

Kalaupapa National Historical Park
Hawaii

Project to Repair the Kalaupapa Dock Structures Environmental Assessment

August 2010

EXECUTIVE SUMMARY

The Kalaupapa Settlement is home to surviving Hansen's disease (leprosy) patients, and is currently managed jointly by the Hawaii Department of Health and the National Park Service (NPS). The vast majority of materials needed to sustain the park and the Kalaupapa Settlement is received by barge delivery. An engineering study (Daly 2005) has determined that severe winter swell conditions have compromised the structural integrity of the Kalaupapa harbor facilities used by the barge. The NPS proposes to ensure delivery of supplies essential to operate and maintain Kalaupapa National Historical Park ("the park") and the community by improving conditions of the dock structures at the harbor. This environmental assessment considered two alternatives for improving conditions of the dock structures:

Alternative A: The No Action Alternative: Current NPS management operations at the dock and harbor would remain unchanged without repair to the dock structures. The integrity and stability of the pier may be compromised to the point of being unsafe for barge operations. Over the long-term, barge service to the park would likely be disrupted or become sporadic. Deliveries of annual supplies and materials used for state operations, park programs, and the park's ongoing rehabilitation of historic properties would be affected.

Alternative B: The Preferred Alternative: This alternative would include completion of the repairs necessary to maintain service via a small barge. Voids in the bulkhead wall toe, the low dock toe, and the breakwater would be filled for structural integrity, and repairs would be made to the pier dock. This maintenance is expected to lengthen the effective life of the pier for an additional 10 to 15 years.

The alternatives were considered for their effects on water resources; benthic resources and essential fish habitat; fish; special-status species; natural soundscape; cultural resources of the Kalaupapa Settlement; and park operations.

PUBLIC REVIEW AND COMMENT

This environmental assessment will be available for public review for 30 days. If you wish to comment on this environmental assessment, you may mail comments to the park superintendent at the address below or post comments online at http://parkplanning.nps.gov/kala. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment - including your personal identifying information - may be made publicly available at any time. While you may ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so. We would make all submissions from organizations, businesses and from individuals identifying themselves as representatives or officials of organizations or businesses available for public inspections in their entirety.

Please address written comments to:	Superintendent Kalaupapa National Historical Park, attention Dock EA P.O. Box 2222 Kalaupapa, HI 96742 808-567-6802

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Chapter 1: Purpose of and Need for Action

INTRODUCTION

The National Park Service (NPS) proposes to ensure delivery of supplies essential to operate and maintain Kalaupapa National Historical Park ("the park") by improving the condition of the dock structures in Kalaupapa harbor.

The park was once referred to as the "Kalaupapa Leprosy Settlement" and is located in an isolated setting at the base of 2,000-foot cliffs on the north shore of the island of Moloka`i, Hawaii (Figure 1). In this remote setting, non-perishable supplies and materials arrive by barge from Honolulu. The Kalaupapa Settlement is home to several surviving Hansen's disease (leprosy) patients, and is currently managed jointly by the Hawaii Department of Health (DOH) and the NPS. The vast majority of materials needed to sustain the park and the Kalaupapa Settlement is received by barge delivery.

Currently, structural elements of the pier deck and underwater portions of the dock structures are in need of repair in order to ensure continued use. The NPS would implement management strategies to stabilize and complete repair of the dock facilities to sustain barge service to the park.

Figure 1. View of Kalaupapa National Historical Park from Nearby Cliffs

The overall goal of this project is to provide safe, reliable dock and harbor structures to support continued barge access that is essential for maintaining community services and operations. The project area includes the park's harbor, dock facilities, and a potential land disposal site for any removed materials (such as displaced armor stones). In this Environmental Assessment (EA), the term "the park" refers to the entire Kalaupapa Settlement (including the marine and terrestrial facilities and environments).

This EA defines the purpose and need for the project, alternatives for ensuring continued barge service, and impacts to the environment that would result from implementing these alternatives.

This document has been prepared in compliance with the *National Environmental Policy Act (NEPA)*, *Management Policies* (NPS 2006b), and NPS Director's Order #12 – *Conservation Planning, Environmental Impact Analysis, and Decision-Making* (2001).

PROJECT BACKGROUND

Kalaupapa National Historical Park is located on the Kalaupapa Peninsula, along the northern shoreline of the Island of Moloka`i in the State of Hawaii, approximately 57 nautical miles east of Honolulu (Figures 2 and 3). The peninsula has a rocky shoreline and generally receives heavy north shore wave action. The peninsula is isolated from the remainder of the island by rugged sea cliffs (*pali*) exceeding 2,000 feet in elevation. Access to the park is severely limited as there are no roads to the peninsula from "topside" Moloka`i. Land access is on foot or mule-back via a steep trail on the *pali* that is approximately three miles long with 26 switchbacks. The main access to the park is provided by a commuter class air taxi service, arriving and departing two to four times a day, weather permitting. Mail, freight, and perishable food arrive by cargo plane on a daily basis.

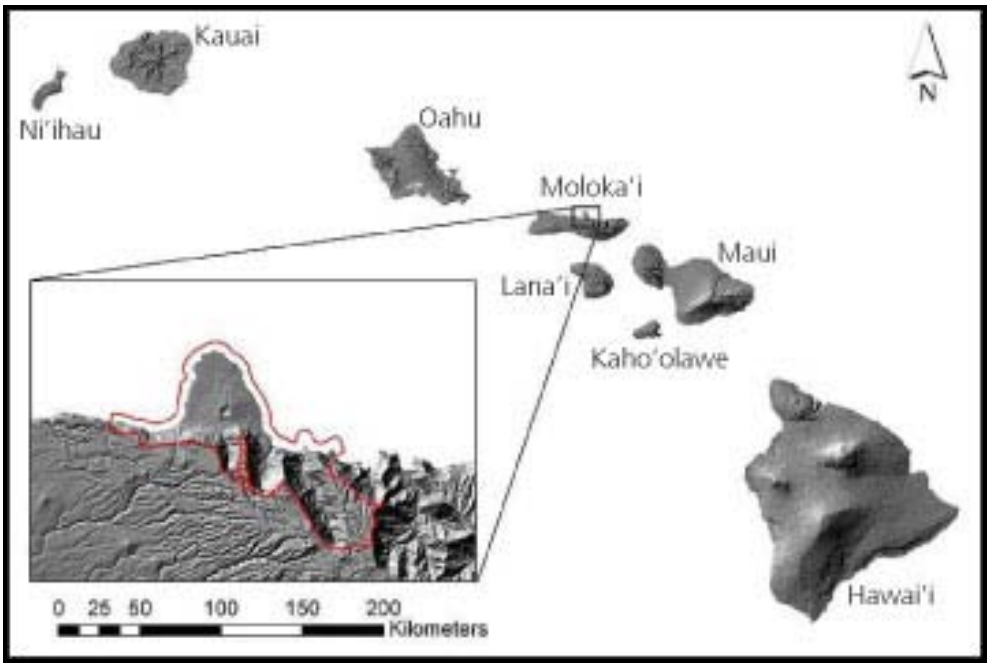

Figure 2. Main Hawaiian Islands Showing Kalaupapa National Historical Park
(The park boundary is delineated as a solid red line.)

Because of its location on the north shore of Moloka`i, the Kalaupapa harbor is provided little protection from direct Pacific Ocean waves generated by trade winds and the North Pacific Swell. Combined with the abrupt change in bathymetry from deeper ocean to the immediate coastline, waves generate significant forces.

Figure 3. Map of Kalaupapa National Historical Park and Harbor Location

Currently, bulk goods are transported to the park one to three times yearly via barge service to the existing dock facility in Kalaupapa harbor on the western side of the peninsula (Figure 3). Additionally, emergency supplies are flown in periodically. Heavy wave action during winter months prevents barge services from making the open ocean crossing and requires that delivered goods last until services are restored the following summer.

The barge that has serviced the park for many years, the *Aukai* (Figure 6), was the smallest available in the Hawaiian Islands (226 feet long by 58 feet wide by 13 feet deep) capable of providing service. The current barge berthing basin was designed to accommodate this size of barge and measures 70 feet wide by 310 feet long. The *Aukai* was decommissioned March 31, 2008 due to age and cost of repairs necessary to recertify the barge for open ocean crossings. Currently, there is only one other barge of comparable size to the *Aukai* in the vicinity. This barge provided delivery service to the park during the summer of 2008; and in the spring of 2009, the park secured a 5-year contract with its barge service provider (Young Brothers Limited) for use of this small barge through the summer of 2014. The availability of small barges in the future is in question, as barge service providers are now using larger vessels. The park has been pursuing different means to secure commercial small barge service beyond the period of the new contract.

The harbor consists of several structures including a concrete and stone masonry bulkhead wall, a concrete pier, a concrete and armor stone breakwater, bitts, bollards and fendering system, and the barge berthing basin (Figure 4). An engineering study (Daly 2005) has determined that severe winter swell conditions have compromised the structural integrity of the facilities. Many buildings and other works on the Kalaupapa Peninsula are classified as historically or culturally significant. One of the historic structures, the Community Food Warehouse, is located immediately adjacent to the bulkhead wall. Failure of the bulkhead wall could undermine the warehouse, adding to the urgency of the repair needed.

The armor stone breakwater with a concrete cap was designed and constructed in the 1930s. The breakwater is 114 feet in length and protects a parallel berthing basin (which was dredged for barge accessibility), a bulkhead wall, the current pier structure, and the original landing area. In 1967, the U. S. Army Corps of Engineers designed the existing dock structure at Kalaupapa harbor to allow for more convenient supply delivery by barge (USACE 2004). These dock structures and harbor configuration remain in use today, having only been modified by minor repairs and routine maintenance procedures.

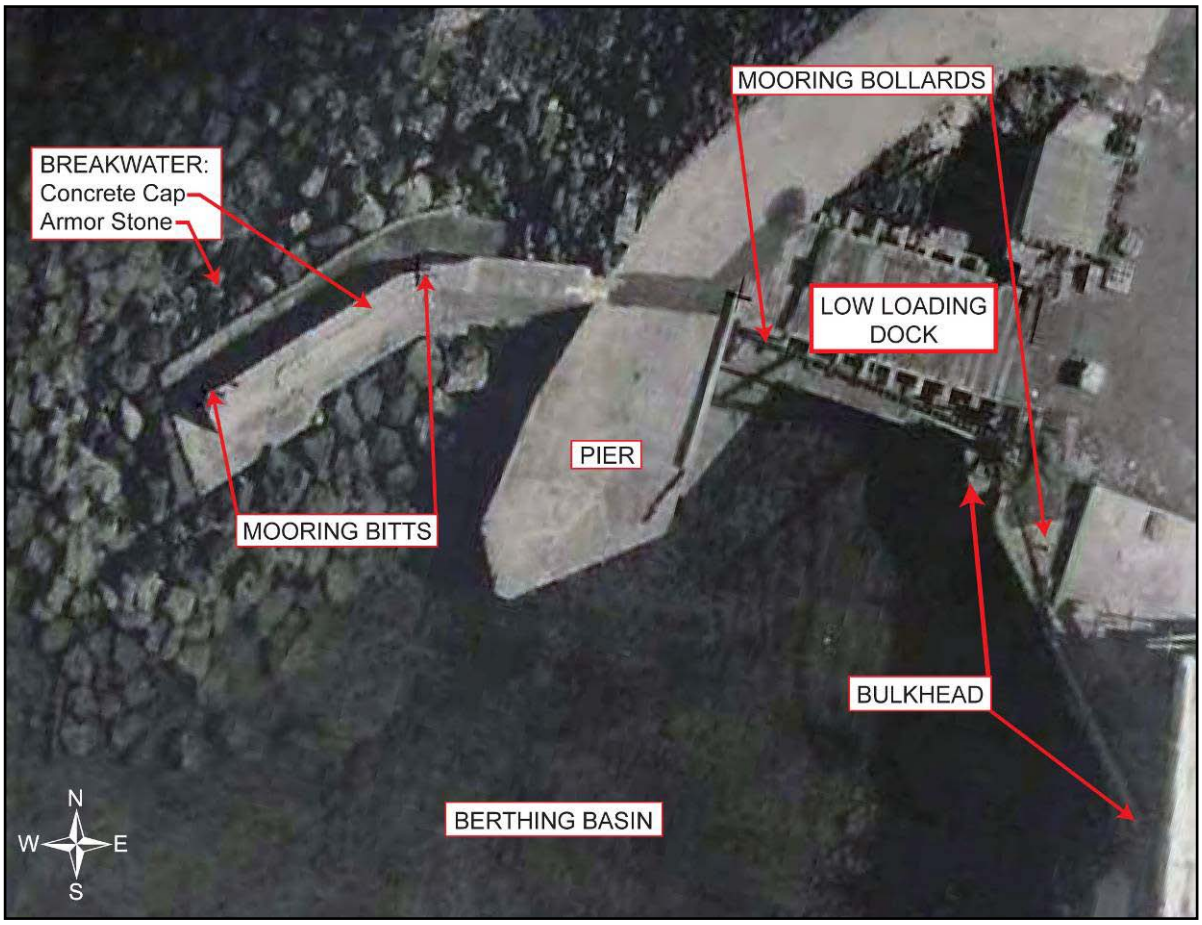

Figure 4. Dock Structure and Barge Basin

In the 1970s, a mooring dolphin was installed within the harbor area to stabilize the barge during mooring and delivery. This structure collapsed in the winter season shortly after installation. The size of the dolphin was not sufficient to withstand the force of the waves that occur in the area. An updated fendering system, consisting of large tractor tires chained to the face of the wharf, and two landside bollards were added in 1991 and again in 2009 as part of the Hawaii DOH emergency repairs.

During the winter months of 2004 to 2005, continuous sizeable waves impacted the coastline along the western side of the Kalaupapa Peninsula (Figure 5), adversely impacting some of the existing structures in the harbor and increasing the need for repairs.

In 2007, the Hawaii DOH began emergency repairs in a three phase process. Phase 1, completed in the fall of 2007, involved repairing the above-waterline voids to the bulkhead wall by replacing the missing stones, filling a large void behind the wall with concrete, and repairing a pothole in the concrete ramp to the pier. Phase 2, undertaken in the summer 2009, included replacing both the fendering system and corroded bitts and bollards. A hydraulic winch was also installed to assist berthing of the barge. Phase 3 includes all underwater repairs as well as completion of

concrete repairs to deck pier caps and beams and repair of a void on the north side of the pier that were not completed under Phase 2. The third phase repairs are to be completed by the NPS and are addressed in this environmental assessment.

Figure 5. Winter Waves at Kalaupapa Harbor

The park contains many biological and cultural resources to be considered during the harbor repairs. The area is a winter breeding ground for humpback whales. Additionally, the area is periodically home to the endangered monk seal, as well as green sea turtles. Some coral species have established in the harbor, with less than one percent of the localized harbor area having coral cover. Overall coral habitat has been described as low density and not complex. Resource protection measures and scheduling of the construction period will need to be considered for the protection of these sensitive marine species.

The dock structures are approximately 50 years old and are considered a contributing element to the National Historic Landmark status of the park. In addition, the harbor and the characteristics of the area hold many cultural memories for the resident patients and native Hawaiians including areas of traditional use, such as the freshwater springs near the ladder and at the toe of the bulkhead wall.

PURPOSE OF AND NEED FOR ACTION

The purpose of the Kalaupapa dock project is to provide safe, operable, and reliable dock structures to support continued barge service. Proposed improvements and modifications would ensure that the harbor accommodates barge service to the park in support of NPS and DOH operations necessary to meet the on-going needs of the park and community.

Nearly all supplies for the park and community residents, ranging from foods to fuel to equipment, are transported via the barge. Based on favorable weather conditions, barge sailing typically occurs once or twice a year, most often in July. The annual arrival of goods is termed "barge day" and is an important local event (Figure 6). As a necessary component in receiving

the barge, the harbor and dock thus provide a critical link in receiving goods and sustaining the park and community.

Figure 6. Barge Day 2007

Of the approximately 260 structures in the park, the NPS has identified more than half as historically or culturally significant, including the dock. Thus, besides being a critical piece of the infrastructure supporting the viability of the park and community, the dock is a contributing feature to the historic district.

The project is needed because several of the dock elements are in poor condition and the bulkhead and breakwater are failing structurally. Age and exposure to wave impact have deteriorated the structures, requiring an aggressive repair schedule to maintain stability and to assure continued barge deliveries (Daly 2005). The proposed project must address the failing bulkhead wall and toe structure located adjacent to the pier, and the severely cracked concrete pier elements. Repair of the breakwater is also needed to ensure continued protection of the harbor from heavy wave action. The breakwater is critical to minimize future damage to the pier and bulkhead wall. If these structures were to fail, safe and effective barge delivery service would be compromised.

Long delays or missed barge service at Kalaupapa National Historical Park would cause a hardship for the resident patient community, State of Hawaii staff, and the NPS. The lifestyle and quality of life of the patient community and their medical and support staff would be severely impacted by unreliable barge service. In addition, the enabling legislation for the park specifically directs the NPS to support the Kalaupapa patient community, infrastructure, and historic buildings located onsite. It would be very difficult to achieve these directives in the absence of a safe and reliable barge service to Kalaupapa.

CONDITION OF DOCK STRUCTURES

In 2005, the condition of the dock structures was investigated by the Leo A. Daly architectural and engineering firm, located in Honolulu. Their findings are documented in the *Harbor and Pier Engineering Report* (Daly 2005), and provide the basis for the structural conditions described here. The elements of this investigation include: 1) the pier, 2) the bulkhead wall, 3) breakwater, 4) bitts and fendering system, and 5) barge berthing basin.

In general, the dock structures need structural repair for long-term sustainability and the harbor could be modified to increase barge operation safety and flexibility. The Hawaii DOH has recently completed a two-phase repair program in areas above the water line which included repairs to bitts, bollards, and fendering system. The repairs conducted through the State's program are analyzed as cumulative effects to resources in this EA.

Pier Structure

The pier is a reinforced concrete slab supported by cross beams on concrete columns. The pier is approximately 1,200 square feet in area. All structural elements of the pier show deterioration from the harsh environment, including evidence of concrete spalling. However, many of these changes are cosmetic, and the structure has not lost its ability to function as designed (Daly 2005).

Bulkhead Wall

The bulkhead wall is a vertical structure designed to protect the shoreline adjacent to the pier. The wall is made of volcanic stone, bonded by mortar, and capped with concrete. Most of the wall lies above the waterline, with approximately 6 feet submerged to the seabed. The bulkhead provides structural support to the foundation of the historic Community Food Warehouse at the shoreside end of the pier.

Erosion and bottom scour have created voids at the base of the wall, making it susceptible to structural failure, suggesting that failure has already begun and that the wall has already lost the majority of its strength in this location (Figure 7). Other portions of the wall show similar deterioration, including small cracks in the concrete cap and increasing voids behind the wall's façade (Daly 2005). Failure of the bulkhead wall could jeopardize the historic Community Food Warehouse.

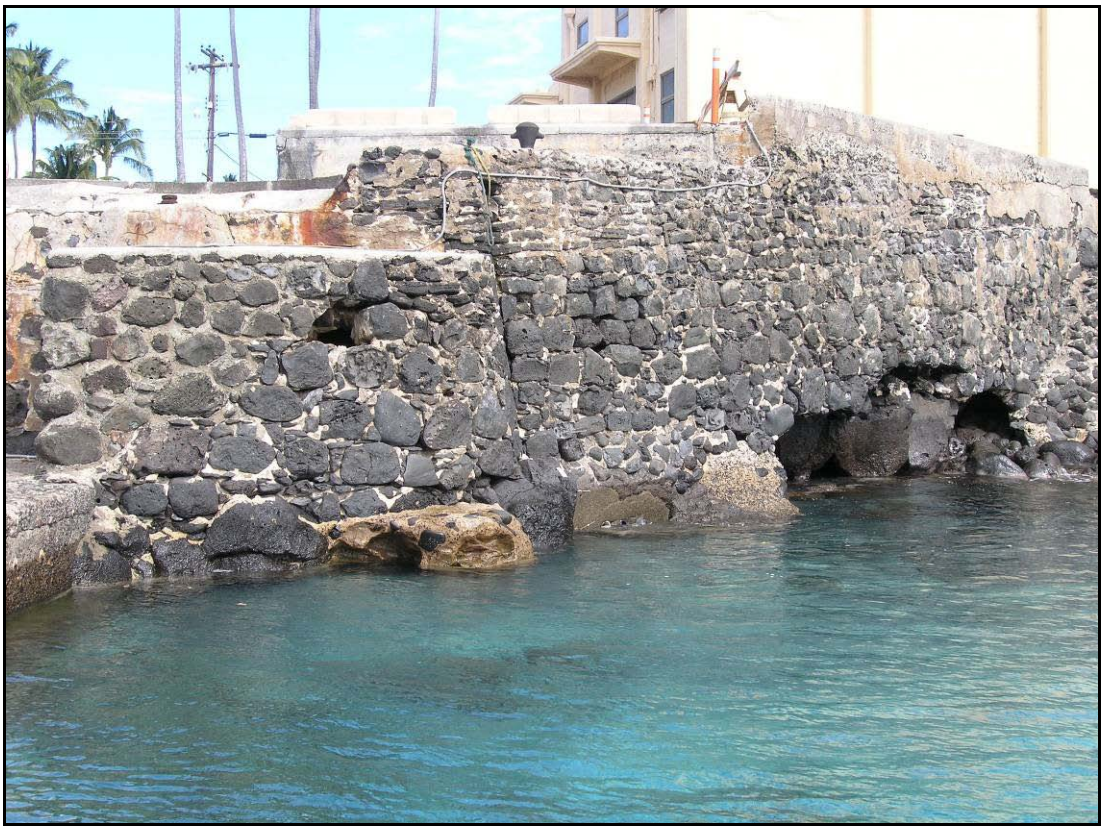

Figure 7. Bulkhead with Void and Shoreside Historic Warehouse

Breakwater

The breakwater is a concrete structure surrounded by large armor stones. It extends 114 feet from the shoreline and past the pier (Figure 8). The breakwater dissipates wave impact forces and prevents waves from directly impacting the pier. High-energy wave action has displaced many armor stones from the base of the breakwater, creating protection voids and littering the berthing basin with large boulders. However, the core of the structure remains intact and has not been compromised.

Figure 8. Breakwater – Shifted Armor Stones and Cracked Concrete

Barge Berthing Basin

The berthing basin has no immediate structural needs other than the removal of the armor stones displaced from the breakwater. The basin has been dredged at least twice in the past – once in the 1960s and again in the 1990s.

Barge Service

As noted above, in early 2009, the park established a new contract for small barge service through 2014. This contract assures that the park will have necessary deliveries using a vessel similar in size to the *Aukai* for the next five years. However, the barge service provider found it necessary to lease the small barge from another company and the long-term availability of the small barge is not assured beyond the contract period.

It should be noted that the patient population within the Kalaupapa Settlement is decreasing and the State of Hawaii support personnel will decrease accordingly. Therefore, the general amount of supplies needed to be delivered for state operations is expected to decrease. However, NPS operations are expected to grow as NPS takes responsibility for more facilities currently maintained by the state. The current barge delivery requires only 60 percent of the capacity of the *Aukai*. Thus, a larger barge is not needed for the amount of supplies; rather, the larger barge size would be dictated by the commercial fleet available in Hawaii. Currently, deliveries to Kalaupapa have to be scheduled around the availability of the small barge. Lack of availability of the small barge has resulted in deliveries of construction supplies being delayed for up to a year.

PARK PURPOSE AND SIGNIFICANCE

The Hawaiian place name for Kalaupapa is interpreted as “a flat leaf” and being appropriately named, the peninsula is a comparatively flat plateau of lava about 2¼ miles wide, projecting north from a 2,000-foot cliff on the island of Moloka`i. Kalaupapa National Historical Park is unique among units of the NPS system as there is an active community of Hansen's disease patients living within the park. The residential area of the Kalaupapa Settlement is located on the western side of the peninsula (Figure 1) and includes the following: residences, dormitories, a clinic, a post office, a dining hall, a firehouse, a small grocery store, a gas station, a social hall, maintenance and storage buildings, churches, and the attendant infrastructure needed to support a small and isolated community.

The park includes approximately 10,726 acres within the authorized boundary including about 8,726 acres of land and about 2,000 offshore acres. The authorized boundary includes the Kalaupapa Peninsula, Kukaiwaa, and Nihoa (two land shelves on the east and west boundaries of the park, respectively). Also included are three narrow valleys deeply eroded into the original shield volcano of east Moloka`i, adjacent cliffs, and the offshore waters extending ¼-mile out and around the peninsula.

Kalaupapa was established in 1865 by the Kingdom of Hawaii as a confinement facility after the initial recognition of the presence of Hansen's disease in Hawaii. With the development of sulfur drugs commonly in use by the late 1940s, separation and isolation of patients was no longer practiced by 1969. The patient residents of Kalaupapa now remain there by choice. There are currently about 30 remaining Hansen's disease patients in the registry, with 13 of these still living in the Kalaupapa Settlement. The site was designated a National Historic Landmark in 1976 and Kalaupapa National Historical Park was established in 1980 to preserve and interpret the Kalaupapa Settlement for present and future generations.

The Hawaii DOH, through the Hansen's Disease Program in the Communicable Disease Division, provides income support and essential services such as housing, medical services, and community facilities for the patient residents of Kalaupapa. In December 1980, Congress passed Public Law 96-565 (94 Stat. 3321) establishing Kalaupapa National Historical Park and providing a guarantee to patients that "they may remain at Kalaupapa as long as they wish." In addition, a public visitation limit of 100 visitors per day remains in effect as long as the patients so desire. On March 30, 1984, the Hawaii DOH and the NPS entered into a cooperative agreement which specified that the state health department would continue health care programs while the NPS would operate, preserve, and protect the park. Operationally, this means that NPS would eventually maintain and operate all community facilities, including the harbor and dock. To date, however, the transfer of the harbor facility has been deferred due to limitations on NPS funding levels.

PARK PURPOSE

Park purpose is a clear statement of the reason, or reasons for which the park was set aside as part of the national park system. It is the most fundamental criteria against which the appropriateness of all plan recommendations, operational decisions, and actions are tested. The purpose is derived from law and policy. However, developing the park purpose often requires some interpretation of the language in the park's establishing legislation or presidential proclamation.

According to the draft foundation statement for the park, "Kalaupapa National Historical Park tells the story of the isolated Hansen's disease (leprosy) community by preserving and interpreting its site and values. The park also tells the story of the rich Hawaiian culture and traditions at Kalaupapa that go back at least 800 years" (NPS 2009).

PARK SIGNIFICANCE

The draft park significance statements below were developed during the early phases of the park's ongoing general management plan effort.

- Kalaupapa National Historical Park preserves the only intact historic institutional settlement in the United States created for the sole purpose of isolating people with Hansen's disease from the rest of society.
- Kalaupapa National Historical Park's surviving (and deceased) Hansen's disease population, with its material culture, oral histories, and intact physical community, is the only one of its kind in the United States.

- Kalaupapa National Historical Park is the site of Father Damien's renowned work that brought global attention to Hansen's disease and its treatment, and inspired Mother Marianne and others to serve the Hansen's disease community.
- Kalaupapa National Historical Park presents an exemplary geologic and scenic panorama of towering sea cliffs and a flat, leaf-shaped peninsula that were created by a cataclysmic landslide and subsequent volcanic eruption.
- From *mauka* to *makai* (mountain top to coast line) Kalaupapa National Historical Park preserves and interprets some of the last remaining examples of fragile Hawaiian Island plant and animal communities not found elsewhere in the world.
- Kalaupapa National Historical Park preserves robust and diverse near-shore marine resources due to the geographic remoteness, locally restricted access, and traditional subsistence practices.
- Kalaupapa National Historical Park's number of archaeological resources, vast variety of site types, extensive time range of habitation and land use, and the exceptional preservation of its archaeological sites combine to make the park one of the richest and most valuable archaeological areas in Hawaii.

OBJECTIVES

Objectives are specific statements of purpose; they describe what must be accomplished, to a large degree, for the project to be considered a success. As a means to measure success of the project, criteria and thresholds of acceptability and cost-effectiveness must be identified. These criteria will allow the NPS to make a decision on which alternative to choose in order to address delivery of supplies to the inhabitants of Kalaupapa. The following objectives were developed by the planning team and will be used as a measure of performance of the alternatives in the EA.

- During implementation of the project, minimize impacts to both terrestrial and aquatic natural resources.
- Provide continued protection and preservation of cultural resources during implementation of the project and into the future.
- Improve operational efficiency and sustainability, while reducing maintenance.
- Provide the necessary repairs and improvements to ensure continued safe and effective barge delivery service.

RELEVANT LAWS, POLICIES, PLANS, AND CONSTRAINTS

FEDERAL REGULATORY FRAMEWORK

National Park Service Legislation and Policy

In the ***Organic Act of 1916***, Congress directed the US Department of the Interior and the NPS to manage parks "to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations" (16 USC 1). Congress reiterated this mandate in the Redwood National Park Expansion Act of 1978 by stating that the NPS must conduct its actions in a manner that will ensure no "derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress" (16 USC 1 a-1).

Despite these mandates, the Organic Act of 1916 and its amendments afford the NPS latitude when making resource decisions that balance visitor recreation and resource preservation. By

these acts, Congress "empowered [the NPS] with the authority to determine what uses of park resources are proper and what proportion of the park resources are available for each use" (*Bicycle Trails Council of Marin v. Babbitt,* 82 F.3d 1445, 1453 [9th Cir. 1996]).

Management Policies (NPS 2006b) establishes service-wide policies for the preservation, management, and use of park resources and facilities. These policies provide guidelines and direction for management of resources within the park. The alternatives considered in the EA would incorporate and comply with these policies.

NPS *Director's Order #12 and Handbook: Conservation Planning, Environmental Impact Analysis, and Decision-Making* and the accompanying handbook (NPS 2001) lay the groundwork for how the NPS complies with NEPA. Director's Order #12 and the handbook set forth a planning process for incorporating scientific and technical information and establishing a solid administrative record for NPS projects. Director's Order #12 requires that impacts to park resources be analyzed in terms of their context, duration, and intensity. It is crucial for the public and decision-makers to understand implications of the project impacts in the short and long-term, cumulatively, and the site's context, based on an understanding and interpretation by resource professionals and specialists. Director's Order #12 also requires that an analysis of impairment to park resources and values be part of the NEPA document.

Park Law 96-565 established Kalaupapa National Historical Park in 1980 "to provide for the preservation of the unique nationally and internationally significant cultural, historic, educational, and scenic resources of the Kalaupapa Settlement on the island of Moloka`i." The establishment of the park followed designation of Kalaupapa Settlement as a National Historic Landmark District in 1976. The NPS goal for this park unit is to protect the lifestyle and individual privacy of the Hansen's disease patients who are residents there. Although the primary resource management emphasis at Kalaupapa is cultural preservation and education, NPS resource management objectives also recognize the park's inherent scenic, geologic, biotic and archeological resources, including National Natural Landmark designation for 27,000 acres of the North Shore Cliffs.

Other Relevant Federal Laws and Policies

A variety of federal laws and policies guide the environmental compliance process. These regulations have been designed to assure that the public and appropriate regulatory agencies are aware of proposed major federal actions and impacts to the human and natural environment that would result from implementing those actions. As part of the consultation and regulatory review process, this EA has been distributed to the National Marine Fisheries Service (NMFS), the US Army Corps of Engineers, and the US Fish and Wildlife Service.

A listing of the primary examples of legal and regulatory constraints and bounds follow. Details of these mandates can be found in the Affected Environment and Environmental Consequences sections of the relevant impact topics.

- The ***Endangered Species Act of 1973*** established protection over and conservation of threatened and endangered species and the ecosystems upon which they depend. The act requires federal agencies to conserve listed species and consult with the US Fish and Wildlife Service or the NMFS when proposed actions may affect listed species or critical habitat. In support of the proposed action, this environmental assessment will also serve as a Biological Assessment for NMFS and US Fish and Wildlife Service consultation purposes (see "Special-Status Species").
- The ***Marine Mammal Protection Act of 1972*** established a moratorium on the "taking" of marine mammals in waters or on lands under US jurisdiction. The Act allows, upon request, the incidental (but not intentional) taking of marine mammals, if certain findings are made and regulations are issued or, if limited to harassment, an authorization is issued. In support of the proposed action, the NPS has prepared an analysis following the format

of an Incidental Harassment Authorization permit application for use in consultation with NMFS (see "Special-Status Species").

- The ***National Historic Preservation Act of 1966*** (Section 106) requires federal agencies to consider the effects of their undertakings on properties listed or potentially eligible for listing on the National Register of Historic Places. All actions affecting the parks' cultural resources must comply with this legislation (see "Cultural Resources").
- Provisions of the ***Magnuson-Stevens Fishery Conservation and Management Act*** authorize NMFS to evaluate projects proposed by federal agencies that may adversely impact "essential fish habitat." Federal agencies must consult with NMFS regarding those impacts. In support of the proposed action, an Essential Fish Habitat Assessment is included in this EA (see "Benthic Resources and Essential Fish Habitat").
- The ***Coastal Zone Management*** **Act of 1972** encourages coastal states to develop comprehensive programs to manage and balance competing uses of, and impacts to coastal resources. States implement the national coastal management program to manage coastal uses and resources and to facilitate cooperation and coordination with federal agencies. See "Benthic Resources and Essential Fish Habitat" for further discussion. In compliance with the act, a Coastal Zone Consistency Determination was prepared and submitted to the Hawaii Coastal Zone Commission as part of this EA effort (Appendix A).
- Under the ***Rivers and Harbors Act*** and the ***Clean Water Act***, the US Army Corps of Engineers is authorized to regulate the construction of any structure or work within navigable waters. The NPS will obtain all necessary permits for the project from the US Army Corps of Engineers (see "Water Resources" and "Benthic Resources and Essential Fish Habitat").

STATE REGULATORY FRAMEWORK

Kalaupapa National Historical Park differs significantly from most other national parks in that nearly all of the land, shore, and facilities within the park remain under non-federal ownership but are still managed by the NPS through cooperative agreements. Land within the park boundaries is owned by the State of Hawaii; and the state departments of Health, Land and Natural Resources, Transportation, and Hawaiian Home Lands. There are also small private holdings at the top of the cliffs. The NPS owns 23 acres that include two historic houses and four outbuildings that surround the Moloka`i Light Station.

A variety of agencies in Hawaii are responsible to ensure that projects comply with regulations for protection of human and natural environments. In compliance with applicable statutes and requirements, the NPS will complete required permits or leases with the state agencies described below.

Department of Heath

The Hawaii DOH conducts investigations of health and environmental-related problems, and performs regulatory functions to monitor compliance with applicable statutes and rules. These functions include permit issuance, monitoring, and enforcement. It provides for access to essential services, and directs its resources toward problems that pose the greatest risk to public health and the environment. The two branches of the department described below have responsibilities most relevant to the proposed project and this EA.

- The **Indoor Radiological Health Branch** is responsible for enforcing Title 11 of the Hawaii Administrative Rules, Chapter 46 Community Noise Control. The NPS will complete a Community Noise Permit as part of the overall compliance effort for the dock and harbor project (see "Cultural Resources").

- The **Clean Water Branch** is responsible for enforcing the federal Clean Water Act under state implementing statutes. This project will require a Water Resources Section 401 Water Quality Certification verifying that water quality will be maintained and protected. The NPS will complete this certification as part of the overall compliance effort for the dock and harbor project (see "Water Resources").

Department of Land and Natural Resources

The mission of the Department of Land and Natural Resources is to "enhance, protect, conserve and manage the state's unique and limited natural, cultural and historic resources held in public trust for current and future generations of visitors and the people of Hawaii in partnership with others from the public and private sectors." The two offices described below have responsibilities most relevant to the proposed project and this EA.

- The **Office of Conservation and Coastal Lands** is responsible for overseeing approximately 2 million acres within the State Land Use Conservation District, including the marine waters of the Kalaupapa harbor. The NPS will complete a Conservation District Use Authorization permit as part of the overall compliance effort for the dock and harbor project (see "Benthic Resources and Essential Fish Habitat").
- The **Division of Aquatic Resources** manages the state's aquatic resources for long-term sustainability. The NPS will submit this EA for review of resource protection measures proposed to reduce impacts to marine mammals, sea turtles, corals and benthic habitats during the compliance process (see "Benthic Resources and Essential Fish Habitat").

Department of Hawaiian Home Lands

The mission of the Department of Hawaiian Home Lands is "to manage the Hawaiian Home Lands trust effectively and to develop and deliver lands to native Hawaiians." Approximately 200,000 acres of land in the Hawaiian Territory were set aside as a land trust for homesteading by Native Hawaiians. Some of those lands are on the Kalaupapa Peninsula.

Department of Business, Economic Development and Tourism

The **Office of Planning** within the department implements the state's coastal zone management program. The program's focus is on resource management of coastal areas that are under the highest stress. Action proponents must submit a coastal zone consistency determination no sooner than 90 days prior to project approval. The NPS has prepared a consistency determination.

RELATIONSHIP TO OTHER PLANS

The action alternative needs to consider other applicable plans and actions. The following initiatives serve to guide park development and management or address issues relevant to this project.

- ***General Management Plan:*** The park has begun development of a new general management plan that will provide the framework for protecting park resources, determine what levels and types of uses are appropriate, and what types of facilities should be developed. The NPS is in the early phases of planning, and has developed the foundation for planning and management which will guide the creation of the overall general management plan. The park has drafted the purpose, significance, and interpretive theme statements which are now on review to the public.
- ***Ocean Resources Management Plan:*** The Ocean Resources Management Plan (ORMP) is a statewide plan mandated by Chapter 205A, Hawaii Revised Statutes. Building on tradi-

tional Hawaiian management principles and lessons from past efforts, the ORMP is a shift toward integrated and area-based approaches to natural and cultural resources management that require greater collaboration among jurisdictional authorities and that will catalyze community involvement and stewardship. In effect, it is a bottom-up approach that builds on community partnerships. However, because the change is comprehensive, it will take significant time, effort, and considerable thought to realize. The ORMP maps incremental 5-year management priorities to embark on a new course of action and achieve the primary goal: to improve and sustain the ecological, cultural, economic, and social benefits we derive from ocean resources today and for future generations.

SCOPING PROCESS AND PUBLIC PARTICIPATION

SCOPING ACTIVITIES

Scoping is the effort to involve agencies and the general public in determining the issues to be addressed in the environmental evaluation. Among other tasks, scoping determines important issues and eliminates unimportant issues; allocates assignments among the interdisciplinary team members and other participating agencies; identifies related projects and associated documents; and identifies other permits, surveys, or consultations required by other agencies.

The Council on Environmental Quality (1978) guidelines for implementing NEPA and the NPS NEPA guidelines contained in NPS Director's Order # 12: Conservation Planning, Environmental Impact Analysis and Decision Making Handbook (NPS 2001) require public scoping of federal actions that would require an environmental impact statement. The NPS conducted scoping for the proposed dock repair project to ensure input from all interested stakeholders.

The public scoping process began on March 11, 2008, with the NPS proposing to complete an Environmental Assessment for the dock repairs. However, potential effects to special-status species (marine mammals and those listed under the Endangered Species Act), led the NPS to determine that an environmental impact statement (EIS) would be the appropriate compliance pathway for this project. Thus, a second phase of scoping began in early 2009 for the EIS. On April 17, 2009 a notice of intent to prepare an Environmental Impact Statement was published in the *Federal Register* (Volume 74, Number 73).

In March 2009, a brochure was distributed to the park's mailing list of interested individuals, organizations, and businesses. The brochure summarized the proposed project, the purpose of and need for the project, identified potential issues, and presented opportunities for public involvement in the NEPA process.

Five public meetings were held to gather comments and record issues related to the proposed dock and harbor project – three on the island of Moloka`i and two in Honolulu. These meetings included a presentation on April 8, 2009, to the Moloka`i Planning Commission. The meetings were preceded by news releases and other announcements. A summary of the agency and public scoping activities is presented in "Chapter 4: Consultation and Coordination."

The NPS received a total of 133 written and oral comments on the management options, schedule and other concerns about the project. The majority of comments were submitted by state and federal agencies; their comments focused on regulatory and environmental concerns. Other comments expressed concerns about the decision-making process leading to the proposed project, including the purpose and need of the project. Most of those commenting questioned the necessity of dredging the berthing basin. Commenters did not approve of the project because it would disturb natural and cultural resources in the Kalaupapa harbor. Also, suggestions were offered for non-structural methods to assure continued deliveries to the community.

The community expressed objections about re-installing the dolphin. This resulted in a reassessment of the benefit of the dolphin. Other factors weighing into the assessment of benefits

of the dolphin were the low number of barge trips made per year, the historic safety record, and the future maintenance that would be needed because of harsh site conditions. The incremental benefits were not believed to outweigh the potential negative impacts to corals and mammals. Acoustic studies completed for the preliminary analysis raised concern for the impacts to marine mammals, especially the Hawaiian monk seal.

In the meantime, a smaller barge was purchased by American Marine Company and the park was able to enter into a 5-year contract with for barge delivery. The park believed that the commercial barge companies showed a commitment to future service to the community and that the Army and Public Utility Commission (PUC) avenues also had the potential to guarantee continued service.

In response to public and agency comment, the interdisciplinary planning team refined the alternatives, and as a result, widening of the berthing basin and installation of a mooring dolphin were removed from the project. More details on how the alternatives were refined can be found on pages 25-26, in Chapter 2. The preferred alternative now consists of completion of deferred maintenance at the Kalaupapa dock. Considering the greatly reduced impacts to park resources resulting from dismissal of alternatives which include berthing basin widening and/or installation of a dolphin, the NPS reached a decision that an EIS was no longer necessary. Subsequently, notice was given to the public and consulting agencies via a scoping notice sent to the park's mailing list on May 21, 2010. Scoping flyers were distributed on Molokai, the project website was updated, and a press release was sent to media outlets in Hawaii. No comments were received during this scoping period. A Federal Register Notice announcing the termination of the EIS process was published on July 6, 2010.

AGENCY CONSULTATION

Scoping also includes early input from any interested agency or any agency with jurisdiction by law or expertise. As outlined under "Relevant Laws, Regulations, and Policies" above, the NPS is consulting with federal agencies and coordinating with state agencies and would obtain all necessary permits to protect and manage natural and cultural resources. Initial responses are summarized below. NPS consultation and coordination letters and agency responses are included as Appendix B.

ISSUES AND IMPACT TOPICS

Issues are problems, opportunities, and concerns regarding the current and potential future management of the Kalaupapa harbor and structures. Issues were identified by the NPS and the public throughout the public scoping process.

Impact topics are derived from issues. They focus the planning process and the assessment of potential consequences of the alternatives. NPS Director's Order #12 and handbook (NPS 2001) list impact topics that must be considered, based on the requirements in federal legislation, executive orders, and the Council on Environmental Quality (1978) guidelines for implementing the National Environmental Policy Act. Other impact topics are identified based on regional or park-specific concerns, or as a result of scoping.

ISSUES AND IMPACT TOPICS RETAINED FOR ANALYSIS

Table 1 presents a summary of issues that are considered important by the public, consulting agencies, and the NPS interdisciplinary planning team, and identifies the corresponding impact topics addressed in "Chapter 3: Affected Environment and Environmental Consequences," where they are analyzed and discussed. Issues related to species listed under the federal Endangered Species Act and marine mammals protected under the Marine Mammal Protection Act are considered together as "Special-Status Species."

Table 1. Issues to Be Evaluated and Corresponding Impact Topics

Issue	Impact Topics
What effects would construction activities have on the project area ecosystem, particularly marine mammals?	Fishes, Special-Status Species, Soundscapes, Cultural Resources
There are federal and state-listed threatened and endangered species in the potential area of effect, and potential impacts on these species must be considered in the decision-making.	Special-Status Species
What will be the effects on corals from construction activities?	Benthic Communities and Essential Fish Habitat
What will be the effects to water quality in the harbor as a result of construction?	Water Resources
Will non-native species be introduced into park waters from any of the proposed activities?	Fishes, Benthic Communities
How would access to the breakwater for fishing be affected during construction?	Cultural Resources
What effect would repairs to the existing dock have on cultural resources? The dock is a contributing resource in a National Historical Park.	Cultural Resources
Would construction disturb the quiet and peacefulness of the Kalaupapa Settlement?	Soundscapes, Cultural Resources
How will the park, visitors, and residents be affected during construction?	Park Operations, Cultural Resources

IMPACT TOPICS DISMISSED FROM FURTHER ANALYSIS AND RATIONALE FOR DISMISSAL

The following impact topics were dismissed from further analysis in this document for the reasons noted. These topics are **NOT** included or described in "Chapter 3: Affected Environment and Environmental Consequences."

Climate Change and Sea Level Rise: Climate change refers to any significant changes in average climatic conditions (such as mean temperature, precipitation, or wind) or variability (such as seasonality and storm frequency) lasting for an extended period (decades or longer). Recent reports by the US Climate Change Science Program, the National Academy of Sciences, and the United Nations Intergovernmental Panel on Climate Change provide evidence that climate change is occurring and could accelerate in the coming decades.

While climate change is a global phenomenon, it manifests differently depending on regional and local factors. General changes that are expected to occur in the future as a result of climate

change include hotter, drier summers; warmer winters; warmer water; and higher ocean levels, among other changes.

Climate change is a far-reaching, long-term issue that could affect Kalaupapa National Historical Park, the patient community, its resources, visitors, and management. It is generally agreed upon in the scientific community that human-induced climate change will cause the rate of sea level rise to increase from current conditions. Although some effects of climate change are considered known or likely to occur, many potential impacts are unknown. Much depends on the rate at which the temperature would continue to rise and whether global emissions of greenhouse gases can be reduced or mitigated. Climate change science is a rapidly evolving field with new information being developed continually.

The level of the world's oceans is predicted to rise as a result of climate change. A variety of estimates have been presented including an estimate issued by the Intergovernmental Panel on Climate Change (IPCC) that anticipates a sea level rise of between 0.3 and 2.9 feet between years 1990 and 2100 (Intergovernmental Panel on Climate Change 2001). This range is based on the results of the various models used by the IPCC and includes a substantial amount of uncertainty. The IPCC model range of estimates for global sea level average rise by 2060 is predicted to be less than 1.3 feet.

Ocean level rise could exacerbate storm surge impacts and coastal erosion associated with tropical storms. But since this change is anticipated to be less than 1.3 feet by 2060, it is expected that the Kalaupapa dock should remain serviceable for the next 10 to 15 years under Alternative B, but not under the No Action Alternative. The dock is not expected to remain serviceable if repairs are not made to the existing structure, regardless of climate change impacts.

