Environmental Assessment
for the
Interim Visitor Services Plan
at
Midway Atoll National Wildlife Refuge,
the Battle of Midway National Memorial, and
Papahānaumokuākea Marine National Monument

May 21, 2007

Field of Laysan Albatrosses with downy chicks, Midway Atoll NWR

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Section 1. Purpose of and Need for Action

1.1 Need for the proposed action

Midway Atoll National Wildlife Refuge (Midway Atoll) comprises an atoll ecosystem of exceptional wildlife value. Approximately 2 million seabirds nest on the islands of Midway Atoll including the world's largest Laysan albatross (*Phoebastria immutabilis*) and black-footed albatross (*Phoebastria nigripes*) colonies. The atoll supports at least 16 other species of migratory seabirds; 4 species of migratory shorebirds; and a diversity of other native wildlife including endangered Hawaiian monk seals (*Monachus schauinslandi*), short-tailed albatrosses (*Phoebastria albatrus*), and Laysan ducks (*Anas laysanensis*); threatened green sea turtles (*Chelonia mydas*); marine mammals; and other marine organisms. Consistent with the National Wildlife Refuge System Administration Act of 1966, as amended (16 U.S.C. 668dd-668ee) (Act), the U.S. Fish and Wildlife Service (FWS) manages, conserves, and where appropriate, restores fish, wildlife, plants, and their habitats at Midway Atoll.

Midway Atoll is also the National Memorial to the Battle of Midway, and FWS is also responsible for the significant historic resources found there. Midway Atoll was defended from attack by the Japanese military on December 7, 1941, and was the base for the June 1942 "Battle of Midway," widely recognized as the turning point for World War II in the Pacific. In addition to resources associated with the War in the Pacific, other historic properties include cable station buildings associated with trans-Pacific communication history and buildings associated with defense-related patterns of Navy base development.

In 1996, the FWS prepared a public use plan to guide visitor services on Midway Atoll. Since then, the National Wildlife Refuge System Improvement Act of 1997 (an amendment to the Act) set new standards for visitor programs on refuges, and in 2006, new guidance was issued in the form of FWS Manual chapters regarding wildlife-dependent recreation. Since the former visitor services program ended in 2002, FWS has received numerous inquiries from people requesting the program be reinstated in some form to allow more regularly scheduled visitor access. In accordance with the Act, and FWS guidance, this visitor services plan is required to ensure recreational uses are compatible with the National Wildlife Refuge System mission and the purposes, goals, and objectives of the refuge, national memorial, and compliant with the recently designated Papahānaumokuākea Marine National Monument.

The interim visitor services plan documents approved recreational activities at Midway Atoll and identifies the structure of visitor services management on the refuge. It discusses operational limitations, biological constraints, and off-refuge opportunities. The plan also includes partnership opportunities, projected costs, and required staffing.

Since 1995, FWS has been strongly committed to welcoming visitors to Midway Atoll. This is the first and only remote island national wildlife refuge in the Pacific to provide the public with an opportunity to learn about and experience these unique ecosystems.

1.2 Purpose of the proposed action

FWS is proposing to implement an interim visitor services plan to satisfy requirements of the Act and to allow the public the opportunity for high quality compatible education and interpretation of wildlife and historic resources and wildlife-dependent recreation at Midway Atoll.

1.3 Description of the proposed action

The proposed interim visitor services plan would be managed by FWS but would function with the assistance of its operations contractor, its monument co-trustees, and possibly private tour operators. The visitor services plan builds upon previous documents addressing a visitor services program at Midway and provides the foundation for an ecologically friendly public experience on the refuge while at the same time allowing FWS to accomplish its primary purpose, preserving and enhancing the biological diversity of the land and waters. As outlined in the interim visitor services plan, wildlife observation, photography, environmental education (EE), interpretation, and a limited number of nonwildlife-dependent recreational activities would be authorized at Midway Atoll.