Implementation of the dock and harbor project, with limited construction equipment over a short time period, would not measurably contribute to global climate change. The dock and harbor project would not contribute cumulatively to the impacts on the park's natural resources that may result from changes in climate that are expected over the next 50 years. Therefore, climate change and energy resources were dismissed from further evaluation in this EA.

Ecologically Critical Areas: Aside from essential fish habitat for the marine waters of the harbor, (see "Benthic Communities and Essential Fish Habitat"), the alternatives being considered would not affect any designated ecologically critical areas, wild and scenic rivers, or other unique natural resources, as referenced in the Wild and Scenic Rivers Act (16 USC 1271, et seq.), Management Policies (NPS 2006b), 40 CFR 1508.27, or the 62 criteria for designating national natural landmarks. Therefore, this impact topic is dismissed from further consideration.

Energy Requirements and Conservation Potential: The NPS reduces energy costs, eliminates waste, and conserves energy resources by using energy-efficient and cost-effective technology. Energy efficiency is incorporated into the decision-making process during the design and acquisition of buildings, facilities, and transportation systems that emphasize the use of renewable energy sources.

Under the Preferred Alternative (Alternative B), energy use would remain largely unchanged because barge service would continue using the "small" size barge, consistent with the size that has been serving the settlement for decades. Young Brothers, the park's current barge service provider, makes 12 barge shipments weekly, with on-call service to Moloka`i and Lana`i. This would total a minimum of 648 round-trips from Honolulu to various locations each year. Because Kalaupapa receives only one to three deliveries per year, the change in fuel consumption from eliminating one tug or increasing the barge size would be a small fraction of Young Brothers annual fuel usage. Because the potential changes in fuel consumption are negligible, this topic has been eliminated from full analysis.

Environmental Justice: Executive Order 12898, "General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires all federal agencies to

incorporate environmental justice into their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. Guidelines for implementing this executive order under NEPA are provided by the Council on Environmental Quality. According to the US Environmental Protection Agency (1998), environmental justice is:

> *The fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic group, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies. The goal of this "fair treatment" is not to shift risks among populations, but to identify potentially disproportionately high and adverse effects and identify alternatives that may mitigate these impacts.*

There are both minority and low-income populations residing on Moloka`i. However, environmental justice is dismissed as an impact topic because:

- NPS staff actively solicited public participation as part of the planning process and gave equal consideration to input from all persons, regardless of age, race, income status, or other socioeconomic or demographic factors.
- Impacts associated with implementation of the preferred alternative would not disproportionately affect any minority or low-income population or community.
- Implementation of the preferred alternative would not result in any identified effects that would be specific to any minority or low-income community.
- The NPS staff does not anticipate that any adverse impacts on public health or the socioeconomic environment would appreciably alter the physical and social structure of the local minority or low-income populations or communities.

Floodplains and Wetlands: Executive Order 11988, "Floodplain Management," and Executive Order 11990, "Protection of Wetlands," require analyses of impacts on floodplains and regulated wetlands. There are no rivers or major drainages within the area of potential effect. Due to the absence of known tsunami generating faults in the general region, the risk for inundation of the dock area by a tsunami is negligible. The harbor and dock are also a "day use only" area with no overnight occupation or activity. It is anticipated that in event of a tsunami warning, adequate time for evacuation would exist. Therefore the risk for tsunami would be so low as to not require further evaluation under Procedural Manual 77-2: Floodplain Management. In addition, there are no wetlands regulated under the provisions of Section 404 of the Clean Water Act. Three conditions must be present for an area to be considered a wetland under CWA Section 404 – wetland plants ("hydrophytic vegetation"), wetland ("hydric") soils, and wetland hydrology (USACE 1987; 33 CFR 328.3[b]). No vascular plants exist in the project area, so one of the three parameters is lacking and the project area would not be considered a wetland under Section 404. For the same reason (i.e., no rooted vascular plants), the area would not be considered "vegetated shallows."

According to the NPS Procedural Manual 77-1: Wetland Protection; the marine environment of the harbor is considered subtidal as it remains flooded and is therefore a deepwater habitat, not a wetland. Inter-tidal systems include the splash zones from breaking waves that may trap enough water above the inter-tidal zone to maintain saline wetland conditions. Physical alteration of the harbor area from previous development and shore armoring has modified the intertidal zone to the extent that the resultant community is artificial and no longer natural. The splash-zone in the area of the breakwater would not be adversely affected by the proposed action. Replacement of armor stones into the breakwater would provide a modest amount of addi-

tional habitat to those invertebrates that occupy the splash-zone, which may be considered a negligible benefit. As such, wetlands have been dismissed from further evaluation.

Compliance with the Coastal Zone Management Act will be accomplished through a consistency determination, as required by the State of Hawaii, which is included as Appendix A to this document.

Archeological Resources: An underwater archeological survey of the Kalaupapa harbor was conducted in June of 2008 (Viernes-Stein 2008). An assortment of boat and mechanical parts were identified within a centralized location within the harbor. Oral accounts from patients describe a tugboat wreck in the same vicinity during the timeframe of 1964 to 1968, which likely resulted in the material observed during the survey. Other resources recorded during the survey included:

Anchor: An anchor of unknown origin was located near the harbor, out of the area of potential effects.

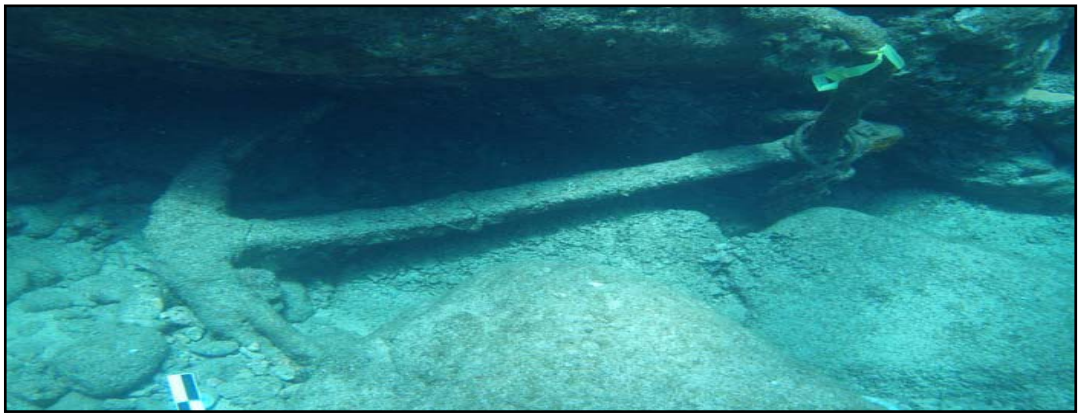

Figure 9. View of Anchor

Mooring Dolphin: In the 1970's a mooring dolphin was installed at the Kalaupapa Harbor. The dolphin is presently located at a depth of approximately 10 meters (32.81 feet). The top portion of the dolphin has two raised squares on one side and a square depression on the other side; the underside is a convex curve. The dolphin measures 4.32 meters (14.17 feet) on the long side and 2.05 meters (6.73 feet) on the short side. The height of the dolphin measures 1.20 meters (3.94 feet).

Members of the Kalaupapa community told engineers that a dolphin would not withstand the elements due to the large swells that pound the northern shores of the Hawaiian Islands. The engineers insisted that modern technology of dolphin construction would ensure the dolphin's durability, but the people in the Kalaupapa Community remained skeptical. The dolphin did not last through the first winter swell after installation.

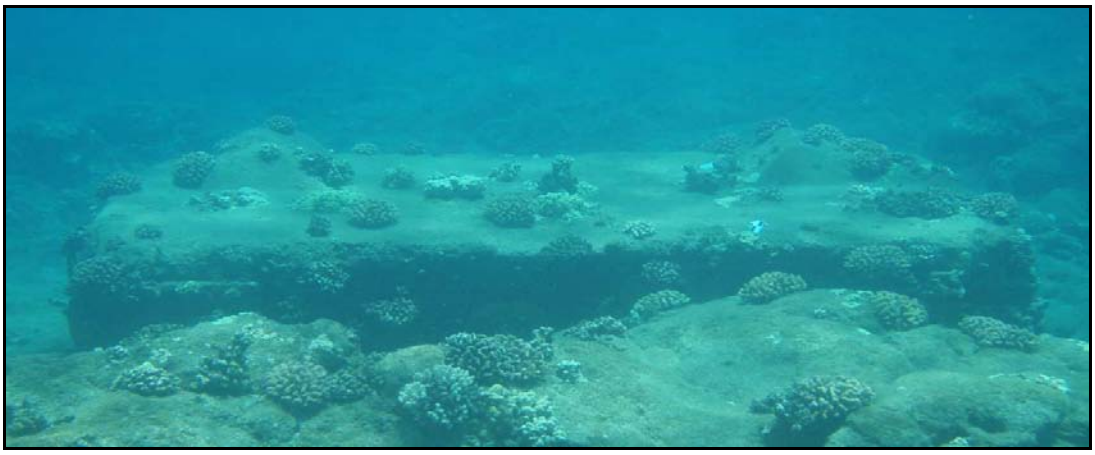

Figure 10. View of 1970's Dolphin Resting on Harbor Floor

Various Harbor Components: At least two bollards were located underwater. Two primary clusters of pilings were also identified and are likely associated with earlier pier structural components. It is unclear whether or not these harbor components were associated with the installation of the 1970's dolphin.

The archeological survey report concluded that the "…material identified in the present underwater archaeological inventory survey does not suggest strong archaeological or cultural significance," and is ineligible for listing in the National Register of Historic Places. In addition, the anchor, which is outside the area of potential effects, would remain in situ and undisturbed by construction activities.

Therefore, archeological resources is dismissed as an impact topic. If during construction previously undiscovered archeological resources were uncovered, all work in the immediate vicinity of the discovery would be halted until the resources could be identified and documented and an appropriate mitigation strategy developed in consultation with the state historic preservation officer and, if appropriate, Native Hawaiian groups.

Indian Trust Resources: Indian trust assets are owned by American Indians, but are held in trust by the United States. Requirements are included in the Secretary of the Interior's Secretarial Order No. 3206, "American Indian Tribal Rites, Federal – Tribal Trust Responsibilities, and the Endangered Species Act," and Secretarial Order No. 3175, "Departmental Responsibilities for Indian Trust Resources." According to park staff, Indian trust assets do not occur within Kalaupapa National Historical Park. Therefore, there would be no effects on Indian trust resources from any of the proposed alternatives.

Museum Collections: Museum collections (prehistoric and historic objects, artifacts, works of art, archival material, and natural history specimens) would be unaffected by the implementation of either alternative. The Park's museum collections would continue to be acquired, accessioned and cataloged, preserved, protected, and made available for access and use according to NPS standards and guidelines. Therefore, museum collections is dismissed as an impact topic.

Natural Lightscapes: The natural lightscapes of parks are natural resources and values that exist in the absence of human-caused light. Night construction or use of artificial lighting during construction would be prohibited. No artificial lighting would be installed as part of the proposed project. Therefore, no loss of dark conditions or impacts to natural night skies would occur, and natural lightscapes is eliminated from further analysis in this EA.

Natural or Depletable Resource Requirements and Conservation Potential: The NPS uses sustainable practices to minimize the short- and long-term environmental impacts of development and other activities through resource conservation, recycling, waste minimization, and the use of energy-efficient and ecologically responsible materials and techniques. Although energy

and construction materials would be used for repair and construction activities under either action alternative, none of the proposed alternatives would change the park's overall energy consumption, use of non-renewable (depletable) resources, or conservation potential. Thus, this topic is eliminated from analysis.

Possible Conflicts with Other Land Use Plans and Policies: The proposed project would not interfere with plans or policies of the Hawaii DOH or other park neighbors. The relationship of this project to other past, present, and reasonably foreseeable actions, within and adjacent to the park, is addressed in the cumulative impact analyses.

Prime and Unique Agricultural Lands: Prime farmland has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. Unique agricultural land is land other than prime farmland that is used for production of specific high-value food and fiber crops. Both categories require that the land is available for farming uses. Land associated with the proposed project is not available or used for farming and therefore does not meet the definitions.

Public Health and Safety: During project implementation, all proposed construction activities addressed in this EA would be conducted by experienced contractors operating under Occupational Safety and Health Administration guidelines. Community residents and park staff would be restricted from entering the construction area, as appropriate, throughout project implementation. Therefore, no effects of public health and safety are anticipated.

Terrestrial Natural Resources: The proposed alternatives would not produce a disturbance in the terrestrial environmental of the park. Other than transport of armor stones removed from harbor waters to an existing, hardened site within the park, construction activities would occur in the marine environment of the Kalaupapa harbor. Under Alternative B, transported material includes a limited amount of armor stones removed from the berthing basin but not suitable for reuse at the breakwater.

Transportation: The existing land use and circulation patterns of the still-isolated Kalaupapa Peninsula would remain unchanged under all alternatives. The grid pattern of streets would be unaffected, and no road or trail work would be undertaken. Because the alternatives would neither change existing land use and circulation patterns nor alter existing modes of water transportation access to the Kalaupapa Peninsula, transportation is not analyzed further in this EA.

Special-Status Species Not Addressed in this EA: There are special-status marine species that have been dismissed from further analysis: the false killer whale (*Pseudorca crassidens*), humpback whale (*Megaptera novaeangliae*), Newell's shearwater (*Puffins auricularis newelli* or the Hawaiian shearwater) and the Hawaiian petrel (*Pterodroma phaeophygia sandwichensis*). Rationale for dismissal of each of these species is provided below.

Although the population of false killer whales in Hawaiian waters is declining (primarily due to bycatch in the long-line fishery), it is not listed under the Endangered Species Act. The false killer whale is a special-status species, because it is protected under the Marine Mammal Protection Act. False killer whales are found in waters around the Main Hawaiian Islands. However, they are a deep water species which has not been observed within one kilometer of the harbor, and they are not expected to be impacted by the acoustic disturbances generated during construction. Therefore, false killer whales are not analyzed further in this EA.

The endangered humpback whale migrates to Hawaiian waters in the summer and fall months. During the winter months (January through March), anecdotal sightings offshore of the harbor have been reported. Generally, however, the humpback whales have not been seen in water depths less than 30 feet and seem to prefer the sandy habitat in depths greater than 45 feet (Brown et al. 2008). Humpback whales observed off Moloka`i are most frequently in waters off the northeast coast, clockwise along the south coast, to the northwest coast. Previous aerial surveys have identified the south coast as having a higher abundance than the north coast (Mobley

et al. 2001); the Humpback Whale National Marine Sanctuary is located off the south coast of Moloka`i. Since humpback whales are not expected to be found in the vicinity of Kalaupapa harbor during the summer months when construction would occur, these whales are not analyzed further in this EA.

Neither the pygmy sperm whale (*Kogia breviceps*) nor the dwarf sperm whale (*Kogia sima*) is listed under the Endangered Species Act, and no breeding or calving areas for these whales in Hawaii have been described. Both species of *Kogia* prefer deep waters and generally occur along the continental shelf break and over the continental slope (Baumgartner et al. 2001; McAlpine 2002; Baird 2005). Although dwarf and pygmy sperm whales have potential to occur in the vicinity, neither the pygmy nor dwarf sperm whale have been documented in the waters of Kalaupapa harbor. Since pygmy and dwarf sperm whales are not expected to be found in the vicinity of Kalaupapa harbor, these whales are not analyzed further in this EA.

In their response to initial agency scoping, the US Fish and Wildlife Service requested that night lighting at the construction site be used minimally in order to protect the flight paths of two seabirds listed under the Endangered Species Act – the Newell's shearwater (*Puffins auricularis newelli* or the Hawaiian shearwater) and the Hawaiian petrel (*Pterodroma phaeophygia sandwichensis*). Newell's shearwater is endemic to the Hawaiian Islands as a breeding bird. Its population is declining and it is listed as a threatened species. The Hawaiian petrel is also endemic to Hawaii. It was formerly found on all the main Hawaiian Islands, but today it is mostly restricted to the Haleakalā Crater on Maui; and a small population may exist on Moloka`i. The Hawaiian Petrel is an endangered species. Major threats to both species include loss of habitat from development, and predation by cats, mongooses, and rats. Utility wires can injure these species, and city lights disorient them, contributing to their decline.

Because the project would not include lighting at the construction site, no effects to seabird flight or night habits are anticipated. In addition, the project does not include installation of lighting for the dock or harbor structures. Therefore, impacts to these species are not addressed in this EA.

Urban Quality and Design of the Built Environment: The issues related to community life and the historic properties located within Kalaupapa are addressed under the topic "Cultural Resources."

Visitor Use and Experience: This topic was dismissed from analysis because no issues were raised, either by the public or the interdisciplinary NPS team. In addition, visitors would be prohibited from accessing the harbor area during construction activities. Potential effects to family members (or others) who visit patients or members of the Kalaupapa Settlement are addressed under "Cultural Resources."

Wilderness: There are no areas currently designated as wilderness within Kalaupapa National Historical Park. It is also unlikely that any lands would meet the criteria established in the Wilderness Act of 1964 (16 USC 1131, et seq.) – that the "imprint of man's work substantially unnoticeable" – because of existing community development, historic structures, and a long history of human occupation of the area. Therefore, this impact topic is dismissed.

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Chapter 2: The Alternatives

This chapter describes alternatives for maintaining barge service to the park and Kalaupapa community. It also identifies alternatives or actions eliminated from further consideration. The preferred alternative and environmentally preferred alternative are also identified. The important features of the alternatives, their effectiveness in meeting objectives of the proposed action, and a summary of the effects of the alternatives are provided.

DEVELOPMENT OF THE ALTERNATIVES

NEPA implementing regulations provide guidance on the consideration of alternatives in an EA. These regulations require the decision-maker to consider the environmental effects of the proposed action and a range of alternatives (40 CFR 1502.14). The range of alternatives includes reasonable alternatives that must be rigorously and objectively explored, as well as other alternatives that are eliminated from detailed study. To be "reasonable," an alternative must meet the stated purpose of and need for the project. In addition, Sections 1502.14 and 1508.25 of the Council on Environmental Quality (1978) regulations for implementing the National Environmental Policy Act require that the alternative of no action be included in all environmental evaluations.

Accordingly, the NPS has included Alternative A, the No Action Alternative, under which current NPS management operations at the dock and harbor would remain unchanged and no repair projects would take place. The purpose of including a No Action Alternative in environmental assessments is to ensure that agencies compare the potential impacts of the proposed action to the known impacts of maintaining current conditions. By using the current conditions as the No Action Alternative, the impacts of the proposed alternative can be directly compared to the existing baseline.

The action alternative considered in this EA was developed by the NPS after careful assessment by an interdisciplinary team, including engineers, resource specialists, and park planners and managers, as well as with input from consulting agencies and the public. The collective efforts of these individuals in documenting the requirements for the Kalaupapa dock structures formed the basis for the development of proposed action alternative.

The primary planning constraints bounding the development of reasonable alternatives carried through analysis for this project:

1. The environmental conditions of the Kalaupapa harbor limit the construction period for in-water work to approximately April to October. The North Pacific Swell often occurs from October to May, bringing large waves into the harbor from the north. Waves are typically 5 to 20 feet high and arrive every 10 to 20 seconds (DoN 2005). These rough seas create unsafe conditions for in-water and barge-supported construction activities from late fall through early spring. Alternatives that could not be implemented in one construction period would generate two seasons of environmental impacts and have greatly escalated costs due to duplicate staging and start-up activities.
2. The Kalaupapa Peninsula is home to a group of Hawaiian monk seals, an endangered marine mammal. Recently, the peninsula has emerged as a premier birthing location for the seals in the Main Hawaiian Islands. Pupping takes place in the spring and early summer on the beaches, increasing monk seal occurrences in and near the park during that time period. This timeframe also coincides with the safe construction period. After pups are weaned, they venture into adjacent rocky habitats, including areas in the vicinity of the harbor. Seals generally depart the peninsula during the winter months from January to March (Brown et al. 2008). Acoustic

studies completed for the preliminary analysis during the scoping period raised concern for the impacts to marine mammals, especially the Hawaiian monk seal. The preliminary analysis concluded there would be an adverse affect determination under the Endangered Species Act. There would be minor, short-term adverse behavioral harassment of the monk seals during construction and possible impacts to the monk seal pupping success. The NPS determined that injuries to monk seals would be unacceptable. Thus, actions that could not be mitigated to avoid such impacts were removed from consideration as viable components of the alternatives (see Alternatives Considered and Dismissed).

3. As previously discussed in Chapter 1, during the scoping process for the proposed action public and agency concerns prompted further evaluation of alternatives. One concern was the potential impact of widening the berthing basin. In order to eliminate the need for widening the berthing basin, alternate means of barge delivery were pursued including requesting barge delivery assistance from the Army and having Kalaupapa become a listed community with the Public Utility Commission. The latter would compel the commercial barge companies to continue deliveries to the park. Concurrently, a smaller barge was purchased by American Marine Company and the Park was able to enter into a 5-year contract with for barge delivery. The park believed that the commercial barge companies showed a commitment to future service to the community and that the Army and Public Utility Commission avenues also had the potential to guarantee continued service. Resultantly, widening of the berthing basin was removed from consideration as a component of the alternatives (see Alternatives Considered and Dismissed).

4. Another concern was the installation of a mooring dolphin. A previous mooring dolphin was installed in the 1970s by the Army Corps of Engineers but did not survive the first winter. A replacement was included in the original project scope to provide an additional mooring point for the barge. The community expressed objections about re-installing the dolphin. This resulted in a re-assessment of the benefit of the dolphin. Previous project reports were reviewed, and Young Brothers Tug and Barge Company was asked to comment on the benefits. Previous reports and consultation with Young Brothers were consistent in stating the dolphin would provide increased maneuverability of the barge during docking by allowing the barge to pivot in to the berthing slot. However, it would not reduce the number of tugs from the two currently used during delivery. There would also be a risk that installation of pilings would not be able to be completed due to exceeding “take” allowances and the inability to successfully mitigate turbidity issues. Additionally, acoustic impacts could not be known until construction starts. Other factors weighing into the assessment of benefits of the dolphin were the low number of barge trips made per year (1-3 trips mooring at the dock, 1 day per trip), the historic safety record (no accidents or injuries), and the future maintenance that would be needed because of harsh site conditions. The incremental benefits were not believed to outweigh the potential negative impacts to corals and mammals (see Alternatives Considered and Dismissed).

Alternative B, The Preferred Alternative, includes deferred maintenance and completion of the repairs necessary to maintain barge service. Implementation of this alternative would accommodate the current sized (small) barge. This alternative is the NPS preferred alternative.

NEPA regulations require that the action proponent assess means to mitigate adverse environmental impacts associated with implementation of the proposed alternatives (40 CFR 1502.16). This EA includes resource protection measures intended to reduce the environmental effects of installation of dock structures and harbor modifications in the description of the alternative.

VALUE ANALYSIS

A value analysis study was conducted by an interdisciplinary NPS team on March 11 and 12, 2008, at the park. Value analysis is a problem-solving and decision-making process used to produce alternatives that achieve the required goals of a project. Value analysis compares design components for their ability to best meet project needs, environmental effects, and cost/benefit ratios. The study addressed 1) available alternatives to continue delivery of essential supplies and materials, 2) repairs required to provide 10 to 15 years of additional service from the existing pier and harbor, 3) potential harbor configurations to accommodate available barges, and 4) cultural and natural resource data needs.

The value analysis team recommended repairs and alterations be made to extend the usable life of the dock structures and to safely accommodate commercially available barges. Since the value analysis workshop was conducted in early 2008, the park was able to obtain a new 5-year contract for barge delivery service using a small barge. In addition, preliminary impact analyses for options to enlarge the berthing basin and install a mooring dolphin revealed potential adverse impacts to special-status species, an unacceptable impact to park resources. Thus, maintaining the existing berthing basin size, and completing necessary repairs– Alternative B – has emerged as the Preferred Alternative.

ALTERNATIVE A: THE NO ACTION ALTERNATIVE

The dock and harbor consist of several structures, including a concrete and armor stone breakwater, a concrete pier with bitts and bollards for line fasteners and tie-downs, a concrete and stone masonry bulkhead wall, and a berthing basin (Figure 4). Under Alternative A, current management and operations at the Kalaupapa harbor would continue. Only above-water emergency repairs would be conducted such as backfilling of the wall with concrete, as was done in 1991. Necessary emergency repairs such as above-water patching and maintenance would take place, but no underwater work would occur. The NPS would continue to manage materials delivery, including fuel, as it has in the past.

NON-STRUCTURAL METHODS TO OBTAIN CONTINUED BARGE SERVICE

Under both alternatives, the NPS would pursue a variety of methods to obtain continued service with a small barge, beyond the current 5-year contract period. In order to accomplish this, the park superintendent would work cooperatively with a variety of agencies, entities, and individuals. These measures are assumed to result in continued annual barge service to the park and community. Examples of potential service mechanisms and delivery partners include:

- Pursue continued service contracts for small barge delivery service with the existing, or other, barge service providers.
- Work cooperatively with other federal agencies that are willing and able to provide barge service to the community. The Department of Defense (U.S. Army) is a potential delivery partner.
- Work cooperatively with the Hawaii Public Utilities Commission to assure that the Kalaupapa community receives continued barge service through regulatory requirements. Hawaii Public Utilities Commission regulates barge schedule and rates to specific, listed communities, but Kalaupapa is not a listed community. The park would discuss listing the community with state legislature representatives.
- Continue discussions with Hawaii state legislators and regulators in order to assure that legislative mandates and obligations to the serve the patient community at Kalaupapa are met.

ESTIMATED COST OF ALTERNATIVE A

Barge service would be provided on a trip-by-trip basis, with each trip bid separately following a Request for Proposal. Barge service to Kalaupapa has cost approximately $100,000 per trip (NPS 2008). This cost level is anticipated to escalate due to inflation for each year of the new 5-year service contract.

ALTERNATIVE B: THE PREFERRED ALTERNATIVE – DEFERRED MAINTENANCE

Alternative B would include completion of the repairs necessary to maintain service via a small barge. Voids in the bulkhead wall toe, low dock toe, and breakwater would be filled for structural integrity. Armoring of the breakwater would be re-established and displaced armor stones impacting the draft would be removed from the berthing basin. In addition, completion of concrete repairs to the deck pier caps and beams, as well as repair of a void on the north side of the pier would be completed. This work was started by the State of Hawaii in their Phase 2 project but was not completed. This maintenance is expected to lengthen the effective life of the pier for an additional 10 to 15 years.

PIER STRUCTURE

Deck and Structure Support Columns

Areas in need of repair include the pier curb, concrete berms under the deck, above water piles and pile caps, and the ocean side void on the north side of the pier. A potential repair for the void is the injection of grout into pre-placed coarse aggregate within the void. Findings indicated that the general below-waterline condition of the pier pilings is good. There is little evidence of major defects such as concrete spalls or delaminating (Daly 2005).

Low Dock Toe Repair

The toe of the low loading dock has intermittent undermining as a result of wave action within the harbor basin. The undermining can be described as relatively minor, with the exception of a 24-inch deep by 36-inch high void located at the west end of the low loading dock. A potential repair for the void is the injection of grout into pre-placed coarse aggregate within the void. Another possible repair method would be the use of a tremie to place concrete in the low loading dock void. Scour protection would be installed at the toe of the low dock toe. Riprap is one potential method of toe stabilization. Riprap may consist of randomly placed stones at the low dock toe or bags of synthetic fiber-woven, water-permeable material filled with concrete may be used. A filter fabric may be used beneath the riprap or bags to prevent scour through the individual units. The stone riprap or concrete bags would likely be hand-placed by divers, depending on the weight of the stones.

BULKHEAD WALL REPAIRS

Under Alternative B, the repair of the bulkhead wall would include repairing the void in the toe of the wall and replacement of dislodged stones of the toe in areas that have not yet been undermined. There would likely be addition of new armor stones to reinforce the structure from further erosion. A recent bathymetry study and visual inspection of the basin indicates that a significant amount of the bulkhead toe rock has been dislodged via wave refraction and deposited into the berthing basin. These displaced stones would be removed from the basin and if suitable reused for the toe repair. Scour protection would be installed at the toe of the bulkhead similar to repairs to the toe of the low dock.

Grout may be used to seal or repair the bulkhead voids by injecting it into preplaced coarse aggregate within the voids. This method physically strengthens the structure to make it more resistant to wave loading. Grout would consist of Portland cement and sand, chemical grouts, or a combination of these materials depending on the size of voids. The cavity would then be sealed using concrete-filled bags. Concrete could also be used to fill the voids in the bulkhead wall. The "tremie method" uses an anti-washout admixture in the concrete. The concrete is placed in a rigid tube from above the water, with the concrete displacing water in the void.

BREAKWATER REPAIRS

Armor Stone Relocation

The existing breakwater extends 114 feet from the shoreline into the harbor. Armor stones that were placed against the breakwater have been displaced by constant wave action. The geometry of the breakwater alignment appears to create wave refraction within the harbor, increasing the scouring evident at the pier and bulkhead wall. This has led to many stones being perched on the open ocean side and within the berthing basin of the harbor, creating a safety hazard for docked barges.

Repairs would consist of rebuilding the breakwater within the original design footprint. The armor stones within the berthing basin would be plucked and reset in the breakwater to accommodate safe docking in the berthing basin. In some cases, displaced armor stones may be replaced and secured or replaced with more suitable size stones capable of withstanding the wave action. The contractor would move the displaced breakwater armor rocks that are within the berthing basin. The method and equipment used for the removal would likely depend on the weight or size of the rock and could include equipment such as a rock grapple, clamshell bucket, or tether. The contractor may add rocks to the slope to ensure the newly-placed rocks rest on a solid base. Slope inclination and armor stone or shaped concrete block density and porosity would be designed while considering the consistent wave action and the need for reduced wave energy. If replaced, stones would be disposed of at an upland location for use by the park.

Concrete Cap Repairs

Concrete repairs on the breakwater cap would be accomplished using “shotcrete” or handplaced mortar. Shotcrete uses fiber-reinforced concrete for repairs of locations with spalled concrete. Shotcrete is defined as the application of mortar using a pneumatic method. The damaged concrete surface is prepared by chipping and hydroblasting the loose and unsound concrete and by removing concrete from the reinforcing steel using a light, hand-operated pneumatic hammer. The steel is then cleaned of rust and scale and coated with a zinc-rich coating. The concrete surfaces are coated with an epoxy resin bonding agent and shotcrete is applied.

An alternative for repairing spalled concrete is the use of epoxy mortar applied by hand at the damaged areas on the breakwater cap. The area is first cleaned of loose concrete by pneumatic chipping or hydroblasting. Concrete is removed from around the reinforcing and the steel is cleaned of corrosion and scale. The exposed reinforcing bars are treated with a zinc-rich coating to add protection for the steel. A bonding agent is applied to the surrounding concrete, and a non-sag mortar is applied in subsequent layers. It is important to fill the void behind the reinforcing bars and consolidate the mortar. Cracks in the concrete would be repaired using an epoxy injection method.

MOVEMENT AND STAGING OF EQUIPMENT

Equipment used to accomplish deferred maintenance tasks would be brought to the park by transport barges and tugboats from other Hawaiian locations, most likely from Honolulu. Equipment would be determined by the construction contractor. A list of potential equipment to be used during construction is included below.

1. Towing tug of 3500 horsepower, or similar, would be used to transport construction barges and equipment from their origination point to Kalaupapa harbor. This vessel would not remain in the harbor during construction.

2. Tender tug of 880 horsepower, or similar, would be used for transport of construction barges and equipment from their origination point to the Kalaupapa harbor. This vessel would not remain in the harbor during construction.

3. Deck barge of approximately 60 feet by 200 feet would be anchored adjacent to the harbor throughout the construction period to support the construction equipment. The work barge would be mounted with a crawler crane with rock grapple to relocate the breakwater armor stones from the berthing basin.

NON-STRUCTURAL METHODS TO OBTAIN CONTINUED BARGE SERVICE

As described for the No Action Alternative, the NPS would pursue a variety of contractual, co-operative, and legislative means to maintain small barge delivery service. The park is confident that these methods would be successful in maintaining annual barge delivery service to the park and community.

ESTIMATED SCHEDULE AND COST OF ALTERNATIVE B

The construction period for Alternative B would cover approximately four months of the overall available construction window of April to October. The total estimated cost for actions proposed under Alternative B would be approximately $5,000,000. As described for Alternative A, the cost of barge delivery service through the remaining 5-year contract period would be approximately $100,000 per visit.

RESOURCE PROTECTION MEASURES AND MONITORING OF ALTERNATIVE B

Resource protection measures would be implemented to avoid and minimize potential construction related adverse impacts to natural and cultural resources and the Kalaupapa community. These measures would be implemented as part of the action alternative. Any other practicable resource protection measures identified as part of compliance with the Endangered Species Act, the Marine Mammal Protection Act authorization process, or other required project permitting would be incorporated as part of the project.

Resource protection measures would be supplemented with monitoring and to verify the efficacy of resources protection measures and ensure compliance with permit requirements for state and federal regulating agencies. Table 2 presents the resource protection, monitoring, and reporting measures that would be implemented with Alternative B, the Preferred Alternative.

Table 2. Resource Protection Measures of the Proposed Action Alternative

Special-Status Species (marine mammals and sea turtles)

Construction Schedule

Construction activities would be conducted in summer months, when sea conditions are typically most favorable. Hawaiian monk seals typically haul out to pup at two different times: April and August. Pups are weaned in approximately six weeks. Therefore, the greatest likelihood that mother/pup pairs would be in the vicinity of the harbor is April through May, and August through September. Construction activities would be scheduled, to the greatest extent practicable, around these times. However, pupping typically happens approximately two weeks later each sequential year for a given mother. Therefore, the optimum work window may not be exactly between the above dates. Any adjustment to these dates based on the pupping records of the known Kalaupapa mothers would be determined in consultation with NMFS.

Construction activities would only occur during daylight hours and when weather conditions are adequate for visual monitoring of animals within the designated safety zone (see below).

Construction Vessel Operation

Vessel operators would alter course to remain at least 100 yards from whales, and at least 50 yards from other marine mammals and sea turtles and would reduce their speed to 5 knots or less in the proximity of these animals. If a boat is approached by a marine mammal or turtle, the operator would put the engine in neutral and allow the animal to pass. Marine mammals and sea turtles would not be encircled or trapped between multiple vessels or between vessels and the shore and no attempts would be made to feed, touch, ride, or otherwise intentionally interact with any marine species.

Safety Zone

A safety zone would be established around construction areas based on in-water and in-air noise measurements. The zone would be monitored during all construction work by trained observers to detect the presence of marine mammals and sea turtles.

A no start/shut down zone would include all areas where the underwater sound pressure levels are anticipated to equal or exceed 160 dB (re:1 microPa rms), the behavioral disturbance threshold for impulse noise (i.e., armor stone placement) and/or the in-air noise levels are anticipated to equal or exceed 100 dB (re: 20 microPa rms), the behavioral disturbance threshold for pinnipeds. This zone would encompass and extend beyond the injury threshold of 180 dB for cetaceans and 190dB for pinnipeds that NMFS uses to estimate injurious effects from underwater noise. The extended no

Table 2. Resource Protection Measures of the Proposed Action Alternative

start/shut down zone range would provide an additional safety margin in protecting animals from construction effects. Work would not start or would be shut down if monitors observed animals approaching or within this zone during construction.

Prior to commencement of construction activities, a preliminary 50-meter radius no start/shut down safety zone would be established around the construction site. At 50-meters, in-water and in-air sound levels from construction are expected to diminish below the 160 dB in-water threshold and 100 dB in-air threshold (see acoustic analysis in Chapter 3). Once construction begins, either the 50-meter safety zone would be retained or a new, larger no start/shut down safety zone would be established based on actual sound level measurements. All work would be postponed or halted when special-status marine species are approaching or within the safety zone, and would only begin/resume after the animals have voluntarily departed the area.

Acoustic and Visual Monitoring

The purpose of in-water and in-air sound monitoring is to modify the safety zone if necessary and to provide information on sound propagation for future marine projects. Acoustic monitoring would be performed by qualified NPS/NMFS approved persons. Monitoring would be implemented prior to the first day of construction to establish baseline data. Acoustic monitoring would begin at least 15 minutes prior to the commencement of daily construction activities and continue through completion or termination of work. Post-construction monitoring would also be conducted to confirm non-construction ambient noise levels.

Visual monitoring of the safety zone would be conducted by a minimum of two qualified NPS/NMFS-approved observers. Monitoring would occur from locations on shore, or from a boat if necessary, to adequately survey the safety zone. Observers would survey the no start/shut down safety zone for a period of no less than 15 minutes prior to daily construction to ensure that no marine mammals or sea turtles are within this safety zone. If marine mammals or sea turtles are found within this safety zone, construction would be delayed until they voluntarily move out of the area. After the last sighting of an animal and no further sightings inside the safety zone have occurred for a period of no less than 15 minutes, construction would be allowed to commence. If a marine mammal or sea turtle is sighted approaching or within the no start/shutdown zone after construction has begun, work would be halted until the animal has voluntarily moved beyond the no start/shutdown safety zone. If construction activity ceases for 15 minutes or more, prior to resuming of these activities, the waiting period procedures described above would be implemented. Monitoring would be continuous through the construction activities and would end approximately 15 minutes after completion of the activities.

Monitoring and data collection protocols and equipment would be further defined in a marine mammal/sea turtle visual and acoustic monitoring plan that would be prepared for review and approval by the NPS and NMFS prior to construction. The visual portion of the plan would be developed to collect data for each distinct special-status species observed during construction activities. Sighting data such as date, time, observer, animal ID if known, animal behavior, overall numbers of individuals observed, frequency of observation, and environmental conditions would be recorded. The acoustical portion of the plan would be developed to collect data for baseline underwater and in-air noise levels and for noise levels associated with the construction activities. Specific start up and shut down procedures as well as reporting requirements and coordination with NMFS during construction would also be included in the plan.

In addition, the NPS would provide NMFS with a draft final report within 90 days after completion of the project. This report would detail the monitoring protocol, summarize the data recorded during monitoring, and estimate the number of marine

Table 2. Resource Protection Measures of the Proposed Action Alternative

mammals and sea turtles in the area during construction. If comments are received from NMFS on the draft final report, a final report would be submitted to NMFS within 30 days thereafter. If no comments are received from NMFS, the draft final report would be considered to be the final report.

Soundscapes and Kalaupapa Community

In-Air Noise Abatement

The contractor would create and implement a noise reduction plan. The contractor may elect any combination of legal, non-polluting methods to maintain or reduce noise to thresholds levels or lower, as long as those methods do not result in significant environmental impacts or create a substantial public nuisance. The plan for attenuating construction-related noises would be implemented prior to the initiation of any work. The noise reduction plan would be reviewed and approved by the NPS with consultation from the community.

The contractor would also obtain a Community Noise Permit from the Hawaii DOH.

DOH may require specific noise abatement measures, and submittal of plans, procedures, and specifications for the abatement of noise emissions from specific construction equipment.

Standard noise abatement measures could include the following elements:

• Equipment would be shut off rather than allowed to idle;

• Scheduling would be designed to minimize impacts on adjacent noise-sensitive areas; and

• Hydraulically or electrically powered impact tools would be used when feasible.

Project information such as construction phasing, schedule and time changes, etc. would be made available to community residents by several means and methods, including but not limited to:

• Posting the construction schedule on the local bulletin board where information is commonly shared; and

• Sharing the construction schedule and information at regular community meetings.

Water Resources

Water Quality Monitoring Plan

NPS would protect water quality to conform to internal and external policy and regulatory requirements. Basic water quality monitoring parameters involve turbidity, total suspended solids, and pH. For projects involving habitat impacts, monitoring parameters include dissolved oxygen, temperature, light extinction, and biological elements. Photographic documentation may also be required. Other parameters related to nitrogen, phosphorus, chlorophyll, and silicates may be imposed on a case-by-case basis. Daily monitoring is required for projects lasting up to two months. Specific monitoring activities would be detailed in permits issued by the Hawaii DOH.

A Water Quality Monitoring Plan (WQMP) would be prepared by the contractor to Hawaii DOH standards. DOH standards are the most externally stringent. It is anticipated that these requirements would satisfy water monitoring requirements for other agencies. If other agencies have specific water quality measures not covered by DOH standards and required by law, then they would be added to the core WQMP. This plan is required to be approved by the Hawaii DOH in order to be valid. Water Quality Monitoring Plans are required to contain what parameters will be sampled, when they will be sampled, how they will be sampled, how the samples are analyzed, how ga-

Table 2. Resource Protection Measures of the Proposed Action Alternative

thered data is to be reported, and timelines for reporting. Typically this also includes establishment of ambient conditions from a baseline survey dependent on site and project particulars. DOH and other resource agencies' standard requirements and best management practices for water quality monitoring plans, which would be adopted for this project, include:

• A provision for cessation of work should testing indicate that a water quality standard is exceeded, development of remedial measures to solve the issue, and the updating of the water quality plan with those measures.

• Use of material clean of contaminates and earthen material.

• The use of proven containment devices, when practicable, for isolated activities that are determined to generate sustained turbidity.

• Documentation and accounting for varying ocean conditions such that water quality monitoring practices and results are considered valid by defined standards.

• Excavated material (e.g., armor stones) removed from the berthing basin would be disposed of at an upland site.

• No project related material would be stockpiled in the water.

• A litter control and removal plan would be developed to prevent contamination of marine/aquatic environments from trash or construction debris.

Spill Response and Prevention Plan

The NPS must also have an oil and chemical management and spill response plan in place. The construction contractor would be required to submit the plan, which would include construction best management practices (BMPs) to prevent spills and toxic releases from occurring, as well as a plan detailing the actions that would be taken in case of a spill. Prevention and spill response measures would be required to be specific enough to have their performance measured. Examples of BMPs include appropriate placement of fueling areas and material storage, safe storage and handling of hazardous materials, spill notification procedures, and onsite storage of absorbent pads and booms available for spill clean-up.

Benthic Resources, Fishes, and Essential Fish Habitat

The following resource protection measures would be implemented to avoid, minimize, and compensate resource disturbance:

• A water quality monitoring plan and spill prevention and response plan identified above would also protect aquatic habitat and species.

• All construction vessels, equipment, and materials arriving from other islands would be inspected for invasive species before arriving at Kalaupapa. Equipment would also be inspected prior to leaving Kalaupapa for marine invasive species (e.g. *Acanthophora spicifera* and *Carijoa riisei*), which are present at Kalaupapa.

• Compensatory mitigation would account for all unavoidable loss of corals. Mitigation would be scaled using a Habitat Equivalency Analysis to compensate for lost functions. This would include the installation of seasonal mooring buoys offshore of the Kalaupapa settlement. Use of mooring buoys would allow recovery of corals in areas currently being impacted by anchoring of recreational vessels and would help prevent further anchor damage from occurring in the future.

Table 2. Resource Protection Measures of the Proposed Action Alternative

Ethnographic Resources	
	The NPS would work closely with Native Hawaiians to help ensure a sense of respect for and protection of the more intangible aspects of cultural resources in the project area.
	The NPS would work closely with the Kalaupapa community and consult with spiritual leaders to help reduce or prevent any possible effects to fish, other marine resources, or to sites culturally valued by the community.
Archeological Resources	
	If previously undiscovered archeological resources were uncovered during construction, all work in the immediate vicinity of the discovery would be halted until the resources could be identified by park staff and documented. At that time, an appropriate mitigation strategy would be developed in consultation with the state historic preservation officer and, if appropriate, Native Hawaiian groups.

ALTERNATIVES CONSIDERED AND DISMISSED

DELIVERY OPTIONS

NPS Purchase of Barge

Purchase and operation of a barge was also investigated as an alternative to harbor and dock improvements. Under this option, the NPS would purchase and operate its own barge rather than depend on a commercial shipping service. A barge similar in size to the *Aukai* would be required to transport construction materials and equipment to Kalaupapa for future improvements and maintenance. A vessel of this size would cost approximately $7 million new, and anywhere from $2 to $6 million used depending on age and condition. Cost for a barge purchase, operation and maintenance would be approximately $73 million over a 20-year period, for an annualized cost of $3.6 million per year in 2008 dollars. The bulk of the cost is in operation and maintenance expenses; the original cost of the barge has little effect on the total cost over twenty years. A barge obtained for free would still incur an annual cost of $3 million per year. Any savings gained by purchasing a barge without drive-on drive-off capabilities would be offset by the cost of a crane necessary to unload the barge. The crane would require continual maintenance even though it would only be used once or twice a year. In addition, NPS would still have to contract for the tugboats ($5,000 per trip) necessary to tow the barge to Kalaupapa. The park has no berthing area suitable for storing a barge, so rental of a dock area on another island would be necessary. Expenses could be reduced considerably if the NPS purchased and then leased back the barge to a private operator. However, the government is prohibited from this action based on government contracting restrictions (NPS 2008).

Supply Delivery Operations Using a Workboat

Deliveries of material and fuel using a "workboat" are not feasible at the Kalaupapa harbor. Workboats have V-shaped hulls rather than flat bottoms and are not suitable for the existing depth of the harbor. This was verified with Young Brothers at a meeting held on May 5, 2008 at the Young Brother's office with Mark Houghton (Young Brothers), Christopher Lewis (NPS), Richard Frey (Engineering Solutions), and other personnel at the state health department and Young Brothers. As a result of this meeting, no further evaluation of this alternative was performed (NPS 2008).

Delivery of Supplies via Mules

Delivery of supplies by mules would not support large or heavy deliveries, effectively eliminating transfer of construction materials and equipment, vehicles, fuel, and other materials essential to maintaining operation at Kalaupapa. Many trips by mule train would be needed to meet the basic supply needs of the patients and staff. The *pali* (steep cliff) trail is designed for foot and regular mule traffic and would be subject to degradation if used for supply delivery.

Changes to Airport and Air Cargo Service

Air cargo is limited to small plane service due to the size of the runway at the Kalaupapa airport. Passengers, small goods and mail are delivered by Pacific Wings (daily) and George's Aviation Services (charter only). Aircraft capable of using the runway are not suitable for general freight delivery and cannot handle large items. The Hawaii Department of Transportation has no plans to lengthen the runway to accommodate larger aircraft. The alternative of the NPS expanding the runway to accommodate larger aircraft was investigated. The requirement for providing freight service capable of transporting construction material and vehicles requires an aircraft of a size similar to a C-130 or C-17. The existing runway is 2,700 feet long and 75 feet wide. A C-

130 requires a minimum runway length of 4,100 feet and 90 feet in width. Enlarging the runway would require an extension into the open ocean of approximately 2,000 feet and the placement of approximately 600,000 to 1,000,000 cubic yards of fill. For cost estimating purposes, we have assumed the fill would be imported, as it is unlikely a quarry of a size necessary to provide that volume would be approved by the State of Hawaii on Kalaupapa. Costs could be less if a source could be located for dredged material off shore. Providing a runway of that length would require closure of the airport for at least two years if dredged fill was used. Imported fill would extend the construction period to 10 years or more and 400 barge trips would be necessary to transport the fill material to the park. During that time there would be no passenger or light freight delivery to the park. Cost for extending the runway would be approximately $966 million, with an annualized cost of $48 million per year over 20 years in 2008 dollars. The cost estimate does not include additional taxiways, lighting, security improvements, operation, or maintenance. Environmental permitting costs are also not included. Because of the high level of environmental impacts and great financial cost, this alternative was dismissed from further consideration.

Installation of a Tram to Move Supplies down the *Pali* from Topside

Installation of an aerial tram from the top of the *pali* to the park would change the historic nature of the landmark district by introducing a highly-visible, modern component to the landscape. This type of conveyance could not support delivery of heavy items such as vehicles and equipment needed to conduct construction and historic rehabilitation activities. Additional compliance, and perhaps land acquisition, would be necessary to address potential impacts on the topside environment where the tram terminus would need to be located.

Delivery of Supplies via Heavy-Lift Helicopter

Delivery by heavy-lift helicopter would involve extremely high operating costs. For example, in 2007 the Navy estimated that the hourly rate for use of a heavy lift helicopter was $13,000, including fuel, operating costs, and personnel requirements (Samo 2008). In addition, helicopter service has limited availability and payload capacity, which could limit service to the park and delay receipt of important shipments.

Develop a New Harbor at a Different Location

Development of a new harbor would increase negative impacts to natural resources, and the interdisciplinary team could not determine a better location. The dock is a contributing element to the Kalaupapa National Historic District, and is the community's tie to the outside world. This alternative would also change the historical use of the current dock facility and would not maintain the cultural memories of the remaining patients. Environmental impacts of developing a new dock and pier structure at another location could include effects on corals, the monk seal, other marine mammals, sea turtles and fish habitat. Use of a new facility would require that supplies then be brought to the community by road. The road system on the Kalaupapa Peninsula is limited and vehicles capable of making supply delivery would need to be purchased and brought to the park. These impacts, plus the cost of construction, led to the dismissal of this alternative.

CONSTRUCTION OPTIONS

Extended Breakwater

A wave study performed for the Kalaupapa harbor (NPS 2008) found that extending the breakwater would reduce wave impacts to the dock structures and to watercraft using the dock. However, the structure would need to be extended from its current length of 114 feet to the full

length of the barge (in excess of 200 feet). The analysis included consideration of the increase in number of operable days of the dock per year. The sea conditions in the harbor currently produce an average of 140 operable dock days per year. The extension of the breakwater would have increased this number to 188 days per year. Open sea conditions in the crossing from Oahu remained a limiting factor in increasing the dock's annual operable period.

The estimated cost of the extension was $3 million, which would have increased project costs without providing for larger barge access and with only modest increases in the barge season. Additionally, the existing breakwater is a historic element and contributing resource in the National Historic District, and changing its dimensions could result in an adverse impact to the park's cultural resources. As a result, this option was dismissed in order to avoid an adverse effect to a National Register of Historic Places property.

Use of Explosives to Widen the Berthing Basin

Preliminary engineering solutions for breaking the basalt seafloor in the barge berthing basin included the use of explosives. In order to excavate the harbor for larger barges, up to 450 holes would have been drilled into the basalt formation. A maximum of 9,000 pounds of explosive gel would have been placed in the pre-drilled holes and detonated to break the rock and prepare it for removal. This option would have shortened the period of time needed to fracture the basalt from 2 to 3 months to 2 to 4 weeks.

To determine the potential effects of these explosions on marine mammals and sea turtles, acoustic modeling was performed on the construction methods proposed under this option (Marine Acoustics 2009). "Zones of Influence" were determined for various construction activities, based on NMFS noise level criteria for potential injury and harassment to marine mammals and sea turtles.

The strongest noise levels, and largest zones of influence, were produced by explosive detonations proposed in options including basin widening. Noise levels from pile installation and chiseling were far less that those associated with detonations. Injuries or fatalities to marine mammals and sea turtles from the explosive noise and pressure wave could have been generated up to 853 feet from the detonation site. In addition, temporary threshold shifts (short-term physical effects) could have occurred at distances up to 3,170 feet. Changes in behaviors could have resulted at distances in excess of 5 nautical miles from the detonation site.

Mitigation measures to assure that no marine mammals or sea turtles would be present in the injury or temporary threshold shift zones of influence (up to one kilometer [0.6 mile] in radius) would be difficult to implement. Thus, the NPS would not have been able to assure that no injuries to monk seals or sea turtles would occur. Given that the NPS has determined that injury to Hawaiian monk seals and sea turtles would be an unacceptable impact, the use of explosives to widen the berthing basin was dismissed from further consideration.

Basin Widening

An alternative was originally considered that would have widened the berthing basin in order to accommodate the commercial barge fleet. The previously used small barge was decommissioned in 2008, and there was no guarantee to the park that it would be replaced. However, there was considerable negative public input in relation to the proposed berthing basin widening and perceived threats to natural and cultural resources. This concern was shared by regulatory agencies during initial consultation.

Alternate means of barge delivery were concurrently pursued; including requesting barge delivery assistance from the Army and having Kalaupapa become a listed community with the Public Utility Commission (PUC). The latter would compel the commercial barge companies to continue deliveries to the park. In addition, a smaller barge was purchased by American Marine

Company (AMC) and the park was able to enter into a 5-year contract with Young Brothers (who leases the small barge from AMC), for barge delivery. The Park believes the commercial barge companies have shown a commitment to future service to the park and that the Army and PUC avenues also have the potential to guarantee continued barge service. For all these reasons, widening of the berthing basin was removed from consideration.

Installation of Mooring Dolphin

A previous mooring dolphin was installed in the 1970s by the Army Corps of Engineers, but did not survive the first winter. A replacement was included in the original range of alternatives to provide an additional mooring point for the barge. This would decrease lateral movement during loading/unloading, which was originally thought would make the operation safer. It would also eliminate the mooring line that runs under the barge and causes scraping of the existing corals. No design document, photos, or records were available, so the cause of failure of the original dolphin cannot be determined. The community also expressed objections about re-installing the dolphin. Acoustic studies completed for the preliminary analysis raised concern for the impacts to marine mammals, especially the Hawaiian monk seal. The preliminary analysis concluded there would be an adverse affect determination under the Endangered Species Act. There would be minor, short-term adverse behavioral harassment of the monk seals during construction and possible, but unlikely impacts to the monk seal pupping success.

These determinations resulted in a re-assessment of the benefit of the dolphin. The previous project reports were reviewed and Young Brothers Tug and Barge Company were asked to comment on the benefits. Previous reports and consultation with Young Brothers were consistent in stating the dolphin would provide increased maneuverability of the barge during docking by allowing the barge to pivot into the berthing slot, but that it didn't substantially improve safety of the operations. It would not reduce the number of tugs from the two current y used during delivery. Due to the remoteness of the park, two tugs would always be sent in case there are mechanical difficulties. There was also a risk that installation of pilings would not be able to be completed due to the potential inability to adequately mitigate turbidity issues and the possibility of exceeding marine mammal "take" allowances prior to completion of all construction activities.

Other factors weighing into the analysis of a potential dolphin were the low number of barge trips made per year (1-3 trips mooring at the dock 1 day per trip), the historic safety record (no accidents or injuries), and the future maintenance that would be needed because of harsh site conditions. The NPS interdisciplinary team determined that incremental benefits did not outweigh the potential negative impacts to corals and mammals, and the mooring dolphin was subsequently removed from the preferred alternative. The preferred alternative now consists of completion of the emergency dock repairs.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

The environmentally preferred alternative is the alternative that will best promote national environmental policy as expressed in the National Environmental Policy Act (40 CFR 1505.2[b]). The NPS NEPA guidelines explain the environmentally preferred alternative as the alternative that would cause the least damage to the biological and physical environment, and would best protect, preserve, and enhance historical, cultural, and natural resources (NPS 2006b). NEPA Section 101(b) identifies the following six criteria to help determine the environmentally preferred alternative.

1. Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.
2. Assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings.
3. Attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences.
4. Preserve important historical, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity and variety of individual choice.
5. Achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities.
6. Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

Under Alternative A, there would be limited routine maintenance of the dock structures and no disturbance of the harbor bottom, marine species, or park inhabitants. As such, this alternative would preserve marine resources in the park thereby preserving them for the benefit of future generations (criterion 1).

Alternative A would fail to meet criteria 2-6 as the structural integrity of the dock structures would continue to decline and jeopardize the historic and cultural resources within the park. Present levels of maintenance would not be adequate to prevent continued deterioration of the bulkhead wall, which could result in its collapse. Such a collapse would likely result in indirect structural damage to this historic warehouse, a contributing element of the National Historic Landmark District. Over time, the dock structures would deteriorate to the point that they would become unsafe and unreliable for barge service and for recreational use by the community. Failure of any of the dock elements could result in delays in transport of vital supplies and materials needed to repair and stabilize structures within the historic district and to maintain the community's relatively high standard of living. Alternative A would involve limited routine maintenance of the dock structures and no modification of the harbor bottom and as such, this alternative would have negligible to minor impacts to marine resources in the park thereby preserving them for the benefit of future generations.

Alternative B would include maintenance of the dock structures, allowing for continued use of a small barge to service the park and community and thereby assuring for all Americans safe, healthful, aesthetically pleasing and productive surroundings (criterion 2). Alternative B would include maintenance to the dock structures and repositioning or replacement of armor stones with more suitable size stones or engineered armor.

Alternative B would best preserve important historical, cultural, and natural aspects of our national heritage and an environment which supports diversity (criterion 4). Alternative B would allow for continued barge service to the park to provide vital supplies and materials needed for the historic district and the community with less impact to the physical environment of the

berthing basin, the natural soundscape within the community, and to marine species within the area than other alternatives considered but dismissed, which would have resulted in significant levels of impact to the park's natural and cultural resources.

Based on the principals of NEPA Section 101(b), Alternative B, the Preferred Alternative, is identified as the environmentally preferred alternative. This alternative would result in minor localized adverse effects to the marine environment for approximately one to two days; these effects would be mitigated to a large degree and would primarily be short-term. This alternative provides for reliable continuation of barge service which would preserve cultural and historic resources to the benefit of future generations, and maintain the standard of living of the Kalaupapa community.

SUMMARY OF THE ALTERNATIVES

This section summarizes the alternatives by presenting information in a series of tables. Table 3 outlines the components of the alternatives to provide a comparison of the actions under consideration. Table 4 compares how the different alternatives meet the objectives that were detailed in Chapter 1. Table 5 summarizes the anticipated effects of the alternatives on the impact topics retained for analysis.

Table 3. Comparison of the Components of the Alternatives

Alternative A, the No Action Alternative	Alternative B, the Preferred Alternative
Pier	
No changes to superficial dock and piling deterioration.	Dock and piling surface concrete repaired and stabilized.
Bulkhead Wall	
No repairs would be made; structural failure possible at any time.	Structure would be stabilized above and below the waterline, and voids backfilled.
Berthing Basin	
Existing basin measuring 70 feet by 310 feet would remain adequate for small barge.	Same as Alternative A.
Non-structural Means to Secure Barge Service	
Park would pursue a variety of contractual, cooperative, and legislative means to maintain small barge delivery service. The park is confident that these methods would be successful in maintaining annual barge delivery service to the park and community.	Same as Alternative A.
Resource Protection Measures	
None.	Resource protection measures would be implemented to reduce impacts of construction noise (in air and water), protect water resources, and reduce impacts to benthic habitats.
Cost	
Approximately $100,000 per barge delivery service.	Estimated at $5,000,000, plus barge delivery service.

*Disclosure of how each alternative meets the criteria set forth in section 101(b) of NEPA is included in the preceding "Environmentally Preferred Alternative" section.

Table 4. Ability of the Alternatives to Meet Project Objectives

Alternative A, the No Action Alternative	Alternative B, the Preferred Alternative
During implementation of the project, minimize impacts to both terrestrial and aquatic natural resources.	
Alternative A does not meet this objective because repairs necessary to maintain the bulkhead wall and breakwater would not be undertaken. Potential collapse of the bulkhead wall or loss of sections of the breakwater into the harbor waters could result in localized adverse impacts to aquatic natural resources.	Alternative B meets this objective as it includes resource protection measures to reduce impacts during construction. Repairing the breakwater and moving the armor stones would generate short-term, localized adverse impacts on the park's natural resources including marine mammals and sea turtles.
Provide continued protection and preservation of cultural resources during implementation of the project and into the future.	
Alternative A does not meet this objective because repairs necessary to maintain the dock (contributing element) and bulkhead wall (supporting a historic structure) would not be undertaken. In addition, continued deterioration of the dock and associated structures would jeopardize their integrity and usefulness, potentially diminishing the cultural landscape.	Alternative B would meet this objective by completing repairs that are expected to lengthen the effective life of the pier for an additional 10 to 15 years.
Improve operational efficiency and sustainability, while reducing maintenance.	
Alternative A would not meet this objective because the dock structure would not be repaired; and, if structures deteriorate, barge service could not be guaranteed. As the structure ages, emergency repairs would increase thereby increasing maintenance requirements.	Alternative B would meet this objective by completing repairs that are expected to lengthen the effective life of the pier for an additional 10 to 15 years. Barge service could continue uninterrupted and emergency maintenance activities would be reduced.

Table 5. Summary of Impacts of the Alternatives

Alternative A, the No Action Alternative	Alternative B, the Preferred Alternative
Water Resources	
Alternative A could result in long-term, localized, negligible-to-minor, adverse effects on water quality. The cumulative effect of Alternative A and other projects and plans would be localized, negligible-to-minor, and beneficial due to improved management of wastewater under the NPS septic tank project.	Alternative B would have localized, negligible-to-minor, and adverse impacts on water quality during project implementation. No long-term, water quality effects are anticipated. The cumulative effect of Alternative B and other projects and plans would be localized, negligible-to-minor, and beneficial due to improved management of wastewater under the NPS septic tank project.
Benthic Resources and Essential Fish Habitat	
Alternative A would have localized, minor, and adverse impacts to benthic resources as a result of disturbance during barge operations, and potential collapse of the bulkhead or loss of sections of the breakwater. There would be no effects on EFH. The cumulative effect of Alternative A and other projects and plans would be long-term, localized, moderate, and adverse, mostly due to previous harbor development.	Impacts of Alternative B on turf algae and mobile marine organisms would be short- and long-term, localized, minor, and adverse. Due to the length of time for coral to recover from disturbance, impacts would be long-term. Compensatory mitigation would include installation of seasonal mooring buoys to allow recovery of corals in areas currently being impacted by anchoring of recreational vessels and prevent further anchor damage from occurring in the future. There would be no adverse effect to EFH. The cumulative effect of Alternative B and other projects and plans would be long-term, localized, moderate, and adverse.
Fishes	
Alternative A could have long-term, localized, negligible and adverse impacts on fish or habitat in the harbor due to potential collapse of the bulkhead or loss of sections of the breakwater. The cumulative effect of Alternative A and other projects and plans on fishes and their habitats in the harbor would be long-term, localized, adverse, and moderate.	Impacts of Alternative B on the harbor fish community would be localized, negligible, and adverse, resulting from construction noise and reduction in forage in the project area. Cumulative effects would be long-term, moderate, and adverse, resulting from local and regional development and fishing pressures.

Table 5. Summary of Impacts of the Alternatives

Alternative A, the No Action Alternative	Alternative B, the Preferred Alternative
Special-Status Species	
Implementation of Alternative A would have no effect on Hawaiian monk seals, hawksbill and green sea turtles, and spinner or bottlenose dolphins. Alternative A would have no effect on critical habitat under consideration for Hawaiian monk seals. Alternative A may result in short-term, minor adverse impacts to hawksbill or green sea turtles. The cumulative impact of Alternative A and other projects and plans on special-status species and their habitat would be widespread, long-term, moderate, and adverse.	The effects of Alternative B on special-status species (Hawaiian monk seals, hawksbill and green sea turtles, and spinner and bottlenose dolphins) would be localized, short-term, and minor. Effects on ESA-listed species are as follows: Alternative B may affect but is not likely to adversely affect Hawaiian monk seals, green sea turtles, and hawksbill turtles. Alternative B is not likely to adversely modify critical habitat or areas under consideration for future designation of critical habitat for Hawaiian monk seals. The cumulative effects of Alternative B and other projects and plans on special-status species and their habitat would be localized, long-term, adverse, and moderate. The contribution of Alternative B to cumulative impacts would be incremental, short-term and localized.
Soundscape	
The No Action Alternative would have a localized, short-term, negligible to minor adverse impact on the soundscape at Kalaupapa National Historical Park resulting from associated noise with continued barge deliveries to the harbor. Cumulatively, the effects of the No Action Alternative and the existing conditions in the community would represent a localized, short-term, minor, adverse effect on the soundscape as a result of other projects and park operations that could occur during barge delivery.	Alternative B would have short -term, local, minor to moderate, adverse effects on the soundscape as a result of noise associated with deferred maintenance. Cumulative effects would be localized, short-term, adverse and minor to moderate as a result of other projects and park operations that could occur during barge delivery and/or construction.

Table 5. Summary of Impacts of the Alternatives

Alternative A, the No Action Alternative	Alternative B, the Preferred Alternative
Cultural Resources	
Historic Resources	
The present level of maintenance would not be adequate to prevent long-term effects to the dock structures or the historic warehouse and could result in delays in materials needed to repair structures within the NHL district. Continuation of Alternative A would have direct and indirect, localized moderate long-term adverse effects on the landing structures and minor, indirect long-term adverse effects on the structures within the NHL. Despite the best efforts of park management and the state of Hawaii to preserve the historic structures, the combined effects of past actions and events, ongoing natural resources threats (wind, weather and wave action), and future projects would have a long-term, moderate, adverse cumulative effect on the structures at the Kalaupapa landing area and on the NHL District.	Implementation of Alternative B would result in both negligible and long-term negligible to minor adverse effects to historic resources.
Cultural Landscape	
Failure of the landing elements could result in delayed repairs to components of the cultural landscape as well as inadequate controls of natural threats to the landscape. Continuation of Alternative A could result in moderate long-term adverse effects to the cultural landscape. Cumulative effects would be long-term, moderate, and adverse because of the extensive losses of buildings and structures at Kalaupapa and Kalawao over the past century, and because of corresponding changes in vegetation and land use patterns.	Overall, implementation of Alternative B would result in negligible to minor long-term adverse effects to the cultural landscape. There would be no intrusive visible changes to the landing area; the setting, spatial organization, views, and overall landscape integrity would be preserved. Adverse effects on the landscape from construction would be minor and short-term.

Table 5. Summary of Impacts of the Alternatives

Alternative A, the No Action Alternative	Alternative B, the Preferred Alternative
Ethnographic Resources	
Under Alternative A, should components of the landing fail, barge service would be temporarily halted, disrupting community life, inhibiting access or use of ethnographic resources, and temporarily severing the primary lifeline to the outside world for the Kalaupapa community, a short- and long-term minor to moderate adverse effect on ethnographic resources, landscapes, and the community. Alternative A would have a long-term, moderate, adverse, cumulative effect on ethnographic resources and landscapes.	Implementation of Alternative B would have direct and indirect, long-term beneficial effects on ethnographic resources, landscapes, and the Kalaupapa community by helping to preserve the landing structures, facilitating ongoing cultural traditions of the community, and assuring materials would continue to be available for preservation of valued resources. Short-term negligible to minor adverse effects would result from noise from armor stone removal, effects on fish populations from construction, and lack of access to the harbor. Alternative B would have a long-term, moderate adverse, cumulative effect on ethnographic resources, landscapes, and the community. The adverse effects of Alternative B would be a very small component of the adverse cumulative impacts.
Park Operations	
Alternative A would have short- and long-term, minor to moderate, and adverse impacts on park operations and management depending on the rate of deterioration of the harbor structures. Implementation of other plans and projects would require additional time and efforts from park staff, resulting in short- and long-term, minor to moderate, and adverse cumulative effects.	Short-term impacts of Alternative B would be localized, moderate, and adverse due to efforts required to implement resource monitoring, access restrictions, and housing crew during construction activities. With less on-going maintenance requirements for park staff, long-term effects would be localized, minor to moderate, and beneficial. Cumulative effects would be short- and long-term, minor to moderate, and adverse resulting from additional time and efforts required from park staff through implementation of other plans and projects.

Chapter 3: Affected Environment and Environmental Consequences

INTRODUCTION

This chapter provides a description of the Affected Environment for a resource followed by an evaluation of the Environmental Consequences of the alternatives. It is organized by impact topics, which allows a standardized comparison among alternatives, based on issues.

The Affected Environment section describes the resources within Kalaupapa National Historical Park that could be affected as a result of implementation of the proposed alternative to repair the dock structures in Kalaupapa harbor. The resource descriptions provided in this chapter serve as a baseline with which to compare the potential effects of the management actions considered in this environmental assessment (EA). This section is required by the Council on Environmental Quality (CEQ), regulations implementing the National Environmental Policy Act (NEPA), to succinctly describe the environment of the area(s) likely to be affected by the alternatives under consideration, and focus efforts and attention on important issues (40 CFR 1502.15).

The Environmental Consequences portion of each impact topic analyzes both beneficial and adverse impacts that could result from implementing any of the alternatives described in "Chapter 2: Alternatives." The analysis includes a summary of laws and policies relevant to each impact topic, definitions of impact thresholds (negligible, minor, moderate, and major), methods used to analyze impacts, and the methods used for determining cumulative effects. As required by the CEQ, a summary of the environmental consequences of each alternative is provided in Table 5 in "Chapter 2: The Alternatives." The following provides a summary of the laws and policies that guide the analysis of impacts and the general method by which impacts were assessed.

The following section discusses the general methods that were used to identify impacts and includes definitions of terms. Additionally, it includes policy, terminology, and methods related to general analysis, cumulative impacts, and impairment of park resources. The alternatives are then analyzed in the order they appear in "Chapter 2: The Alternatives." Each impact topic includes a description of the effects of the alternative, a discussion of cumulative impacts, and a conclusion.

METHODS FOR ANALYZING IMPACTS

GENERAL ANALYSIS

The NPS based the impact analyses and conclusions on scientific literature; project specific noise modeling; information and insights provided by NPS experts, other agencies, the public; and best professional judgment.

Under each impact topic is a brief description of relevant components of existing conditions and information for determining the effects of implementing each alternative. The impact analyses involved the following steps:

- Define issues of concern, based on internal and external scoping.
- Identify the geographic area that could be affected.
- Define the resources within that area that could be affected.
- Impose the alternative on the resources within the area of potential effect.
- Identify the effects caused by the alternative, compare these to the baseline represented by the No Action Alternative, and determine the relative change in resource conditions. Characterize the effects based on the following factors:
  - Whether the effect would be beneficial or adverse.
  - The intensity of the effect, as negligible, minor, moderate, or major. Impact topic-specific thresholds for each of these intensities are provided in each impact topic methodology section. Threshold values were developed based on federal and state standards, consultation and coordination with regulators from applicable agencies, and discussions with subject matter experts.
  - Duration of the effect, either short-term or long-term. Impact topic-specific thresholds for each of these durations are provided in each impact topic methodology section.
  - The area affected by the alternative, such as the area within the harbor (i.e., localized) or the area within the park boundary (i.e., parkwide).
  - Whether the effect would be a direct result of the action or would occur indirectly because of a change to another resource or impact topic. An example of an indirect impact would be increased mortality of an aquatic species that would occur because an alternative would increase soil erosion, which would reduce water quality.
- Determine cumulative effects by evaluating the effect in conjunction with the past, present, or reasonably foreseeable future actions for Kalaupapa National Historical Park and the region.
- Determine whether impairment would occur to resources and values considered necessary and appropriate to fulfill the purposes of Kalaupapa National Historical Park.

ANALYSIS PERIOD AND GEOGRAPHIC AREA EVALUATED

This EA establishes goals, objectives, and implementation actions needed to maintain barge service at Kalaupapa National Historical Park for the next 10 to 15 years. Therefore, the analysis period for this environmental assessment is 10 to 15 years.

The geographic area within the park that was evaluated for effects varied by impact topic and is defined in the method provided in each impact topic.

ASSUMPTIONS

Several guiding assumptions were made to provide context for the analysis. These general assumptions applied to all or the majority of impact topics. Assumptions were also made that were specific for the analysis of a particular resource topic and are therefore provided in the methodology for that topic. For the impact topics evaluated, it was assumed that delivery of supplies necessary to support the Kalaupapa community and the park would be received under each alternative. For Alternative A, the No Action Alternative, it was assumed that supplies would continue to be received at the park but that there could be interruptions or delays in deliveries, the length of which would be dependent upon the condition of the dock structure. It was also assumed for the analysis that repair to the dock structures would not result in changes in the function of the dock and therefore would not indirectly result in an increase in visitor use of the park. In addition, it was assumed for the purposes of cumulative analysis evaluation that the visitation to the park would not change from current conditions with implementation of a new general management plan.

IMPACT THRESHOLDS

Determining impact thresholds is a key component of NPS *Management Policies* (NPS 2006b) and Director's Order #12 (NPS 2001). These thresholds provide the reader with an idea of the intensity of a given impact on a specific topic. The impact threshold is determined primarily by comparing the impact to a relevant standard from state or federal regulations or scientific research. Because definitions of intensity vary by impact topic, intensity definitions are provided separately for each impact topic analyzed in this document. The following NPS intensity definitions are used throughout this analysis: negligible, minor, moderate, major. The exception to this is the evaluation of special-status species, which uses the following intensity definitions: inconsequential, minor, moderate, major. The negligible threshold is not used in the evaluation of special-status species because the Marine Mammal Protection Act of 1972, as amended, includes a definition for negligible impacts that does not equate to the lowest impact threshold as defined in this EA. This is discussed further in the methods of special-status species and benthic resources for resource specific regulatory requirements.

CUMULATIVE IMPACTS ANALYSIS METHOD

The CEQ requires assessment of cumulative impacts in the decision making process for federal actions (1978). Cumulative impact "is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative impacts are considered for all alternatives, including the No Action Alternative.

Cumulative impacts were determined by combining the impacts of each alternative with known past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify such actions within Kalaupapa National Historical Park and in the surrounding area. Other actions that have the potential to have a cumulative effect in conjunction with measures that would be implemented in this EA were identified in Chapter 1 in the "Relationship to Other Plans, Policies, and Actions" section.

Those past, present and reasonably foreseeable future actions, plans, and projects that are considered in the environmental analysis for most impact topics include the following:

- ***Phases 1 and 2 of State of Hawaii Department of Health dock repairs:*** The Hawaii DOH has completed the first and second phases of a three phase program to repair the dock structures. Phase 1 and Phase 2 addressed repairs above the water line. Phase 1 of the program included repair of the concrete roadway to the dock and filling in voids in the bulkhead wall with grout. This phase was completed in 2007. Phase 2 of the program

was completed in 2009 and included repairs to the above-waterline pier pile, soffits, and beams, and replacement of the bits, bollards, and fendering system. These improvements also included repair of some spalling concrete and replacement of corroded rebar. Phase 3 includes all underwater repairs as well as completion of concrete repairs to deck pier caps and beams and repair of a void on the north side of the pier that were not completed under Phase 2. The third phase repairs are to be completed by the NPS and are addressed in this environmental assessment.

- ***Integrated solid waste management program:*** The landfill that has serviced the park and community is scheduled for closure on August 31, 2010. The park has instituted a recycling program and a composting center on a small concrete pad adjacent to the landfill. The remaining 20 to 30 percent of solid waste produced is transported offsite by aircraft.
- ***Development of memorials:*** The NPS is currently in the process of developing two memorials within the park. One memorial would be dedicated to Father Damien and the other would memorialize the patients of Kalaupapa. The location of these memorials has not been determined at the time of this writing.
- ***Stabilization and restoration of historic structures:*** Kalaupapa National Historical Park has specific authorizing legislation that requires the NPS to preserve the Kalaupapa Settlement, and to preserve and maintain the present character of the community. The Kalaupapa Settlement contains about 260 structures, of which the NPS has identified more than half as historically or culturally significant. Maintenance of these structures is currently shared between the Hawaii DOH and the NPS. Challenging environmental conditions and reductions in state operations have contributed to the deterioration in the condition of the buildings. The NPS has undertaken stabilization and restoration of structures in the settlement based on the priority identified in the Building Inventory completed in 1977.
- ***Development of a new general management plan for the park:*** The park has begun development of a new general management plan that will provide the framework for protecting park resources, determine what levels and types of uses are appropriate, and what types of facilities should be developed.

In addition to specific agency actions and programs, other activities would continue in the region that would cumulatively impact particular resources. Actions, plans, or programs that have the potential to cumulatively affect specific resources are described in the cumulative effects analysis for those topics.

IMPAIRMENT ANALYSIS METHOD

"Chapter 1: Purpose of and Need for Action" describes the federal acts and policies that, collectively, prohibit the impairment of resources and values in units of the national park system.

NPS policy states that an action constitutes an impairment when its impacts "would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values" (NPS 2006b). Impairment may result from NPS activities in managing the park, from visitor activities, or from activities undertaken by concessioners, contractors, and others operating in the park.

The laws prohibiting impairment give the NPS the management discretion to allow impacts on park resources and values when necessary and appropriate to fulfill the purposes of a park, so long as impairment does not occur. Although the U.S. Congress has given the NPS management discretion to allow certain impacts within parks, that discretion is limited by the statutory requirement (*i.e.*, enforceable by the federal courts) that the NPS must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise.

To determine impairment, the NPS must evaluate: 1) the resources that would be affected; 2) the severity, duration, and timing of the impact; and 3) the cumulative effects of the impact when combined with impacts of other projects and plans (NPS 2006b). An impact on any park resource or value may constitute impairment. However, an impact would be most likely to constitute impairment if it affected a resource or value whose conservation is:

- Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- Key to the natural or cultural integrity of the park or opportunities for enjoyment of the park; or
- Identified as a goal in a park's general management plan or other relevant NPS planning documents.

A determination of impairment is included in the impact analysis sections for all impact topics relating to the natural and cultural resources and values of Kalaupapa National Historical Park. The impact analysis includes findings of impairment of applicable park resources for each of the alternatives.

WATER RESOURCES

AFFECTED ENVIRONMENT

The character of water resources for the Kalaupapa harbor dock repair project is largely a result of the harbor's location on the north shore of Moloka`i and the harbor's exposure to the open ocean (Figure 3). Water circulation around the Hawaiian Islands is driven by a combination of tides, ocean currents, and local wind and eddy systems. Mean tidal range in the Hawaiian Islands is two feet (DoN 2005). Trade winds and the North Pacific Swell are responsible for most surf conditions on the north shore. Trade winds blow from the northeast and east-northeast between 10 and 20 miles per hour, 70 to 80 percent of the time. Waves created by the trade winds range between 3 to 12 feet and arrive every 5 to 9 seconds. The North Pacific Swell occurs most often from October to May, bringing waves typically 5 to 20 feet high, arriving every 10 to 20 seconds (DoN 2005). North Pacific Swell conditions create extreme turbulence and mixing in the project area when they occur.

Offshore water quality in the Hawaiian Islands is generally considered good. Much of the poor water quality along the Hawaiian island coasts are associated with harbors, bays, and protected shores where water mixing is limited and pollutants are retained. Many of these areas are associated with population centers with frequent problems related to excess nutrients, sedimentation, and fecal coliform (Friedlander et al. 2005), which is not the case at Kalaupapa. There are three areas on Moloka`i with state-listed impaired water quality: Kawa`aloa Bay and Mo`omomi Beach (about ten miles west of the Kalaupapa harbor), and the south Moloka`i coast because of nutrients and suspended solids (HDOH 2008a). According to personnel at the Hawaii DOH, there are no established water quality sampling points in the vicinity of the Kalaupapa Peninsula, and a few sampling points exist on the north shore, but those have not been sampled recently.

Kalaupapa staff has not identified any systematic water quality impacts arising from barge service, and water clarity is good. There have been a few accidents over the years associated with the barge service. However, these were dealt with and have not resulted in long term impacts from these events. Good water quality conditions result from:

- Low population and limited development, which reduce land-based sources of pollution, such as excess nutrients and sediments;
- A high-energy coastal environment, which ensures constant mixing and dissipation of suspended materials that do exist; and
- Remaining materials – basalt seafloor and sand – resist suspension or settle quickly.

Cesspools in the Hawaiian Islands are a potentially harmful source of untreated wastewater, although little is known about the impact of seepage of pathogens and excess nutrients on coral reefs (Friedlander et al. 2005). In recent years, NPS assumed responsibility for 22 large-capacity (1,000 gallons) cesspools on the Kalaupapa Peninsula and converted them to septic systems (NPS 2006a, USEPA 2005). According to Aruch (2006), evidence from intertidal areas "suggests localized presence of high nutrients that may be associated with septic leaching," however conclusive data is lacking. The presence of freshwater flows in the harbor near the bulkhead wall had been reported by residents of the community, and gathering and use of freshwater from this source is included as local lore (see "Cultural Resources"). Water quality testing performed at the location in August 2009 identified two potential freshwater seeps in the project area (Figure 11). Tests revealed salinity levels less than that of ocean water (33 parts per thousand) at two locations. At the bulkhead wall, salinity registered 15.2 parts per thousand, and at the base of the dock adjacent to the pier, salinity registered 25.6 parts per thousand (Brown, pers. comm. 2009). No major streams or drainages empty into the harbor.

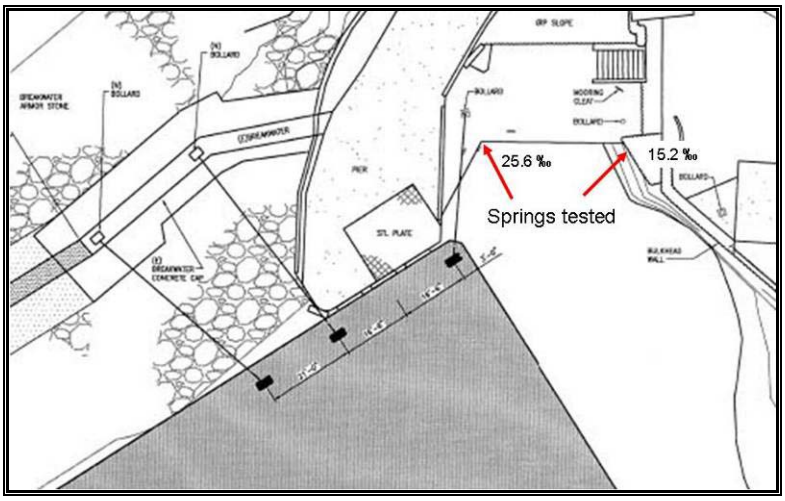

Figure 11. Location of Freshwater Seeps in the Project Area

Drinking water for Kalaupapa residents and staff is provided by a well at approximately 600 feet from the project location (Prokop, pers. comm. 2009). There is one domestic water supply well within the park registered with the state. Currently, there is no comprehensive inventory of water rights and uses for the park (NPS 2000a).

ENVIRONMENTAL CONSEQUENCES

Guiding Regulations and Policies

Federal Regulatory Framework. The federal ***Clean Water Act*** (CWA) is intended "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (33 USC 1251, et seq.). The Clean Water Act established the regulatory framework for water quality standards and the discharge of pollutants into "navigable waters." Within the CWA there are two sections that are relevant to the proposed project.

CWA section 401 requires projects requiring a federal permit, waiver, agreement, or other form of permission to conform to state water quality standards when a project may result in the discharge of material into waters of the U.S. CWA 401 approval is commonly called a clean water certification.

CWA section 402 focuses on the elimination of pollution to waters of the U.S. the National Pollution Discharge Elimination System (NPDES). Typically, section 402 is administered at the state level, as is the case in Hawaii. According to Hawaii DOH, if the project disturbs more than one acre of terrestrial habitat, a permit would be required under Section 402. Neither alternative would disturb an area greater than the one-acre threshold under Section 402, and it is anticipated that a permit would not be required.

Section 404 regulates navigable waters of the U.S. Waters of the U.S., included flowing water such as streams and rivers, standing water such as ponds and lakes, and coastal waters such as estuaries and open ocean. A subset of these waters includes special aquatic sites such as wetlands, mudflats, and reefs.

The NPS is required to protect water quality under both the *Organic Act of 1916* and Clean Water Act. Toward that goal, NPS *Management Policies* provide service-wide guidelines and mandates for the preservation, management, and use of park resources and facilities. Based on these laws and policies, the NPS will "take all necessary actions to maintain or restore the quality of

surface waters and groundwater within the parks consistent with Clean Water Act and all other applicable federal, state, and local laws and regulations" (NPS 2006b, Section 4.6.3).

Section 10 of the ***Rivers and Harbors Act of 1899*** regulates the construction of any structure or work within navigable waters of the U.S. that may affect the course, location, condition, or capacity of those waters (33 USC 403 and 33 CFR 320, et seq.). The U.S. Army Corps of Engineers must authorize such activities. In the case of the Kalaupapa harbor, "navigable waters" refers to waters subject to the ebb and flow of the tide. The U.S. Army Corps of Engineers must consider the following criteria when evaluating project permits: 1) the relative extent of the public and private need for the activity; 2) reasonable alternative locations and methods to accomplish the objective; and 3) the extent and permanence of the beneficial and detrimental effects on the public and private uses to which the area is suited (33 CFR 320.4[2]). A U.S. Army Corps of Engineers permit issued under Section 10 would trigger state water quality certification requirements under Clean Water Act Section 401 (33 USC 1341). The U.S. Army Corps of Engineers informed NPS that the proposed Kalaupapa harbor project comes under U.S. Army Corps of Engineers jurisdiction (USACE 2008).

The ***Coastal Zone Management Act*** encourages coastal states to develop comprehensive programs to manage and balance competing uses of coastal land and water (16 USC 1451, et seq.). Emphasis is placed on controlling non-point source pollution. The program is voluntary, but federal financial incentives are available to states that participate. The concept of "federal consistency" under Section 307 of the act requires that federal agency activities that may affect coastal resources must be consistent with the coastal state's federally-approved coastal management program to the extent practicable. In Hawaii, the Office of Planning in the Department of Business, Economic Development and Tourism manages the coastal management program and reviews all federal consistency determinations (Chapter 205A, Part I, HRS). NPS policies also require the service to comply with state coastal zone management programs (NPS 2006b, Section 4.8.1.1). See Appendix A for the federal consistency determination for the proposed action.

State Regulatory Framework. The Hawaii DOH is responsible for water quality monitoring and enforcement (11-54-3, HAR). DOH areas of protection extend out three nautical miles from the shore. The project will occur in marine waters. Marine waters in Hawaii are classified as either Class AA or Class A (11-54, HAR). The objective of Class AA waters is to ensure that they remain in their natural state as nearly as possible. Class A waters are managed for multiple uses and have lower water quality standards. These designations extend from the shoreline to the 600-foot depth contour. The open coastal waters around the Kalaupapa Peninsula are classified as Class AA (11-54-6[b][2], HAR).

DOH regulations are tied to CWA 401 standards and typically meet or exceed other water quality standards for federal agencies. DOH is also the state lead agency in Hawaii for determining compliance with water quality regulation. Therefore, it is anticipated that meeting DOH water quality requirements for permitting and monitoring will satisfy the requirements for other federal and state agencies. The water quality monitoring plan would be developed by the construction contractor.

The minimum DOH water quality monitoring parameters are turbidity, total suspended solids, and pH. Other parameters related to nitrogen, phosphorus, chlorophyll, and silicates may be imposed on a case-by-case basis. Monitoring typically consists of water sampling at locations established in a water quality monitoring plan, which must be approved by the Hawaii DOH. However, alternate methods may be approved based on site conditions. Sampling is required for all projects and the frequency of sampling is based on the duration of in water activities. For example, projects lasting up to two months require daily sampling, while projects lasting up to five months require sampling three times each week (HDOH 2009). Table 6 provides the DOH water quality limits for turbidity and total suspended solids (light extinction coefficient) that are likely applicable for the project area. It should be noted that the sampling includes control

points so that naturally occurring (ambient) conditions are taken into account and the project is not penalized if nature exceeds the water quality standards.

Table 6. Selected Water Quality Criteria for Class AA Open Coastal Waters

Parameter	Geometric mean not to exceed the given value	Not to exceed the given value more than 10% of the time	Not to exceed the given value more than 2% of the time
Light extinction coefficient (k units)	0.20 *	0.50 *	0.85 *
	0.10 **	0.30 **	0.55 **
Turbidity (NTU)	0.50 *	1.25 *	2.00 *
	0.20 **	0.50 **	1.00 **

*Wet criteria – open coastal waters receive more than 3 million gallons per day of fresh water discharge per shoreline mile
**Dry criteria – open coastal waters receive less than 3 million gallons per day of fresh water discharge per shoreline mile
k units = the ratio of light measured at the water's surface to light measured at a particular depth
NTU = "nephelometric turbidity units," a comparison of the intensity of light scatter

The first column is the value (in NTU) which overall turbidity cannot exceed when sampling values are averaged using the geometric mean method. The second and third columns are maximum standards developed with the understanding that construction will have some impact on the environment. For example, if a project in water extends for 50 days; then, because it is less than two months in duration, sampling would occur daily - generating 50 samples from each sample location. The overall average of non-control samples would need to be less than 0.2 NTUs. Only five of the individual samples (10%) could exceed 0.5 NTUs, while only ones sample (2%) could exceed 1.0 NTU.

Methods and Assumptions

Water quality can be split into two classes: drinking water quality and general water quality. Because the proposed project would not impact drinking water quantity, the topic is not considered for analysis. The proposed project would have the potential to affect marine water quality. The topic of ballast water management is addressed in "Benthic Resources and Essential Fish Habitat."

Information Sources. Impacts on water quality were evaluated and determined qualitatively based on the professional judgment of NPS staff and consultants. The primary sources of information used in this analysis included existing park and NPS management documents, prior park studies and environmental documents, NPS policy documents, agency regulations, published reports and scientific literature, and unpublished observations and insights from knowledgeable park staff.

Assumptions. As noted in the introduction, coastal water quality in the Hawaiian Islands is generally good. Although waters in the project area are not monitored, water quality in the harbor is assumed to be good based on comparing conditions known to generate water quality issues in the islands to the project location. Conditions that are known to generate water quality issues are typically related to population centers, coastal development, and poor water circulation. By comparison, the Kalaupapa Peninsula is sparsely settled, development is minimal, and the harbor's exposure to the open ocean creates more or less continually circulating water. Last, given

the harbor's exposure to the open ocean, removal of armor stones proposed under Alternative B would not appreciably alter existing patterns of water circulation or deposition in the harbor.

Other assumptions used in this analysis include: 1) the geographic area considered for impacts to water quality is the Kalaupapa harbor; 2) non-structural methods undertaken to ensure continued barge service would have no environmental impacts; and 3) construction activities proposed under Alternative B would not preclude regular barge delivery service.

Impact Criteria and Thresholds

The most common issues related to water resources from harbor construction projects include turbidity, sedimentation, spills, and other discharges from construction activities. Impacts to water quality were evaluated using the criteria and thresholds described below.

Negligible: Impacts to water quality would be below the level of detection.

Minor: Impacts to water quality would be detectable, but localized, and would dissipate almost immediately. State water quality standards would not be violated.

Moderate: Impacts to water quality would be readily apparent, localized, and would result in periodic violations of state water quality standards.

Major: Impacts to water quality would be readily apparent, widespread, and result in ongoing violations of state standards.

Duration:

Short-term: Effects occur only during duration of project implementation; or during a timeframe further refined by the water quality monitoring plan.

Long-term: Effects extend beyond the duration of the project.

Impacts of Alternative A, the No Action Alternative

Alternative A would continue current management and operations at the Kalaupapa harbor. Necessary emergency repairs such as above-water patching and maintenance would take place, but no underwater work would occur. This present level of maintenance would not be adequate to prevent long-term effects such as collapse of the bulkhead, further damage to the low dock toe from erosion, or loss of sections of the breakwater, which could result in occasional long-term, localized, negligible-to-minor, adverse effects to water quality when portions of the structure collapse into the harbor. The NPS would continue to manage materials delivery, including fuel, as it has in the past. No measurable effects on water quality in the harbor related to barge delivery service have been noted to date, and this condition is anticipated to continue. There could be long-term, localized, negligible-to-minor, adverse effects on water quality under Alternative A.

Cumulative Impacts. Alternative A could result in localized, negligible-to-minor, adverse effects on harbor water quality. Improved management of wastewater under the NPS septic tank project has reduced the potential for nutrient and coliform bacteria contamination of the harbor, producing localized, negligible-to-minor, long-term benefits. Other projects and plans would have no impacts on water quality because they would not likely alter the frequency of barge deliveries or the types and amounts of materials delivered, nor would those projects and plans alter overall park activities. The anticipated effect on water quality from other projects and plans would be localized, negligible-to-minor, and beneficial. Alternative A would make no contribution to these cumulative effects.

Conclusion. Alternative A could result in localized, negligible-to-minor, adverse effects on water quality. Alternative A would not contribute to cumulative effects of other plans and projects.

There would be no unacceptable impacts to or impairment of water resources or values under Alternative A.

Impacts of Alternative B, the Preferred Alternative

Alternative B would include completion of the repairs necessary to maintain barge service – filling voids and repositioning boulders. These activities would require up to four months to complete. The armor stone removal portion of the project is anticipated for approximately one to two days.

The existing basin is approximately 70 feet wide by 310 feet long (21,700 square feet), with depths increasing from 5 to 13 feet in the seaward direction. The work proposed under Alternative B is estimated to directly disturb about 25 percent of the existing basin or about 5,500 square feet (0.13 acre). Impacts to water quality would arise from suspended sediments caused by repositioning the breakwater armor stones and bulkhead stones and stabilization of the low dock and bulkhead toes. Materials disturbed would include existing sand and basalt rock, and a limited amount of finer sediments associated with these materials (e.g., organics, detritus, silts, and clays). The volume of armor stone material to be moved under Alternative B is not known.

Given the limited amount of work associated with work on the underwater structure and the relatively high-energy environment of the harbor; turbidity above ambient conditions would not likely persist and finer sediments would be minimal and would dissipate quickly. A WQMP will be developed in conjunction with and approved by the DOH as mitigation. The WQMP has quantifiable water quality thresholds for a range of water quality parameters based on the projects details. The WQMP would contain further BMPs and mitigation measures, including a stop work clause in case of violations. Violations of water quality parameters are not anticipated. Overall impacts from construction disturbance during project implementation would be short term, localized, negligible-to-minor, and adverse.