1.4 The project area

Midway Atoll is a unique atoll located approximately 1,250 miles northwest of Honolulu encompassing a total of 581,864 acres (Fig. 1.1). The refuge consists of coral reefs, a shallow lagoon, deep ocean, and three islands: Sand 1,117 acres, Eastern 336 acres, and Spit 15 acres, (Fig. 1.2) (Klavitter 2004). The total submerged area (everything underwater, including areas inside the atoll) is 580,394 acres. Of this amount, approximately 605 acres are emergent reef. Total upland area (all the dry land inside the atoll) is 1,468 acres. The refuge boundaries are circular in nature and extend 12 nautical miles (nmi) out from the fringing coral reef. The airfield (143 acres) is located on Sand Island. For the purposes of this assessment, the proposed action area is the entire area of Midway Atoll National Wildlife Refuge and Special Management Area, roughly a 12-nmi circle surrounding the atoll. No visitor-related activities would extend beyond that boundary.

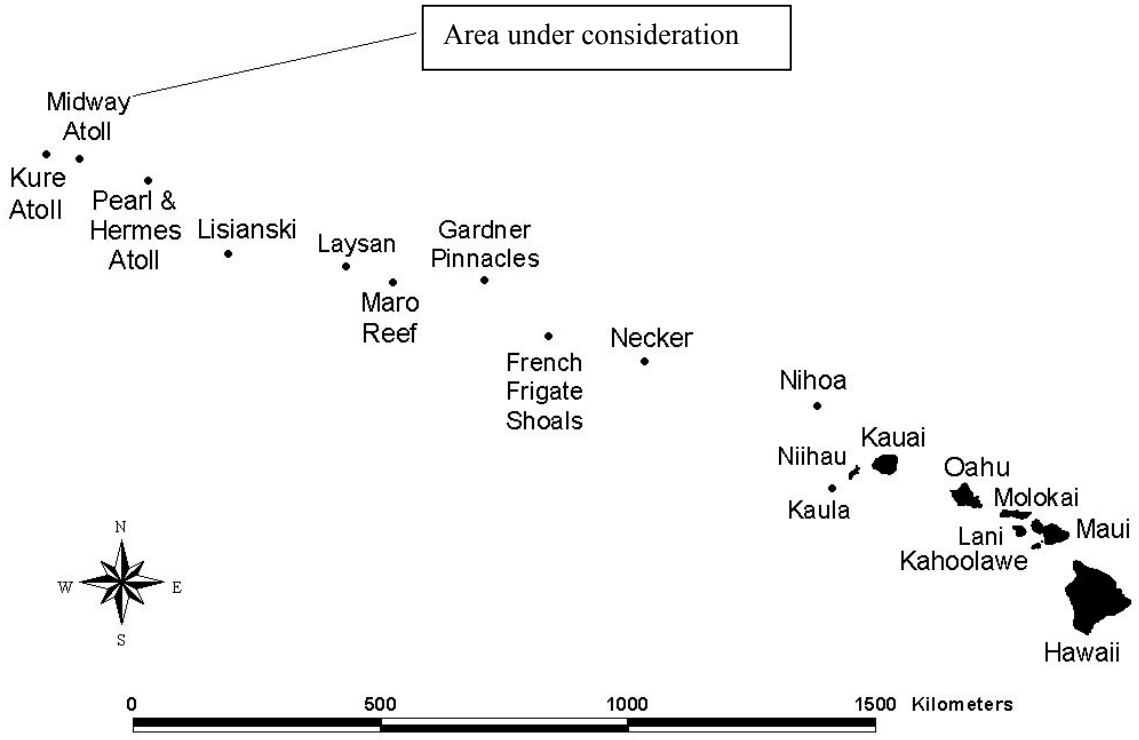

Figure 1.1. Hawaiian Islands archipelago with reference to Midway Atoll.