Other impacts from marine construction projects that are often noted include release of contaminants and changes in water circulation patterns (Rogers 1990, Maragos 1993). However, the limited amount of underwater work proposed under Alternative B would not change water circulation patterns, and the sand and basalt rock that comprise the harbor bottom are not the types of materials that release contaminants.

The use of cement-based and chemical grouts is proposed for the bulkhead wall. Cement-based grouts are common and generally use Portland cement as their primary ingredient. Chemical grouts are composed of two or more chemicals that when injected into place they form a solid, semi-solid, or gelatinous material by binding the adjacent materials. The resulting product is largely inert. Such grouts were developed to address issues related to the unwanted movement of water or sediment and to strengthen materials within or around existing structures. They are often used in situations where the spaces to be filled are too small for cement-based grouts to be effective. Table 7 provides a list of major types of chemical grouts (USACE 1995).

Table 7. Selected Properties of Chemical Grouts

	Properties*		
Type of Grout	Durability	Ease of Application	Relative Cost
Portland Cement-based	L	M	L
Silicates	H	H	L
Acrylates	H	H	H
Lignins	H	H	H
Urethanes	M	M	H
Resins	L	M	H

* L = Low, M = Moderate, and H = High

The choice of grout will be influenced by the specific problem to be addressed (e.g., strength), specific project needs (e.g., durability), the amount of grout needed, and project site characteristics. Important site characteristics include flows, the type and size of substrate material, its permeability and porosity, and the size of voids.

Site-specific conditions would determine whether cement grout or some other type of grout would be used on the bulkhead wall and the breakwater (Craig Lewis, pers. comm. 2009). Some of these materials are toxic if improperly handled, or may become toxic if improperly used. Unreacted grout components may also pose problems. In some cases, regulatory approval may be required (USACE 1995).

Due to environmental conditions at the site and the nature of the work, the grout used must be strong and durable. In order to work, such grouts must not dissolve in water, but must displace the water present in the voids and adhere to the adjacent materials in order to bind them solidly. If they do not, the desired structure fails. These characteristics limit potential problems related to grout toxicity or the movement of grout beyond the area of application. The use of grout will be discussed with the DOH as part of the development of the Water Quality Monitoring Plan (WQMP) and appropriate prevention, emergency response, and monitoring provisions will be included. Based on these considerations, the impacts of grout on water quality would be short-term, localized, minor, and adverse.

Under normal circumstances, the barge occupies the berthing basin one to three days a year. During construction, more barges and more machinery would be present in the harbor. This increases the potential for water quality impacts from wet exhaust and inadvertent spills (e.g., construction materials, cement, hydraulic fluids, and fuel). NPS policies require that each park take all reasonable measures to prevent and minimize the release of materials harmful to park resources (NPS 2006a, Section 9.1.6.2). Units of the NPS system must also have an oil and chemical spill response management plan in place to address spills, whether related to NPS activities or not (NPS 2006a, Section 8.2.5.2). As a resource protection measure, the construction contractor would be required to submit a spill prevention plan detailing the actions that would be taken in case of a spill.

Such a plan would also include construction best management practices (BMPs) to prevent spills from occurring. Examples of BMPs include:

- Appropriate placement of fueling areas and material storage;
- Safe storage and handling of hazardous materials;
- Spill notification procedures;
- Onsite storage of spill clean-up materials, such as absorbent pads and booms;
- Development of a Water Quality Monitoring Plan that would be developed in consultation with the DOH.

Harbor water quality would return to normal natural conditions shortly after cessation of work, and no long-term effects would occur. However, due to the variable natural conditions on the north shore of Moloka`i, providing an exact meaningful estimate of duration is difficult. A reasonable estimate is likely measured in days.

Cumulative Impacts. Alternative B would have localized, negligible to minor, and adverse impacts on water quality during project implementation. No long-term effects are anticipated. As described for Alternative A, improved management of community septic systems by the NPS would produce long-term, localized, negligible-to-minor benefits. The cumulative effect of Alternative B and other projects and plans would be long-term, localized, negligible-to-minor, and beneficial.

Conclusion. Alternative B would have localized, negligible-to-minor, and adverse impacts on water quality during project implementation. No long-term, water quality effects are anticipated. The cumulative effect of Alternative B and other projects and plans would be localized, negligible-to-minor, and beneficial.

There would be no unacceptable impacts to or impairment of water resources and values under Alternative B.

BENTHIC RESOURCES AND ESSENTIAL FISH HABITAT

AFFECTED ENVIRONMENT

"Benthic" (or bottom habitat) is derived from the Greek "benthos" which means "depths of the sea." The character of the benthic environment of the Kalaupapa harbor is largely the result of three conditions. First, excavation to modify the harbor in the 1960s and again in the 1990s reduced the complexity of the harbor bottom and thereby reduced the habitat and species diversity relative to other areas of the park. Second, because of the peninsula's orientation (Figure 3 in Chapter 1), the area is exposed to open ocean surf. Third, the area is dominated by basaltic rock substrate. The influence of these conditions on the biological components of the benthic environment is described below.

The impact of harbor excavation is described in recent evaluations of benthic habitat in the park and elsewhere in the Hawaiian Islands. According to Brown et al. (2008), the complexity of submerged habitat within the harbor is quite low, especially when compared to other areas of the park along the peninsula. Beets et al. (2006) reported that, overall, habitat complexity in the offshore areas of Kalaupapa National Historical Park compared favorably with other NPS units on the west side of the island of Hawai`i. Figures 12 and 13 from Brown et al. (2008) demonstrate the differences between benthic habitat inside and outside the harbor.

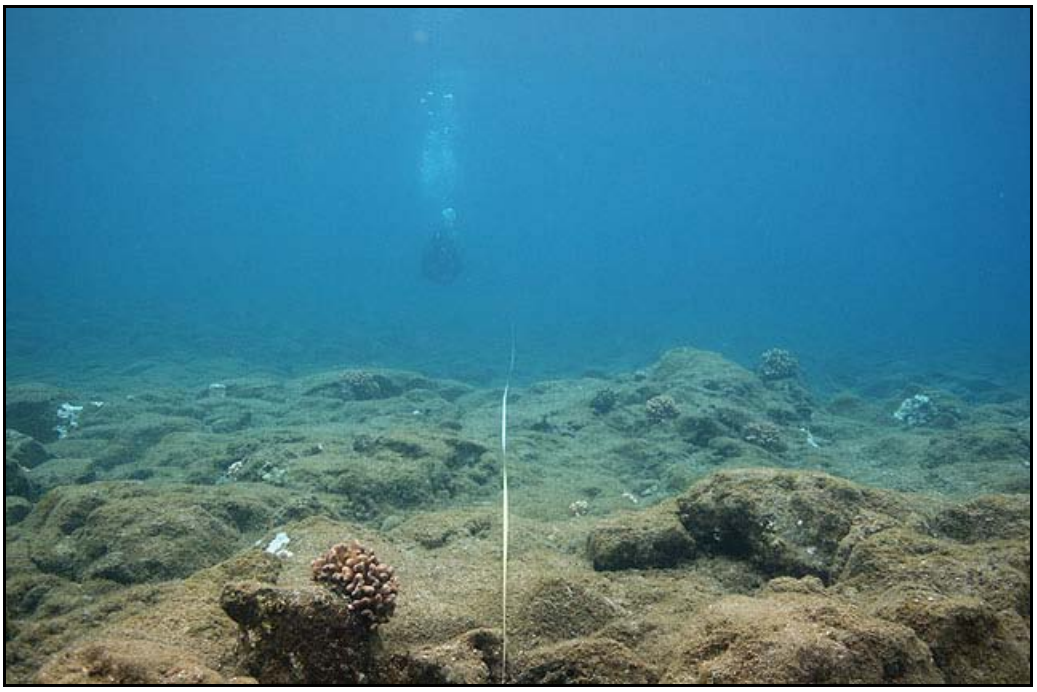

Figure 12. Harbor Seafloor Habitat in the Project Area

Figure 13. Harbor Seafloor Habitat Adjacent to Project Area

Physical alteration of the harbor area has also eliminated much of the intertidal zone in the project area. See Figures 14 (NPS 2008) and 15 (from Minton and Carnevale 2006) for a comparison of intertidal habitat in the harbor and another area to the south.

Figure 14. Harbor Berthing Basin

Figure 15. Intertidal Habitat South of the Harbor

Ocean currents along the north shore of Moloka`i flow from east to west, and trade winds blow from the northeast and east-northeast 70 to 80 percent of the time. Kona (southerly) winds generally blow from the opposite direction the remainder of the time (DoN 2005). The Trade winds and the North Pacific Swell are responsible for most surf conditions on the north shore of Moloka`i. Trade wind waves range between 3 to 12 feet and arrive every 5 to 9 seconds. The North Pacific Swell occurs most often from October to May, although it can occur any time during the year. It generally comes from the northwest. Waves are typically 5 to 20 feet high and arrive every 10 to 20 seconds (DoN 2005). Mean tidal range in the Hawaiian Islands is two feet, which restricts the extent of the inter-tidal zone (DoN 2005).

The volcanic origin of the Hawaiian Islands accounts for the dominance of basaltic rock substrate in the Kalaupapa harbor (Figure 16). The majority of the substrate is either pavement or volcanic rock/boulder habitat. Under such conditions, both plants and animals are largely limited to surface attachment (e.g., turf and other algaes, sponges, corals, barnacles, and bivalves), or movement among these stationary creatures (e.g., starfish, snails, fish, and crab, shrimp, and other crustaceans). Mostly absent are burrowing organisms and deep-rooted plants (Tait and Dipper 1998).

Benthic Resources at Kalaupapa Harbor

Although the south coast of Moloka`i supports the largest fringing reef in Hawaii, no significant reef development exists on the north shore of Moloka`i, including the Kalaupapa Peninsula (WPRFMC 2005, Minton and Carnevale 2006). A recent assessment of marine resources in the Kalaupapa harbor noted that the percent cover of the few coral species present was less than one percent. Macroalgae represented about two percent, and turf algae averaged over 75 percent (Brown et al. 2008). Estimates in Beets et al. (2006) for similar habitat on the north shore were eight percent coral cover, four percent macroalgae, and 67 percent turf algae. Turf algae provides habitat for many creatures, including parrotfishes, surgeonfishes, crustaceans, polycheates, and bivalve larvae (Jennings et al. 2001; Miller et al. 1996).

Eight coral species were identified by Brown et al. (2008) within the harbor, including *Montipora* spp. (rice corals), *Pocillopora meandrina* (cauliflower coral), and *Porites lobata* (lobe coral), species that are indicative of high-energy environments (Storlazzi et al. 2001). Similar observations regarding benthic habitat on the peninsula were noted in recent National Oceanic and Atmospheric Association (NOAA) habitat mapping studies of the north shore (NOAA 2003) and by Friedlander et al. (2005). Minton and Carnevale (2006) noted that for intertidal invertebrates

"species richness appears to decline moving around the peninsula from Piko'one and Kauwo," perhaps as a result of wave exposure. Brown et al. (2008) also noted the low level of diversity and productivity within the harbor as compared to other areas of the park. However, those authors also commented that, overall, the Kalaupapa Peninsula "has exceptional examples of exposed, basalt shoreline, intertidal communities and submerged boulder communities."

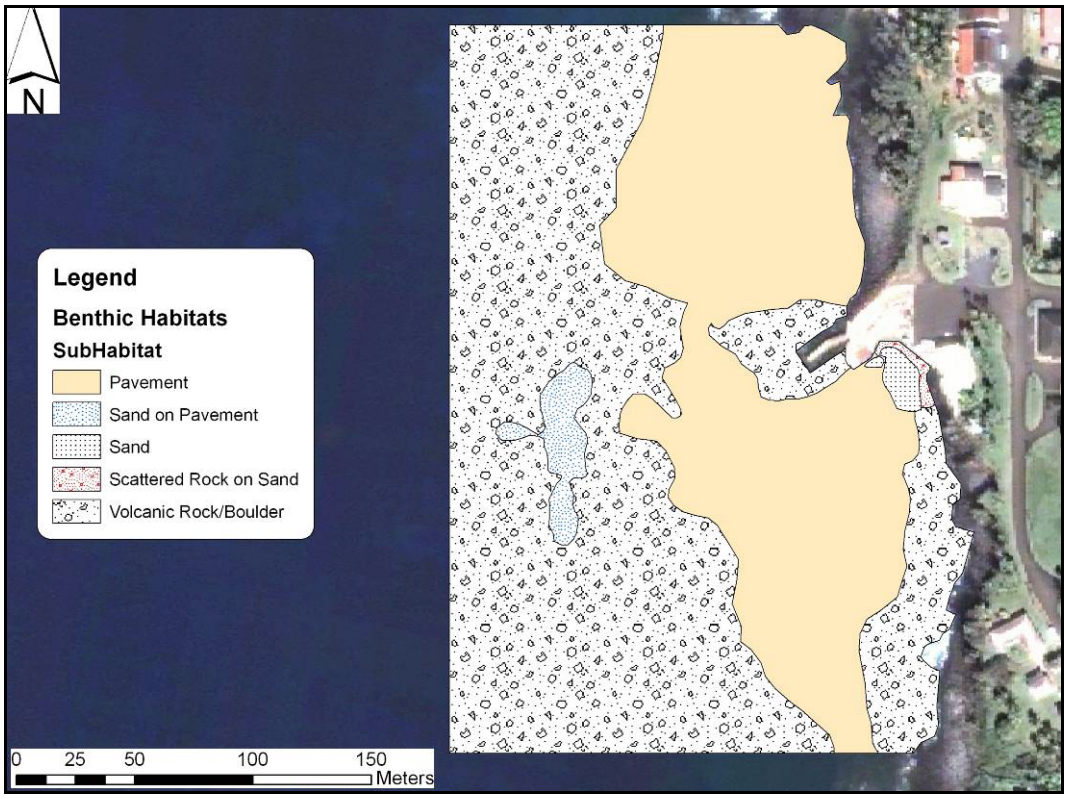

Figure 16. Location of Benthic Habitat

Several factors influence coral colonization within the Kalaupapa harbor. Most influential of these is previous harbor excavation, which occurred most recently in the early 1990s. At that time, a large cylindrical weight with a rounded end was dropped repeatedly on the seafloor to break up uneven surfaces and to smooth out the substrate (Brown et al. 2008). Those authors estimated that recolonization of the harbor would require 10 to 15 years, but disturbance to shallow-water coral species may require 20 years to recover (WPRFMC 2005). In comparison, recovery of turf algae is fairly rapid.

The relatively high-energy environment at the harbor also influences coral recolonization. Waves are the single most important factor in determining the community structure and composition of exposed reef communities throughout the main Hawaiian Islands (Friedlander et al. 2005; WPRFMC 2005). According to Jokiel et al. (2005), areas in the islands that are exposed to the larger west and northwest swells generally had lower percent coral cover, lower species richness, and lower diversity. Brown et al. (2008) cited occasional damage from annual barge operations, such as dragging cable lines, as another reason for the lack of coral development within the barge berthing basin.

Invertebrates found along Moloka`i's coastline include limpets (*Cellana* spp.), sea snails (*Nerita picea*), periwinkle (*Littorina* spp.), cowry (*Cypraea* spp.), several species of sea urchins (*Heterocentrotus mammillatus, Colobocentrotus atratus* and *Centrechinus paucispinus*), and crustaceans such as the red rock crab (*Grapsus grapsus tenuicrustatus*). Sand or silt bottom conditions present in some parts of the harbor provide habitat for lamellibranchs such as the bivalve *Brachiodontes cerebristriatus*.

No unique or rare species of coral or invertebrates were noted by Brown et al. (2008), although the brown alga, *Padina melemele*, was seen throughout the harbor. Considered rare in some locations, it is common along the north shore of Moloka`i. Minton and Carnevale (2006) noted the presence of four endemic species of limpet (*opihi*), in notably high densities and large sizes. Godwin and Bolick (2006) noted three new species of sea cucumbers (e.g., holothuroids, a type of echinoderm) and two new species for the Hawaiian Archipelago (a sea cucumber and a ribbon worm). Aruch (2006) estimates that, due to the low level of sampling, about 10 percent of the total number of subtidal benthic species in the park has been observed.

Brown et al. (2008) noted two introduced marine species, spiny seaweed (*Acanthophora spicifera*) and snowflake coral (*Carijoa riisei*), near the project area. Spiny seaweed is a red algae native to Caribbean reef flats. It occurs primarily in the tidal and subtidal zones to depths of 65 feet. *A. spicifera* likely arrived in Hawaiian waters on boat hulls during the late 1940s and early 1950s. Although this species has been shown to compete with native species in Hawaii, it has added to the overall productivity of the area as a significant part of the diet for some fish species and the green sea turtle, *Chelonia mydas* (Smithsonian 2007).

Snowflake coral is native to the western Atlantic and the Caribbean from Florida to Brazil. *C. riisei* was first discovered in Pearl Harbor in 1972 and has since spread throughout the archipelago. It was likely introduced via ship hulls or in ballast water. It is found at depths over 300 feet in Hawaiian waters. Snowflake coral can consume large quantities of zooplankton and has a high rate of reproduction compared to other corals. It has been described as the most invasive of the non-indigenous marine invertebrates in Hawaii. Of particular concern are its impacts on black coral colonies (GISD 2005; see "Precious Corals" in the next section).

Godwin and Bolick (2006) noted nine introduced invertebrate species in the Kalaupapa harbor, including a hydrozoan (1), tube worms (2), an amphipod (1), mantis shrimp (1), and tunicates (4).

Differences in the findings of these three studies result from differences in the areas studied and the intensity of sampling. For instance, the study by Brown et al. (2008) was limited to the project area, and no nighttime sampling was conducted which would limit the census of nocturnal species such as crustaceans. Godwin and Bolick (2006) focused on the intertidal habitat in the park, with 12 transects distributed across the peninsula. Minton and Carnevale (2006) focused on intertidal invertebrates at 14 sites along the peninsula.

Essential Fish Habitat at Kalaupapa Harbor

Essential fish habitat (EFH) includes water and substrates necessary to fish for spawning, breeding, feeding, or growing to maturity. EFH components include aquatic areas (physical, chemical, and biological aspects), sediments and hard substrates, and related biological communities (NMFS 2004). Such areas are designated by regional fisheries councils under the authority of the federal Magnuson-Stevens Fishery Conservation and Management Act. Regulations implementing the act further define "habitat areas of particular concern" (HAPC) as discrete areas within EFH that either play especially important ecological roles in the life cycles of federally managed fish species or are especially vulnerable to degradation from fishing or other activities (50 CFR 600.815[a][8]). More details regarding the regulatory aspects of the Magnuson-Stevens Act, EFH, and related topics are provided in the Environmental Consequences section that follows.

Additional information regarding species managed under the act – "management unit species" – is provided below. Units include bottomfish, crustaceans, precious corals, and coral reef ecosystem species. This information was drawn from Western Pacific Region Fisheries Management Council (2005), which also contains lists of species for each group.

Bottomfish. Bottomfish include species from four families: snappers (*Lutjanidae*), groupers (*Serranidae*), jacks (*Carangidae*), and emperors (*Lethrinidae*). Each group contains species that

are predominantly deep-water (300 to 1,200 feet) and others that prefer shallow water and reef systems (0 to 300 feet). These distinctions often change with age, with juvenile fish preferring shallower habitat. Some species school while others are solitary. Habitat is often a mosaic of sandy, low-relief areas and rocky, high-relief areas. Important components appear to be high relief with water movement. Adults are usually found in areas of hard substrate with complex structure. Beets et al. (2006) noted the presence of a native and an introduced snapper, an introduced grouper, a native amberjack, and a native emperor in nearshore peninsula habitat.

Designated EFH for the eggs and larvae of both deep- and shallow-water bottomfish is the water column from the shoreline to a depth of 1,200 feet. Designated EFH for juveniles and adults of both deep- and shallow-water bottomfish consists of the water column and all bottom habitat from the shoreline to a depth of 1,200 feet. Based on these descriptions, the proposed project area includes EFH for bottomfish. No HAPC for bottomfish is within the project area.

Crustaceans. The most likely to occur crustaceans in the proposed project area are spiny lobsters (*Palinuridae*) and slipper lobsters (*Scyllaridae*). Spiny lobsters are common in rocky, well-protected areas and in crevices under rocks. They are nocturnal predators on reef flats. Depth distribution is 10 to 655 feet, but most commonly in waters less than 300 feet deep. After hatching, larval stages are planktonic (free-floating) from one month to a year. Recent studies of nearshore peninsula habitats did not identify the presence of these species (Beets et al. 2006; Godwin and Bolick 2006; and Brown et al. 2008). However, Minton and Carnevale (2005) did find these species subtidally, which was the focus of their study in comparison to the others mentioned.

Designated EFH for lobster larvae is the water column from the shoreline to a depth of roughly 500 feet. Designated EFH for juvenile and adult lobsters is bottom habitat from the shoreline to a depth of roughly 325 feet. This EFH includes the Kona crab (*Ranina ranina*). Based on these descriptions, the proposed project area includes EFH for crustaceans. No HAPC for crustaceans is within the project area.

Precious Corals. Precious corals are grouped into shallow-water species that live from roughly 100 to 330 feet below the surface ("black corals"; *Antipathes* spp.), and deep-water species that live from roughly 1,150 to 3,300 feet below the surface (e.g., *Gerardia* sp. and *Parazoanthus* sp.). Unlike other corals, precious corals lack symbiotic algae in their tissues. They are slow growing and long lived, are non-reef-building, filter-feeders, and are often found in areas with moderate to strong currents. Larvae of precious corals are planktonic (free-floating) and adults sessile (stationary).

Designated EFH for precious corals in the Hawaiian Islands includes three black coral beds and six known areas where other precious coral species exist, none of which are found in or near the project area.

Coral Reef Ecosystems. The most commonly harvested species in this ecosystem are surgeonfishes (*Acanthuridae*), triggerfishes (*Balistidae*), jacks (*Carandidae*), parrotfishes (*Scaridae*), soldierfishes (*Holocentridae*), wrasses (*Labridae*), octopus (*O. cyanea*, *O. ornatus*), and goatfishes (*Mullidae*). This ecosystem also includes cephalopods, crustaceans, lobsters, shrimp, crabs, and annelid worms. Little is known about the life histories, habitat utilization patterns, food habits, or spawning behavior of most coral reef-associated species. Several of these species were noted in nearshore peninsula habitats by Brown et al. (2008) and Beets et al. (2006).

Designated EFH for coral reef ecosystem species includes the water column and all benthic habitat from the shoreline to 300 feet below the surface. Based on this description, the proposed project area includes EFH for the coral reef ecosystem group. No HAPC for coral reef ecosystems is within the project area.

Effects of Sound on Benthic Invertebrates

Very little is known about sound detection and use of sound by invertebrates (see Budelmann 1992a, b; and Popper et al. 2001 for reviews). The limited data shows that some crabs are able to detect sound and other groups of invertebrates are thought to sense low-frequency sound, such as cephalopods (octopus and squid) and decapods (lobster, shrimp, and crab) (Budelmann 1992b). McCauley et al. (2000) reported that caged squid show behavioral responses when exposed to sounds from a seismic airgun.

Like fish, some invertebrate species produce sound, with the possibility that it is used for communication. Sound is used in territorial behavior, to deter predators, to find a mate, and to pursue courtship (Popper et al. 2001). Well-known sound producers include lobsters (*Panulirus* sp.) (Latha et al. 2005) and snapping shrimp (*Alpheus heterochaelis*) (Heberholz and Schmitz 2001). Snapping shrimp make up a significant portion of the ambient noise in many locales (Au and Banks 1998).

There has been a recent and unpublished study in Canada that examined the effects of seismic airguns on snow crabs (DFO 2004). However, the results of the study were not definitive, and it is not clear whether there was an effect on physiology and reproduction of the animals.

There is also some evidence that increased background noise (for up to 3 months) may affect at least some invertebrate species. Lagardère (1982) demonstrated that sand shrimp (*Crangon crangon*) exposed in a sound-proof room to noise that was about 30 dB above ambient for 3 months demonstrated decreases in both growth rate and reproductive rate. In addition, Régnault and Lagardère (1983) showed changes in the physiology of the same species (e.g., greater ammonia excretion rate) with increased noise, and that these changes showed no evidence of adaptive reduction after five days.

Finally, there was a recently published statistical analysis that attempted to correlate catch rate of rock lobster in Australia over a period of many years with seismic airgun activity (Parry and Gason 2006). The results, while not examining any aspects of rock lobster behavior or doing any experimental study, suggested that there was no effect on catch rate from seismic activity, thus suggesting no behavioral response to noise at that level.

ENVIRONMENTAL CONSEQUENCES

Guiding Regulations and Policies

Federal Regulatory Framework. The ***Magnuson-Stevens Fishery Conservation and Management Act*** is the primary law governing marine fisheries management in United States federal waters (NMFS 2009; 16 USC 1801, et seq.; 50 CFR 601, et seq.). The act authorizes the National Marine Fisheries Service (NMFS) to evaluate programs and projects that are proposed, permitted, or licensed by federal agencies that may adversely affect marine, estuarine, or anadromous species (e.g., salmon), or the habitats of these species. Adverse effects may be direct (e.g., physical disruption of habitat) or indirect (e.g., loss of prey species). NMFS may make recommendations regarding how to avoid, minimize, or compensate those adverse impacts. Federal agencies are required to consult and cooperate with NMFS.

The act requires the regional fisheries management councils to describe and identify the EFH for the species managed under the act ("management unit species"). EFH includes water and substrates necessary to fish for spawning, breeding, feeding, or growing to maturity. EFH components include aquatic areas (physical, chemical, and biological aspects), sediments and hard substrates, and related biological communities. The regional councils are also required to identify other actions to encourage the conservation and enhancement of EFH. Regulations implementing the act further define "habitat areas of particular concern" (HAPC) as discrete areas within EFH that either play especially important ecological roles in the life cycles of federally-

managed fish species or are especially vulnerable to degradation from fishing or other activities (50 CFR 600.815[a][8]).

Note: Since there are no habitat areas of particular concern within the project area, the issue will not be analyzed further.

Executive Order 13089, *Protect Reef Habitat* (1998), directs all federal agencies with programs or projects that may impact coral reef ecosystems to ensure that those activities do not degrade those ecosystems. Agencies are also directed to use their programs or projects to protect and enhance those ecosystems. Toward those ends, federal agencies are directed to cooperate with regional fisheries councils, affected states, non-governmental organizations, and commercial interests.

The ***Coastal Zone Management Act*** was enacted to encourage coastal and Great Lakes states to develop comprehensive programs to manage and balance competing uses of and impacts to coastal resources (16 USC 1451, et seq.; 15 CFR 923 and 930). Federal agencies with projects or activities likely to impact coastal resources are required to perform those projects or activities in conformance with a coastal state's federally-approved coastal management program. This is often referred to as "federal consistency." Hawaii's coastal zone program is administered by the Office of Planning within the Department of Business, Economic Development and Tourism. See Appendix A for a detailed discussion of the state program and the federal consistency determination.

Section 10 of the ***Rivers and Harbors Act of 1899*** (RHA) regulates the construction of any structure or work within navigable waters of the U.S. that may affect the course, location, condition, or capacity of those waters (33 USC 403). Such activities must be reviewed and approved by the U.S. Army Corps of Engineers. Resource impacts may have to be avoided, minimized, and mitigated (33 CFR 332.1). Additional provisions of the act are discussed in "Water Resources."

The federal ***Clean Water Act*** is intended "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (33 USC 1251, et seq.). It established the regulatory framework for water quality standards and the discharge of pollutants into navigable waters of the U.S. The law is administered by the U.S. Army Corps of Engineers ("Corps") and the U.S. Environmental Protection Agency. The Corps informed NPS that the proposed Kalaupapa harbor project came under Corps jurisdiction (USACE 2008). See "Methods and Assumptions" for additional discussion of habitat evaluation in the context of the Clean Water Act.

State Regulatory Framework. The Hawaii Department of Land and Natural Resources (DLNR) manages all state lands and submerged lands out to three nautical miles. Management of marine resources falls largely on the Division of Aquatic Resources within DLNR. Construction activities may impact submerged resources in the berthing basin, which would require a "conservation district use permit" from the Office of Conservation and Coastal Lands (OCCL) within DLNR (13-5, HAR). The Conservation District Use Permit would also address state prohibition on the breaking or damaging of any stony coral from the waters of Hawaii, including any reef or mushroom coral (13-95-70 and 71, HAR). The NPS would complete this permitting process as part of the overall compliance effort for this project.

State standards as defined in the Hawaii Administrative Rules also contain special classifications for marine bottom ecosystems as Class I or Class II (11-54-7, HAR). The management objective is to keep Class I marine bottom ecosystems as natural as possible, with only non-consumptive uses allowed. Class II marine bottom ecosystems allow multiple uses. The marine bottom of the Kalaupapa Anchorage is Class II (11-54-7d2A, HAR).

The Hawaii coastal zone program is administered by the Department of Business, Economic Development and Tourism. Proposals with likely impacts to coastal resources must submit a coastal zone consistency determination no sooner than 90 days prior to approval of the project

(15-150, HAR). See Appendix A for more details of the state program and the federal consistency determination.

Methods and Assumptions

Information Sources. Impacts on benthic habitat and EFH were evaluated and determined qualitatively based on the professional judgment of NPS staff and consultants. The primary sources of information used in this analysis included existing park and NPS management documents, prior park studies and environmental documents, NPS policy documents, published reports and scientific literature, and unpublished observations and insights from knowledgeable park staff.

Assumptions. Assumptions used in this analysis include: 1) the geographic area considered for impacts to benthic resources, special aquatic sites, and EFH is the Kalaupapa harbor; 2) non-structural methods to ensure future barge service would have no environmental effects; 3) the eventual adoption and implementation of the park's new general management plan would not appreciably affect harbor operations or benthic habitats; and 4) none of the alternatives would impact wetlands or other special aquatic sites. Two different directives govern benthic habitat in the project area. One is a category of habitats referred to as "special aquatic sites" (CWA Section 404; 40 CFR 230, Subpart E). These are a subset of "waters of the U.S." under the Clean Water Act and the Rivers and Harbors Act. Common special aquatic sites in a marine shoreline setting could include wetlands, vegetated shallows, and coral reefs. If any of these habitats are within the project area, CWA Section 404 ***would*** apply, as would NPS natural resource policies. The other category is governed by NPS policies that require the use of the aquatic habitat classification system developed by Cowardin et al. (1979) (NPS 2002). Common aquatic habitats in a marine shoreline setting in the Cowardin system include intertidal wetlands, coral reefs, and deepwater. If any of these habitats are within the project area, CWA Section 404 ***may*** apply, as would NPS natural resource policies.

As previously stated, according to the NPS Procedural Manual 77-1: Wetland Protection; the marine environment of the harbor is considered subtidal as it remains flooded and is therefore a deepwater habitat, not a wetland. Physical alteration of the harbor area from previous development and shore armoring has eliminated much of the inter-tidal zone in the project area. Under Alternative B, the splash-zone in the area of the breakwater would not be adversely affected by the proposed action. Replacement of armor stones into the breakwater would provide additional habitat to those invertebrates that occupy the splash-zone, which may be considered a negligible to minor benefit. As such, wetlands have been dismissed from further evaluation. For CWA Section 404, coral reefs are defined as calcium or silicon-based materials produced by anthozoans or other invertebrates. Under the Cowardin system, coral reefs are "characterized by their elevation above the surrounding substrate and their interference with normal wave flows." Because corals cover less than one percent of the substrate in the project area (Brown et al. 2008) and exist as individual colonies (Figure 12), the area is not considered a coral reef under both Section 404 and Director's Order #77-1 (NPS 2002).

Impact Criteria and Thresholds

The impact criteria and thresholds for benthic resources and essential fish habitat are provided below. These thresholds are based on the laws, regulations, and NPS policies applicable to each resource.

Impact Criteria and Thresholds – Benthic Resources. Impact criteria and thresholds for benthic resources are described below.

Negligible: Effects would be below the level of detection. Changes would be so slight that they would not be of any measurable or perceptible consequence to the diversity, abundance, or

health of the resource. There would be no loss of organisms. The habitat would retain its current level of ecological function.

Minor: There would be detectable effects to benthic habitat or species and the loss of individual organisms may occur. However, no measurable changes would occur in natural processes and overall ecosystem function, nor would there be population-level impacts.

Moderate: Effects would be readily detectable and result in a reduction in species abundance and diversity. Key lifecycle processes would be disrupted that would alter population size or distribution, but natural conditions would return after the initial disturbance. Sufficient habitat would remain functional to support plant and animal populations that depend on it.

Major: Effects would be readily detectable, resulting in substantial reduction in the abundance and diversity of species. The effects would alter the function of the benthic habitat and its ability to support plant and animal populations that depend on it.

Impact Criteria and Thresholds – Essential Fish Habitat. Adverse impacts to essential fish habitat (EFH) are those that reduce the quality or quantity of EFH by: 1) altering the physical, chemical, or biological condition of the waters or substrates; or 2) resulting in the injury or loss of benthic organisms or prey species and their habitat.

Adverse effects may be any impact which reduces quality and/or quantity of EFH. Adverse effects may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey, or reduction in species' fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810[a]). Determination of substantial adverse effects "should be based on project-specific considerations, such as the ecological importance or sensitivity of an area, the type and extent of EFH affected, and the type of activity. Substantial adverse effects are "effects that may pose a relatively serious threat to EFH and typically could not be alleviated through minor modifications to a proposed action" (67 FR 2367). Based on the above, impact criteria and thresholds for EFH are described below.

No effect: The waters and substrates that define EFH would not be affected, nor would the organisms that depend on those waters and substrates be affected.

No adverse effect: Effects to waters and substrates that define EFH would be minimal and temporary. Impacts would affect a relatively small portion of the affected environment and the area would eventually recover. Consideration should be given to the importance of the habitat and its functions.

Adverse effect: Effects to waters and substrates that define EFH would be more than minimal, and impacts would permanently affect a relatively large portion of the affected environment. The habitat impacted performs relatively important functions.

Duration:

Short-term: Effects occur only during duration of project implementation.

Long-term: Effects extend beyond the duration of the project.

Impacts of Alternative A, the No Action Alternative

Impacts to Benthic Resources. Alternative A would continue current management and operations at Kalaupapa harbor. No underwater work would occur. This present level of maintenance would not be adequate to prevent long-term effects such as collapse of the bulkhead, further damage to the low dock toe from erosion, or loss of sections of the breakwater, which could result in occasional long-term, localized, negligible-to-minor, adverse effects to benthic resources when portions of the structure collapse into the harbor.

Park staff report that during delivery service the barge mooring lines come in contact with corals and other benthic organisms, both on the seafloor and on various harbor structures. Although

damage is localized and affects individual organisms, once dislodged or killed, recovery of these species requires several years. Thus, impacts from continued barge services on benthic resources would be short- and long-term, localized, minor, and adverse. There would be no change in the function or value of the benthic habitat as a result of annual barge service at Kalaupapa.

In addition to the direct effects of mooring the barge, management of barge ballast water may affect benthic resources in the harbor by introducing non-native species. At least two exotic benthic species are present are in close proximity to the project area (Brown et al. 2008). However, it does not appear that these species have displaced natives or altered the ecological functions of the harbor's benthic environment (Brown, pers. comm. 2009). Mandatory ballast water management guidelines are in place at the federal level (33 CFR 151, et seq.; see Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, 16 USC 4701). Based on these previous studies and current management guidelines, it appears that continued barge delivery to the park would result in minor long-term effects to benthic resources.

Impacts to Essential Fish Habitat. Under Alternative A there would be no change in harbor structures or activities and habitat conditions would remain unchanged. There would be no effects on EFH.

Cumulative Impacts. Alternative A would have short- and long-term, localized, minor, and adverse impacts to benthic habitat. However, harbor development and prior excavations, most recently in the early 1990s, reduced substrate complexity and, therefore, habitat and species diversity. This has had long-term, localized, moderate, and adverse impacts on benthic habitat. The cumulative effect of Alternative A and the other projects and plans would be long-term, localized, moderate, and adverse. There would be no adverse effects on EFH from Alternative A and the other projects and plans.

Conclusion. Alternative A would have localized, minor, and adverse impacts to benthic resources as a result of disturbance during barge operations. There would be no effects on EFH. The cumulative effect of Alternative A and other projects and plans would be long-term, localized, moderate, and adverse, mostly due to previous harbor development.

Under Alternative A, there would be no impairment of benthic habitat or EFH resources or values.

Impacts of Alternative B, the Preferred Alternative

Alternative B would include completion of the repairs necessary to maintain barge service such as filling voids and repositioning armor stone boulders. These activities would require up to four months to complete.

Impacts to Benthic Resources. Under Alternative B, impacts to benthic habitat during project implementation would be short-and long-term, localized, minor, and adverse. Short-term impacts would be primarily to turf algae and mobile marine organisms. Long-term impacts would be primarily to corals and other sessile marine organisms that are slow growing and long-lived. The harbor has low habitat diversity and species richness compared to adjacent areas, which may be the result of prior construction activities.

Most impacts for Alternative B would be short-term and would take place during the construction phase. Coral impacts would be primarily to discrete coral colonies growing on the basalt pavement, breakwater boulders, and concrete structures. These impacts would include: injury or loss of corals from construction equipment during repair of the bulkhead wall, repositioning of breakwater armor stone boulders, and concrete piling repair.

Activities proposed under Alternative B are estimated to directly disturb about 25 percent of the existing basin or about 5,500 square feet (0.13 acre) of benthic habitat. The existing basin is approximately 70 feet wide by 310 feet long (21,700 square feet [0.5 acre]), with depths increasing

from 5 to 13 feet in the seaward direction. Based on the cover estimates from the five transects cited in Brown et al. (2008), impacts would include the loss of 4,160 square feet (0.1 acre) of turf algae and up to approximately 90 square feet of existing corals depending on how many of the breakwater armor stone boulders are moved. Individual benthic organisms would be dislodged from their attachment sites, injured, or killed by construction activities. However, no population or community level effects would result.

Coverage estimates do not necessarily reflect lost coral functions such as provision of habitat for other species. A preliminary Habitat Equivalency Analysis was performed to evaluate and scale the compensatory mitigation required to replace lost functions and values. Impacts and recovery rates used in this analysis utilized coral parameters, such as the number of coral colonies by species, size class, and growth forms that would best reflect functionality in the ecosystem. Compensatory mitigation would include the installation of seasonal mooring buoys offshore of the Kalaupapa settlement. Use of the mooring buoys would allow recovery of corals in areas currently being impacted by anchoring of recreational vessels and would help prevent further anchor damage from occurring in the future.

Temporary removal and post-construction replacement of coral colonies at risk to construction impacts was not considered to be a viable mitigation measure or best management practice because the success of replacing coral colonies in the high energy exposed harbor environment is low (Bowden-Kirby 17 2003; Fox et al. 2005). The NPS will consult with NMFS, USFWS, EPA, and Hawaii Department of Land and Natural Resources on the results of the preliminary Habitat Equivalency Analysis and the proposed compensatory mitigation. The FONSI will document the results of these resource agency consultations.

Additional impacts often cited for marine construction projects include increases in turbidity, sedimentation, and changes in water circulation patterns (Rogers 1990, Maragos 2007). Suspended sediments may abrade, settle on, and smother corals and turf algae. However, given the limited extent of underwater work (0.1 acre) and the relatively high-energy environment of the harbor, turbidity above ambient conditions would not persist, sediments would be minimal and water circulation patterns would not change. Level of suspended sediments would be relatively minor compared to the suspended sediments generated during winter wave activity and heavy rainfall events. Implementation of water quality monitoring during marine construction activities would indicate if water quality standards were being exceeded so that construction could be halted and remedial actions taken. In addition, work would be curtailed during adverse tidal and weather conditions. Releases of contaminants associated with disturbance of the substrate are not anticipated given the predominance of basalt rock substrate and low amount of sand in the harbor. Therefore, no adverse impacts on benthic resources outside of the immediate project area would result. See the "Water Resources" section for additional discussion of water quality issues.

Following project completion, the 0.1 acre area disturbed during project implementation would be naturally recolonized by a variety of marine organisms. Turf algae would recover fairly rapidly because they have evolved under conditions in which they are heavily grazed (Hackney and Sze 1988); and, adjacent, undisturbed areas would provide a source. Once the turf algae is recovered, marine organisms that graze on turf algae (e.g., surgeonfishes) and that utilize this substrate as habitat, such as crustaceans, polycheates, and other invertebrates, would also recolonize the area from adjacent, undisturbed areas. However, full recovery of corals to pre-disturbance levels may require 10 to 20 years. Periodic barge service under current conditions might also adversely impact coral development in the berthing basin.

The construction contractor would be required to submit a spill prevention and response plan. The plan would include construction best management practices (BMPs) to prevent spills from occurring. It would also detail the actions that would be taken in case of a spill. Consequently, there would be no adverse impacts to benthic resources anticipated as a result of oil or chemical spills related to construction activities.

In addition to the direct effects of mooring the barge, management of barge ballast water may affect benthic resources in the harbor by introducing non-native species. As discussed in the analysis of Alternative A, it does not appear that non-native species have displaced natives or altered the ecological functions of the harbor's benthic environment. Mandatory ballast water management guidelines are in place at the federal level (33 CFR 151, et seq.; see Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, 16 USC 4701). Continued barge delivery to the park may result in minor long-term adverse effects to benthic resources.

Impacts to Essential Fish Habitat. Under Alternative B, and in accordance with methodologies discussed in the previous impact criteria and thresholds section, there would be no adverse effects on EFH. Assuming the activities proposed for Alternative B directly impact 25 percent of the current berthing basin, approximately 5,425 square feet (0.1 acre) of EFH would be impacted. Based on cover estimate from the five transects cited in Brown et al. (2008), impacts would include 4,160 square feet (0.1 acre) of turf algae and about 27 square feet of existing corals. For comparison, EFH within the park totals 2,000 acres, itself a small percentage of total EFH along the peninsula. Impacts would arise from work related to filling existing voids in the bulkhead wall toe, the low dock toe, and the breakwater; and repositioning of displaced armor stones.

Turf algae provides habitat for a variety of vertebrate and invertebrate species, but compared to adjacent areas, habitat and species diversity in the project area are low (see Figures 12 and 14). Activities under Alternative B would likely result in the loss of individual marine organisms, especially those attached to the repositioned and removed armor stones. Existing habitat in these areas and habitat associated with repositioned boulders would be disrupted. Turf algaes would recover fairly rapidly, but full recovery of corals to pre-disturbance levels would require 10 to 20 years. Habitat and individual organisms associated with removed armor stones would be lost, and eggs of demersal species (i.e., those found on or near the bottom of the sea) may also be lost. EFH impacts from sedimentation and changes in water quality would be minor (see "Water Resources" for more details). Over time, new habitat would develop in and around the repositioned boulders.

Cumulative Impacts. Alternative B would have short- and long-term, localized, minor, and adverse impacts. The overall impact of other projects and plans described in Alternative A would be long-term, localized, moderate, and adverse, mostly resulting from prior harbor development and construction. The overall cumulative effect of Alternative B and other projects and plans would be long-term, localized, moderate, and adverse. There would be no adverse effects on EFH.

Conclusion. Impacts of Alternative B on turf algae and mobile marine organisms would be short- and long-term, localized, minor, and adverse. Due to the length of time for coral to recover from disturbance, impacts would be long-term. The FONSI will document the results of NPS consultation with resource agencies on the preliminary Habitat Equivalency Analysis and the proposed compensatory mitigation.

There would be no adverse effects to EFH. The cumulative effect of Alternative B and other projects and plans would be long-term, localized, moderate, and adverse.

Alternative B would not result in impairment of benthic habitat or EFH resources or values.

FISHES

AFFECTED ENVIRONMENT

The Kalaupapa National Historical Park has approximately 2,000 acres of marine habitat, including two small islets and wet shorelines, which support fish resources. The Kalaupapa harbor dock repair project would affect the area of the harbor and associated dock. This section focuses on fishes found within the harbor. Many marine mammals and sea turtles that are occasionally observed in the waters off shore of the park are federally-listed threatened and endangered species. These federally listed species are discussed in the "Special-Status Species" section. Benthic habitats are components of essential fish habitat and are therefore discussed within the "Benthic Resources and Essential Fish Habitat" section of the document.

Fish Species and Habitats

The Hawaiian Islands are an archipelago, with many species inhabiting the chain of islands and associated marine environments. Many of the aquatic species found at the park are endemic to the Hawaiian Islands, meaning they are only known to occur in Hawaii. Although endemism is typical of isolated island groups across the world, the Hawaiian Islands have the greatest degree of marine endemism (24.3 percent) among the 340 species of reef and shore fishes classified within 99 families (Randall 1996). Beets et al. (2006) conducted an inventory of marine ecosystems, including coral reef vertebrate communities, in four Hawaiian NPS units. According to the Beets survey, of the four coastal NPS units in Hawaii, Kalaupapa National Historical Park has the most unique coastal environment, which includes large boulders, deep water environments, inshore benches and basalt pavement into offshore slopes. These habitat characteristics contribute to the park having the highest species richness and biomass among the four units in the study.

In the Beets survey, three sampling zones including subtidal pools, shoreline, and tidepools, were sampled within each NPS unit. Biomass values for the park were attributed to the relatively high densities of larger-size fish species observed throughout park waters. Most fish species observed in the survey were associated with reef habitats. Larger fish species found in the subtidal habitats included: goatfishes (*Mulloidichthys vanicolensis* and *Parupeneus multifasciatus),* parrotfishes (*Scarus dubius* and *S. psittacus),* and unicornfishes (*Naso hexacanthus* and *N. unicornis).* The most abundant fish species observed in the park was the blackfin chromis (*Chromis vanderbilti*). Other fish species observed include the endemic saddle wrasse (*Thalassoma duperrey*), surgeonfish (*Acanthurus leucopareius*); multiband butterflyfish (*Chaetodon multicinctus)*; Hawaiian sergeant (*Abudefduf abdominalis)*; and belted wrasse (*Stethojulis balteata)*. The subtidal environments in the park (past the inshore basalt benches), were found to be dominated with algae-covered boulders that provide habitat for fish not readily observed in other parks in the survey.

Within the project area, dynamic wave action, previous excavation, and dredging activities have reduced habitat complexity, and subsequently the diversity of fishes. Based on the Brown et al. (2008) biological assessment of marine resources in the harbor, the fish assemblage in the vicinity of the project area is not highly diverse or abundant relative to areas outside of the harbor. The fish assemblage within the harbor is a considerably smaller subset of the species observed in the Beets et al. (2006) survey. The Brown et al. survey in the harbor was characterized by few larger predatory fish (e.g., bluefin trevally: *Caranx melampygus* and peacock grouper: *Cephalopholis argus*) and numerous small fish (e.g., saddle wrasses: *Thalassoma duperrey* and *Stethojulis balteata*, damselfish: *Chromis* spp. and *Stegastes fasciolatus*) that forage primarily on the algal substrate.

Brown et al. (2008) did not observe rare or unique fishes within the survey, with the vast majority of observed fish species being common throughout the Main Hawaiian Islands (MHI). They

also reported that fish communities outside of the harbor, but still within Kalaupapa National Historical Park had, on average, greater species richness, biomass and greater diversity. Overall, the results from the surveys indicate species richness outside of the harbor is greater than that found within.

Figure 17. Congregation of Common Fishes Near the Harbor

Brown et al. (2008) reasoned that fish species occupying higher trophic levels (predators) are suppressed in the harbor compared to the reef communities because they are more likely to be caught by fishermen from the Kalaupapa community. Additionally, the lack of habitat complexity, resulting from the dynamic wave action and previous excavation, may be contributing to a lack of large fish and associated prey species in the harbor.

Hearing in Fish

Over the past decade, the effects of noise in the marine environment have increased as an area of concern. It has become apparent that human-generated sound has the potential to impact the health and well-being of marine animals. Depending upon the magnitude of these sounds, there may be no impact on aquatic animals, or they may be disturbed or injured (Hastings and Popper 2005).

Fish are vulnerable to noise in the aquatic environment. Depending on the noise source level, duration and proximity, fish will have different responses to noise including; avoidance, adaptation, injury or death. Factors that affect fish response include species type, size, noise duration, and source distance, in addition to natural environmental factors (water temperature, depth, and substrate). Fish can sustain injury or death from intense acoustic noise (McCauley et al. 2003).

All fish have two sensory systems that are used to detect sound in the water. These include the inner ear, which functions very much like the inner ear found in other vertebrates (Popper et al. 2003), and the lateral line, which consists of a series of receptors along the body of the fish (Popper et al. 2006). The inner ear generally detects higher frequency sounds, while the lateral line detects water motion at low frequencies (Hastings and Popper 2005). In addition to the above mentioned sensory systems, fish in the class Actinopterygii (which includes most ocean and freshwater fish) have a gas bladder. A gas bladder is a gas-filled sac located in the dorsal re-

gion of the body cavity of the fish. The gas bladder helps fish control buoyancy in the water. Not only is the gas bladder used for swimming, it is also able to respond to soundwave compressions in the water. Because the gas bladder is often located near the inner ear of the fish, it may act as a sound amplifier and aid in sound detection (Jobling 1995). Injury from intense noise ranges from disorientation and internal bleeding to rupturing of the gas bladder (Hastings and Popper 2005).

Studies on noise effects to fish hearing have generally focused on two types of exposure – long-term increases in background noise and exposure to short-duration, high-intensity sound. Metrics used to assess the potential impacts to fish include sound exposure levels and peak sound pressure level. The sound exposure level is the noise produced from a single noise event, and the sound pressure level is the absolute loudest observed noise over an extended noise exposure. While data are limited, long-term increases in background noise levels up to 170 dB do not permanently alter the hearing ability of most species, even if the sound level continued for an extended period of time (Popper et al. 2006). Popper et al. (2005) demonstrated that temporary threshold shift in hearing sensitivity varied between species of fish. Temporary threshold shift is not actual injury, but rather a temporary fatiguing of the auditory system, which can potentially reduce survival, growth, and reproduction in fish. Small fish (2 grams or less) exposed to short-duration, but high-intensity, signals of approximately 180 dB showed results varying from no effect to temporary threshold shift in hearing sensitivity (Popper et al. 2005 and 2006).

Hearing loss in fish can hinder their ability to swim normally, detect predators, stay oriented and feed or breed successfully. Hearing is also critical for fish in the larval stage to detect their natal reef during the settlement phase (Leis and Lockett 2005). The impact of such physical changes on fish survival is not clear. However, fishes with impaired hearing may potentially have reduced growth, fitness, or may be unable to communicate acoustically and leave them vulnerable to predation (McCauley et al. 2002).

ENVIRONMENTAL CONSEQUENCES

Guiding Regulations and Policies

NPS regulations and policies, including the *Organic Act of 1916* and *Management Policies* (NPS 2006b), direct parks to provide for the protection of park resources. Broadly stated, these policies and regulations require the NPS to manage natural resources in a manner that will maintain, rehabilitate, and perpetuate the inherent integrity of aquatic systems and the fish therein. The NPS seeks to maintain and restore aquatic habitats to protect their ecological and aesthetic character and dependent plant and animal communities. The NPS achieves this through:

- Preserving and restoring the natural abundance, diversities, dynamics, distributions, habitats, and behaviors of native plant and animal populations and communities and ecosystems in which they occur; and
- Minimizing human impacts on native plants, animal populations, communities, and ecosystems, and the processes that sustain them (Section 4.4.1).

Methods and Assumptions

Information Sources. The effects of dock repair and harbor enhancement activities under this topic focus on fish. The primary sources of information used in this analysis include existing park and NPS management documents, NPS policy documents, and published and unpublished observations and insights from knowledgeable park staff and wildlife experts.

Assumptions. The assumptions used in this analysis were that: 1) there would be no change in barge deliveries to the Kalaupapa community; and 2) existing park management programs would have no change in present operations. The geographic area considered for impacts on

fish includes the area of the park immediately inside the harbor. The area evaluated for impacts related to sound in the water is based upon the results of the noise modeling.

Results from sound modeling (Marine Acoustics 2009) were used to estimate impacts to fish both in and near the project area. Because modeling results are presented in metric units (meters), this impact analysis uses meters are a primary measurement, with conversion to English units (feet) provided in the text as appropriate.

As there are limited studies regarding the effects of such activities on hearing in fish and there is a lack of standard metrics and thresholds, there is a high degree of uncertainty regarding the potential for an individual project to injure fish (Stadler and Woodbury 2009). As a result, NOAA NMFS established a precautionary approach for assessing the potential effects on fish that considers temporary threshold shift to be synonymous with injury. Injury is expected if either the peak sound pressure level exceeds 206 dB or the accumulated sound exposure level exceeds 187 dB for fishes that exceed 2 grams or larger and 183 dB for fishes smaller than 2 grams. Therefore, for purposes of analysis, the level of 180 dB threshold used for marine mammals was assumed to represent a conservative threshold where injury to fish could potentially occur.

It should be noted that, where data are available, caution must be used in extrapolating between species even for identical sound stimuli (Hastings and Popper 2005). For example, there are data of injury and mortality to fishes that are close to sound sources, where sound levels are very high. However, the degree of damage is not only related to the distance of the fish from the source, but also to the received noise level and duration of the sound exposure (Hastings and Popper 2005). These parameters are used in the evaluation of effects on fishes.

The geographic area considered when evaluating the effects of the proposed action on fish is the areal extent of influence into the marine environment beyond the immediate construction area in Kalaupapa harbor.

Impact Criteria and Thresholds

Issues related to fish that were evaluated in this impact analysis of alternatives include the following:

- Disturbance to fish that might be expected from construction-related noise. Disturbance ranges from mortality, morbidity/injury, to physiological costs related to altered behavior, including the energetic cost of startled response to the flushing of foraging fish (e.g., reduced foraging success, leading to reduced reproductive success, etc).
- Bulkhead and breakwater stone removal and stabilization of the low dock and bulkhead toes could result in an alteration of habitat that may affect the abundance or distribution of fish species in the harbor.
- Construction-related activities may alter fish distribution, abundance, and availability in the harbor and surrounding area.

Negligible: Impacts to fish species, their habitats, and the natural processes sustaining them would be at or below the level of detection. Habitats would retain adequate ecological integrity to support the fish community. No bodily harm or life threatening injuries would be detectable.

Minor: An action that would result in detectable effects to fish species and/or their habitats, but changes would not be expected to result in population fluctuations, their habitats, or the natural processes (e.g., competition, dispersal, foraging). Occasional responses to disturbance could be expected, but without interference to feeding, reproduction, or other factors affecting population levels. Injury to or mortality of individual fishes may occur.

Moderate: An action would result in detectable effects on fish, their habitats, or the natural processes sustaining them. Key processes such as dispersal, competition, or predation may experience disruptions that would alter population size or distribution, but would return to natu-

ral conditions after initial disturbance. Injury and mortality rates may alter fish populations or communities. Sufficient habitat would remain functional and maintain viable native fish populations.

Major: An action would result in readily apparent effects on fish, their habitats, or the natural processes sustaining them. Key processes such as dispersal, competition, or predation would experience disruptions that would alter population size or distribution, and natural conditions would not return after initial disturbance. Injury and mortality would alter fish populations and community structure. Habitats may not remain functional or capable of maintaining viable fish populations.

Duration:

Short-term: The effect would occur, and be limited to, those times when equipment is operating and the actual repair/construction is occurring.

Long-term: Species would continue to be affected beyond one year's time or conditions would not be similar to those that predominated previously.

Impacts of Alternative A, the No Action Alternative

Alternative A would continue current management and operations at Kalaupapa harbor. No underwater work would occur. This present level of maintenance would not be adequate to prevent long-term effects such as collapse of the bulkhead, further damage to the low dock toe from erosion, or loss of sections of the breakwater, which could result in occasional long-term, localized, negligible, adverse effects to benthic habitat in the berthing basin when portions of the structure collapse into the harbor, which affect forage for fish species. Barge service would continue for as long as the dock structures would support safe and effective deliveries, and resource conditions would remain unchanged. Effects of barge mooring on corals and benthic habitat in the berthing basin and on the pier pilings would not affect forage for fish species. Under Alternative A there could be long-term, localized, negligible, adverse effects on fish.

Cumulative Impacts. There could be long-term, localized, negligible, adverse effects on fish under Alternative A. The cumulative effect of Alternative A and the effects of other projects and plans on fishes and their habitats in the harbor would be long-term, localized, adverse, and moderate.

Conclusion. Alternative A could have long-term, localized, negligible, adverse effects on fish or habitat in the harbor. Alternative A, combined would not measurably contribute to the cumulative effects of other projects and plans.

Under Alternative A, there would be no impairment of fishes, their habitat, or associated resources and values.

Impacts of Alternative B, the Preferred Alternative

Alternative B would include completion of the repairs necessary to maintain barge service – underwater activities would include bulkhead and breakwater stone removal and stabilization of the low dock and bulkhead toes. Activities anticipated to affect fishes and their habitats include construction disturbance (presence of equipment and noise) and reduction in available forage areas. These activities would require up to four months to complete.

During project implementation, in-water noise would disturb fishes in the vicinity, and likely generate a range of responses. However, the source level of underwater noise for armor stone removal (161 dB) would not exceed the 180 dB threshold established to conservatively estimate where injury to fish could potentially occur, as shown in Table 8. Other deferred maintenance actions (i.e., repairs to the pier, low dock toe, bulkhead wall, and breakwater cap) are expected to generate lower levels of underwater noise than armor stone placement. Under Alternative B,

fishes could be expected to show no response, or retreat from the area. Noise from armor stone removal is not expected to result in injury or mortality to fish.

Table 8. In Water 180 dB Noise Zone for Fish Under Alternative B

	Source Level*	Duration	Estimated Threshold for Injury to Fish 180 dB
Armor stone removal	161	1 to 2 days	N/A**

* Unit of measure for Source Levels is dB re:1µPa@1m. In-water no-attenuation ranges are based on a transmission loss of 18logR.

**Not applicable, source level is below threshold.

Armor stone removal is expected to take up approximately one to two days; however, as shown in Table 8, noise levels in the vicinity of construction activities would not reach levels capable of injuring fish. Further, the relatively low density of fishes and ability of fishes to relocate to nearby areas of suitable habitat would reduce the potential for physical injuries and mortalities. As a result, noise associated with these construction activities is expected to produce primarily behavioral responses (swimming away) (Hasting and Popper 2005). Thus, impacts to fishes from construction disturbance under Alternative B would be adverse, localized, short-term, and negligible. No long-term effects from in-water noise would be anticipated.

Approximately 25 percent of the berthing basin (5,500 square feet) would be altered by bulkhead and breakwater stone removal and stabilization of the low dock and bulkhead toes. Benthic algae cover would be removed from this area. This would result in decreased food for fishes such as surgeon fish (*Acanthurus leucopareius*), damselfish (*Stegastes fasciolatus*), and parrot fish (*Scarus dubius*). However, given the size of the harbor and local abundance of this food source (much of the harbor is covered by benthic algae) negligible, short-term, adverse effects would be anticipated.

Removal of bulkhead and breakwater stones would have short-term, negligible, adverse localized effects on fishes. Temporary displacement of fishes would occur during stone relocation activities. However, fish would likely return to the area immediately following construction. Repairing the bulkhead, including the use of concrete and grout in the voids of the bulkhead would not adversely affect fish in the harbor because of anticipated minimal or non-detectable changes in water quality (see Water Resources section).

Cumulative Impacts. Fishes in the Hawaiian archipelago are subject to a variety of man-made impacts. Both commercial and recreational fishing have reduced populations of bottomfish (e.g., grouper, rockfish, and snapper) and pelagic game species (e.g., tuna, swordfish, and sharks). Although some groundfish species are now at sustainable levels (NMFS 2008), overfishing of open water species continues. Degradation of reefs and nearshore environments by development and pollution (see "Benthic Resources and Essential Fish Habitat") diminishes the availability of suitable habitat for reef species, such as those found in the proposed project area. These past and ongoing activities have resulted in widespread, long-term, moderate, adverse effects on fishes. Within the harbor, habitat degradation by harbor development and previous excavations reduced bottom complexity in the berthing basin. However, given the dynamic wave action of the harbor, natural habitat within the project area may not have been of high value. Recreational fishing in the harbor is a traditional pastime, and is ongoing. Fishing can directly reduce fish

populations, and this may have occurred in and near the project area (Brown et al. 2008). The combined effects of other projects and plans on fishes and their habitats in the harbor would be localized, long-term, adverse, and moderate.

Implementation of the park's new general management plan would improve overall protection of park resources, including marine habitats of the harbor. This would provide long-term, localized benefits to fishes, of negligible to minor intensity. However, these would not offset the widespread, long-term, moderate cumulative adverse impacts of overharvesting and habitat degradation.

Alternative B would have localized, negligible, and adverse impacts to fish during project implementation. No long-term effects are anticipated. Other past, present, and future activities would continue to affect fish species and habitats on a local and regional scale, resulting in long-term, moderate, adverse effects. Alternative B would make no contribution to these cumulative effects.

Conclusion. Impacts of Alternative B on the harbor fish community would be localized, negligible, and adverse, resulting from construction noise and reduction in forage in the project area. Cumulative effects would be long-term, moderate, and adverse, resulting from local and regional development and fishing pressures.

Under Alternative B, there would be no impairment of fishes, their habitat, or associated resources and values.

SPECIAL-STATUS SPECIES

AFFECTED ENVIRONMENT

The Kalaupapa Peninsula is surrounded by seas that are often turbulent and unpredictable. The coastline is primarily volcanic and rocky, but the western side of the peninsula, where the harbor is located, offers protection from the prevailing tradewinds from May until September. During winter months the entire peninsula coastline is subjected to strong northwesterly swells that can reach 5 to 10 meters (16 to 33 feet) in height. Waves periodically breach the breakwater and create a strong mixing zone within the harbor basin. There are a few nearby beaches where canoes and small boats can launch and land, but the majority of the vessel traffic is at the harbor.

The Kalaupapa park boundary extends for a quarter mile offshore totaling 2,000 acres of ocean, two small islets, and wet shorelines which support the fish and wildlife resources. Significant marine resources occurring in and near Kalaupapa National Historical Park during summer months and that may be affected by the project include:

- Federally-listed endangered species – hawksbill turtle (*Eretmochelys imbricata*) and Hawaiian monk seal (*Monachus schauinslandi*); and
- Federally-listed threatened species – green sea turtle (*Chelonia mydus*); and
- Other marine mammals, including bottlenose dolphin (*Tursiops truncatus*) and spinner dolphin (*Stenella longirostris*); and
- High-wave-energy benthic communities.

Overall, marine resources within the harbor are not diverse or abundant. Observations and records on rare or transient animals including turtles, whales, and wide-ranging pelagic fish species often rely on field observations and local information. The distribution, abundance, and movements of these animals do not permit secured surveys for semi-quantitative assessments within a feasible level of effort.

Three marine species that are listed under the ESA could potentially occur in or near the project area: green sea turtle, hawksbill turtle, and Hawaiian monk seal. Accordingly, the NPS has initiated the ESA Section 7 informal consultation process with NMFS. A list of the special-status species with the potential to occur in the area during project activities is presented in Table 9. There is no designated critical habitat in the vicinity of the project area. However, NMFS is considering designating critical habitat for the Main Hawaiian Islands that would likely include the project area.

Table 9. Special-Status Species with the Potential to Occur in the Project Area

Common Name	Species Name	Endangered Species Act Status	Regulatory Framework	Documented In or Near Project Area	Critical Habitat In or Near Project Area
Green sea turtle	*Chelonia mydus*	Threatened	Endangered Species Act	Yes, year-round	No
Hawksbill sea turtle	*Eretmochelys imbricata*	Endangered	Endangered Species Act	Not documented	No
Hawaiian monk seal	*Monachus schauinslandi*	Endangered	Endangered Species Act, Marine Mammal Protection Act	Yes, year-round	Under consideration for future designation
Spinner dolphin	*Stenella longirostris*	Not listed	Marine Mammal Protection Act	Yes, year-round	NA
Bottlenose dolphin	*Tursiops truncatus*	Not listed	Marine Mammal Protection Act	Yes, year-round	NA

The species description and potential use of the proposed project area for each of the special-status species are included in the following section.

Green Sea Turtle

Species Description, Status, and Distribution. The green sea turtle (*Chelonia mydus*) is a federally-listed, threatened species that frequents the reef communities around Hawai`i. After emerging from the nest, hatchlings swim to offshore areas where they are believed to live for several years, feeding close to the surface on a variety of pelagic plants and animals. After the juveniles reach a certain age or size, they leave the pelagic habitat and travel to nearshore foraging grounds. After they move to these nearshore benthic habitats, adult green turtles feed almost exclusively on sea grasses and algae (NOAA 2008).

Green turtles reach a maximum size of about 4 feet and a weight of about 440 pounds. They have heart-shaped shells, small heads, and single-clawed flippers. Hatchlings typically have a black carapace (top shell), white plastron (bottom shell), and white margins on the shell and limbs. The adult carapace is smooth, keelless, and light to dark brown (USFWS 2009).

Life History and Habitat Requirements. Green turtles are slow-growing reptiles that are reproductively active between 10 and 59 years of age. Optimum habitats for late juveniles and adults are warm, quiet, and shallow (3 to 10 meters, or 10 to 33 feet, deep) waters with abundant submerged aquatic vegetation, such as sea grasses or algae, which are located near reefs or rocky coastlines used for resting. Around the Hawaiian Islands, green turtles often forage in coastal

waters less than 10 meters (33 feet) deep, but have been known to forage and rest at depths of 20 to 50 meters (65 to 165 feet). Important resident areas occur on the islands of Hawai`i, Maui, Lãna`i, Moloka`i, and Kaua`i.

Green turtles are unique among sea turtles in coming ashore periodically during the day to bask. Terrestrial basking most often occurs on undisturbed beaches with little or no human presence. Adults tend to bask more often than juveniles and, although most basking takes place during the day, turtles also may emerge from the water at night to rest. Turtles also may emerge at low tide to feed on algae on exposed rocks.

Adult green turtles undertake long migrations between their foraging habitats and nesting beaches. Adult green turtles that forage around the Main Hawaiian Islands make regular reproductive migrations to the Northwestern Hawaiian Islands. Nesting also occurs along the northern shore of Moloka`i (NOAA 2001). Egg-laying occurs from late April through September, during which females haul out at their natal (birthing) beach to lay their eggs. They can deposit up to seven clutches of eggs at 12 to 14 day intervals in nests dug with their flippers. The clutch of 40 to 200 round, leathery eggs incubate in the warm sand until they are ready to hatch. The incubation period is about 45 to 75 days.

Population Trends. Green turtles are distributed world-wide in tropical and subtropical waters. The green turtles that nest in Hawai`i are considered genetically distinct and geographically isolated from other green turtle populations. Green turtle populations are in serious decline throughout most of the Pacific Ocean, but their population has increased by approximately 800 percent in the Hawaiian Islands since the early 1970s. The Hawaiian population of green turtles appears to have increased gradually over the past 30 years, and currently has population sizes sufficient to warrant a status review (Balazs and Chaloupka 2004). This improvement is presumably due to effective protection at primary nesting areas in the Northwestern Hawaiian Islands and better enforcement of regulations prohibiting take of the species. In 2001, the size of the green turtle population in the Pacific Ocean was estimated at about 21,000 adults (Seminoff 2004).

Human exploitation for food, shells, and skin; entanglement in discarded fishing nets and line; incidental catch in commercial fishing operations; and marine pollution all contribute to stress on the populations of the green turtle worldwide. Boat collisions and increased development of coastal nesting sites also contribute to the decline of sea turtle populations. Another primary threat to green turtles that may be related to human activity is the disease fibropapillomatosis that is caused by a herpes-type virus. Fibropapilloma may be caused by exposure in marine areas affected by agricultural, industrial, or urban pollution (Aquirre and Lutz 2004). To date, no sea turtles at Kalaupapa have been documented with these growths which are typically found on turtles near human population centers. However, the disease threatens to roll back improvements in the status of the Hawaiian population.

Occurrence In or Near the Project Area. This species typically stays outside of the Kalaupapa harbor basin, but has been documented around the breakwater as it feeds on benthic macroalgae. Green sea turtles were observed during survey dives and were generally seen swimming in the water column and not hauling out on shore (Brown et al. 2008). This species is considered to be generally present in the waters of Kalaupapa harbor. Several nesting attempts have been documented at Piko‘one beach about 1,000 yards southwest of the harbor in 2006, 2007, and 2008. In 2006, a nest with eggs was documented, but was subsequently excavated by pigs and mongoose. In 2009, two successful nests were documented with 49 and 50 hatchings entering the sea in August and September respectively.

Hawksbill Sea Turtle

Species Description, Status, and Distribution. The hawksbill sea turtle (*Eretmochelys imbricata*) is listed as endangered under the Endangered Species Act. Hawksbill sea turtles are small-to-

medium-sized compared to other sea turtles, reaching up to 3 feet long and weighing up to about 300 pounds. They have an elongated oval shell with overlapping plates on the carapace, a relatively small head with a distinctive hawk-like beak, and flippers with two claws. Juveniles are black or dark brown, with light brown or yellow on the edge of the shell, limbs, and raised ridges on the carapace. Adults are brown, with splotches of yellow, orange, or red-brown (USFWS 2009).

Hawksbill turtles are known to occur throughout the year in the coastal waters of the eight Main Hawaiian Islands, although in much lower numbers than green sea turtles. They also nest on the main islands. Most of the nests are on small sand beaches on the islands of Hawai`i and Moloka`i (see further discussion below). Hawksbills are much more abundant in the shallow offshore waters of the Hawaiian Islands than they are in deeper offshore waters of the central Pacific Ocean (HDLNR 2002). Throughout the year, the area of primary occurrence for hawksbill turtles can be found in Hawaiian waters shoreward of the 55-fathom isobath. Beyond the 55-fathom isobath, hawksbill occurrence is rare year round.

Life History and Habitat Requirements. Early juveniles are known to inhabit oceanic waters, but the exact locations of this early life stage are unknown. When they reach late juvenile size, hawksbill turtles migrate to benthic foraging grounds where they feed around coral reefs, mangroves, and other hard-bottom habitats in open bays and coastal zones. Adults occupy deeper waters (up to 80 feet) than juveniles (up to 40 feet) and feed primarily on sponges. Preferred feeding habitat consists of shallow water with little turbidity near rock or reef habitats with steep drop-offs.

Hawksbills nest at widely scattered locations in very small numbers. Recent surveys indicate that about 20 to 30 individuals nest in the Main Hawaiian Islands each year. Nesting sites consistently include the eastern coast of the island of Hawai`i and a black sand beach on the eastern end of Moloka`i. Turtles also nest at Kealia Beach on Maui, and on O'ahu. Nesting occurs from late May to early December, with peak nesting activity from late July to early September. Turtles nest on both low- and high-energy beaches with sufficient vegetative cover, usually at night. Hawksbills nest 4 to 5 times per season at approximately 14-day intervals. Egg clutches average about 140 eggs. The incubation period is about 60 days. The age of sexual maturity is unknown, but is believed to be more than 30 years (USFWS 2009).

Population Trends. The hawksbill turtle has experienced global population declines of 80 percent or more over the last 100 years, and further declines are expected (USFWS 2009). Worldwide, the population of breeding females is estimated at about 1,000 individuals. A lack of regular, quantitative surveys and the secretive nesting behavior of this species have made assessments of the distribution and population status in the Hawaiian Islands difficult (USFWS and NMFS 1998; Seminoff et al. 2003). Major threats to hawksbill turtle populations in the Hawaiian Islands include increased human populations, beach erosion, nest predation, artificial lighting on beaches, boat collisions, and driving vehicles on beaches.

Occurrence In or Near the Project Area. Although this species has potential to occur in the area, the hawksbill sea turtle has not been documented in the park. Hawksbill turtles may occasionally migrate in the waters near Kalaupapa; however, they are not expected to be found in the harbor area since Kalaupapa does not offer suitable habitat for hawksbill turtles that prefer aggregated reef structures to forage for sponges and invertebrates.

Sea Turtle Hearing. Information on the hearing of sea turtles is limited, but suggests that their auditory capabilities are centered in the low-frequency range and that they hear best from about 200 hertz (Hz) to 700 Hz (Ridgway et al. 1969; Lenhardt et al. 1983; Bartol et al. 1999; Lenhardt 1994). A recent study on the effects of airguns on sea turtle behavior revealed that green and loggerhead turtles will avoid air-gun arrays at distances up to 2 kilometers (1.2 miles) (McCauley et al. 2000). Sea turtle response at 166 dB was a noticeable increase in swimming activity. Above 175 dB, their behavior became erratic, possibly indicating that the turtles were agitated. Given

the broadband nature of construction noise, it is anticipated that sea turtles would be able to detect sounds from the project's proposed actions.

Hawaiian Monk Seal

Species Description, Status, and Distribution. The Hawaiian monk seal (*Monachus schauinslandi*) is the only truly tropical seal in the world and is listed as an endangered species under ESA. It is also listed as depleted under the Marine Mammal Protection Act (MMPA). Small populations today are found only in Hawai`i. Most monk seals are found in the Northwestern Hawaiian Islands, with fewer found in the Main Hawaiian Islands. Hawaiian monk seals were given the Hawaiian name *`ilio holo i ka uaua*, which translates literally as "the dog that runs in the rough (seas)."

Hawaiian monk seals spend approximately two-thirds of their time in the water, spending the remainder of the day hauled out on sandy beaches (NMFS 2007). Monk seals feed on a variety of benthic and mid-water fish and invertebrates (Goodman-Lowe 1998; Parrish et al. 2000). In a study conducted by NMFS and Hubbs-Sea World Research Institute, movements of 11 tagged seals were monitored in the Main Hawaiian Islands for 32 to 167 days (Yochem et al. 2004). Most locations for all seals were in nearshore marine habitats and within the 200 meter (660 foot) depth contours surrounding the Main Hawaiian Islands or nearby banks. Several seals moved between islands in the Main Hawaiian Islands.

Hawaiian monk seals may give birth throughout the year, but most births occur between February to August, with a peak from March to June. Hawaiian monk seals show very high site fidelity to natal islands, with only about 10 percent of individuals moving to another island in their lifetime (Gilmartin and Forcada 2002).

Designated Critical Habitat. Critical habitat for the Hawaiian monk seal is designated from the shore out to 20 fathoms in 10 areas of the Northwestern Hawaiian Islands (NMFS 1988). A revised recovery plan was issued in 2007 and included species status, threats to the population, and recommendations to prevent extinction (NMFS 2007). On June 12, 2009, NMFS published a 12-month finding for a petition to revise critical habitat for the seal to expand the current critical habitat and designate additional critical habitat in the Main Hawaiian Islands. Based on the finding, NMFS intends to revise the monk seal critical habitat.

Critical habitat under consideration for the Main Hawaiian Islands may include key beach areas and waters out to a depth of 200 meters (660 feet). Key biological or physical elements essential to the conservation of the Hawaiian monk seal could include terrestrial and marine areas used for resting, molting, and reproduction. Terrestrial resting and molting habitat for the monk seal consists of nearshore areas where they can haul out. Terrestrial reproductive habitat consists of sandy beaches suitable for pupping and nursing. Marine areas include foraging habitat for pups, juveniles, and adults. Pup foraging habitat consists of shallow areas adjacent to pupping beaches where pups become accustomed to the marine environment and learn feeding behaviors. As such, the modification to critical habitat under consideration for the seal currently identifies the following primary constituent elements:

- Sandy beaches preferred by monk seals for pupping and nursing;
- Marine areas less than 20 meters (66 feet) depth adjacent to pupping and nursing beaches where young pups learn to forage;
- Marine areas approximately 20 to 200 meters (66 to 660 feet) depth in the Main Hawaiian Islands (and other areas in the Northwest Hawaiian Islands not described here);
- Low levels of unnatural disturbance; and
- High prey quantity and quality.

Based on these critical habitat criteria for the Hawaiian monk seal; Kalaupapa harbor is likely to be designated as an area of critical habitat for the species. Initially published in the *Federal Register* on June 12, 2009, the proposed rule could differ slightly from what is described above.

Population Trends. The best estimate of the total Hawaiian monk seal population size is 1,146 individuals in the archipelago (Carretta et al. 2009), with an estimated 90 seals in the main islands. Monk seal population declines approximately four percent annually (NMFS 2007).

Even though the vast majority (approximately 92 percent) of the monk seal population resides in the Northwestern Hawaiian Islands, an increasing number of observations and births have been recorded in the Main Hawaiian Islands (Baker and Johanos 2004). The monk seal population at Kalaupapa has been increasing since 1997 and Kalaupapa has emerged as the premier pupping location in the main islands (Baker and Johanos 2004). Since 1997, the number of pups born annually at Kalaupapa has increased from 1 to 7, with 46 total pups, making Kalaupapa the top birthing location among the main islands (Eric Brown, pers. comm. 2009).

Continuing population threats that impede recovery include food limitation, single and multiple-male aggression (mobbing), shark predation, disease, and parasites. After 1999, losses of pups to shark predation have been fewer, but this source of mortality remains a serious concern. Various mitigation efforts have been undertaken by the NMFS in cooperation with the U.S. Fish and Wildlife Service (USFWS). An Unusual Mortality Event contingency plan has recently been published for the monk seal (Yochem et al. 2004). While disease effects on monk seal demographic trends are uncertain, there is concern that diseases of livestock, feral animals, pets or humans could be transferred to native monk seals in the Main Hawaiian Islands. Recent diagnoses confirm that in 2003 and 2004, two deaths of free-ranging monk seals were attributable to diseases not previously found in the species – leptospirosis and toxoplasmosis. Leptospira bacteria are found in many Hawaiian streams and estuaries and are associated with livestock and rodents. Cats, both domestic and feral, are a common source of toxoplasmosis.

Vocalization and Hearing. There is no information on underwater communications by monk seals. In-air sounds are low frequency sounds (below 1,000 Hz) such as "soft liquid bubble," short duration guttural expiration, and a roar and belching/coughing sound (Miller and Job 1992). Pups produce a higher frequency call that presumably is used to call their mothers. The underwater hearing range is considered mid-range (2 kHz to 48 kHz), but that information was obtained from one animal and may not be indicative of the species.

Occurrence In or Near the Project Area. Kalaupapa has emerged as the premier birthing location for monk seals in the Main Hawaiian Islands with up to 7 pups born annually on the peninsula. These numbers have been increasing since 1997 when the first mother-pup pair was documented. Pupping takes place in the spring and early summer on the beaches (ʻĪlio piʻi and Papaloa) and accounts for the increase in monk seal density during that time period. Papaloa is the pupping beach closest to the project area, approximately 310 meters (1,016 feet) to the north (See Figure 18). After 6 weeks, the pups are weaned and they begin to forage and play in the adjacent rocky habitats including the area by the harbor (Kahikilo, approximately 200 meters from the project site). This seasonal shift is evident in the late summer and fall as monk seal pups and weaners begin to explore the peninsula and venture beyond the beaches. Eventually the seals depart the peninsula during the winter months from January to March. However, this period of absence has been decreasing as monk seal numbers increase within the park. In the winter of 2007-2008, there were several observations of juveniles and adults hauling out within the park. Some of these animals were found at Kahikilo next to the harbor, but not during the course of the NPS survey work (Eric Brown, pers. comm. 2009). Monk seals likely prefer the Kalaupapa area for a number of reasons, specifically the lack of interaction and disturbance from humans. The beaches and rocky areas around the park also provide desirable habitat for seals and pups to forage and learn to swim.

Spinner Dolphin

The spinner dolphin (*Stenella longirostris*) is not listed under the Endangered Species Act and is not listed as depleted under the MMPA. NMFS is considering whether to propose regulations to protect spinner dolphins in the Main Hawaiian Islands from "take," as defined in the Marine Mammal Protection Act. Resting areas include near shore habitats off the Main Hawaiian Islands, including Moloka`i. Spinner dolphins are seen year-round in the harbor area and have been reported to use Kawa'aloa Bay west of the harbor as a resting area (Eric Brown, pers. comm. 2009).

In the Hawaiian Islands, spinner dolphins occur year-round along the leeward coasts. Spinner dolphins are expected to occur in shallow water (about 162 feet or less) resting areas throughout the middle of the day. Foraging can begin in the late afternoon (Lammers 2004), but takes place primarily at night when the prey migrates vertically towards the surface and also horizontally towards the shore (Benoit-Bird et al. 2001; Benoit-Bird and Au 2004). They feed primarily on small mesopelagic fishes, squids, and sergestid shrimp. They are known to dive between 660 and 980 feet (Perrin and Gilpatrick 1994).

Population Trends. The best available estimate of abundance for the Hawaiian stock of the spinner dolphin is 3,351 individuals (Barlow 2006). However, no information exists on population trends. Spinner dolphins have island-specific populations and breeding may occur throughout the year (Östman-Lind et al. 2004).

Vocalization and Hearing. There is little information on the acoustic abilities of the spinner dolphin. They produce whistles in the range of 1 to 22.5 kHz (mid-frequency). Whistles have harmonics that may extend past 50 kHz and sometimes as high as 100 kHz (Lammers et al. 2003). They also display pulse burst sounds in the range of 5 to 60 kHz. Their full range of hearing may extend down to 1 kHz or below as reported for other small toothed whales (Richardson et al. 1995; Nedwell et al. 2004; Bazúa-Durán and Au 2002). Given the wide hearing range of this species and the broadband nature of construction noise associated with the proposed action, spinner dolphins would be able to hear construction noise.

Occurrence In or Near the Project Area. Spinner dolphins are seen in the Kalaupapa harbor year-round and have been reported to rest on the sandy shoal approximately 260 meters (850 feet) to the southwest of the project area. They are often found close to shore during the day, but move into deeper water at night to feed.

Bottlenose Dolphin

The bottlenose dolphin (*Tursiops truncatus*) is not listed under the Endangered Species Act. Pacific coast bottlenose dolphins feed primarily on surf perches (Family *Embiotocidae*) and croakers (Family *Sciaendae*) (Norris and Prescott 1961; Walker 1981; Schwartz et al. 1992; Hanson and Defran 1993), and also consume squid (*Loligo opalescens*) (Schwartz et al. 1992).

Population Trends. The best available estimate of abundance for the Hawaiian stock of the bottlenose dolphin is 3,215 individuals (Barlow 2006). However, no information exists on population trends. Bottlenose dolphins are regularly found around the Main Hawaiian Islands in both onshore and offshore waters (Rice 1960; Shallenberger 1981; Mobley et al. 2000; Baird et al. 2003). However, they are rarely seen at Kalaupapa harbor. Bottlenose dolphins found in offshore waters around the Main Hawaiian Islands are island associated, with all sightings occurring in offshore and shallow waters (less than 660 feet). There is no apparent movement between the islands (Baird et al. 2002, 2003). Mead and Potter (1990) suggested a prolonged calving season with a peak in spring. No specific breeding or calving areas for Hawai`i have been described.

Vocalization and Hearing. Sounds emitted by bottlenose dolphins have been classified into two broad categories, clicks and whistles. Vocalization frequencies range from 0.8 to 24 kHz

(mid-frequency) and from 110 to 130 kHz (high-frequency). Source levels can reach 218 to 228 dB (Ketten 1998; Richardson et al. 1995). The bottlenose dolphin has a functional high-frequency hearing limit of 160 kHz (Au 1993) and can hear sounds at frequencies as low as 40 to 125 Hz (Turl 1993). Given the broadband nature of construction noise associated with components of the proposed alternative, bottlenose dolphin would be able to hear construction noise.

Occurrence In or Near the Project Area. Bottlenose dolphins are rarely observed within the park and have never been documented within Kalaupapa harbor. Bottlenose dolphins were observed near the Kalaupapa Peninsula during aerial surveys conducted in 1993 to 1998 (Mobley 2004). Observations were typically beyond 100 fathoms off the northern coastline of Moloka`i (Mobley 2004).

ENVIRONMENTAL CONSEQUENCES

Disturbance from construction activities and vessels has the potential to affect sea turtles and marine mammals that frequent or may occur in the nearshore waters around the harbor. The following sections discuss effects that the alternatives may have on sea turtles and marine mammals in the vicinity of the harbor.

Guiding Regulations and Policies

This special-status species analysis incorporates National Park Service regulations and regulatory requirements of NEPA, the Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA). The Marine Mammal Protection Act and Endangered Species Act prohibit the unauthorized harassment of marine mammals and endangered species, and provide the regulatory processes for authorizing any such harassment that might occur incidental to an otherwise lawful activity. These regulations establish the context for determining potentially adverse impacts to these special-status species from the range of proposed activities.

Under the *Organic Act of 1916*, *Management Policies* (NPS 2006b), and Director's Order #12 (NPS 2001) the NPS is required to manage natural resources in a manner that will maintain, rehabilitate, and perpetuate the inherent integrity of aquatic systems and the fish therein. The NPS seeks to maintain and restore aquatic habitats to protect their ecological and aesthetic character and dependent plant and animal communities. The NPS achieves this through:

- Preserving and restoring the natural abundance, diversities, dynamics, distributions, habitats, and behaviors of native plant and animal populations and communities and ecosystems in which they occur.
- Minimizing human impacts on native plants, animal populations, communities, and ecosystems, and the processes that sustain them.

The *Marine Mammal Protection Act* (MMPA) of 1972 established, with limited exceptions, a moratorium on the "taking" of marine mammals in waters or on lands under U.S. jurisdiction. The term "take," as defined in Section 3 (16 USC 1362) of the MMPA, means "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal." "Harassment" was further defined in the 1994 amendments to the MMPA, which provided two levels of harassment, Level A (potential injury) and Level B (potential disturbance).

For activities proposed in this EA, the relevant definition of harassment is any act that:

- Level A – Has the potential to injure a marine mammal or marine mammal stock in the wild.
- Level B – Has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering.

Section 101(a)(5) of the MMPA directs the Secretary of the Department of Commerce to allow, upon request, the incidental (but not intentional) taking of marine mammals by U.S. citizens who engage in a specified activity (exclusive of commercial fishing), if certain findings are made and regulations are issued or, if limited to harassment, an authorization is issued. Authorization will be granted by the Secretary for the incidental take of marine mammals if the taking would have a negligible impact on the species or stock and would not have an unmitigable adverse impact on the availability of such species or stock for taking for subsistence uses.

The *Endangered Species Act of 1973* established protection over and conservation of threatened and endangered species and the ecosystems upon which they depend. An "endangered" species is a species that is in danger of extinction throughout all or a significant portion of its range, while a "threatened" species is one that is likely to become endangered within the foreseeable future throughout all or in a significant portion of its range. The USFWS and NMFS jointly administer the ESA and are also responsible for the listing of species (i.e., designating a species as either threatened or endangered). The U.S. Fish and Wildlife Service has primary management responsibility for management of terrestrial and freshwater species, while the NMFS has primary responsibility for marine species. The ESA allows the designation of geographic areas as critical habitat for threatened or endangered species.

The ESA requires federal agencies to conserve listed species and consult with USFWS or NMFS to ensure that proposed actions that may affect listed species or adversely modify critical habitat are consistent with the requirements of the ESA. The ESA specifically requires agencies not to "jeopardize" the continued existence of any endangered or threatened species, or to destroy or adversely modify habitat critical to any endangered or threatened species. Under Section 9 of the ESA, "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect. Under Section 7 of the ESA, "jeopardize" means to engage in any action that would be expected to reduce appreciably the likelihood of the survival and recovery of a listed species by reducing its reproduction, numbers, or distribution.

Methods and Assumptions

The geographic area considered when evaluating the effects of the proposed action on marine species is the areal extent of influence into the marine and terrestrial environment beyond the immediate construction area in Kalaupapa harbor.

Information Sources. Impacts were evaluated through available scientific literature and best professional judgment of NPS staff and experts from NMFS. In addition, an evaluation was recently conducted of the potential underwater and in-air noise generated by specific construction activities for the Kalaupapa dock repair project (Marine Acoustics 2009). This report contains the results of an acoustical analysis that modeled, in terms of distance and intensity, the noise introduced to the marine and terrestrial environment as a result of actions associated with the proposed action alternative. The methods used for the acoustics analysis are summarized briefly below and the full report (Marine Acoustics 2009) is available at the park. Because modeling results are presented in metric units (meters), this impact analysis uses meters as the primary measurement, with conversion to English units (feet) provided in the text as appropriate.

The analysis evaluated the distances at which the potential exists for adverse impacts to marine mammals and sea turtles when they are in the water, and for the monk seal when on land or above the water. The following sources or construction activities were evaluated: 1) the mechanical chiseling of bedrock to widen the berthing basin, 2) the use of explosives to widen the berthing basin, 3) the mechanical removal of broken rock from the harbor by dredging, 4) the drilling of holes to install mooring dolphin piles, 5) impact driving to install the piles into the harbor bottom for the mooring dolphin, 6) vibratory driving to install the piles, and 7) placement of armor stones. The NPS ultimately dismissed widening of the berthing basin and installation of the mooring dolphin from further consideration (see "Alternatives Considered and Dis-

missed" section). The noise impacts from armor stone placement were carried forward from the analysis and are evaluated in the following impact evaluation.

The MMPA-established levels of harassment – Level A and Level B – were used as the reference points in the acoustic analysis. NMFS has identified sound exposure thresholds that are used to determine when anthropogenic underwater sounds might result in injury (Level A harassment) and behavioral disturbance (Level B harassment) of marine mammals. Injury thresholds are: 180 dB re 1 microPa root mean squared (rms) (180dB) for cetaceans and 190 dB for pinnipeds. Behavioral disturbance thresholds are 160dB for impulse sounds such as placement of armor stones (see Table 10). NMFS has not identified thresholds for sea turtles such as those used for marine mammals. Although the effects of underwater noise on sea turtles are not well studied, turtles are much less susceptible to disturbance from noise due to their hearing ranges. The thresholds developed for marine mammals are also applied to sea turtles in this EA with the expectation that these thresholds are likely to be relatively conservative for sea turtles.

NMFS has also identified in-air noise behavioral disturbance thresholds for pinnipeds. The NMFS behavioral disturbance threshold applicable to monk seals is 100 dB re: 20 microPa rms (unweighted). Currently, NMFS does not have injury thresholds for in-air sounds.

Table 10. Marine Mammal Injury and Disturbance Thresholds for Construction Activities

Functional Hearing Group	Airborne Noise Thresholds	Underwater Noise Thresholds	
	Disturbance threshold re 20 microPa rms (unweighted)	Injury threshold re 1 microPa rms	Disturbance threshold for impulse sounds *re 1 microPa rms
Pinnipeds: Hawaiian monk seal	100 dB	190 dB	160 dB
Cetaceans: spinner dolphin and bottle-nose dolphin	NA	180dB	160dB

* armor stone placement

In general, as sound propagates there is a reduction in the sound intensity over increasing ranges. This specific field of transmission loss for each source of sound was identified and combined with the sound source levels for each of the construction activities. The resulting fields of received levels of the sound (areas where a receptor [e.g., a marine mammal or turtle] would be exposed to a specific sound level) were then documented and compared to the acoustic thresholds. The general zones of influence (ZOIs) for the various construction activities for all acoustic threshold criteria, both in water and air, were then identified. ZOIs refer to the maximum range from a source of sound at which an animal might be harassed. Additionally, plots of these ZOIs are provided to identify the extent of the potentially impacted area.

Assumptions. For the purposes of the analysis in this EA, ZOIs were used to determine potential exposures of special-status species to construction generated noise at levels that could result in injury and/or behavioral disturbance.

Impact Criteria and Thresholds

Special-status species were evaluated based on guiding laws, regulations, and policies. The impact criteria and thresholds for special-status species are provided below. In addition, for those

species that are regulated under the ESA, a determination of effects as defined in the regulatory guidance is included in the conclusion section for each alternative.

Inconsequential: Effects to marine mammals and sea turtles, their habitats, and the natural processes sustaining them would be at or below the level of detection. No bodily harm or life-threatening injuries would occur. There would be no change in marine mammal or sea turtle feeding or reproductive behaviors.

Minor: Effects on marine mammals and sea turtles or their habitats may be detectable, but would not be expected to result in population fluctuations, changes in critical habitat, or changes in natural processes (e.g., competition, dispersal, foraging). Occasional responses to construction activities may occur, but such responses would not interfere with feeding, reproduction, or other factors affecting population levels. No bodily harm or life threatening injuries would occur.

Moderate: Effects on marine mammals and sea turtles, their habitats, or the natural processes sustaining them would be readily detectable. Key processes such as dispersal, competition, or predation may experience disruptions that would alter population size or distribution, but those processes would return to natural conditions after initial disturbance. Sufficient habitat would remain to maintain viable native marine mammal and sea turtle populations.

Major: Key life processes such as dispersal, competition, or predation would experience disruptions that would alter population size or distribution. Natural conditions would not return after initial disturbance. Injury and mortality would alter marine mammal or sea turtle populations and community structure. Habitats may not remain functional or capable of maintaining viable populations. A major adverse impact would represent a significant impact to marine mammals or sea turtles.

Duration:

Short-term: The effect would occur, and be limited to, those times when equipment is operating and the actual repair/construction is occurring.