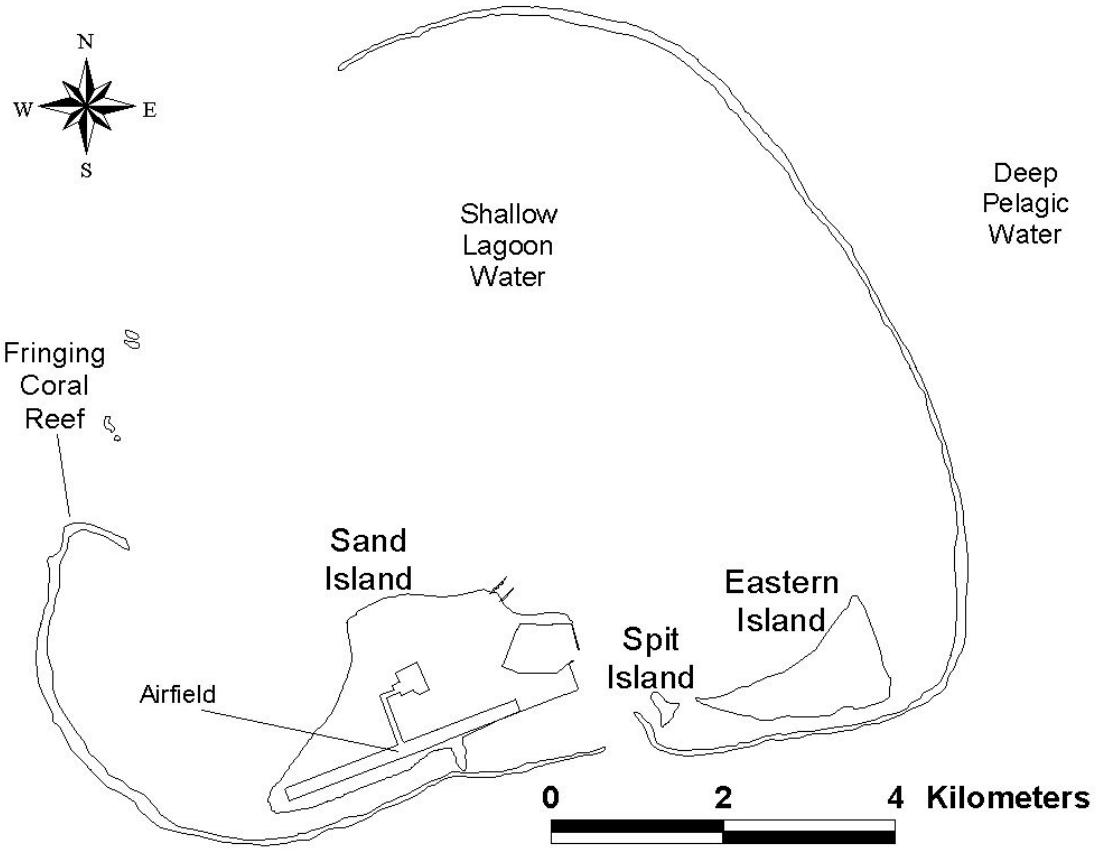

Figure 1.2. Sand, Eastern, and Spit Islands within Midway Atoll.

1.5 Related agency actions

1.5.1 Refuge Vision and Management Goals

FWS managed Midway Atoll as an overlay national wildlife refuge from 1988 to 1996 through a cooperative agreement with the U.S. Navy. Refuge management is guided by the following Midway Atoll plans: habitat management, seabird, invasive species, and Laysan ducks, that build upon the Midway Atoll Natural Resources Management Plan (FWS 1991). Accomplishments are reported in narrative reports, scientific publications and presentations, and Annual Refuge Accomplishments Reports.

Because the refuge has not yet completed a comprehensive conservation plan, current refuge management is based on draft versions of a refuge vision and management goals.

Midway Atoll National Wildlife Refuge and Battle of Midway National Memorial
Draft Vision Statement

Midway Atoll National Wildlife Refuge is a unique and peaceful treasury of wildlife and history in the midst of the Pacific,

where nature rules, but wildlife and people live in harmony;

where native terrestrial and marine habitats dominate the landscape, supporting enhanced diversity and densities of plants and animals;

where present and future generations of visitors find an opportunity to recreate their spirit and their connection with nature, an occasion to remember and honor the heroic servicemen who fought in the Battle of Midway, and a rare opportunity to experience and appreciate the importance of remote island national wildlife refuges;

where wildlife always find safe haven to rest and rear their young;

where a living laboratory provides lessons allowing the restoration of other altered island ecosystems; and

where the albatross, which has been the common thread through centuries of life on Midway, continues to persevere, singing its serenade of life and dancing its intricate steps in rhythm to the call of nature, forever.

Midway Atoll National Wildlife Refuge and Battle of Midway National Memorial
Draft Goal Statements

Goal 1. Conserve and restore the natural diversity and abundance of native plants and animals, both terrestrial and marine, at Midway Atoll, emphasizing seabirds and shorebirds,

threatened and endangered species, and coastal and marine communities within the Northwestern Hawaiian Islands ecosystem.