Long-term: Species would continue to be affected beyond the construction period or conditions would not be similar to those that predominated prior to the construction activity.

Determination of Effects for Species Listed under the ESA. The following effects determinations from the *Final ESA Section 7 Consultation Handbook* (USFWS and NMFS 1998) are identified for each species protected under the ESA. For this analysis, these determinations apply to the Hawaiian monk seal, green sea turtle, and hawksbill turtle.

No effect is the conclusion when the proposed action would not affect listed species or critical habitat.

May affect, but not likely to adversely affect is the conclusion when effects on listed species are expected to be discountable, or insignificant, or completely beneficial. Beneficial effects are contemporaneous positive effects without any adverse effects to the species. Insignificant effects relate to the intensity of the impact and would not reach the scale where take occurs. Discountable effects are those effects extremely unlikely to occur. Based on best judgment, a person would not: 1) be able to meaningfully measure, detect, or evaluate insignificant effects; or 2) expect discountable effects to occur.

Likely to adversely affect is the conclusion if any adverse effect to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not: discountable, insignificant, or beneficial (see definition of “may affect but not likely to adversely affect”). In the event the overall effect of the proposed action is beneficial to the listed species, but also is likely to cause some adverse effects, then the proposed action "is likely to adversely affect" the listed species. An "is likely to adversely affect" determination requires formal Section 7 consultation.

Impacts of Alternative A, the No Action Alternative

Physical Water Quality. Alternative A would temporarily disturb the marine floor during barge operations by re-suspending sediment and possibly discharging ballast water containing pollutants and invasive species. These effects, however, would be localized to a small area and would be no different from previous years. The relatively high-energy environment of the harbor would quickly dissipate finer sediments and previous benthic surveys have not detected any invasive algae or macroinvertebrates. Therefore, long-term water quality impacts would be minimal with Alternative A.

Vessel Movements and Disturbance. Under Alternative A, the No Action Alternative, construction equipment would not be necessary. There would be no short-term effects resulting from vessel disturbance and, therefore, no short- or long-term changes from current conditions for marine mammals and sea turtles. Tug boats and barges are expected to operate at 5 knots or less in or approaching the harbor. At this speed, animals have adequate opportunity to avoid collisions, so potential strikes are not anticipated. Annual barge service has not historically affected marine mammals or sea turtles.

Over the decades of annual barge service, the Kalaupapa Peninsula has developed into a preferred pupping location for the Hawaiian monk seal, so continued vessel movements at the current level of annual service are not expected to result in adverse effects.

Acoustic Effects. Under Alternative A, the No Action Alternative, construction would not be necessary. There would be no short-term acoustic effects and, therefore, no short-or long-term changes from current conditions for marine mammals and sea turtles.

Cumulative Impacts. There would be no short- or long-term changes from current conditions for marine mammals and sea turtles. As there would be no impacts to marine mammals and sea turtles associated with the continuation of actions associated with Alternative A, there would be no cumulative impacts.

Conclusion. Implementation of Alternative A, the No Action Alternative, would have no effect on Hawaiian monk seals, hawksbill turtles, green sea turtles, spinner dolphins, or bottlenose dolphins. Alternative A would have no effect on critical habitat under consideration for Hawaiian monk seals.

There would be no cumulative impacts to special-status species and their habitat under Alternative A.

Alternative A would not result in impairment of special-status species or critical habitats.

Impacts of Alternative B, the Preferred Alternative

Physical Water Quality. As described in the Water Resources section, Alternative B would temporarily disturb the marine floor in the immediate vicinity of the project area. Sediment disturbance may temporarily increase turbidity; however, the affected area would be localized to a small area. Given the limited amount of activity associated with work on the underwater structures and the relatively high-energy environment of the harbor; turbidity above ambient conditions would not likely persist and finer sediments would be minimal and would dissipate quickly. In addition, a Water Quality Monitoring Plan will be developed in conjunction with and approved by the DOH as mitigation.

Vessel Movements and Disturbance. Under Alternative B, marine mammals and sea turtles may be affected by vessel movements or disturbed by the presence of construction barges in the harbor. Construction equipment would be transported to the harbor by barge. Tug boats would be used to maneuver barges to and from the harbor. The construction barges are expected to be active for less than 120 days.

Barge and tug boat movement in the vicinity of the harbor would result in temporary, localized disturbance of the ocean surface. Given the existing surface conditions in and near the harbor, the disturbance resulting from tug boats and barges is considered discountable. Tug boats and barges are expected to operate at five knots or less in or approaching the harbor. At this speed, animals have adequate opportunity to avoid collisions, so potential strikes are unlikely. Resource protection measures such as vessel speed restrictions, requirements for vessels to alter course to remain at least 50 yards from sea turtles and marine mammals, requirements for vessels to shift to neutral to allow approaching animals to pass, and no attempts by vessel crews to intentionally interact with any marine species, would be utilized to avoid and protect sea turtles and marine mammals.

Bottlenose dolphins have been rarely observed at Kalaupapa and have been typically observed beyond 100 fathoms offshore, therefore they are not expected to be present in the harbor area, so adverse impacts from the movement or presence of construction vessels in the harbor are not expected.

A pod of spinner dolphins utilize a sandy shoal located approximately 260 meters (850 feet) southwest of the harbor as resting habitat for approximately 30 to 40 days of the year (Eric Brown, pers. comm. 2009). The pod size ranges from 50 to 100 animals. NMFS recommends people conduct dolphin watching at a distance and avoid approaching dolphins closer than 50 yards (150 feet) in order to avoid harassment of wild dolphins. Given these recommendations, barge and tug movement in the harbor is not expected to affect spinner dolphins at their resting habitat which is 260 meters from the construction activity.

Although hawksbill sea turtles may occasionally migrate in the waters near Kalaupapa, hawksbill sea turtles have not been documented in the park and Kalaupapa does not offer suitable habitat for hawksbill turtles that prefer aggregated reef structures to forage for sponges and invertebrates. As such, hawksbill turtles are not expected to be in the vicinity of the harbor and effects to hawksbills from the presence and movement of construction barges in the harbor are not expected.

Although bottlenose dolphins, spinner dolphins, and hawksbill turtles are not expected to be in the harbor area and therefore adverse impacts are not expected, these species could occasionally transit or migrate through the harbor vicinity. Potential impacts from presence of construction barges and construction activity in the harbor would be unlikely based on the discontinuation of construction activities if an animal approaches the safety zone (minimum of 50 meters) and restrictions on starting or resuming work only after animals have voluntarily departed the area.

The closest monk seal pupping beach (Papaloa) is approximately 310 meters (1,016 feet) north of the project area and not within line of sight of the harbor. Therefore mother/pup pairs at Papaloa would not be expected to be affected by the presence of construction barges in the harbor. Since this species may forage at any time and do utilize the harbor on occasion, seals could encounter construction barges and day time construction activity in the harbor. Green sea turtles are also known to use the harbor area and may also encounter construction barges in the harbor. Should monk seals or other marine mammals or sea turtles be in or approach the harbor, resource protection measures include postponing or halting work when special-status species are within the safety zone (minimum of 50 meters) and restrictions on starting or resuming work only after animals have voluntarily departed the area. Thus no physical (non-auditory) harm to animals is expected.

In summary, with the implementation of construction vessel operation restrictions and discontinuation of construction activities if an animal approaches within the safety zone (minimum of 50 meters), vessel movements or the presence of construction barges in the harbor would not be expected to result in mortality or injury to marine mammals or sea turtles. Monk seals and green sea turtles may temporarily avoid the immediate area of the harbor, but other suitable nearshore

foraging areas are available outside of the harbor and vessels and construction activity in the harbor would not prevent animals from accessing preferred feeding, resting haul outs or pupping / nursery grounds. Therefore, disruption of behavioral patterns to green sea turtles or Hawaiian monk seals is expected to be short-term and minor. Impacts to hawksbill turtles, spinner dolphins, and bottlenose dolphins from the presence and movement of construction barges in the harbor are not expected because hawksbill turtles and bottlenose dolphins are not likely to be present in the vicinity of the harbor and spinner dolphins resting habitat is located far enough south of the harbor such that disturbance to resting dolphins should not occur. Should hawksbill turtles or dolphins transit through the harbor vicinity, resource protection measures mentioned previously would reduce the likelihood of interaction with animals or possible harm to these animals.

Under Alternative B, there would be no long-term changes from current barge service and operations, therefore existing conditions would not change and there would be no long-term effect to marine mammals and sea turtles.

Acoustic Effects – Marine Mammals and Sea Turtles. The acoustic abilities of marine mammals are important in communicating with others of their species, navigating, foraging, and avoiding predators. Human activities that affect their hearing could have adverse consequences for their survival and recovery. Noise generated from underwater construction activities may travel considerable distances from the source. Such noise could result in physiological or behavioral effects to marine mammals and sea turtles.

Physiological and Behavioral Effects of Noise. Sound exposure may affect more than one biological trait of a marine animal. The analytical framework of this assessment is structured on the basis of the potential physiological and behavioral effects of sound exposure. The range of effects is then evaluated to determine which effects qualify as harm or harassment. The definitions of physiological effect and behavioral effect presented below are specific to this EA and should not be confused with more global definitions used in the field of biology:

- A physiological effect is a variation in an animal's physiology that results from an anthropogenic acoustic exposure, and exceeds the normal daily variation in physiological function (see below).
- A behavioral effect is a variation in an animal's behavior or behavior patterns that results from an anthropogenic acoustic exposure, and exceeds the normal daily variation in behavior, but which arises through normal physiological process (it occurs without an accompanying physiological effect).

The term "normal" is used to qualify distinctions between physiological and behavioral effects. Its use follows the convention of normal daily variation in physiological and behavioral function without the influence of anthropogenic acoustic sources.

Exposure to continuous noise may cause a variety of effects in mammals. For example, exposure to very high sound levels may affect the visual system, vestibular system, and internal organs (Ward 1997). Exposure to high-intensity, continuous sounds of sufficient duration may injure the lungs and intestines (Dalecki et al. 2002). Sudden, intense sounds may elicit a "startle" response and may be followed by an orienting reflex (Ward 1997; Jansen 1998). The primary physiological effects of sound, however, are on the auditory system (Ward 1997).

The effects of sound on marine mammals are highly variable and can be categorized along a gradient as follows (based on Richardson et al. 1995):

1. The sound may be too weak to be heard at the location of the animal (i.e., lower than the prevailing ambient noise level, the hearing threshold of the animal at relevant frequencies, or both);
2. The sound may be audible but not strong enough to elicit any overt behavioral response;

3. The sound may elicit reactions of variable conspicuousness and relevance to the well being of the marine mammal; these can range from temporary alert responses to active avoidance reactions, such as vacating an area at least until the sound ceases;
4. Upon repeated exposure, a marine mammal may exhibit diminishing responsiveness (habituation) or disturbance effects may persist; the latter is most likely with sounds that are highly variable in characteristics, infrequent, unpredictable in occurrence, and associated with situations that a marine mammal perceives as a threat;
5. Any anthropogenic sound that is strong enough to be heard has the potential to reduce (mask) the ability of a marine mammal to hear natural sounds at similar frequencies, including calls from other animals, and underwater environmental sounds such as surf noise;
6. If mammals remain in an area because it is important for feeding, breeding, or some other biologically important purpose even though there is chronic exposure to sound, it is possible that there could be sound-induced physiological stress; this might in turn have negative effects on the well-being or reproduction of the animals involved; and
7. Very strong sounds have the potential to cause temporary or permanent reduction in hearing sensitivity.

In terrestrial mammals, and presumably marine mammals, received sound levels must far exceed the animal's hearing threshold for there to be any temporary threshold shift (TTS) in its hearing ability. For transient sounds, the sound level necessary to cause temporary threshold shift is inversely related to the duration of the sound. Received sound levels must be even higher for there to be risk of permanent hearing impairment. In addition, intense acoustic (or explosive events) may cause trauma to tissue associated with organs vital for hearing, sound production, respiration, and other functions. This trauma may include minor to severe hemorrhage (Richardson et al. 1995).

The mammalian auditory system consists of the outer ear, middle ear, inner ear, and central nervous system. Sound waves are transmitted through the outer and middle ears to fluids within the inner ear. The inner ear contains delicate electromechanical hair cells that convert the fluid motions into neural impulses that are sent to the brain. The hair cells within the inner ear are the most vulnerable to over-stimulation by noise exposure (Yost 1994).

Very high sound levels may rupture the eardrum or damage the small bones in the middle ear (Yost 1994). Lower-level exposures may cause permanent or temporary hearing loss, referred to as a noise-induced threshold shift, or simply a threshold shift (TS) (Miller 1994). The shift may be temporary (TTS) or permanent (PTS). Still lower exposures may result in "auditory masking," that may interfere with an animal's ability to hear other sounds.

For this analysis, PTS and TTS are used as the biological indicators of physiological effects because: 1) the tissues of the ear appear to be the most susceptible to the physiological effects of sound and 2) threshold shifts tend to occur at lower exposures than other more serious auditory effects. Since masking (without TS) is not associated with abnormal physiological function, it is not considered a physiological effect, but rather a potential behavioral effect.

Behavioral disturbance includes: changes in foraging or resting behavior, nursing/reproductive behavior, swimming speeds, or dive times; behavioral changes in social interaction and communication; and the psychological impact of stress.

The ESA-listed species that may be affected by implementing the proposed action include the Hawaiian monk seal, hawksbill, and green sea turtle. The spinner dolphin is a non-listed, marine mammal that may frequent the harbor vicinity (approximately 260 meters away) during implementation of the proposed action. The bottlenose dolphin is also a non-listed, marine mammal that has been documented in offshore waters.

Acoustic Modeling. The effects of in-water and in-air anthropogenic sound expected as a result of the construction activities associated with Alternative B were modeled to estimate potential exposure areas for special-status species.

Model results are discussed below and are presented in Tables 11 through 13. For clarification, a few technical notes are provided:

1. In air the customary intensity reference for a source level of sound is 20 micropascals at a distance of 1 meter (re:20μPa@1m), and in water the customary intensity reference is 1 micropascal at 1 meter (re:1μPa@1m).
2. Additionally, there is a requirement to correct for the difference in acoustic impedance (i.e., acoustic impedance for a medium is the speed of sound in that medium times its density) between air and water. This correction to convert from in-air dB to in-water is 62 dB. Thus a reading of 99 dB re:20 μPa (air) is 161 dB re:1 μPa (water).
3. Finally, in order to match intensity levels with the sensitivity of the human ear, weighting is given to the dB readings as a function of frequency. The most common is "A-weighting," and it is indicated in this EA as "dB(A)." In this analysis the “A-weighting” is approximately 3 dB. Thus, a reading of 99 dB unweighted is 102 dB(A) weighted. This 3 dB has been used to convert between “A-weighting” for human hearing evaluations (discussed in Soundscapes) and unweighted values used in this section for marine mammal and sea turtle hearing analyses.

Table 11 presents the modeled exposure distances for in-water noise resulting from armor stone placement under Alternative B. Other deferred maintenance actions (i.e., repairs to the pier, low dock toe, bulkhead wall, and breakwater cap) are expected to generate lower levels of underwater noise than armor stone placement. However, to protect marine mammals and sea turtles, noise monitoring and enforcement of a safety zone would occur during construction activities. NMFS currently considers 180 dB for cetaceans and 190 dB for pinnipeds to be the thresholds for injury/PTS and 160 dB to be the threshold for behavioral harassment/TTS for impulse sounds.

Modeling results indicate that underwater noise levels from armor stone placement are not expected to exceed the 180 or 190 dB injury/PTS thresholds and that the 160 dB behavioral disturbance/TTS zone of influence extends approximately 1.1 meters. The results of modeling for in-water activities are shown graphically in Figure 18, with approximate locations for in-water armor stone removal; armor stone removal would be the source for in-water noise related with this activity. Figure 19 shows the nearest monk seal habitat areas.

The use of resource protection measures to reduce noise and monitoring to ensure a minimum 50 meter safety zone around the construction area would further reduce the possibility of marine mammals or sea turtles being close enough to the construction area to be subject to physical injury or behavioral disturbance.

Table 11. In-Water Noise Zones for Armor Stone Placement Under Alternative B

	Approximate Duration of Construction Activity	Source Level*	Permanent Threshold Shift in Monk Seals (190 dB)*	Permanent Threshold Shift in Cetaceans and Sea Turtles (180 dB)*	Temporary Threshold Shift / Behavioral Disturbance in Monk Seals, Cetaceans and Sea Turtles (160 dB)*
Armor stone placement	1-2 days	161**	N/A***	N/A***	1.1 meters

* Unit of measure for Source Levels is dB re:1µPa@1m. In-water ranges are based on a transmission loss of 18logR.
** Source level for excavator 161 dB determined based on 99 dB as the unweighted conversion from 102 dB(A) in-air, plus 62 dB correction for in-water source.
*** Not applicable, source level is below threshold.

Since monk seals spend a considerable amount of time above water, this impact analysis includes in-air modeling (Table 12). For in-air analysis, NMFS currently considers 100 dB to be the threshold for Level B behavioral harassment. The in-air noise 100 dB threshold is expected to extend 1.0 meter or less from the sound source during armor stone placement. The results of in-air modeling are shown graphically in Figure 20 which also shows the nearest haul-out typically used by monk seals (Kahikilo). Figure 20 shows the approximate locations where armor stones that were removed from the water would be placed on land; land placement of armor stones would be the source for in-air noise related with the activity.

Table 12. In-Air Noise Zones for Armor Stone Placement Under Alternative B

	Approximate Duration of Construction Activity	Source Level*	Temporary Threshold Shift / Behavioral Disturbance in Monk Seals (100 dB)***
Armor stone placement	1-2 days	99**	< 1.0 meter

* Unit of measure for in-air source levels is dB re: 20µPa@1m.
** Source level for excavator 99 dB determined based on the unweighted conversion from 102 dB(A) in-air.
*** Note: source level of 99 dB re: 20µPa@1m is marginally below threshold level.

Unweighted noise levels expected from typical equipment used for construction (i.e., excavator, jack hammer, fork lift) are presented in Table 13, along with estimated noise loss calculated for various distances from the equipment source. Most construction equipment is not expected to generate in-air noise levels above the 100 dB threshold. Noise levels from all equipment would diminish below the 100 dB threshold well within the safety zone (i.e., 50 meters from the source). As previously stated, the use of resource protection measures to reduce noise and monitoring to ensure a minimum 50 meter safety zone around the construction area would further reduce the possibility of marine mammals or sea turtles being close enough to the construction area to be subject to physical injury or behavioral disturbance.

Table 13. Estimated In-Air Unweighted Source Levels (in dB) at Various Distances from Construction Equipment under Alternative B

		Distance from Source (meters [m])*			
	dB at source distance	***50***	***100***	***500***	***1000***
Electric Generator (at 1 meter)	*64*	30.0	24.0	10.0	4.0
Air Compressor (both 185 and 375 CFM at 7 meters)	*73*	55.9	49.9	35.9	29.9
Welding Machine (at 1 meter)	*95*	61.0	55.0	41.0	35.0
Backhoe/Dozer(at 10 meters)	*77*	63.0	57.0	43.0	37.0
Dozer/Excavator (at 1 meter)	*99*	65.0	59.0	45.0	39.0
Jack hammer (at 1 meter)	*104.2*	70.2	64.2	50.2	44.2
Rivet Buster (at 15 meters)	*82*	71.5	65.5	51.5	45.5
Concrete Pump (115 hp at 15 meters)	*82*	71.5	65.5	51.5	45.5
Telescopic Forklift (at 2 meters)	*103*	75.0	69.0	55.0	49.0

*dB values have been unweighted from the dB(A) values cited from Caterpillar 2003, ENNAH 2001, Taylor 2000, Wu 2008, Geske 2005, LHSFNA No date, The Sullair Corporation 2007 and 2009, The Lincoln Electric Company 2008, The Wacker Neuson Corporation 2009, and Nipko and Shields 2003. Source noise levels for the Huki Pau Landing Craft could not be determined.

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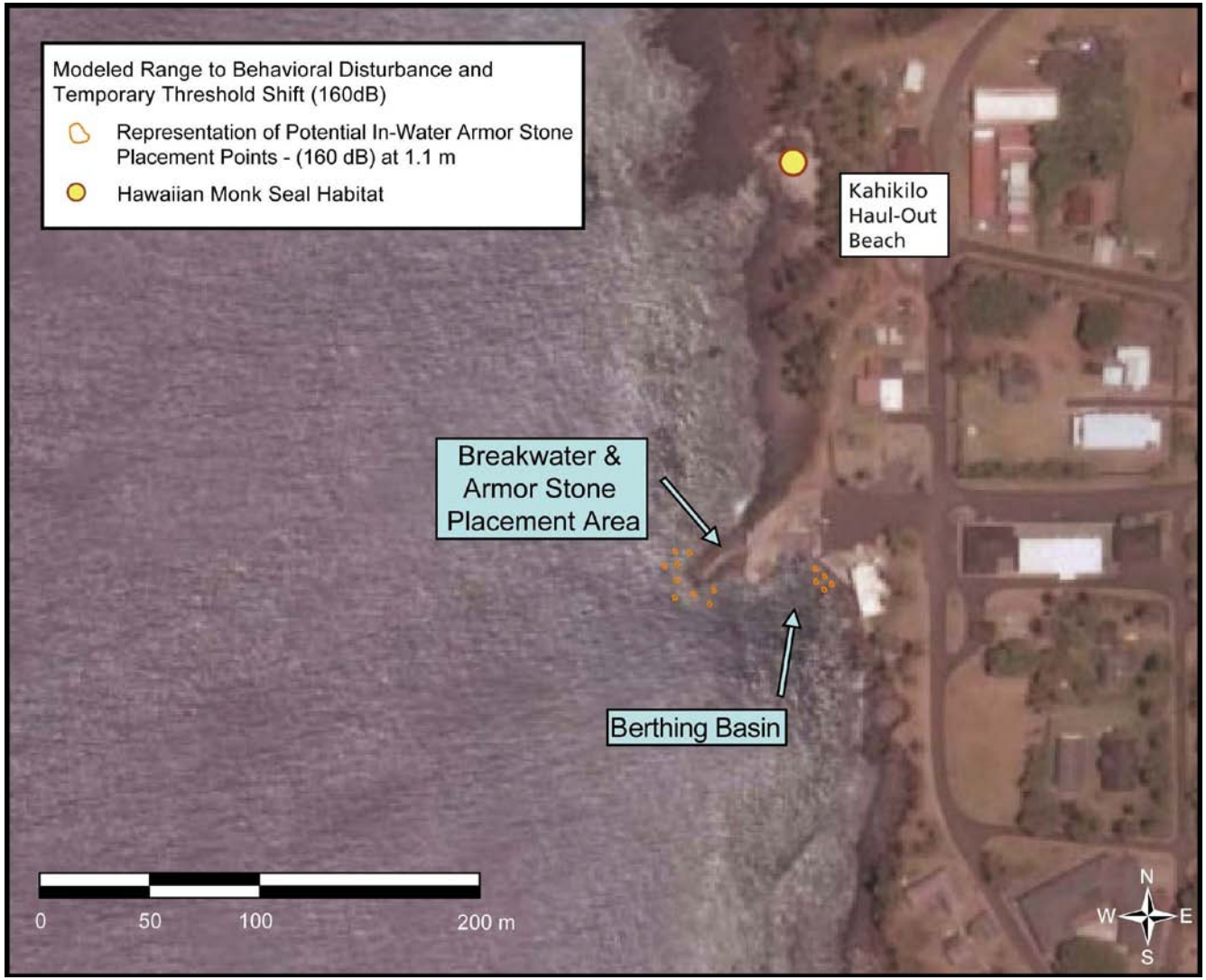

Figure 18. In-Water 160 dB Noise Zones Under Alternative B

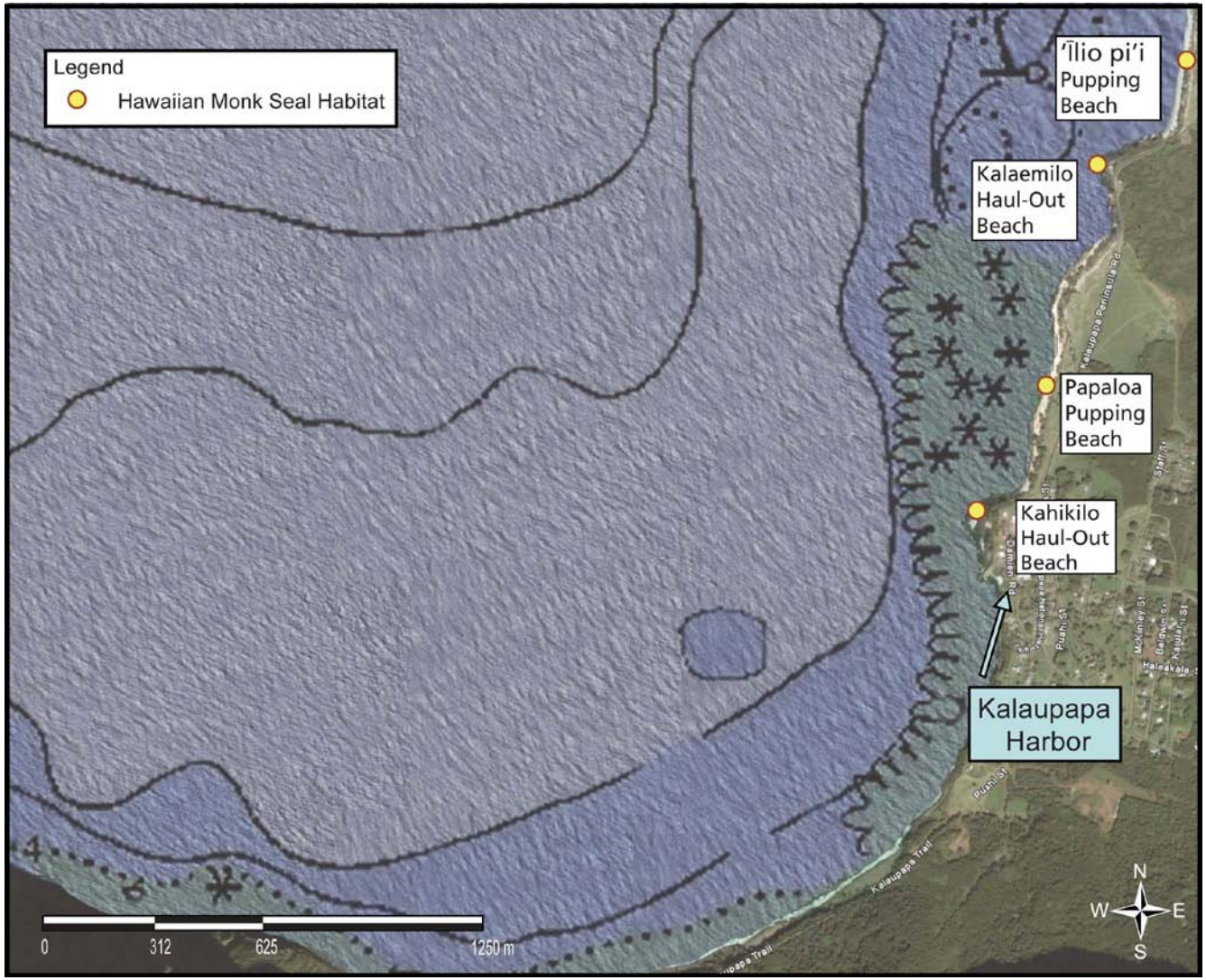

Figure 19. Monk Seal Habitat Areas in the Vicinity of Kalaupapa Harbor

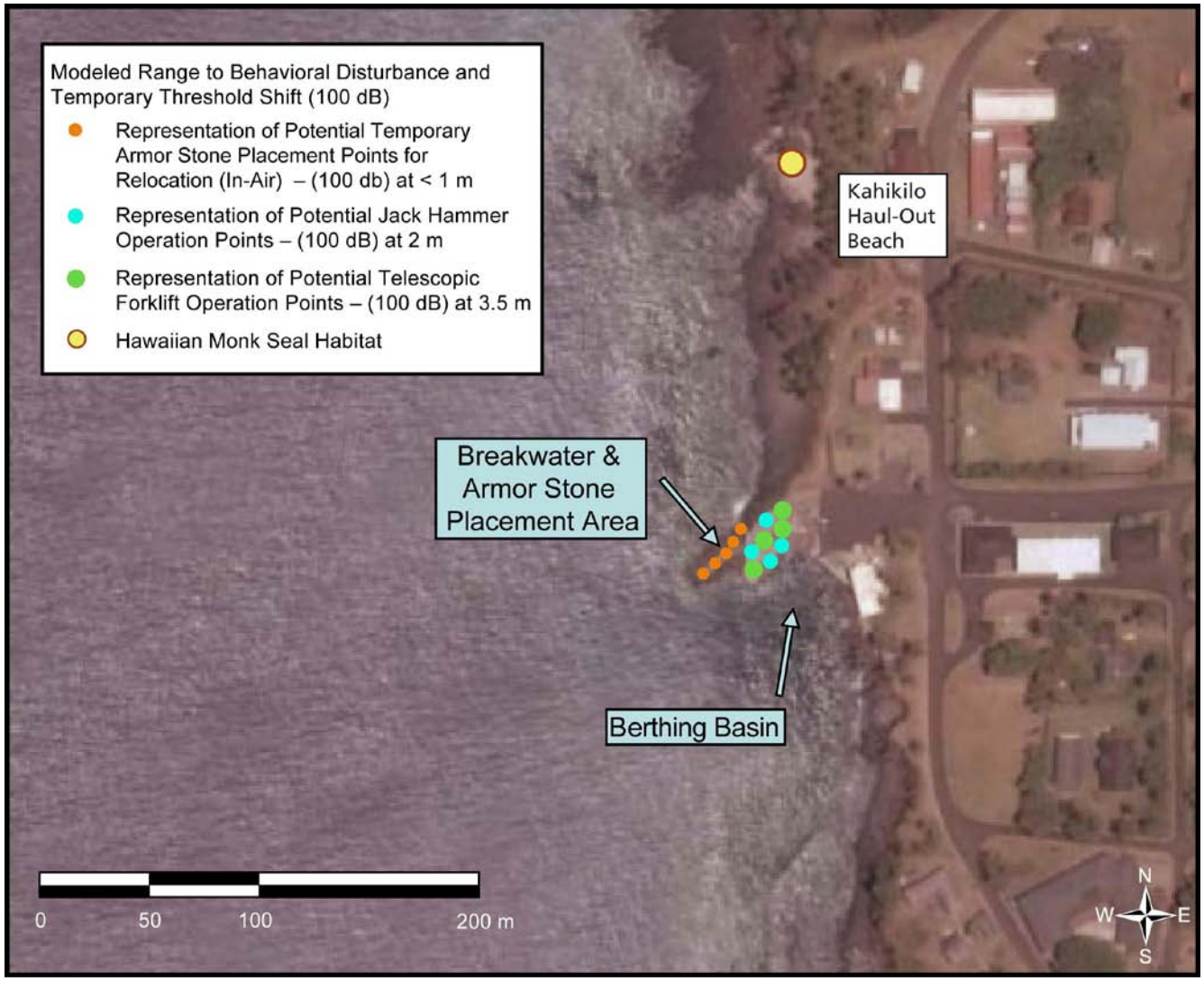

Figure 20. In-Air 100 dB Noise Zones Under Alternative B

Effects on Special-Status Species. The following sections discuss the exposure of special-status species to in-water sound resulting from armor stone placement activities and exposure of the Hawaiian monk seal to in-air sound resulting from general construction activities.

Hawaiian Monk Seal - Hawaiian monk seals are expected to be in the vicinity of the harbor during Alternative B construction activities. Adults and pups could be hauled out on nearby beaches (see Figure 19 for nearest haul out habitat area, Kahikilo), females could be returning to Moloka`i as a birthing island, and/or recently weaned pups could be foraging in the harbor area.

Based on previous distribution and abundance observations of Hawaiian monk seals in and near the harbor (observations made by NPS staff at Kalaupapa), the following are an estimate of monk seals expected to be potentially exposed to Alternative B activities. In May and June, two to three animals (one mother, one pup, and a transient monk seal) would be expected to be in the harbor area on a daily basis. These numbers would fluctuate until September as mothers wean the pups in June, and additional mother-pup pairs take up residence in July-August. The estimated maximum number of animals expected to be in the harbor area on a daily basis is five to six animals.

As shown in Table 11, underwater noise levels from armor stone placement are not expected to exceed the injury/PTS thresholds of 190dB for pinnipeds. In-water and in-air behavioral disturbance noise thresholds from armor stone placement were calculated to extend 1.1 meters and less than 1 meter from the source respectively. Heavy equipment and construction activities associated with the other deferred maintenance work would generate noise in the harbor area for approximately four months. As shown in Table 13, in-air noise levels from the loudest equipment such as a jack hammer would diminish below the 100dB in-air threshold within 50 meters.

Both monk seal pupping beaches (Papaloa and ʻĪlio piʻi) and haul out beaches (Kahikilo and Kalaemilo) are far outside the zone of influence for in-air noise that exceeds the behavioral disturbance threshold of 100 dB re 20 microPa. The closest monk seal pupping beach (Papaloa) is approximately 310 meters (1,016 feet) and the closest haul out beach (Kahikilo) is approximately 200 meters (655 feet) north of the project area. Therefore, disturbance of mother/pup pairs or hauled out animals at these beaches from construction noise would not be expected.

Additionally, in the summer of 2009, State of Hawaii on-shore structural dock repairs occurred from approximately late May through mid-September. A variety of construction equipment was used such as jackhammers, diesel air compressors, electric generator, and concrete pump. During this time, monk seal surveys were conducted weekly and consisted of walking a linear track along the coast from the airport to the harbor. These surveys reported that a female monk seal gave birth at Papaloa beach on August 18, 2009 and the mother and pup remained at this beach through at least September 25, 2009. The pup was weaned shortly thereafter and the pup continued to use the beach until December 2009. This beach is approximately 900 meters north of the harbor where construction work occurred. Construction activities did not preclude use of this pupping beach by this mother/pup pair.

Monk seals may forage at any time and do utilize the harbor on occasion. Behavioral effects from construction noise could range from temporary alert responses to active avoidance reactions. Behavioral responses of marine mammals to noise can be highly variable and are also dependent on a number of other factors such as sound frequency, ambient noise levels, if the source is stationary or moving, and age and behavior of the animals. Animals may leave and/or avoid the construction activity and noise in the harbor area. However, other suitable nearshore foraging areas are available outside of the harbor and construction activity and noise in the harbor area would not prevent animals from accessing preferred feeding, resting haul outs, or pupping / nursery beaches. Animals also may approach the harbor while repair work is underway. During the above-water structural dock repairs in 2009, a monk seal was sighted twice in the

harbor area after construction hours and once during construction, which caused a delay in construction until the animal voluntarily moved out of the area.

Adult seals and weaned pups are not expected to be exposed to noise that exceeds the in-water and in-air thresholds for behavioral disturbance. Resource protection measures including postponing or halting work when special-status species are within the safety zone (minimum of 50 meters) around repair activities and restrictions on starting or resuming work only after animals have voluntarily departed the area would reduce the likelihood of interaction with animals or possible physical or auditory harm to animals from repair work. The water would be visually monitored by qualified observers for animals approaching or within this no start/shut down safety zone. Acoustic monitoring during construction would also be implemented to ensure that a 50 meter safety zone was adequate to encompassed all areas where noise levels equal or exceed disturbance thresholds. The safety zone would be adjusted, if needed, to encompass all areas where the underwater sound pressure levels are anticipated to equal or exceed 160 dB (1 micro-Pa at 1 meter) and the in-air noise levels equal or exceed 100 dB (20 microPa at 1 meter). Consequently, potential disturbance to animals from deferred maintenance work is expected to be minor, short-term, and non-injurious.

Hawaiian Monk Seal Critical Habitat - The NMFS is considering designating critical habitat for the Hawaiian monk seal in the Main Hawaiian Islands. It is likely that when the final rule is published, the harbor will be within the larger coastal area designated as critical habitat for the Hawaiian monk seal. Although primary constituent elements have not been finalized, the June 12, 2009 proposed rule for revision of critical habitat designation for the Hawaiian monk seal identifies features to be essential to conservation of the monk seal. Features that are present in proximity to the harbor include:

- Sandy beaches preferred by monk seals for pupping and nursing;
- Marine areas (less than 20 meters [66 feet] depth) adjacent to these beaches; and
- Areas with low levels of unnatural disturbance.

Although the coastline in the vicinity of the harbor at Kalaupapa contains these features, the proposed action would be conducted in a very small portion of the Main Hawaiian Island beach and marine areas under consideration for critical habitat designation by NMFS.

Construction activities associated with implementation of Alternative B would be short-term (approximately four months) and are not expected to affect the beach areas where monk seal haul out, or the marine areas adjacent to these beaches. Repair of the existing dock structures is not likely to adversely modify areas NMFS is currently considering for future critical habitat designation for Hawaiian monk seals.

Spinner and Bottlenose Dolphin - The nearest area where resting spinner dolphins have been reported is approximately 260 meters (850 feet) from the project area. Spinner dolphins utilize the area approximately ten percent of the year, or 35 to 40 days per year. The pod size is typically between 50 and 100 animals, but is sometimes more than 100 dolphins.

Bottlenose dolphins have been observed occasionally offshore (beyond 100 fathoms) of Moloka`i. They have never been documented in the harbor. It is estimated that two to three bottlenose dolphin would be expected perhaps two or three days per year within 1 kilometer (0.6 mile) of the harbor.

Implementation of Alternative B would include approximately one to two days of armor stone placement. As shown in Table 11, dolphins would need to be within approximately 1.1 meters (4 feet) for exposure to exceed thresholds for behavioral disturbance and temporary threshold shift. Should a pod of dolphins be swimming in the harbor vicinity, activities would be shut

down if the animals approached within the safety zone (minimum of 50 meters) around repair activities; activities would be delayed until the pod vacated the area. Dolphins would be readily observable at this distance. Therefore, impacts from armor stone placement and other deferred maintenance actions are expected to be minor, short-term, and non-injurious.

Green and Hawksbill Turtles - Sea turtles have no external auditory structures. Instead, they have specialized internal structures that transmits sound to their inner ear and nervous system (Ridgway et al. 1969). Sounds also arrive by bone conduction through the skull.

Sea turtle auditory sensitivity is not well studied, although a few preliminary investigations suggest that it is limited to low-frequency sounds, such as the sounds of waves breaking on a beach. Sea turtles may use acoustic signals from their environment as guideposts during migration and as a cue to identify their natal beaches (Lenhardt et al. 1983). A recent study on the effects of airguns on sea turtle behavior suggests that sea turtles are most likely to respond to low-frequency sounds (McCauley et al. 2000). Green turtles exposed to airgun arrays displayed behavior indicative of alarm at approximately 2 kilometers (1.2 miles) and behavior indicative of avoidance at approximately estimated at 1 km. The sea turtles' response was consistent: above a level of about 166 dB, the turtles noticeably increased their swimming activity. Above 175 dB, their behavior became more erratic, possibly indicating that the turtles were agitated. For the purposes of this analysis, exposure thresholds used for marine mammals were applied as a conservative estimate of sea turtle exposure. The results of exposure modeling for sea turtles are presented in Table 11.

Green sea turtles are frequent visitors to the harbor. On a given day, it is estimated that two to three green sea turtles could be present in the harbor area. All proposed activities would be conducted during daylight hours, so there would be no potential effect to sea turtle nesting or hatchling activities.

Kalaupapa does not offer suitable habitat for hawksbill turtles that prefer aggregated reef structures to forage for sponges and invertebrates. As such, hawksbill turtles are not expected in the vicinity of the harbor. Although not documented, hawksbill turtles could migrate in the waters near Kalaupapa.

Implementation of Alternative B would include approximately one to two days of armor stone placement. As shown in Table 11, sea turtles would need to be within approximately 1.1 meters (4 feet) for exposure to exceed 160 dB. Turtles would be readily observable at this distance, and safety zone procedures would prevent armor stone placement to continue until the animal vacated the safety zone (minimum of 50 meters) around repair activities. Turtles may leave and/or temporarily avoid the construction activity and noise in the harbor area. However, other suitable nearshore foraging areas are available outside of the harbor. As such, impacts from armor stone placement and other deferred maintenance actions are expected to be minor, short-term, and non-injurious.

Cumulative Effects. Special-status species include ESA-listed species and marine mammals known to inhabit waters in the vicinity of the harbor during the period of proposed construction. The past and ongoing natural and human threats to survival of these species are described below. These threats are generally widespread (global), long-term, and have contributed to overall population declines that have resulted in federal listing of these species. Overall, proposed NPS actions would not contribute detectably to the widespread effects on these species.

- Hawksbill and green sea turtle populations are threatened by the fishing industry, collisions with marine vessels, marine pollution, and habitat degradation. Disease affecting sea turtles, such as fibropapillomatosis, may be the result of human pollution of the marine environment. Development of coastal areas, artificial lighting on beaches, and beach erosion result in declines to suitable coastal nesting sites.

- The Hawaiian monk seal population is threatened by food limitations, shark predation, habitat loss, and mobbing of females by males. Considerable population decline in Hawaiian monk seals can be attributed to entanglement in fishing gear, poor juvenile survival from starvation, and marine debris (NMFS 2007). Disease, especially leptospirosis and toxoplasmosis, is likely transmitted from human, livestock, and feral animals. Even human intervention to preserve the species has resulted in occasional injury and mortality. In recent years, monk seals have expanded their range and population size from the Northwest Hawaiian Islands to the Main Hawaiian Islands (particularly Moloka`i at Kalaupapa), presumably due to beach erosion, prey availability and shark predation stressors associated with the Northwest Hawaiian Islands.
- Spinner and bottlenose dolphins inhabiting waters in the vicinity of the harbor are exposed to the same human impacts to their environment as ESA-listed species, such as injury and mortality from the fishing industry, collisions with marine vessels, underwater noise, entanglement, ingestion of debris, and disease from pollution.

Implementation of Kalaupapa National Historical Park's General Management Plan would serve to continue the preservation of the park and the minimal human disturbance to the natural environment of Kalaupapa Peninsula and harbor. This would provide long-term, localized, discountable-to-minor benefits to special-status species. However, these would not offset the widespread, long-term, moderate, cumulative adverse impacts of fishing, shipping, whale-watching activities, pollution, disease, and habitat degradation.

Cumulative impacts are based on past, present, and reasonably foreseeable future actions in the greater region, in combination with potential effects of this alternative. Whereas widespread, more intensive impacts have occurred on the regional level, this alternative's contribution to those effects would be short-term, incremental, and localized. As described for Alternative A, past and ongoing activities in the greater region have resulted in widespread, long-term, moderate, adverse effects on special-status species. Implementation of Kalaupapa National Historical Park's General Management Plan would serve to continue the preservation of the park and the minimal human disturbance to the natural environment of Kalaupapa Peninsula and harbor. This would provide long-term, localized benefits to special-status species, of discountable to minor intensity. However, these would not offset the widespread, long-term, moderate, cumulative adverse impacts of fishing, shipping, pollution, disease, and habitat degradation.

On a cumulative basis, Alternative B would contribute a minor short-term adverse impact on special-status species to the current wide-spread, long-term, moderate cumulative adverse impacts discussed above. Therefore the combined effects of Alternative B and other projects and plans on special-status species would be widespread, long-term, adverse, and moderate, principally as a result of impacts outside of the park.

Conclusion. The effects of Alternative B on Hawaiian monk seals, spinner dolphins, bottlenose dolphins, green sea turtles, and hawksbill turtles would be localized, short-term, and minor. Based on these conclusions, the effects determination for the three species protected under the ESA is:

- May affect, but not likely to adversely affect Hawaiian monk seals, green sea turtles, or hawksbill turtles;
- Not likely to adversely modify Hawaiian monk seal critical habitat or areas under consideration for future designation of critical habitat for Hawaiian monk seals.

The cumulative effects of Alternative B in conjunction with other projects and plans on special-status species and their habitat would be localized, long-term, adverse, and moderate, principal-

ly as a result of impacts outside of the park. Alternative B's contribution to these effects would be incremental, short-term, and localized.

Alternative B would not result in impairment of special-status species or critical habitat.

SOUNDSCAPE

AFFECTED ENVIRONMENT

This section addresses the terrestrial soundscape characteristics of Kalaupapa National Historical Park, and the potential impacts of the proposed activities on this soundscape. Soundscapes are intrinsic elements of the environment that are often associated with parks. They are inherent components of "the scenery and the natural and historic objects and the wild life" protected by the Organic Act of 1916. The soundscape is composed of the sound conditions in a park in relation to the park's significant resources and park mission. At Kalaupapa National Historical Park, the soundscape is an aggregate of the natural and community sounds that occur in the park. The soundscape is vital to the function of the park, and is also a concern for patients and resident staff.

Increasingly, even parks that appear as they did in historical context do not sound like they once did. Natural sounds are being masked or obscured by a wide variety of human activities. Soundscape preservation and noise management is one dimension of preserving park resources for the enjoyment of present and future generations. This is the basis for determining the potential impacts of the proposed action on the park soundscape. Effects of project-related sound on receptors, such as wildlife and humans, are addressed in the "Special-Status Species," "Fish," and "Cultural Resources" sections.

Characteristics of Sound

As stated in the "Special-Status Species" section of the document, sound is a physical phenomenon consisting of minute vibrations of pressure that travel through a medium such as air or water. The decibel (dB) is the standard unit for measuring noise levels. For the purposes of this discussion, the human receptor-weighted values of dB(A) are used to describe potential effects to the park's soundscape.

Noise is generally defined, or considered to be unwanted sound that disrupts normal activities or that diminishes the quality of the environment. Normal conversation is typically between 44 and 65 dB(A) (people speaking approximately three to six feet apart). Noise levels in a quiet rural area at night are typically between 32 and 35 dB(A). Quiet urban nighttime noise levels range from 40 to 50 dB(A). Noise levels during the day in a noisy urban area may be as high as 70 to 80 dB (A). Table 14 depicts sound levels for common noise sources (FAA 2005).

Table 14. Sound Levels for Common Situations	
Reference Sound	dB(A) Level
Whispering at 5 feet	20
Quiet residential area	40
Distant bird calls	45
Light traffic at 100 feet	50
Normal conversation at 5 feet	60
Helicopter landing at 200 feet	80
Heavy surf at 3 feet	107

Existing Sounds within Kalaupapa Community

Kalaupapa National Historical Park is located on the north side of the island of Moloka`i. The remote nature of the park's location provides a soundscape that is a combination of natural ambient sounds and the sounds of small, rural community life. In, and near the harbor, the sounds of wind and waves dominate the soundscape. Moving inland, the sounds of community activities join the natural sounds. Along with wind in the trees, the sounds of human conversations, vehicle movement, crowing of chickens and barking of dogs, add to the soundscape of a small rural town. Birds and wildlife in, or near the park also contribute to ambient sound levels in the park. The seclusion of the park allows the soundscape to be relatively undisturbed by noise and consistent with levels found in a "quiet residential area" at 40 dB(A) (see Table 14).

The greatest proportion of human-generated sound in the park, during the day is from residents, park management activities, and flights in, and out of the nearby airport. Other man-made noise in the park harbor includes infrequent uses of motorized boats by the park staff for research purposes and by patients during fishing and crabbing activities. At night, the level of human-caused sounds decreases substantially and the natural ambient sounds are dominant.

ENVIRONMENTAL CONSEQUENCES

Guiding Regulations and Policies

Federal Regulatory Framework. NPS management goals for soundscapes are included in Section 4.9 of *Management Policies* (NPS 2006b) and in NPS Director's Order #47: *Soundscape Preservation and Noise Management* (NPS 2000b).

As stated in Section 8.2.3 of *Management Policies* (NPS 2006b), "The natural ambient sound level – that is, the environment of sound that exists in the absence of human-caused noise – is the baseline condition, and the standard against which current conditions in a soundscape will be measured and evaluated."

Management Policies (NPS 2006b) requires restoration of degraded soundscapes to the natural condition whenever possible, and protection of natural soundscapes from degradation. In Section 4.9, the NPS is directed to "take action to prevent or minimize all noise that, through frequency, magnitude, or duration, adversely affects the natural soundscape or other park resources or values, or that exceeds levels that have been identified as being acceptable to, or appropriate for, visitor uses at the sites being monitored."

However, NPS policies acknowledge that motorized equipment, which generate noise are necessary for administrative uses within the parks to meet management objectives (NPS 2006b).

Policies direct that where motorized equipment is necessary and appropriate, the least impacting equipment, vehicles, and transportation systems should be used, consistent with public and employee safety.

NPS Director's Order #47: Soundscape Preservation and Noise Management (NPS 2000b) requires, "to the fullest extent practicable, the protection, maintenance, or restoration of the natural soundscape resource in a condition unimpaired by inappropriate or excessive noise sources." It also states that "the fundamental principle underlying the establishment of soundscape preservation objectives is the obligation to protect or restore the natural soundscape to the level consistent with park purposes, taking into account other applicable laws." Noise is generally considered appropriate if it is generated from activities consistent with park purposes and at levels consistent with those purposes.

NPS Director's Order #47 also directs that where legislation provides for specific noise-making activities in parks, the soundscape management goal would be to reduce the noise to the level consistent with the best technology available, which would mitigate the noise impact but not adversely affect the authorized activity. Where a noise-generating activity is consistent with park purposes, "soundscape management goals are to reduce noise to minimum levels consistent with the appropriate service or activity."

State Regulatory Framework. The Indoor Radiological Health Branch of the state health department is responsible for enforcing noise regulations (11-46, HAR). The primary goal of the noise control program is to provide a tranquil and healthy environment. To this end, the branch evaluates Community Noise Permits for construction and other noise-generating activities. During the permit process, the branch works with project proponents to promote consideration of noise emissions prior to construction or operations. The NPS would complete a Community Noise Permit as part of the overall compliance effort for the dock and harbor project. The NPS would abide by the regulation under the Community Noise Permits in which noise can only be generated between 7:00 a.m. and 6:00 p.m. Monday through Friday.

Methods and Assumptions

Information Sources. Issues related to the park soundscape identified during internal and public scoping included: (1) sound generated from use of motorized vessels including barges and tugboats; and (2) sound generated due to construction related activities to the repairing of the dock structures.

An assessment of the effects of proposed activities on the soundscape was made using noise modeling. The Rough Noise Loss Calculation spreadsheet provided by the NPS Natural Sounds program was used to determine the effect of project-related noise on the park's soundscape. The noise levels of source equipment and activities proposed under the action alternative was entered into the model. The model then generated an estimate of human-perceived (A-weighted) decibel ranges for the noises at various distances. Because modeling results are presented in metric units (meters), this impact analysis uses meters as the primary measurement, with conversion to English units (feet) provided in the text as appropriate.

Assumptions. The major assumptions used in the analysis of effects on soundscapes were that: (1) The background ambient noise level of the community is assumed to be similar to that of a "quiet residential area", or approximately 40 dB(A), and sound levels in excess of 40 dB(A) have the potential to affect the soundscape. (2) Continued current management would lead to deterioration of the dock structures and unreliable barge delivery service. (3) Construction related noise would occur from 8:00 a.m. to 6:00 p.m. on regular work days and there would be no affect on the soundscape during nighttime hours. (4) The noise effects from construction activities are expected to have no lasting positive or adverse impacts to the park's soundscape.

Noise levels above 40 dB(A) were assumed to be capable of affecting the in-air or terrestrial soundscape, within the harbor and Kalaupapa Community. Modeled noise sources included,

jackhammers, and construction equipment. Effects on the in-air soundscape were evaluated by considering the aerial extent, intensity, and duration of the noise.

The geographic area analyzed for possible impacts on soundscape includes a 3,280-foot (1 km) radius from the pier, which encompasses the community and portions of the Kalaupapa harbor. The boundaries for the cumulative impacts analysis correspond to the area analyzed for direct noise impacts.

Impact Criteria and Thresholds

Impact threshold definitions for soundscape are as follows:

Negligible: Project sounds do not compete with ambient sounds present in the soundscape. Project sounds are infrequently present within parts of the community during daylight hours and at low levels compared to ambient sound levels.

Minor: Project sounds are detectable above ambient sounds of the soundscape. Project sounds seldom predominate within parts of the community. For the majority of daylight hours project sounds would be at low levels compared to ambient sound levels.

Moderate: Project sounds dominate ambient sounds of the soundscape. Project sounds may predominate within a large portion of the community for a portion of the construction period. For the majority of daylight hours project sounds would only rarely exceed moderate levels compared to ambient sound levels.

Major: Project sounds overwhelm ambient sounds of the soundscape and replace natural and community sounds. Project sounds predominate throughout the community for the majority of the construction period. For the majority of daylight hours project sounds would be at high levels compared to ambient sound levels.

Duration:

Short-term: Intermittent or persisting throughout the proposed project period.

Long-term: Effects would occur beyond the proposed project implementation period.

Impacts of Alternative A, the No Action Alternative

One to three days per year, short-term, minor, adverse and localized effects would result from barge deliveries to the harbor. Barge deliveries create noise from tug boats in the harbor, truck and forklift use, and conversations at elevated volumes. Noise levels would be expected to remain consistent with present day noise levels. No additional increase in noise levels are expected under this alternative.

However, if dock repairs are not completed, barge service could become less frequent or sporadic because of unsafe docking conditions. This would result in a decrease in occurrence of barge delivery noise in the harbor and community. A reduction in fuel available for generators and other equipment, including vehicles, would potentially reduce the amount of machinery noise present in the community. This would have an intermittent, long-term, beneficial effect on the soundscape, of negligible intensity.

Cumulative Impacts. Implementation of the park's general management plan would protect important resources, such as the park's soundscape, providing long-term, negligible benefits. Adverse cumulative impacts to the soundscape would occur only if other noise-generating projects and plans coincide with barge delivery service. Operations at the local airport, including removal of park waste, would contribute short-term, negligible to minor, adverse effects. Construction of park monuments and rehabilitation of historic structures would produce short-term, minor adverse effects. In combination with the localized, short-term, negligible to minor

adverse effects of Alternative A, overall cumulative impacts would be localized, short-term, minor, and adverse.

Conclusion. The No Action Alternative would have a localized, short-term, negligible to minor adverse impact on the soundscape at Kalaupapa National Historical Park resulting from associated noise with continued barge deliveries to the harbor. Cumulatively, the effects of the No Action Alternative and the existing conditions in the community would represent a localized, short-term, minor, adverse effect on the soundscape as a result of other projects and park operations that could occur during the same time as barge delivery.

There would be no impairment of park soundscape resources or values under Alternative A.

Impacts of Alternative B, the Preferred Alternative

The short-term effects associated with deferred maintenance would result in a minor to moderate, adverse and localized impact to the soundscape in the harbor and community. Heavy equipment and construction activities would generate noise in the harbor area for up to four months. Each facet of construction incorporates different equipment and methods which all emit noise at different frequencies and durations.

Table 15 displays results from the Rough Noise Loss Calculation model for Alternative B. Using the 40 dB(A) threshold of impacts to the soundscape of the community and harbor, the model reveals that most of deferred maintenance activities would affect the park's soundscape throughout the 1 kilometer (0.6 mile) radius containing the park and harbor project area.

Use of the excavator to relocate armor stones would also affect the soundscape. Noise levels would exceed the 40 dB(A) threshold up to 1,640 feet (500 meters) from the project area, but would fall to near or below the threshold at the 3,280 (1 km) radius. This activity would last one to two days.

Table 15. Estimated In-Air dB(A) Levels at Various Distances from Construction Activities under Alternative B

		Distance from Source (meters [m])*			
	dB(A) at source distance	***50***	***100***	***500***	***1000***
Electric Generator (at 1 meter)	*67*	33.0	27.0	13.0	7.0
Air Compressor (both 185 and 375 CFM at 7 meters)	*76*	58.9	52.9	38.9	32.9
Welding Machine (at 1 meter)	*98*	64.0	58.0	44.0	38.0
Backhoe/Dozer(at 10 meters)	*80*	66.0	60.0	46.0	40.0
Dozer/Excavator (at 1 meters)	*102*	68.0	62.0	48.0	42.0
Jack hammer (at 1 meter)	*107.2*	73.2	67.2	53.2	47.2
Rivet Buster (at 15 meters)	*85*	74.5	68.5	54.5	48.5
Concrete Pump (115 hp at 15 meters)	*85*	74.5	68.5	54.5	48.5
Telescopic Forklift (at 2 meters)	*106*	78.0	72.0	58.0	52.0

*dB values cited from Caterpillar 2003, ENNAH 2001, Taylor 2000, Wu 2008, Geske 2005, LHSFNA No date, The Sullair Corporation 2007 and 2009, The Lincoln Electric Company 2008, The Wacker Neuson Corporation 2009, and Nipko and Shields 2003. Source noise levels for the Huki Pau Landing Craft could not be determined. Potential noise reduction resulting from resource protection measures could not be determined using the Rough Noise Loss Calculation spreadsheet.

Resource protection measures to minimize impacts on the natural soundscape could include standard noise abatement mitigation measures such as: a schedule that minimizes impacts on adjacent noise-sensitive areas; use of hydraulically or electrically powered impact tools when feasible; and, when possible, equipment would be shut off rather than allowed to idle when not in operation. All construction equipment would be kept in proper operating condition and the location of stationary, noise emitting equipment would be strategically placed to reduce widespread noise in the soundscape.

Cumulative Impacts. The short-term, minor, adverse effects of other project, plans, and activities would be the same as described above for Alternative A. Adverse cumulative impacts to the soundscape would occur only if other noise-generating projects and plans coincide with barge delivery service and/or during construction. In combination with the localized, short-term, minor to moderate, adverse effects of Alternative B, including the above-water concrete repair tasks, the overall cumulative impacts on the park's soundscape would be localized, short-term, minor, at times approaching moderate levels, and adverse.

Conclusion. Alternative B would have short-term, local, minor to moderate, adverse effects on the soundscape as a result of noise associated with deferred maintenance. Cumulative effects would be localized, short-term, adverse and minor to moderate.

There would be no impairment of natural soundscape resources or values under Alternative B.

CULTURAL RESOURCES

AFFECTED ENVIRONMENT

Background History

The Kalaupapa Settlement is situated on a broad volcanic peninsula on the north shore of the island of Moloka`i, bordered on the west, north, and east by the Pacific Ocean. Steep cliffs, some reaching heights of 2,000 feet, define the peninsula. The peninsula is just over 13 square miles in total area, and its foreboding boundaries have made it difficult to access throughout history. It was this characteristic that led to Hawaii's decision to utilize the area, beginning in the mid-1800s, for those suffering from Hansen's disease.

Research indicates that the peninsula was home to a sizable native Hawaiian population for several centuries before the arrival of Hansen's disease patients. An archaeological survey conducted by the NPS identified many sites that predate the arrival of Hansen's disease patients. These include about 50 *heiau* or religious temples, eight *ko'a* or fishing shrines, a multitude of burial sites, two *holua* sled runs, several caves with human artifacts, and numerous agricultural features (NPS 2005a).

In 1854, Kalaupapa was referred to as a "large village" (Remy 1893) with a "scatter of dwellings and numerous pasture lands and plantations" (Bates 1854). Sweet potatoes were a primary crop for export in a local economy predominantly reliant on agriculture, and terraces used for farming are said to still be present in outlying areas of the peninsula today (De Loach 1970).

In 1865, Kamehameha V approved the "Act to Prevent the Spread of Leprosy." A new settlement was begun at Kalawao, on the eastern side of the peninsula, in order to accommodate the government-imposed isolation of those with Hansen's disease. The Native Hawaiian community living on the peninsula was displaced via land exchange, land purchase, or eviction. However, some former residents took some of the Hansen's disease patients into their homes; others who had left continued to return to visit friends and relatives.

The first patients arrived in 1866, and an estimated 8,000 exiles would be sent to the peninsula before modern medicine was able to effectively and definitively treat symptoms and prevent spread of the disease in 1969. Although this era (1866-1969) was initially determined to be the period significance for cultural resources (Greene 1985), the Park considers the period of significance to be ongoing due to the continued presence of living patients. During that era, wooden residences, churches and auxiliary buildings were constructed to accommodate the increasing numbers of patients.

Just before the turn of the 20th century, settlement began to shift to Kalaupapa because here the land areas under the lee of Kauhako Crater were warmer than at Kalawao, and the shore at Kalaupapa could be more easily accessed by seagoing vessels (Viernes-Stein 2009).

Various religious groups provided aid, including most notably Father Joseph Damien DeVeuster, a Belgian priest who received worldwide acclaim by selflessly caring for the patients and who eventually contracted the disease. Father Damien died of Hansen's disease in 1889, and was canonized by the Catholic Church October 11, 2009 in Rome as Hawaii's first saint (Honolulu Advertiser 2009).

Only a small number of Hansen's disease survivors voluntarily remain in the settlement today, which retains much of its historic character. Hundreds of historic structures remain very much intact, including cottages, churches, and tombs. Additionally, the landscape's spatial organization and land patterns, circulation features, and vegetation have remained largely unchanged over time.

The landing area at Kalaupapa has been undergoing changes ever since the late 1800s. (Note that the term “landing” as used in the “Cultural Resources” section of this document reflects the NHL district designation, and includes the harbor, the dock, the breakwater, and the bulkhead.) In 1884, a pier was built at Kalaupapa, but it was expected to “go to pieces in the first heavy gale” (Greene 1985). By 1897 a freight warehouse and small wharf were present but the landing was still considered "unimproved," consisting only of a platform for "loading and unloading into surf boats that relayed passengers and supplies back and forth from the steamers" (Greene 1985). A solid masonry stone wall was built on both sides of the landing in 1906, and within a year or two the “old unsightly buildings at the landing had been torn down, the grade raised four feet, and concrete steps put in leading from the wharf to the landing” (Greene 1985).

A new landing dock had been completed at Kalaupapa by the end of 1931, and half of the breakwater stone had been placed. Between 1931 and 1938, the breakwater was completed and an extension added, and the boat channel was cleared of rocks. An electric winch was installed in 1940 and during the spring of 1954 a “substantial wooden landing ramp was constructed” (Greene 1985). Maps from the 1960s show a concrete breakwater and wooden ramp (Greene 1985). A dolphin was installed at the Kalaupapa harbor in the 1970s, but was destroyed by large swells shortly after installation (Viernes-Stein 2008) (see below).

The harbor area at Kalaupapa has had a great deal of physical disturbance over the past century and a half, including several generations of pier construction, creation of the breakwater, the short-lived dolphin, and the bulkhead, and repairs to these structures. The sea floor in the harbor area has been heavily disturbed by dredging and by measures to increase harbor depth on at least two previous occasions, once in 1967 and again in 1992 when the harbor was modified to break up the uneven substrate and smooth out the surface (Brown et al. 2008).

Cultural Landscape

According to a cultural landscape inventory completed in 2005 for the Kalaupapa National Historical Park (NPS 2005a), the Kalaupapa Settlement landscape continues to demonstrate the characteristics that made the peninsula an ideal location in the eyes of its founders. The landscape continues to exhibit those characteristics that reflect its unique development patterns from 1866 to 1969, when patients were allowed to leave their enforced isolation due to the development of sulphone drugs that halted the advancement and communicability of Hansen’s disease. The natural systems and features of the landscape, particularly the unique setting of the peninsula, over 2,000 feet below the looming cliffs of the northern coast of Moloka`i, were instrumental in its designation as a Hansen’s disease settlement. The cliffs continue to invoke feelings of both awe and isolation today. In addition, the climatic characteristics which historically prompted the early 20th century migration of the settlement from windward Kalawao (colder and wetter) to leeward Kalaupapa (warmer and drier) are still evident.

The historic vernacular landscape is strongly associated with Father Damien, who devoted himself to personally assisting the patients and improving the settlement's living conditions by garnering political and financial support. The efforts of Damien, and other historical figures like Mother Marianne Cope and Brother Joseph Dutton, enabled Kalaupapa to provide most of the amenities of normal society. The settlement contains boat landings, a road network (for cars), several neighborhoods, single-family patient housing, dormitories and hospitals for those requiring more assistance, churches, convents, community recreational facilities, cemeteries, dairies, slaughterhouses, and a light industrial area. Historically, healthier patients were active in carpentry, farming, fishing, animal husbandry, and other work necessary for administering food, housing, and medical assistance to the entire settlement. Kalaupapa's administrative philosophy encouraged patient participation in the operation and maintenance of the settlement to foster feelings of self-worth and community cohesion.

Spatial organization within the landscape is still evident in the overall development on relatively flat land at the base of the cliffs. Within the Kalaupapa Settlement, the overall pattern of streets was laid out on a modified grid, with centralized clusters which continues to define the overall spatial patterns of development within the landscape. Existing cluster arrangements within the spatial organization are found where specific medical/residential groupings were developed to house and care for Settlement personnel, relatively healthy patients who desired to have single-family homes, individuals whose health was rapidly deteriorating, and invalid patients. Of the four original clusters (Bay View Home, McVeigh Home, Bishop Home, and Baldwin Home), all but the Baldwin Home cluster remain.

The hundreds of buildings and structures at Kalaupapa and the two remaining churches at Kalawao, as well as numerous small scale features, continue to showcase the functions and styles used throughout the settlement history and provide clues to the specific infrastructure concerns and needs, especially in the cemeteries, of residents and staff on the peninsula. Circulation patterns within the landscape continue to demonstrate the routes of travel off of the peninsula (boat landing, airport, and *pali* trail), along Father Damien Road and the peninsula's perimeter jeep road, and within Kalaupapa proper (the modified grid street pattern). Their routes, configurations, and materials have not been significantly altered and continue to perform their historic functions.

Although the broad vegetative patterns across the peninsula have changed throughout the settlements' history, due to invasive species colonization, the culturally established vegetation patterns (and species) within Kalaupapa also contribute to the significance of the landscape. Throughout the settlement, edible fruit trees, ornamental trees and shrubs, lawns, gardens, and other introduced and cultivated vegetation patterns continue to provide information about the utilitarian and aesthetic vegetation patterns established by the settlement population.

Historic Resources

The entire park is recognized as a National Historic Landmark. Of the approximately 400 structures in the Kalaupapa Settlement, the NPS has identified 195 as historically or culturally significant. Kalaupapa landing is within and contributing to the Kalaupapa National Historic Landmark District (NHL District). The landing is an important feature of the circulation patterns within the NHL District that continue to demonstrate the routes of travel on and off the peninsula and that connect to the grid-pattern of roads and walkways within the Kalaupapa Settlement (Greg Cody, pers. comm. 2009). The landing area is a conduit for supplying the settlement. Features of the landing include the concrete and armor stone breakwater, the pier, and the mortar and stone bulkhead. The historic Community Food Warehouse (the "general warehouse") situated landward adjacent to the bulkhead also contributes to the park's landmark designation.

The 114-foot-long breakwater of concrete-capped armor stone was installed in the 1930s to protect the parallel berthing basin that was later dredged to provide barge accessibility. The breakwater is suffering from age and from large winter swells that have cracked the concrete cap and shifted some of the armor stones away from the structure.

The U.S. Army Corps of Engineers-designed pier was constructed in 1967 to provide for more convenient and safe barge deliveries. (Remnants of an earlier pier remain within the existing pier). The 1967 pier remains in use, having been modified only by minor repairs and routine maintenance. The mooring bitts and bollards and fendering system were recently replaced by the Hawaii DOH during Phase 2, undertaken in the summer of 2009. The bulkhead, an important component of the historic landing, is composed of large to small volcanic stones mortared in place; on the top shore side is concrete pavement. The base of the bulkhead has been scoured by wave action that has caused continuing loss of some structural stones as well as armor stones. In addition, the area behind the bulkhead is being undermined by drainage of an undetermined origin.

Area structures embody the distinguishing characteristics of "institutional Hawaiian" architecture of the 1930s and earlier and are exceptionally valuable for a study of the style and methods of construction. The historic Community Food Warehouse adjacent to the bulkhead wall reflects this style of architecture.

Ethnographic Resources

Ethnographic resources are defined by the National Park Service as any "site, structure, object, landscape, or natural resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it" (NPS 1998b). According to *A Cultural Resource Overview of the Maritime Landing Areas of Kalaupapa Ahupua'a* (Viernes-Stein, 2009), Kalaupapa's natural and cultural features combine to form an ethnographic landscape that continues to be used and valued in traditional ways.

On Moloka`i, there are numerous *ko'a* (fishing shrines, typically small in nature) located near the water. A documented tradition tells of Ai'ai, the son of the fish god Kū'ula-Kai. Ai'ai traveled throughout the islands, and left a certain fish stone at Kalaupapa so that the fish would constantly gather there, even to this day (Manu et al. 1992). While the exact location of the stone is unknown, Hawaiian traditions indicate that disturbance of the fish at one site (such as Kalaupapa) can affect fish in other areas around the island as well (Viernes-Stein 2009).

Kalaupapa also is associated with the royal visit of Lono-i-ka-makahiki and his wife Kaikilani, a sovereign Queen or Chieftess of the Hawaiian Islands. During the visit, and as they played the game of *konane*, a voice interrupted to accuse the wife of infidelity. Lono and Kaikilani quarreled, but eventually made amends. The place where the game was interrupted was a "very broad stone" known as Piko`one, located near the harbor of Kalaupapa (Fornander 1996). Later Lono's name became famous with the *makahiki* god--associated with the New Year, agriculture, ceremony, and games—one of which is the game *konane*.

Other places of ethnographic sensitivity include an area near the base of the Kalaupapa *pali*, near the western shore. It is said to be a favorite place for deposit of the *piko*, the umbilical cord, a vital part of early Hawaiian culture.

Oral histories tell of the presence of a cave near the Kalaupapa pier. This discovery was made when the o'o (digging stick) used by Kalaupapa resident John Kaona to excavate a post hole broke through into a cave. When he looked into the post hole, he saw a canoe. When he saw this, he sealed the hole because he did not want anyone to bother it (Viernes-Stein 2009). The presence of a cave with a canoe is very significant because this was one of the styles used for pre-contact burials. One of the most common types of pre-contact internments was the placement of bodies in lava tubes, rock shelters, or niches in steep cliff faces. Such burials may be single, or in groups of several score or more, the latter evidently representing extended family or ÿohana sepulchers. Artifacts interred with the dead can range from tapa cloth and Pandanus mats to food bowls and wooden canoe hulls (Viernes-Stein 2009). While there is no cave entrance visible from the vicinity of the pier, it is possible that a canoe burial is present through a lava tube system which at one point had an opening at some other point on the peninsula. It was common practice to seal such burial chambers. (Viernes-Stein 2009).

A 1909 survey and early maps indicate that a *heiau* known as Ka'ahemo Heiau was located at Kalaupapa somewhere near the present-day visitor quarters, but its precise location is presently unknown (Viernes-Stein 2009). From the Hawaiian cultural view, *heiau* are places of worship where divine power is concentrated and transferred through religious practices.

The relationship of land, water and sky form an elemental part of the spiritual relationship between the Kalaupapa community and their surroundings; the landscape and seascape together are interrelated and cannot be separated. Patients continue to access the harbor to practice subsistence fishing, recreation, *Makai* (towards the ocean swimming) and other activities that are

components of the Hawaiian culture. Although surfing is not presently allowed at Kalaupapa, the surf here (*Puao*) was liked best by the Moloka`i chiefs (Kamakau 1961).

Freshwater springs, generally, are very significant in Hawaiian history and are important to the Kalaupapa Settlement, both for their historical value and for their role in traditional Hawaiian Culture. (Viernes-Stein 2009). Local stories tell that the residents of Kalaupapa used to dive into the harbor area with a calabash to collect fresh water from the springs that exit the terrestrial environment in this area. (Historically there were no other fresh water sources in the *ahupua'a* of Kalaupapa). Recent testing by the NPS verified that the seeps entering the harbor area are freshwater (Brown, pers. comm. 2009).

Kalaupapa Community.

Among the ethnographic resources at Kalaupapa are the people in this community. It has been said that the remaining survivors of Hansen's disease are the greatest cultural resource at Kalaupapa. Lives of these survivors echo the memories of all those who lived and died in this isolated area over the past century and a half. It is their shared, unique experience that that helps to bind them together in this place. Moreover, it is the caring of this community of people that contributes to and is a part of the landscape and the significance of the area. Kalaupapa has evolved from a place to die to a place to live, where the residents depend largely on services and supplies provided by the barges.

Kalaupapa landing is a place that holds special memories for these Hawaiians for several reasons. In one way, the landing has been a "doorway" to the ocean, a larger area that has been important to Hawaiians for its role in the gathering of foods and medicine and for conducting cultural and spiritual customs. The landing itself also is a very special place, for it is here that exiles were first introduced to the settlement that would become both their prison and their home. The harbor has long been the primary port of entry to the peninsula. It was a port of entry for exiled patients and for visiting family members. It is here that barge delivery provided, and continues to provide, a vital lifeline of supplies and connection to the outside world.

The Kalaupapa harbor is the scene of "barge day"— which has become for the Kalaupapa community "part Christmas, part game show and part soap opera" (Monson 1989 from Viernes-Stein 2009). Barge day (boat day) is highly anticipated and has long held great significance at Kalaupapa for it provides access to life beyond the peninsula. Because of the geography, high winds, and rough seas of the northern shore of Moloka`i, boats and barges have only been able to access the peninsula through a short window of time, usually only three months of an entire year. Patients and workers have "immortalized their names in concrete" at the pier (Viernes-Stein 2009). These names have created a vivid memorial to the people of this place.

National Register of Historic Places/National Historic Landmarks

The Kalaupapa Leprosy Settlement was listed on the National Register of Historic Places (NRHP) in 1975 and became a National Historic Landmark (NHL) District in 1976. The landmark district includes both Kalaupapa and Kalowao. Under NRHP significance Criterion A, the Kalaupapa and Kalawao Settlements are nationally significant as national social attitudes, health policies, and treatment paradigms for victims of leprosy were revolutionized during the period of significance, in part as a direct result of the Moloka`i example. On the state level, Criterion A also applies as the isolated historic district is emblematic of broader patterns of social and physical transformations occurring elsewhere in the Hawaiian Islands following Western contact - most importantly the introduction of foreign diseases to which the Hawaiian people were particularly vulnerable. In the aftermath of Western contact, the impacts of leprosy and other foreign epidemics to the communities, demographics, culture, and physical history of the Hawaiian Islands were extensive.

Under Criterion B, Kalaupapa is significant on both the national and state levels for its association with Father Damien (Joseph De Veuster), Mother Marianne Cope, and Brother Joseph

Dutton and others for their heroic humanitarian efforts in serving the afflicted and restoring dignity to the community of exiles. Their example, propelled by the global renown of Father Damien and the "Moloka`i leper colony", significantly influenced social and health perspectives on Hansen's disease throughout the U.S. and the around the globe.

Under Criterion C, the largely intact Kalaupapa Settlement, including its layout, spatial organization, circulation patterns, architecture and other features is significant at the state level. Spatial characteristics of the historic district are indicative of its historical use as a leprosy settlement and include: the clustered arrangement of the various treatment facilities and residential sections (e.g. the Bishop Home for girls, the Baldwin Home for boys), the grid pattern circulation system of roads and walkways within the settlement, and the absence of formal routes leading out of the settlement. In addition, scores of original Hawaii Plantation Style houses, churches, dormitories, and other landscape features remain, as well as utilitarian and aesthetic planted vegetation within the neighborhoods, all of which collectively create a unity in the fabric in terms of scale, density, shape, style, and form. This Plantation Style is rapidly disappearing in Hawaii, and the extended and cohesive group found at Kalaupapa is one of the last remaining collections. Further, the historic district contains scores of unique small-scale features (e.g. shrines, grave markers, tombs) which add a unique and personal dimension to the physical history of the place.

Under Criterion D, the historic district is likely to yield information important to the prehistory and history of the landscape. The Kalaupapa Peninsula is dense in historic and pre-contact archaeological sites uncompromised by contemporary development. Dense invasive vegetation has made it difficult to conduct archaeological surveys; as a result, only about ten percent of Kalaupapa National Historical Park has been surveyed. Large portions of the intensively developed landscape at Kalawao and along Father Damien Road are rich in historic period archaeological sites that may contain crucial information relevant to understanding the cultural historic district's development over the past 150 years. The pre-contact archaeology on the peninsula, presumed to be one of the largest unaltered archeological sites in the state, is significant in its own right and may warrant a separate period of significance at a future date.

The NPS augmented Kalaupapa's NHL District status by designating it a National Historical Park in 1980. The park seeks to fulfill its mission of telling the story of Hansen's disease in Hawaii while also accommodating the remaining disease survivors. The Kalaupapa Leprosy Settlement was added to the Hawaii State Register of Historic Places in 1981 (Hawaii 2009). Kalaupapa landing is within and contributing to the Kalaupapa National Historic Landmark District (NHL District). Features of the landing include the concrete and armor stone breakwater, the pier, and the mortar and stone bulkhead. The historic Community Food Warehouse adjacent to the bulkhead also contributes to the landmark designation.

ENVIRONMENTAL CONSEQUENCES

Guiding Regulations and Policies

Federal Regulatory Framework. Section 106 of the ***National Historic Preservation Act of 1966*** requires federal agencies to consider the effects of their undertakings on properties listed or potentially eligible for listing on the National Register of Historic Places. All actions affecting the parks' cultural resources must comply with this legislation.

The ***National Environmental Policy Act*** requires analysis of the impacts of federal actions on the human environment (the natural and physical environment and its relationship with human culture); and directs that these important historical, cultural and natural aspects of our national heritage be preserved.

Management Policies Section 1.12, indicates that the NPS will maintain open, collaborative relationships with native peoples for whom these islands are their ancestral homes; Section 5.3.5.3

defines park ethnographic resources as the cultural and natural features of a park that are of traditional significance to traditionally associated peoples.

The physical attributes of cultural resources are, with few exceptions, nonrenewable. Once the historic fabric of a resource is gone, nothing can restore its authenticity or gain the information that might have been found through analysis. *NPS-28* (NPS 1998b) and NPS *Director's Order #28* (NPS 1998a) provide guidance for management and protection of the cultural resources in NPS custody.

State Regulatory Framework. The Indoor Radiological Health Branch of the state health department is responsible for enforcing noise regulations (11-46, HAR). The primary goal of the noise control program is to provide a tranquil and healthy environment. To this end, the branch evaluates Community Noise Permits for construction and other noise-generating activities. During the permit process, the branch works with project proponents to promote consideration of noise emissions prior to construction or operations. The NPS would complete a Community Noise Permit as part of the overall compliance effort for the dock and harbor project. The NPS would abide by the regulation under the Community Noise Permits in which noise can only be generated between 7:00 a.m. and 6:00 p.m. Monday through Friday.

Methods and Assumptions

Regulations for implementing the National Environmental Policy Act (NEPA) (42 USC 4321, et seq.) and the National Historic Preservation Act (NHPA) (16 USC 470 et seq.) require the analysis of the effects of proposed actions on important cultural resources. Unfortunately, both acts have different sets of definitions for assessing effects on cultural resources so the following impact analyses are designed to comply with the requirements of both NEPA and NHPA Section 106.

The method for evaluating impact topics under NEPA is described in the "General Methodology" section of this chapter.

In accordance with the Advisory Council on Historic Preservation's regulations implementing NHPA Section 106 (36 CFR Part 800, Protection of Historic Properties), impacts to cultural resources also were identified and evaluated by: 1) determining the area of potential effects; 2) identifying cultural resources present in the area of potential effects that are either listed in or eligible to be listed in the National Register of Historic Places; 3) applying the criteria of adverse effect to affected, National Register eligible or listed cultural resources; and 4) considering ways to avoid, minimize or mitigate adverse effects.

Under the Advisory Council's regulations, a determination of either adverse effect or no adverse effect must be made for affected National Register listed or eligible cultural resources. An adverse effect occurs whenever an impact directly or indirectly alters any characteristic of a cultural resource that qualifies it for inclusion in the National Register. For example, the impact diminishes the integrity of its location, design, setting, materials, workmanship, feeling, or association, or it diminishes the extent to which a resource retains its historic appearance. Adverse effects also include reasonably foreseeable effects caused by the alternatives that would occur later in time, be farther removed in distance or be cumulative (36 CFR 800.5). A determination of no adverse effect means there is an effect, but the effect would not diminish the characteristics of the cultural resource that qualify it for inclusion in the National Register.

To clearly articulate effects on affected National Register listed or eligible properties, a Section 106 summary is included in the impact analysis sections. The Section 106 summary is an assessment of the effect of the undertaking (implementation of the alternative) on National Register eligible or listed cultural resources only, based upon the criterion of effect and criteria of adverse effect found in the advisory council's regulations.

The Council on Environmental Quality regulations and NPS policies (NPS 2001) also call for a discussion of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact, e.g. reducing the intensity of an impact from major to moderate or minor. Any resultant reduction in intensity of impact due to mitigation, however, is an estimate of the effectiveness of mitigation under NEPA only.

It does not suggest that the level of effect as defined by Section 106 is similarly reduced. Cultural resources are non-renewable resources and adverse effects generally consume, diminish, or destroy the original historic materials or form, resulting in a loss in the integrity of the resource that can never be recovered. Therefore, although actions determined to have an adverse effect under Section 106 may be mitigated, the effect remains adverse.

The following discussion correlates the different requirements of NHPA and NEPA to disclose potential effects on cultural resources and to achieve compliance with both laws.

The following issues related to cultural resources were identified during public and internal scoping. The public has expressed concerns that construction activities in the Kalaupapa landing area could affect:

- Fish populations on an island-wide basis,
- Under-sea freshwater springs, and
- Places of special cultural concern (such as *heiau*, human burials, fishing shrines).

Historic Resources Impact Criteria and Thresholds for Historic Resources

Negligible: Effect is at the lowest levels of detection with no perceptible consequences. The determination of effect for Section 106 would be *no adverse effect*.

Minor: Alteration of a feature(s) would not diminish the overall integrity of the resource. The determination of effect for Section 106 would be *no adverse effect*.

Moderate: The action would alter one of more character-defining features of the structure, building, district, or landscape. While the overall integrity of the resource would be diminished, the property would retain its National Register eligibility. For purposes of Section 106, the determination would be *adverse effect*.

Major: The action would alter character-defining features of a structure, building, district, or landscape, seriously diminishing the overall integrity of the resource to the point where its National Register eligibility may be in question. For purposes of Section 106, the determination would be *adverse effect*.

Duration:

Long-term: Historic structures, buildings, and objects are nonrenewable, so adverse effects on structures, buildings and objects would be long-term and extend well beyond implementation of the project.

Impacts of Alternative A, the No Action Alternative

The NPS management and maintenance of the Kalaupapa landing structures would continue without repairs to the dock structures. This present level of maintenance would not be adequate to prevent long-term effects such as collapse of the bulkhead, further damage to the low dock toe from erosion, loss of sections of the breakwater, or possible ancillary structural damage to the historic warehouse. Above-water emergency repairs would help slow but not halt deterioration of the bulkhead wall. Should the bulkhead wall fail, integrity of the adjacent Community Food Warehouse could be threatened.

The Kalaupapa landing and the Community Food Warehouse are only two of the many properties included within the Kalaupapa National Register/NHL district, but the landing is a crucial lifeline to the outside world. Should any of the elements of the pier fail, barges would be unable to unload at Kalaupapa, resulting in delays in delivery of annual supplies and the construction materials vital for upkeep of buildings and structures within the NHL.

Small barge delivery would be available for the next five years; availability of small barge service over a longer period is uncertain. Failure of the landing elements could result in delayed repairs to historic properties in the NHL district, including patients' homes and facilities. Continuation of Alternative A would have direct and indirect, localized moderate long-term adverse effects on the landing structures and minor, indirect long-term adverse effects on the structures within the NHL.

Cumulative Impacts. The area of potential effect for cumulative impacts includes Kalaupapa and Kalawao settlements. The time period extends from 1866 to the future time when there are no Hansen's disease patients present within the community. Many of the structures in the original Kalawao Settlement have succumbed to time, rampant plant growth, termites, weather, and fire. Other structures were moved into the Kalaupapa Settlement and some were dismantled and the stone recycled for walls or crushed for road surfacing. Between the late 1970s and the 1990s, over 200 structures were destroyed, demolished, or salvaged (NPS 2005a). Eighteen of the resources contributing to the NHL District have been lost. These past actions have resulted in long-term moderate adverse effects.

Development of a general management plan (GMP) is underway for the park, but its completion and implementation are several years in the future. The GMP would benefit the park's cultural resources by planning for effective management and preservation, the impact of which would be long-term.

The remaining structures within the park have been maintained and preserved, by the NPS and by the state of Hawaii. Unfortunately the cost of upkeep, the number and the geographic extent of the historic structures within the NHL District, and the threats to their integrity make it difficult for the NPS and others to keep up with preservation needs. Despite the ongoing, beneficial effects of efforts to preserve the park's cultural sites, deterioration of cultural sites and structures would continue. These effects are expected to last into the future, to the time when there are fewer, or even none of the Hansen's disease patients living at Kalaupapa. (Unoccupied/unused structures tend to deteriorate faster than those that are occupied because small problems in occupied structures can be identified early and repaired.)

Past natural events and human actions have had both adverse and beneficial effects on the Kalaupapa landing structures such as the dock, breakwater and the bulkhead wall. Past and recent maintenance by the state of Hawaii and the NPS of the landing facilities, including replacement of the hydraulic winch, and repairs to potholes in the concrete ramp, above-waterline voids in the bulkhead wall, and corroded steel and spalling concrete have had beneficial effects to the landing structures. Unfortunately, wind, weather, age, and wave action have had long-term, moderate adverse effects on many structural elements of the landing, and these threats would continue into the future.

When the beneficial and moderate adverse effects of these past, current and future actions and events are added to the moderate ongoing and expected future adverse effects as a result of the no action alternative, this alternative would have a long-term, moderate, adverse cumulative effect on the historic buildings and structures at the Kalaupapa landing and in the NHL district. Effects would be adverse because of the extensive losses of buildings and structures at Kalaupapa and Kalawao over the past century.

Conclusions. The present level of maintenance would not be adequate to prevent long-term effects such as collapse of the bulkhead, loss of stones from the breakwater, or indirect structural damage to the historic warehouse. Failure of any of the landing elements could result in delays

in transport of vital supplies and materials needed to repair and stabilize structures within the NHL district. Continuation of Alternative A would have direct and indirect, localized moderate long-term adverse effects on the landing structures and minor, indirect long-term adverse effects on the structures within the NHL.

Despite the best efforts of park management and the state of Hawaii to preserve the historic structures, the combined effects of past actions and events, ongoing natural resources threats (wind, weather and wave action), and future projects would have a long-term, moderate, adverse cumulative effect on the structures at the Kalaupapa landing area and on the NHL District.

There would be no impairment of historic buildings, structures, objects or values as a result of park actions under Alternative A.

Impacts of Alternative B, the Preferred Alternative

Under Alternative B, actions would be taken to fill the void beneath the toe of the low loading dock, repair the bulkhead by removing and replacing dislodged stones at the bulkhead toe, and add new armor stones for reinforcement. Sealing/repairing the dock structure with appropriate grout would help stabilize the structure against scouring.

No alterations or additions to the dock structure would occur, and the dock would continue to be used as it was historically. Repair measures such as placement of concrete, grout inserted into aggregate, or use of a tremie injection method would aid in filling voids in and around areas of the low loading pier that are being undermined by wave action. These repairs, which are consistent with the preservation guidelines of *Secretary of the Interior's Standards for the Treatment of Historic Propertie*s, would preserve the dock's integrity and appearance. Patients' and workers' names inscribed into the concrete of the pier would be thoroughly documented prior to construction, and all possible measures would be taken to preserve the inscriptions and keep their association intact. Impacts would be adverse and long-term, but of negligible to minor intensity.

Voids in the bulkhead wall toe, low dock toe, and breakwater would be filled for structural integrity. This maintenance would ensure a lengthened effective life of the dock for an additional five to ten years. During repairs to the bulkhead, care would be taken to ensure that its exterior appearance and design are not altered. Either original materials would be reused or any new materials would match as closely as possible the original in size, scale, proportion, and color. Any adverse effect would be long-term, and of negligible to minor intensity.

The breakwater would be rebuilt within the original design footprint, which would retain the original 1930s design. The armor stones within the berthing basin would be plucked and reset in the breakwater to accommodate safe docking in the berthing basin. In some cases, displaced armor stones may be replaced and secured or replaced with more suitable size stones or engineered armor capable of withstanding the wave action. Repair of the breakwater's concrete cap would be accomplished using either shotcrete or a hand-placed mortar. This work, as well as repairs and replacement of the two double bitts on the breakwater cap, would be consistent with the preservation guidelines of *Secretary of the Interior's Standards for the Treatment of Historic Propertie*s and would retain the integrity and historic appearance of the breakwater. Any adverse impacts would be long-term, but of negligible to minor intensity.

Cumulative Impacts. The time period and location of other past, present and reasonably foreseeable actions affecting historic resources under Alternative B would be the same as described for Alternative A. The beneficial effects associated with future implementation of resource protection measures proposed in the general management plan would be outweighed by adverse effects from past removal and destruction of structures within the settlement and on-going environmental damage. Overall impacts to historic resources from other past, present and reasonably foreseeable actions would be long-term, moderate adverse.

As explained above, implementation of Alternative B would result in long-term negligible to minor adverse effects to historic resources. The negligible to minor, long-term adverse impacts of this alternative, in combination with the long-term, moderate adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term, moderate adverse cumulative impact. The adverse effects of Alternative B, however, would be a very small component of the adverse cumulative impact.

Conclusions. Implementation of Alternative B would result in long-term negligible to minor adverse effects to historic resources. The adverse effects of Alternative B would be a very small component of the adverse cumulative impact. There would be no impairment of park resources and values as a result of the actions proposed under Alternative B.

Section 106 Summary. After applying the Advisory Council on Historic Preservation's criteria of adverse effects (36 CFR Part 800.5, Assessment of Adverse Effects), the National Park Service concludes that implementation of Alternative B would have no adverse effect on the historic resources of Kalaupapa National Historical Park.

Cultural Landscape Impact Criteria and Thresholds

Negligible: Impacts would be at the lowest levels of detection with no perceptible consequences. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Minor: Impacts would affect character-defining features or patterns but would not diminish the overall integrity of the resource. For purposes of Section 106, the determination of effect would be *no adverse effect*.

Moderate: Impacts would alter character-defining features or patterns, diminishing the overall integrity of the resource to the extent that its National Register eligibility could be jeopardized. For purposes of Section 106, the determination of effect would be *adverse effect*.

Major: Impacts would alter character-defining features or elements, diminishing the integrity of the resource to the extent that it would no longer be eligible to be listed on the National Register. For purposes of Section 106, the determination of effect would be *adverse effect*.

Impacts of Alternative A, the No Action Alternative

The NPS management and maintenance of the Kalaupapa landing structures would continue with only minor repairs to the dock structures. This present level of maintenance would not be adequate to prevent long-term effects such as collapse of the bulkhead, further damage to the low dock toe from erosion, loss of sections of the breakwater, or possible ancillary structural damage to the historic Community Food warehouse building. Above-water emergency repairs would help slow, but not halt, deterioration of the bulkhead wall. Should the bulkhead wall fail, the integrity of the adjacent Community Food Warehouse could be threatened. Adverse impacts to the cultural landscape, of which the dock structures and Community Food warehouse building are contributing features, would be moderate and long-term.

The Kalaupapa landing and the Community Food Warehouse are only two of the many historic properties included within the cultural landscape, but the landing is a crucial lifeline to the outside world. Should any of the elements of the pier fail, barges would be unable to unload at Kalaupapa, resulting in delays in delivery of annual supplies and the construction materials vital for upkeep of historic buildings and structures within the NHL. In addition, small barge delivery would be available for the next five years but the availability of small barge service over a longer period is uncertain. Failure of the landing elements could result in delayed repairs to historic buildings and structures and their deterioration, resulting in changes in views and vistas as well as to the overall landscape. Continuation of Alternative A could result in moderate long-term adverse effects to the cultural landscape.

Cumulative Impacts. The area of potential effect for cumulative impacts includes Kalaupapa and Kalawao settlements. The time period extends from 1866 to the future, when there are no Hansen's disease patients present within the community. Many of the structures in the original Kalawao Settlement have succumbed to time, rampant plant growth, termites, weather, and fire. Other structures were moved into the Kalaupapa Settlement and some were dismantled and the stone recycled for walls or crushed for road surfacing. Between the late 1970s and the 1990s, over 200 structures were destroyed, demolished, or salvaged (NPS 2005a). These structural changes have resulted in corresponding adverse changes to the cultural landscape of which they are a part. In addition to human actions, wind, weather, erosion, plant growth (including introduced exotic plants), and changed land use patterns also have contributed to changes in the cultural landscape. These past actions have resulted in long-term moderate adverse effects, and are expected to last into the future, to the time when there are fewer, or even none of the Hansen's disease patients living at Kalaupapa.

Development of a general management plan (GMP) is underway for the park and will, in the future, have long-term benefits on the park's cultural landscape by more effective planning for management and preservation of landscape resources.