Goal 2. Offer visitors, residents, and people afar opportunities to discover, enjoy, and appreciate the Northwestern Hawaiian Islands ecosystem through wildlife-dependent activities.

Goal 3. Honor, maintain, and interpret the unique historical resources of Midway Atoll, with emphasis on its status as the Battle of Midway National Memorial.

Specific refuge management programs include protection and recovery programs for endangered monk seals, short-tailed albatrosses, and Laysan ducks, and threatened green sea turtles; research; monitoring of seabirds; and habitat enhancement (including nonnative plant and animal control, wildlife hazard remediation, out-planting with native plants, erosion control, and control of human disturbance). Refuge employees provide orientation briefings, educational/interpretive brochures and displays, and opportunities for the public to volunteer with refuge management programs.

1.5.2 Protection of historic properties

A number of important historic resources are found on Midway Atoll. In order to meet the requirements of the National Historic Preservation Act of 1966, the Navy and FWS consulted with the Advisory Council for Historic Preservation during the transfer of Midway. This consultation resulted in a programmatic agreement among the parties to ensure the appropriate treatment of Midway's historic properties. FWS prepared a historic preservation plan for the management of historic properties at Midway Atoll in 1999, and is in the process of updating that plan as part of the monument management plan. FWS uses some sites as facilities for its operations, interprets many of the sites to its visitors, and hopes to restore a limited number of sites. A list of historic resources that FWS has responsibility for is found in the programmatic agreement (see Appendix D).

1.5.3 Activities at Midway Atoll by other agencies

Federal Aviation Administration (FAA) works cooperatively with FWS to maintain a certified airfield (14 CFR Part 139.3337) to act as an emergency landing strip for commercial twin-engine jets transiting the Pacific Ocean.

National Oceanic and Atmospheric Administration (NOAA)-National Marine Fisheries Service (NOAA-Fisheries) enforces the provisions of the Marine Mammal Protection Act and the Endangered Species Act. NOAA-Fisheries has trust responsibility for the protection and recovery of monk seals and sea turtles at sea. FWS cooperates with NOAA-Fisheries to implement research and other recovery programs at Midway. Under section 7 of the Endangered Species Act, FWS must consult with NOAA-Fisheries for any action that may affect monk seals or sea turtles. The results of the consultation for this proposal are discussed in section 4.3.3. NOAA also is a co-trustee in the Papahānaumokuākea Marine National Monument.

NOAA-National Marine Sanctuary Program is a co-trustee with FWS in the Papahānaumokuākea Marine National Monument and manages the Northwestern Hawaiian

Islands Coral Reef Ecosystem Reserve. Staff from the co-trustees are working together to outline needs for monument operations and activities on Midway Atoll.

NOAA-National Weather Service in collaboration with the NOAA-National Ocean Service maintains a weather station on Sand Island.

NOAA-National Ocean Service operates and maintains a tsunami monitoring station on Sand Island.

NOAA-Global Monitoring Division (GMD) in collaboration with FWS conducts weekly air sampling on Sand Island to measure greenhouse gases in the Pacific.

State of Hawaii, Department of Land and Natural Resources is the third co-trustee within the Papahānaumokuākea Marine National Monument. Although Midway Atoll is not included within the State of Hawaii, we continue to consult with them on all activities within the monument. The State administers the adjacent Kure Atoll State Wildlife Sanctuary and has expressed interest in using Midway Atoll as a staging area for their activities.

U.S. Coast Guard stages missions including fishery and wildlife law enforcement, immigration patrols and law enforcement, emergency medical evacuations of merchant mariners, and search and rescue from Midway Atoll and provides support for refuge programs including transportation.

U.S. Geological Service and University of Hawaii and other agencies undertake research at Midway Atoll. Research proposals are evaluated by FWS for compatibility on a case-by-case basis and are conducted under special use permits.

Advisory Council on Historic Preservation (ACHP) provides technical assistance to FWS to ensure compliance with historic preservation laws. FWS consults with the ACHP for all activities that may affect historic resources at Midway Atoll including the restoration, maintenance, reuse, and interpretation of historical resources.