When the overall moderate adverse effects of these past, current and future actions and events are added to the moderate ongoing and expected future adverse effects as a result of the no action alternative, this alternative would have a long-term, moderate, adverse cumulative effect on the cultural landscape. Effects would be adverse because of the extensive losses of buildings and structures at Kalaupapa and Kalawao over the past century, and because of accompanying changes in vegetation and land use patterns from human use and natural resource threats.

Conclusions. Failure of the landing elements could result in delayed repairs to components of the cultural landscape, including historic buildings and structures, as well as inadequate controls of natural threats to the landscape. Continuation of Alternative A could result in moderate long-term adverse effects to the cultural landscape.

Cumulative effects would be long-term, moderate, and adverse because of the extensive losses of buildings and structures at Kalaupapa and Kalawao over the past century, and because of corresponding changes in vegetation and land use patterns. There would be no impairment of historic resources as a result of park actions under Alternative A.

Impacts of Alternative B, the Preferred Alternative

Implementation of Alternative B would include actions by the NPS to secure barge service to the park as described under Alternative A. In addition, actions would be taken to fill the void beneath the toe of the low loading dock, repair the bulkhead by removing and replacing dislodged stones at the bulkhead toe, and add new armor stones for reinforcement. Sealing/repairing the dock structure with appropriate grout would help stabilize the structure against scouring. Continued barge service would ensure delivery of annual supplies and the construction materials vital for upkeep of historic buildings and structures within the cultural landscape.

No alterations or additions to the dock structure would occur, and the pier would continue to be used as it was historically. Repairs to the dock structure and breakwater would preserve the landing's resource integrity and appearance, and ensure a lengthened effective life of the pier for an additional 5 to 10 years. The dock structure is an important feature of the circulation patterns within the Kalaupapa settlement that continue to demonstrate the routes of travel on or off of the peninsula (boat landing, airport, and *pali* trail), and significantly serves as a conduit for supplying the settlement. Neither the design nor the exterior appearance of the structures would be altered. Materials would be reused, or any new materials would match as closely as possible the original in size, scale, proportion, and color. In addition, repairs to the dock would neither alter the physiographic setting of the still-isolated Kalaupapa Peninsula nor affect the land use patterns of the settlement, which are still evident in the spatial organization defined by a grid pat-

tern of streets, the clustered arrangement of treatment and residential facilities, and the utilitarian and aesthetic planted vegetation within the neighborhoods. Views and vistas would remain unchanged. The aspect of association, or the direct link between the landscape and the events or persons who shaped it, would be unaffected and retained through the lives of those patients who continue to live at Kalaupapa. Any adverse impacts would be long-term but of negligible to minor intensity.

During construction, the contractor would have both personnel and equipment on site. Visual, audible, and atmospheric intrusions associated with construction would be temporary, lasting only as long as construction. Adverse impacts would be short-term but minor in intensity.

Cumulative Impacts. The time period and location of other past, present and reasonably foreseeable actions affecting cultural landscapes under Alternative B would be the same as described for Alternative A. The impacts to the cultural landscape from extensive losses of buildings and structures at Kalaupapa and Kalawao over the past century and on-going changes in vegetation and land use patterns would outweigh the long-term benefits of future implementation of resource protections measures proposed in the general management plan. Overall, the past, present, and reasonably foreseeable future actions would result in long-term, moderate adverse impacts.

As explained above, implementation of Alternative B would result in long-term negligible to minor adverse effects to the cultural landscape. The negligible to minor, long-term adverse impacts of this alternative, in combination with the overall long-term, moderate adverse impacts of other past, present, and reasonably foreseeable future actions, would result in a long-term, moderate adverse cumulative impact. This impact would result primarily from past damage to the landscape and changes in land use patterns. The adverse effects of Alternative B, however, would be a very small component of the adverse cumulative impact.

Conclusions. Implementation of Alternative B would result in negligible to minor long-term adverse effects to the cultural landscape. The adverse effects of Alternative B would be a very small component of the adverse cumulative impact. There would be no impairment of park resources and values as a result of the actions proposed under Alternative B.

Section 106 Summary. After applying the Advisory Council on Historic Preservation's criteria of adverse effects (36 CFR Part 800.5, Assessment of Adverse Effects), the National Park Service concludes that implementation of Alternative B would have no adverse effect on the cultural landscape of Kalaupapa National Historical Park.

Ethnographic Resources

As defined by the NPS, ethnographic resources at Kalaupapa may be "any site, structure, object, landscape, or natural resource feature assigned traditional, legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it" (NPS 1998).

Kalaupapa can best be described as an ethnographic landscape where the area's tangible and intangible elements blend to reflect the community's shared history, values, beliefs, traditions, practices, and lifeways. Hawaiian peoples see this landscape in a holistic manner; i.e. by the integration of natural and cultural resources. These are resources that traditional communities perceive as heritage resources and that are imbued with special cultural and social meaning. Tangible elements of the landscape include such things as the landforms and topography, vegetation, the spectacular viewsheds and the ocean. The interaction of people and the land and sea are reflected in the spatial organization of the community, its circulation patterns, and the buildings and other structures that provide a living record of the area's past.

This ethnographic landscape also incorporates multiple components that "derive their significance from the interrelationships among other cultural and natural resources such as plants, animals, minerals, landforms and bodies of water…" (Evans et al. 2001). These landscape elements

were meaningful to the Native Hawaiian people that existed here before the settlement, and continue to be meaningful to the Kalaupapa community because the landscape is "inextricably and traditionally linked" to their own histories and cultural identities (Evans et al. 2001). Stories passed down from one generation to the next help to preserve these remembered traditions and resources.

Impact Criteria and Thresholds for Ethnographic Resources, Landscapes, and the Kalaupapa Community.

Because of their intangible nature, most of the ethnographic resources discussed above cannot successfully be analyzed using National Register of Historic Places criteria. Therefore, potential impacts to ethnographic resources are described using NEPA terminology.

Negligible: Impact(s) would be barely perceptible and would neither alter resource conditions, such as traditional or current access or site preservation, nor the relationship between the resource and the affiliated group's body of practices and beliefs.

Minor: Impact(s) would be slight but noticeable, and would neither appreciably alter resource conditions, such as traditional or current access or site preservation, nor the relationship between the resource and the affiliated group's body of practices and beliefs.

Moderate: Impacts of the action would be apparent and would alter resource conditions. Something would interfere with traditional and current access, site preservation, or the relationship between the resource and the affiliated group's practices and beliefs, even though the group's practices and beliefs would survive.

Major: Impacts of the action would alter resource conditions. Something would block or greatly affect traditional or current access, site preservation, or the relationship between the resource and the affiliated group's body of practices and beliefs, to the extent that the survival of a group's practices or beliefs would be jeopardized.

Duration:

Short-term: Impact to the Kalaupapa Community or access to ethnographic resources and landscapes would last only during the period of construction.

Long-term: Effects on the Kalaupapa Community or access to ethnographic resources and landscapes would extend beyond the construction period. Any direct impacts to ethnographic resources would be considered long-term as these resources are non-renewable and effects would extend well beyond implementation of the project.

Impacts of Alternative A, the No Action Alternative

The NPS management and maintenance of the Kalaupapa landing structures would continue only minor repairs to the dock structures. This present level of maintenance would not be adequate to prevent long-term effects such as collapse of the bulkhead, further damage to the low dock toe from erosion, loss of sections of the breakwater, or possible structural damage to the historic warehouse. Above-water emergency repairs would help slow, but not halt, deterioration of the bulkhead wall.

Failure of any of the components of the landing could undermine the integrity and stability of the facilities, compromising them to the point of being unsafe for barge operations. Should components of the landing fail, barge service would be disrupted, temporarily severing the primary lifeline to the outside world for the Kalaupapa community and curtailing the timely delivery of supplies and materials to the Kalaupapa community. Adverse impacts to the well-being and comfort of community residents would be long-term and minor to moderate in intensity.

Failure of the landing structures would mean that the area would be temporarily closed for safety purposes, limiting opportunities for fishing, swimming or other traditional practices. For a period of time, social and traditional activities would be disrupted, causing stress within the Kalaupapa community, a short-term, minor adverse effect. Because the landing is an integral part of the landscape, deterioration of the breakwater, bulkhead wall, or dock structures would diminish the viability of these individual structures and change the circulation patterns that are an integral part of the overall cultural landscape; for a time the harbor would cease to be a focal point of the community.

Under Alternative A, adverse effects on ethnographic, landscape and Kalaupapa community resources would be direct and indirect, short-and long-term, and minor to moderate.

Cumulative Impacts. The area of potential effect for cumulative impacts includes Kalaupapa and Kalawao settlements. The time period extends from 1866 to the future, when there are no Hansen's disease patients present within the community. Past events at these settlements impacted many Native Hawaiian people, places and traditions. Major changes occurred as indigenous peoples were removed from Kalawao and Kalaupapa during 1865 and 1895. The forced isolation of sick people to this remote area severed over 900 years of cultural ties and associations for both groups whose preceding generations had established a long history with the land and its resources. These changes also led to broader disruptions across the Hawaiian society. Broken connections with family members "lost" to Kalaupapa (and those who were removed from this area to make way for the newcomers) are still recognized in Hawaii today. Lost memories of traditional places resulting from these 19th century events make knowledge of existing cultural sites and stories even more important today to Hawaiian culture. This dislocation has resulted in a long-term, major, adverse effect on ethnographic resources for many Native Hawaiians.

Beneficial effects have resulted from state of Hawaii Phase 1 and 2 actions to repair the dock structures; e.g. these actions have extended the life of a resource used and valued by ethnographic groups. NPS and Hawaii past and on-going repairs to historic structures within the NHL district has been valuable in preserving the historic homes and community buildings of the Kalaupapa community, a long-term benefit. Current development of a general management plan (GMP) for the park would benefit the park's cultural resources, including ethnographic resources, by planning for their preservation and effective management.

In the near future, monuments are to be erected to commemorate Hansen's disease patients and Father Damien. These events would benefit the community by contributing to a sense of unity and pride in the community resulting in long-term beneficial effects.

When the major adverse effects of past events and beneficial effects of other past, present, and reasonably foreseeable future actions and events are added to the ongoing and expected future effects from park operations under Alternative A (direct and indirect, short- and long-term minor to moderate adverse effects), this alternative would have a long-term, moderate, adverse, cumulative effect on ethnographic resources and landscapes.

Conclusions. Under Alternative A, should components of the landing fail, barge service would be temporarily halted, disrupting community life, inhibiting access or use of ethnographic resources, and temporarily severing the primary lifeline to the outside world for the Kalaupapa community, a short- and long-term minor to moderate adverse effect on ethnographic resources, landscapes, and the community.

When the major adverse effects and beneficial effects of these past, present, and reasonably foreseeable future actions and events are added to the ongoing and expected future effects from park operations under Alternative A (direct and indirect, short- and long-term minor to moderate adverse effects), this alternative would have a long-term, moderate, adverse, cumulative effect on ethnographic resources and landscapes.

There would be no impairment of ethnographic resources, landscapes, or the Kalaupapa community as a result of park actions under Alternative A.

Impacts of Alternative B, the Preferred Alternative

Implementation of Alternative B would include actions by the NPS to secure barge service to the park as described under Alternative A. In addition, actions would be taken to fill the void beneath the toe of the low loading dock, repair the bulkhead by removing and replacing dislodged stones at the bulkhead toe, and add new armor stones for reinforcement. Sealing/repairing the dock structure with appropriate grout would help stabilize the structure against scouring. Continued barge service would help facilitate the ongoing cultural traditions of the Kalaupapa community by ensuring that supplies and traditionally used resources continue to be accessible to community residents. Supplies for preservation of ethnographic sites, structures, and buildings would also continue to be available.

Continued supplies for repairs of structures at the landing and in the Kalaupapa community would contribute to the preservation of these important elements of the ethnographic landscape, and would help retain traditional circulation patterns and uses by the community. Improvements to the landing area would help ensure that the harbor remains available for fishing, swimming, or other traditional activities in the future. Implementation of Alternative B would have long-term, localized benefits to ethnographic resources, the landscape, and the Kalaupapa community.

Although the harbor and the surrounding area are part of a larger ethnographic landscape containing both tangible and intangible elements, no ethnographic sites have as yet been formally documented within the project area. Because of extensive disturbance to the harbor from past dredging, dolphin construction, creation of the breakwater and other construction activities, it is unlikely that any intact physical remains of ethnographic sites lie beneath the water in the area of potential effect. Thus, construction activities in the harbor waters would be unlikely to destroy physical remains and effects would be negligible.

The seepage of fresh water into the harbor would be adversely affected for a short time during construction, but repairs to the bulkhead would be done in such a way as to continue the seepage. Previous dredging and other work impacting harbor floor did not impede the seepage, so any long-term effects on the fresh water "springs" would be anticipated to be negligible.

Work on the dock structure and breakwater and noise generated by construction (e.g. removal of armor stones) could affect fish that have long been part of the community's cultural traditions, such as changes in fish forage and habitat. These adverse effects, however, would be short-term, localized and minor.

Some cultural resources in the vicinity of the harbor have both tangible and intangible aspects. These include the Pikoone stone, areas where umbilical cords were buried, the Ka'ahemo Heiau, a possible *ko'a*, and a potential burial in the vicinity of the harbor. Because the project's limits of construction are focused tightly on the dock and immediate harbor, no physical effects to these or other tangible ethnographic resources in the vicinity would be expected.

The National Park Service would work closely with Native Hawaiians to help ensure a sense of respect for and protection of the more intangible aspects of cultural resources in the vicinity of the area of potential effects. While repairs to the dock and breakwater would not have any direct effects on documented cultural sites, the repairs would create noise and may be disturbing to the usual quiet of the Kalaupapa community for nearby residents during the construction period. Traditional activities such as fishing and swimming would be restricted in the harbor area during construction. The noise and temporary lack of access would result in localized, short-term, minor adverse effects on traditional activities and on the community itself, but such impacts would end with the cessation of construction.

The NPS would work closely with the Kalaupapa community to help reduce or prevent possible effects to fish, other marine resources, or to sites culturally valued by the community. Keeping in mind the culturally sensitive nature of the area, all possible measures would be taken to maintain quiet and a sense of respect for traditional places, and intangible ethnographic resources, beliefs and activities.

Cumulative Impacts. The area of potential effect for cumulative impacts, the time period, and past actions (eviction of Native Hawaiian residents at Kalawao and Kalaupapa, forced isolation of Hansen's disease patients, and changes in land ownership and management) are the same as described for Alternative A. Effects of implementation of the forthcoming GMP also would be as described for Alternative A.

When the long-term, major adverse effects of past actions and the beneficial effects of past and current actions to preserve and maintain the harbor structures and the community are added to the effects from Alternative B (beneficial effects and negligible to minor adverse effects), this alternative would have a long-term, moderate adverse, cumulative effect on ethnographic resources and landscapes. The adverse effects of Alternative B would be a very small component of the adverse cumulative impact. There would be no impairment of park resources and values as a result of park actions under Alternative B.

Conclusion. Implementation of Alternative B would have long-term beneficial effects on ethnographic resources, as well as short-term negligible to minor adverse effects. Alternative B would have a long-term, moderate adverse, cumulative effect on ethnographic resources; however, the adverse effects of Alternative B would be a very small component of the adverse cumulative impact. There would be no impairment of park resources and values as a result of proposed actions under Alternative B.

Section 106 Summary. After applying the Advisory Council on Historic Preservation's criteria of adverse effects (36 CFR Part 800.5, Assessment of Adverse Effects), the National Park Service concludes that implementation of Alternative B would have no adverse effects on the ethnographic resources of Kalaupapa National Historical Park.

PARK OPERATIONS AND MANAGEMENT

AFFECTED ENVIRONMENT

The superintendent of Kalaupapa National Historical Park is responsible for managing the park, its staff and programs, and its interactions with community residents and agencies at all levels of government. Park staff provide the full scope of functions and activities to accomplish management objectives, including interpretation and education, resource protection, law enforcement, emergency services, public health and safety, science, visitor services, utilities, maintenance, and management support.

The superintendent also coordinates park activities with Kalawao County, local Moloka`i governments, interested religious groups, and historical societies. NPS has several cooperative agreements with parties that detail separate and shared responsibilities regarding protection and maintenance of natural and cultural resources at the park.

Kalaupapa Community Residents, Visitors and Staff

The Hawaii DOH is responsible for providing for the medical and living needs of the former Hansen's disease patients on the Kalaupapa registry (Chapter 326, HRS). There are currently 25 Hansen's disease patients remaining on the Kalaupapa patient registry, 13 of whom still live on the island. The patient population is decreasing at a rate of 3 to 4 people per year (HDOH 2008b).

Currently, some 70 federal and state employees reside on the island, 19 of whom are NPS employees. Visitation is fairly steady throughout the year. Approximately 10,000 people arrive by mule rides, hiking, or by aircraft. The enabling legislation for the park (Public Law 96-565, December 22, 1980) limits daily visitations to no more than 100.

Community and Park Physical Facilities

The Kalaupapa community is comprised of some 400 structures, including private residences, dormitories, a hospital, post office, dining hall, firehouse, grocery store, gas station, social hall, churches, 14 cemeteries, maintenance and storage buildings, and supporting infrastructure (e.g., water, septic, power). Of these structures, NPS has identified 195 as historically or culturally significant, and several have been adapted for NPS administrative use.

In 1984, the Hawaii DOH and the NPS entered into a cooperative agreement which specified that the health department would continue health care programs while NPS would operate, preserve, and protect the park (NPS 1984). Operationally, this means that NPS would eventually maintain and operate all community facilities, including Kalaupapa harbor. To date, however, the transfer of the harbor facility has been deferred due to limitations on NPS funding.

Kalaupapa harbor provides a critical link for the park and the community residents. No roads connect the Kalaupapa Peninsula with other parts of Moloka`i. Alternate access is by daily commuter-class air taxis to the Kalaupapa Airport, and along a 3.2-mile trail over the North Shore Cliffs (*pali*) that is limited to pedestrian and pack mule traffic. Thus, nearly all supplies for the park and the Kalaupapa community are transported from Honolulu via barge. Deliveries typically occur once each year during summer, or more often if necessary. Materials include food, clothing, household items, medical equipment, fuel, heavy equipment, appliances, and construction and maintenance materials. The barge also carries materials away from Kalaupapa, such as scrap metal and hazardous materials.

As the patient population declines, it seems likely that state health department personnel would decrease accordingly, as would the amount of needed supplies delivered by the barge. However, NPS operations are expected to grow as NPS assumes responsibility for more facilities that are

currently operated and maintained by the state. Thus, the harbor and the barge service are critical for supporting the Kalaupapa community, the park, and its natural and historical resources.

The barge that has serviced Kalaupapa for many years was the smallest available in the Hawaiian Islands and the existing docking facilities were constructed to accommodate barges of this size. There is currently one barge small enough to use the existing dock, and deliveries to Kalaupapa have to be scheduled around the availability of this barge. Unavailability in the past has resulted in deliveries of construction supplies being delayed for up to a year. In 2009, the park secured a 5-year contract for use of this small barge through the summer of 2014. Thereafter, and much like the current situation, periodic disruptions or delays in service could occur due to lack of barge availability.

ENVIRONMENTAL CONSEQUENCES

Guiding Regulations and Policies

The larger context for analyzing the impact of each alternative on park operations and management is established by the legislation establishing the park (P.L. 96-565), and *Management Policies* (NPS 2006b). NPS policies provide service-wide guidelines and mandates for the preservation, management, and use of park resources and facilities. For instance, NPS maintenance activities in park units must:

> *"…conduct a program of preventive and rehabilitative maintenance and preservation to (1) provide a safe, sanitary, environmentally protective, and esthetically pleasing environment for park visitors and employees; (2) protect the physical integrity of facilities; and (3) preserve or maintain facilities in their optimum sustainable condition to the greatest extent possible" (NPS 2006b, Section 9.1.4.1)*

Based on these and other laws, regulations, and policies, park operations and management at Kalaupapa concern: 1) serving the needs of community residents; 2) maintaining the physical components of the community and the park; and 3) protecting the natural and cultural resource values of the park.

Methods and Assumptions

Information Sources. The primary sources of information used in this analysis included existing park and NPS management documents, prior park studies and environmental documents, NPS policy documents, published reports, and unpublished observations and insights from knowledgeable park staff.

Assumptions. Assumptions used in this analysis include: 1) the geographic area considered for impacts to park operations and management is Kalaupapa National Historical Park; 2) the existing dock structure will remain serviceable and capable of supporting barge deliveries for the next five years; and 3) construction activities proposed under Alternative B would not preclude regular barge delivery service.

Impact Criteria and Thresholds

Impacts were evaluated using the criteria and thresholds described below.

Negligible: Effects on park management or operations would be below the level of detection. No noticeable impacts to park operations and management would occur.

Minor: Impacts to park management or operations would be detectable, but only to park staff. Park management or operations would not be appreciably affected.

Moderate: Impacts to park management or operations would result in changes that would be noticeable to staff, residents, and visitors. The park's ability to fulfill its mission and mandates would be strained.

Major: Impacts to park management or operations would be readily apparent and result in substantial changes that would be obvious to staff, residents, and visitors. The park's ability to fulfill its mission and mandates would be compromised.

Duration:

Short-term: Effects occur for a maximum of five years.

Long-term: Effects occur beyond five years.

Impacts of Alternative A, the No Action Alternative

Under the No Action Alternative, the park would pursue several options to ensure continued small barge service beyond the current 5-year contract. These efforts are assumed to result in continued barge service to the park and community. These efforts would require staff time and effort in pursuing vendors, addressing regulators, documenting findings, and securing contracts. These efforts would result in long-term, minor, and adverse impacts to park operations and management.

Over the short-term, continued deterioration of existing harbor facilities and related maintenance efforts would demand increasing amounts of park staff, time, and resources. Resulting impacts to park operations and management would be short-term, localized, minor, and adverse.

In the long-term, aging harbor facilities would become increasingly problematic and expensive to maintain, demanding increasing amounts of park staff, time, and resources. A recent structural evaluation of harbor facilities indicated that partial collapse of the bulkhead wall "could occur at any time" (Daly 2005). Should this occur, it could impose moderate adverse impacts on park operations and management, including the park budget, and on Kalaupapa residents.

If the bulkhead failure were dramatic enough to result in interrupted or delayed barge service, other means of delivery of food and medicines would be secured. Park staff would be called on to locate, organize, and participate in alternate delivery methods. Because it is unlikely that fuel (gasoline and diesel) could be delivered by other means, consumption would need to be reduced by decreasing driving, eliminating use of motorized boats, and restricting other activities that consume fuel. It is assumed that providing power to the park's water and wastewater systems would take priority and that these services would continue to function.

In the past, when the smaller barge was not available, delivery of construction materials has been delayed for up to a year. This could hamper the ability of residents and park personnel to respond during and after emergencies (e.g., supplies for rebuilding after a hurricane or tsunami). This may be particularly disruptive to the park's ability to fulfill its mission and mandates, especially as it assumes more duties and responsibilities over time.

Cumulative Impacts. Development and implementation of the park's first general management plan would require substantial and sustained effort from many park staff. Ongoing restoration and rehabilitation of historic properties would require efforts from maintenance and facilities staff, as well as those involved in historic preservation. Ongoing processing of park recycle materials for air transport out of the park would also require time and effort. Installation of two new memorials in the park would impose additional duties. Together, these other projects and plans would have short- and long-term, minor to moderate, and adverse impacts on park management and operations. In concert with the short- and long-term, minor to moderate, and adverse effects of Alternative A, overall cumulative impacts would be long-term, minor to moderate, and adverse.

Conclusion. Depending on the rate of deterioration of the harbor structures, the No Action Alternative would have short- and long-term, minor to moderate, and adverse impacts on park operations and management by demanding increasing amounts of park staff, time, and resources. Implementation of other plans and projects would require additional time and efforts from park staff resulting in short- and long-term, minor to moderate, and adverse cumulative effects.

Impacts of Alternative B, the Preferred Alternative

As described for Alternative A, the park would pursue several options to ensure continued small barge service beyond the current 5-year contract. These efforts would require staff time and effort in pursuing vendors, addressing regulators, documenting findings, and securing contracts. These efforts would result in long-term, minor, and adverse impacts to park operations and management.

In addition, Alternative B would include completion of the repairs necessary to maintain small barge service. Impacts to park operations and management would be localized, minor, and adverse during project implementation. Given the park's small staff (19 individuals), the effort required to implement resource monitoring for construction activities would be burdensome over the short-term.

For instance, several individuals would watch for marine mammals and turtles during construction, and to record their observations on species occurrence and responses to construction activities. In addition, park staff would maintain restricted access to the dock and construction area, and address any resident or patient needs regarding noise and disrupted fishing access. Housing the work crew would produce a modest level of effects, with increased waste generation and maintaining guest housing. Project implementation would result in short-term, localized, moderate, and adverse effects on park operations and management.

Over the long-term, effects on park operations and management would be localized, minor to moderate, and beneficial. The dock structures would be stabilized for the next 10 to 15 years, relieving park personnel of on-going maintenance duties.

Cumulative Impacts. As described for Alternative A, the impacts of other projects and plans on park operations and management would be short- and long-term, minor to moderate, and adverse. In combination with the long-term, localized, minor to moderate benefits of Alternative B, overall cumulative effects would be long-term, localized, minor, and adverse.

Conclusion. Short-term impacts of Alternative B would be localized, moderate, and adverse due to efforts required to implement resource monitoring, access restrictions, and housing crew during construction activities. With less on-going maintenance requirements for park staff, long-term effects would be localized, minor to moderate, and beneficial. Implementation of other plans and projects would require additional time and efforts from park staff resulting in short- and long-term, minor to moderate, adverse cumulative effects.

Chapter 4: Consultation and Coordination

PUBLIC SCOPING

The public scoping process began on March 11, 2008, with the NPS proposing to complete an environmental assessment for the dock repairs. However, potential effects to special-status species – marine mammals and those listed under the federal Endangered Species Act – led the NPS to determine that an environmental impact statement (EIS) would be the appropriate compliance pathway for this project. Thus, a second phase of scoping began in early 2009 for the EIS. On April 17, 2009, a notice of intent to prepare an EIS was published in the *Federal Register* (Volume 74, Number 73).

In March 2009, a brochure was distributed to the park's mailing list of interested individuals, organizations, and businesses. The brochure summarized the purpose of and need for the project, identified potential issues, and presented opportunities for public involvement in the NEPA process.

Five public meetings were held to gather comments and to record issues related to the proposed dock and harbor project. Three meetings were held on the island of Moloka`i and two in Honolulu. These meetings were preceded by news releases and other announcements and distribution of the project brochure. At each public meeting, a presentation on the project was given, including proposed project alternatives, the project approval process, and timeframe for the final decision-making. Thereafter, NPS staff was available to discuss the project, answer questions, and record comments.

- On Tuesday, April 7, 2009, a scoping meeting was held at the park. Attendees at this meeting were park and State of Hawaii staff.
- On Wednesday, April 8, 2009, a daytime public scoping open house and presentation to the Moloka`i Planning Commission was held at Mitchell Pauole Center, in Kaunakakai, Moloka`i. Eight planning commissioners, and four planning commission staff attended the meeting
- On Wednesday, April 8, 2009, an evening scoping meeting was held for the public at Mitchell Pauole Center, in Kaunakakai, Moloka`i. Fifteen members of the public attended the meeting.
- On Monday, May 11, 2009, a daytime open house was held at the Hawaii IMIN International Conference Center. Representatives from the U.S. Environmental Protection Agency and state Department Hawaiian Home Lands attended.
- On Monday, May 11, 2009, an evening open house was held at the Hawaii IMIN International Conference Center. No members of the public attended this meeting.

The NPS received a total of 133 written and oral comments on the management options, schedule, and other concerns about the project. The topics addressed in the responses are summarized below.

- The majority of comments (46 percent) were submitted by state and federal agencies responsible for issuing permits for the project. Their comments focused on regulatory and environmental concerns.
- Other responses (40 percent) ranged from voicing an opinion, to expressing concerns about the decision-making process leading to the proposed project. The necessity of dredging the berthing basin was also questioned.
- Suggestions for non-structural methods to assure continued deliveries to the community were provided. The park is pursuing a variety of these suggested methods.

- The remaining comments (14 percent) were directed at questioning or challenging the purpose and need of the project.
- Most of the public written comments (4 out of 5) were not supportive of repairing the dock and or dredging the harbor. Commenters did not approve of the project because it would disturb natural and cultural resources in the Kalaupapa harbor.
- Many of the public responses sought clarification regarding the pre- and post-construction conditions at the harbor. Concerns regarding potential dredging included duration, noise generation, and storage of dredged materials.

The community expressed objections about widening the basin and re-installing the dolphin. Scoping comments recommended the NPS seek assistance from the PUC and other federal agencies in securing a long-term contract for a barge. The NPS followed up with these agencies, received favorable responses, and felt confident that other options were possible. In the meantime, the NPS secured a 5-year contract with Young Brothers. As a result, widening the berthing basin was removed from the project.

Acoustic studies completed for preliminary analysis raised concern for the impacts to marine mammals, especially the Hawaiian monk seal. The preliminary analysis concluded there would be an adverse affect determination under the Endangered Species Act. There would be minor, short-term adverse behavioral harassment of the monk seals during construction and possible, but unlikely impacts to the monk seal pupping success. These determinations resulted in a re-assessment of the benefit of the dolphin. The incremental benefits of the dolphin were not believed to outweigh the potential negative impacts to corals and mammals. Therefore, installation of a mooring dolphin was removed from the preferred alternative.

Considering the greatly reduced impacts to park resources resulting from dismissal of alternatives which include berthing basin widening and/or installation of a dolphin, the NPS reached a decision that an EIS was no longer necessary. On May 21, 2010 the NPS sent a scoping notice to all agencies and individuals who received previous scoping letters, informing them of the removal of these actions from the proposed actions. Additional public scoping was conducted for preparation of the EA until June 7, 2010. A Federal Register Notice announcing the termination of the EIS process was published on July 6, 2010. No additional public comments were received in response to the removal of the mooring dolphin from the preferred alternative and the termination of the EIS and completion of the EA.

AGENCY SCOPING

Scoping also includes early input from any interested agency or any agency with jurisdiction by law or expertise. As outlined in the “Relevant Laws, Regulations, and Policies” section, the NPS has coordinated with a variety of federal and state agencies responsible to protect and manage our natural and cultural resources. Initial responses are summarized below. NPS scoping letters and agency responses are included as Appendix B of this document.

FEDERAL AGENCY CONSULTATION

National Marine Fisheries Service

The NPS consulted with the NMFS by letter on August 18, 2008, to initiate informal consultation. NPS and NMFS are in consultation regarding impacts to species protected under the Marine Mammal Protection Act (16 USC 1361, et seq.) and impacts to essential fish habitat managed under the Magnuson-Stevens Fisheries Conservation Act (16 USC 1801, et seq.). In their response, NMFS identified the green and hawksbill sea turtles and Hawaiian monk seal as species listed under the Endangered Species Act with potential to occur within the project area. The NPS is in ongoing consultation with NMFS regarding the project and has informed the agency

of the removal of the mooring dolphin installation from the preferred alternative. The NPS does not expect that any of the proposed activities under Alternative B would result in the incidental taking of marine mammals. The NPS will request NMFS concurrence with this determination as part of the MMPA consultation process. To facilitate the consultation process, the NPS will submit to NMFS responses to the 14 criteria contained in an incidental harassment authorization, demonstrating the basis for the NPS determination that incidental take is not expected to occur.

Additionally, a Habitat Equivalency Analysis is being completed to determine compensatory mitigation for coral impacts.

U.S. Fish and Wildlife Service

In accordance with Section 7 of the Endangered Species Act (16 USC 1531, et seq.), the NPS contacted the U.S. Fish and Wildlife Service by letter on December 12, 2008, to initiate informal consultation and to request verification of the list of threatened and endangered species within the project area. Issues and concerns raised by USFWS staff were incorporated into three letters submitted to the park. Staff from USFWS and NMFS conducted a site visit of the project area in November 2009.

Special-status species and potential effects to other fish and wildlife resources from construction were raised as issues by the agency. These are addressed in the EA.

U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers responded to initial agency scoping with a determination that the Kalaupapa harbor is within jurisdictional waters of the U.S. As such, permits under the Rivers and Harbors Act (33 USC 401, et seq.) and Clean Water Act (33 USC 1251, et seq.) will be needed before construction may proceed. The NPS will continue to work with the U.S. Army Corps of Engineers and submit the required application(s) as part of the overall compliance effort.

U.S. Environmental Protection Agency

The U.S. Environmental Protection Agency responded to initial agency scoping with several recommendations involving adherence to various NEPA requirements, such as clear descriptions of project purpose and need, project alternatives, existing conditions, potential impacts to the environment, impact mitigation, and cumulative effects. The dock repair EA process continues to adhere to all NPS policies and procedures related to NEPA and other applicable federal and state natural and cultural resource laws, regulations, and policies.

Advisory Council on Historic Preservation

In August 2008, the NPS sent a letter to the Advisory Council on Historic Preservation (ACHP) as part of the consultation process under Section 106 of the National Historic Preservation Act (NHPA; 16 USC 470, et seq.). The letter notified the ACHP of the proposed project and invited the agency to participate in the planning process. The letter also informed the ACHP that the NPS would use the NEPA process to comply with the provisions of Section 106, in accordance with section 800.8(3)(c) of the ACHP regulations implementing Section 106 (36 CFR Part 800). By letter dated September 2, 2008 the ACHP acknowledged receipt of the letter and requested that should the NPS "…determine in consultation with the SHPO [State Historic Preservation Officer], Native Hawaiian organizations, and other consulting parties, that its proposed undertaking may have an adverse effect on properties listed or eligible for listing on the National Register of Historic Place that you notify us of the adverse effect and provide adequate documentation for our review.

STATE AGENCY COORDINATION

Hawaii State Department of Health Clean Water Branch

The Clean Water Branch of the state health department provided comments regarding permitting and requirements for the proposed action, specifically, Clean Water Act Section 401, National Pollution Discharge Elimination System, and compliance with state Water Quality Standards. Additional comments from the Clean Water Branch included requirements for best management practices to protect the marine ecosystem. The NPS will be obtaining appropriate water quality permits as part of the overall compliance effort.

Hawaii State Historical Preservation Division

As part consultation process under NHPA Section 106, the NPS sent a letter to the State Historic Preservation Division inviting them to participate in the planning process and informing them that the NPS plans to use the EA process to fulfill the requirements of NHPA Section 106 as well as to comply with provisions of NEPA. The division acknowledged the coordination with Section 106 and requested continued consultation throughout the NEPA process.

Hawaii Department of Business, Economic Development, and Tourism

The Hawaii Department of Business, Economic Development, and Tourism requires compliance with the federal Coastal Zone Management Act (16 USC 1451, et seq.) prior to project implementation. The NPS will submit a consistency determination for review and concurrence by the Hawaii Coastal Zone Management program (Appendix A).

Hawaii Department of Hawaiian Home Lands

The Department of Hawaiian Home Lands acknowledged receipt of the NPS scoping letter and indicated that it supports the project, but that it did not currently have specific project comments. The agency requested to be kept apprised as the dock repair EA proceeds.

Table 16. Compliance and Permitting

Agency	Action	Legal Source
US Fish and Wildlife Service & National Marine Fisheries Service	Concurrence with Not Likely to Adversely Affect Hawaiian monk seals, green sea turtles, & hawksbill turtles; Not likely to Adversely Modify Hawaiian monk seal critical habitat or areas under consideration for future designation of critical habitat	Endangered Species Act
Department of Business, Economic Development & Tourism, Office of Planning	Concurrence with Coastal Zone Management determination	Coastal Zone Management Act, Sec. 307
Hawaii Department of Health	Community Noise Permit	Title 13 Chapter 11-46, Hawaii Administrative Rules
Department of Land and Natural Resources	Conservation District Use Authorization	Title 13 Chapter 5, Hawaii Administrative Rules

Table 16. Compliance and Permitting

Agency	Action	Legal Source
Department of Land and Natural Resources	Coral Taking Permit	State law (§13-95-70 & §13-95-71)
US Army Corps of Engineers	Dredge and Fill Permit	Clean Water Act Sec. 404 - Nation Wide Permit and R&H sec 10
National Marine Fisheries Service	Concurrence with No Adverse Effects to Essential Fish Habitat	Magnuson-Stevens Act
Department of Hawaiian Home Lands	Approval	Hawaiian Homes Commission Act, 1920
National Marine Fisheries Service	Concurrence with no take/harassment of marine mammals determination	Marine Mammal Protection Act
State Historic Preservation Officer - Department of Land and Natural Resources	Concurrence with No Adverse Effect determination	National Historic Preservation Act, Sec. 101
Hawaii Department of Health	Water Quality Certification	Clean Water Sec. 401 via Hawaii Administrative Rules, Chapter 11-56
Hawaii Department of Health	Storm Water Pollution Control Permit	Clean Water Act National Pollutant Discharge Elimination System via Hawaii Administrative Rules, Chapter 11-56

LIST OF PREPARERS AND CONTRIBUTORS

Name	Title	Education	Experience
Parsons			
Timberley Belish	Environmental Scientist and Technical Director	B.S., Biology, and M.S., Ecology and Evolution. Responsible for technical direction and NPS/National Environmental Policy Act requirement assurance.	16 years
Jacklyn Bryant	Environmental Scientist, Project Manager	B.S., Natural Resource Management, and M.S., Watershed Sciences. Responsible for team coordination and performance.	13 years
Colleen Conklin	Environmental Scientist	B.S. Environmental Sciences, M.S. Epidemiology Responsible for special-status species and NMFS permitting document requirements	25 years
Gabriel Cosyleon	Senior Scientist	B.S., Biology, and M.S., Zoology Responsible for fishes and soundscape.	6 Years
Bill Goosmann	Environmental Scientist	B.S., Biology, and M.S., Riparian Ecology. Responsible for benthic habitat, park operations, water resources.	20 years
Alexa Miles	Environmental Planner	B.A., Environmental Studies and M.S., Landscape Architecture; LEED AP. Responsible for graphics, document preparation, and coordination.	5 years
Diane Rhodes	Cultural Resource Specialist	M.A., Anthropology/Archeology. Responsible for cultural resources.	30 years
National Park Service			
Stephen Prokop	Kalaupapa National Historical Park	Superintendent	
Eric Brown	Kalaupapa National Historical Park	Marine Ecologist	
Monica Norval	Denver Service Center	Project Manager	

Elaine Rideout	Denver Service Center	NEPA Specialist
Greg Cody	Denver Service Center	Cultural Resource Specialist
Ericka Stein	Kalaupapa National Historical Park	Archeologist
Karen Cantwell	Pacific-West Region Office	Environmental Protection Specialist
Debbie Campbell	Pacific-West Region Office	Line Item Construction Program Coordinator

Marine Acoustics, Inc. (Middletown, RI)

Stanley J. Labak	Underwater Acoustical Analyst
Dr. Adam Frankel	Underwater Acoustical Analyst

LIST OF RECIPIENTS

The following federal, state, and local government agencies; elected officials; native representatives; and libraries, churches, and local organizations were sent a copy of the EA. In addition, individuals, businesses, media outlets, and other groups that have expressed interest in Kalaupapa National Historical Park in the past have been sent letters stating that the EA is available for review and comment.

Federal Agencies

Advisory Council on Historic Preservation

U.S. Environmental Protection Agency, Region IX

U.S. Coast Guard (OPS), Barbers Point

Kalaupapa Federal Advisory Commission

National Marine Fisheries Service, Pacific Islands Regional Office

National Marine Fisheries Service, Office of Protected Resources

U.S. Fish and Wildlife Service, Pacific Island Division

U.S. Army Engineer District, Honolulu

State Agencies

Department of Business, Economic Development and Tourism, Office of Planning

Department of Defense

Department of Health, Office of Planning

Department of Health – Kalaupapa

Department of Health, Clean Water Branch

Department of Land and Natural Resources, State Historic Preservation Division

Department of Land and Natural Resources, Office of Conservation and Coastal Lands

Department of Hawaiian Home Lands, Land Management Division

Office of Hawaiian Affairs – Honolulu

Office of Hawaiian Affairs – Moloka`i

Department of Hawaiian Home Lands

Department of Transportation

Department of Land and Natural Resources, Division of State Parks

Department of Land and Natural Resources, Land Division

Local Agency

County of Maui, Department of Public Works

Elected Officials

Federal and State Elected Officials

Governor Linda Lingle

State Senator J. Kalani English (6th District)

U.S. Senator Daniel K. Inouye

U.S. Senator Daniel K. Akaka

State Rep. Mele Carroll (13th District)

Congressman Neil Abercrombie, District 1

Congresswoman Mazie K. Hirono, District 2

Local Elected Officials

Moloka`i Planning Commission

Native Representatives

Hui Malama O Mo'omomi

Hui Malama I Na Kupuna O Hawaii Nei

Libraries, Museums, Others

Moloka`i Public Library (Kaunakakai)

Moloka`i Museum and Cultural Center

Roman Catholic Church in the State of Hawaii

St. Francis and St. Philomena Catholic Churches

Kana'ana Hou and Siloama Protestant Churches

Kalaupapa Patient Advisory Council

Historic Hawaii Foundation

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List of Acronyms and Abbreviations

APE	Area of Potential Effect
BA	Biological Assessment
BE	Biological Evaluation
BMP	Best Management Practice
BO	Biological Opinion
CEQ	Counsel on Environmental Quality
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
dB	Decibel
DLNR	Department of Land and Natural Resources, Hawaii
DOH	Department of Health, Hawaii
DOI	Department of the Interior
DON	Department of Navy
EFH	Essential Fish Habitat
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
HDOH	Hawaii Department of Health
HPAC	Habitat Area of Particular Concern
HAR	Hawaii Administrative Rules
HRS	Hawaii Revised Statutes
IHA	Incidental Harassment Authorization
IPCC	Intergovernmental Panel on Climate Change
MMPA	Marine Mammal Protection Act
MSFCMA	Magnuson Stevens Fishery Conservation and Management Act
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRHP	National Register of Historic Places
OAR	Oregon Administrative Rules

OCCL	Office of Conservation and Coastal Lands (DLNR)
Pa	Pascal (e.g., micro-Pa)
PUC	Public Utility Commission
RHA	Rivers and Harbors Act
RMS	Root Mean Squared
TS	Threshold Shift
TTS	Temporary Threshold Shift
USACE	U.S. Army Corps of Engineers
USC	United States Code
USEPA	U.S. Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
ZOI	Zone of Influence

Glossary

Acoustics: The scientific study of sound, especially of its generation, transmission, and reception.

***Ahupua'a*:** The principal land division running from mountains seaward; basic unit of Hawaiian socio-economic organization.

***Ali'i*:** The ruling class of chiefs and nobles considered to be of divine origin.

Ambient noise: The typical or persistent environmental background noise present in the ocean.

Anadromous: Migrating up rivers from the sea to breed in fresh water (e.g., salmon).

Anthozoans: Belonging to the Class *Anthozoa*, which includes corals and sea anemones.

Anthropogenic noise: Noise related to or produced by human activities.

Archipelago: An extensive group of islands.

Benthic: Relating to or residing on the bottom of a body of water (see demersal).

Cetacean: Belonging to the Order *Cetacea*, which includes aquatic mammals such as whales, dolphins, and porpoises with anterior flippers, no posterior limbs, and a dorsal fin.

Compression wave: The mechanism by which sound moves through liquids and gasses (also referred to as a P-wave).

Decibel (dB): A unit of measurement expressing the intensity of a sound.

Demersal: Deposited on or dwelling at or near the bottom of a body of water (see benthic).

Endangered species: As defined under the federal Endangered Species Act, "any species which is in danger of extinction throughout all or a significant portion of its range."

Harassment: As defined under the federal Marine Mammal Protection Act, "any act of pursuit, torment, or annoyance" that has the potential to: 1) "injure a marine mammal or marine mammal stock in the wild" (referred to as Level A Harassment); or 2) "disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including migration, breathing, nursing, breeding, feeding, or sheltering" (referred to as Level B Harassment).

***Heiau*:** A religious temple; pre-Christian place of worship or sacrifice.

Hertz (Hz): The unit of measure of frequency in cycles per second.

***Holua*:** A long, narrow sled on runners on which the *ali'i* raced down a long track.

***Kapu*:** A taboo prohibition system with elaborate sanctions regarding behavior between individuals and among classes. In ancient Hawaii, this system was the major social control helping preserve class distinctions and conserve natural resources.

***Ko'a*:** A fishing shrine; pile of stones erected on promontories or headlands overlooking ocean or in form of small temples on rock platforms; designed to entice the gods to attract fish to the area.

***Konane*:** A variant of checkers played on wood board or rock with black and white pebbles.

***Makahiki*:** A ceremony; an annual harvest festival comprising ritual for collecting tribute.

***Makai*:** Toward the ocean swimming.

***Pali*:** A cliff.

Pinniped: Belonging to the Order *Pinnipedia*, containing aquatic mammals such as seals, sea lions, and walruses with fin-like flippers for locomotion. They are carnivorous and "haul out" on shore to have their offspring (pups).

***Puao*:** The surf at Kalaupapa.

Received level: The level of sound that arrives at the receiver, whether a marine organism or listening device.

Refraction: Bending of a wave passing through or around a boundary or barrier.

Salinity: A measure of the quantity of dissolved salts in seawater measured in in parts per thousand.

SONAR: An acronym for SOund NAvigation and Ranging. It includes any system that uses underwater sound, or acoustics, for observations and communications. There are two broad types of sonar. Passive sonar detects the sound created by an object (source) in the water. This is a one-way transmission of sound waves traveling through the water from the source to the receiver. Active sonar detects objects by creating a sound pulse, or ping, that transmits through the water and reflects off the target, returning in the form of an echo. This is a two-way transmission (source to reflector to receiver) and is a form of echolocation.

Sound pressure level: As expression of the level of sound energy or intensity measured in decibels and pascals.

Source Level: The level of sound intensity above a reference level as measured at a particular distance (measured in decibels and pascals).

Spall: To chip, flake, or break off in layers, especially from the surface of stone or concrete.

Take: As defined under the Endangered Species Act, “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct” toward a species listed under the federal Endangered Species Act.

Temporary threshold shift: Temporary increases in threshold occurring after exposure to high noise levels, which can last from minutes to hours to days.

Transmission loss: Energy loss as sound travels through the water.

Threatened species: As defined under the federal Endangered Species Act, “any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.”

Turbidity: The cloudiness or opaqueness of a liquid, often due to suspended sediments and organic matter.

Zone of Influence: The maximum range from a source of sound at which an animal is influenced.

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As the nation's principal conservation agency, the Department of the Interior has the responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

NPS August 2010