1.6 Decisions to be made based on the analysis

The Pacific Regional Chief for the National Wildlife Refuge System will select a proposed alternative and determine whether or not the proposed action would constitute a major Federal action significantly affecting the quality of the human environment.

1.7 Public involvement, scoping, and identification of the issues

On February 6, 2006, FWS posted a notice on its Midway Atoll National Wildlife Refuge Website announcing the initiation of a new visitor services planning process and inviting anyone interested in being on our mailing list to contact us. In addition, readers were invited to identify any issues that should be considered, visitor activities they would want to recommend, or thoughts about how the program should be structured.

We received 180 requests to be included on the mailing list and additional comments from 62 individuals. One person expressed concern about allowing increased visitation at Midway Atoll, and 42 commenters expressed an interest in actually visiting (or revisiting) the refuge. Individual issues identified by those contacting us included:

- fees (e.g., should charge enough to mitigate environmental impacts, costs are not a factor, local residents should be charged less, don't make it too expensive)
- natural resource protection (e.g., need to be conservationists rather than preservationists, need to fiercely protect natural resources while allowing visitation)
- historical recognition (e.g., should be open to all veterans, need to honor World War II history, need to market to veterans' organizations)
- authorized uses (e.g., diving, recreational fishing, photography, amateur radio use, university courses)
- cruise ship impacts
- numbers of visitors to be allowed
- length of visits to be offered
- type of facilities offered (e.g., should not be a resort)

With the inclusion of the refuge within the Papahānaumokuākea Marine National Monument, FWS also contacted our co-trustees regarding issues they may have with a visitor services program at Midway Atoll. The State of Hawaii expressed support for a renewed ecotourism operation at Midway to "ensure some opportunity to have people experience the 'place' and the phenomenal wildlife," as well as a concern that adequate funding and infrastructure be available to support visitors, management activities, research, and enforcement. In addition, the State requested that support be available for management activities at the Kure Atoll State Wildlife Sanctuary.

NOAA also expressed interest in the visitor program at Midway, especially as it relates to environmental education and ocean literacy and within the broader context of the monument. As Proclamation 8031 largely directs visitation to the Northwestern Hawaiian Islands to Midway Atoll, the refuge is being viewed as the "window to the monument" and as such needs to provide visitors an experience that encompasses much of what the ecosystem has to offer. This will include some Native Hawaiian cultural interpretation; although no physical evidence of Native Hawaiian use of Midway Atoll exists, the Northwestern Hawaiian Islands are mentioned in numerous oral histories and traditions.

NOAA-Fisheries, which is charged with protecting federally endangered Hawaiian monk seals and threatened and endangered sea turtles at Midway Atoll, shares FWS' concern that all wildlife species are adequately protected. FWS has entered into informal consultation with NOAA-Fisheries to ensure both agencies meet their goals.

Internally, FWS staff raised concerns about the island's infrastructure (capacity and condition), availability of transportation to Midway, and visitor program costs. In addition, staff want to ensure visitors have a safe, educational, and enjoyable experience while on the refuge.

1.8 Authority and Compatibility

Midway Atoll is managed as part of the National Wildlife Refuge System within a framework provided by legal and policy guidelines. The refuge is guided by the mission and goals of the Refuge System; the purposes of the refuge as described in its acquisition authority; the purpose of the monument as described in its establishing document, FWS policy; Federal laws, Executive orders, and Presidential proclamations; and international treaties, all of which are summarized in section 1.5 of the draft interim visitor services plan.

With few exceptions, lands and waters within the Refuge System are different from other multiple-use public lands in that they are closed to all public access and use unless specifically and legally opened. No refuge use may be allowed unless it is determined to be compatible. A compatible use is a use that, in the sound professional judgment of the refuge manager, will not materially interfere with or detract from the fulfillment of the refuge purposes or Refuge System mission. When determined to be compatible, six wildlife-dependent recreational uses (hunting, fishing, wildlife observation and photography, and environmental education and interpretation) are the priority general public uses of the Refuge System and as such receive priority consideration over other public uses in planning and management. Other (nonwildlife-dependent) uses on a refuge are first reviewed by the refuge manager in writing to determine if they are appropriate uses. If determined appropriate, then a compatibility determination is completed. The interim visitor services plan includes seven compatibility determinations for the visitor program at Midway Atoll.

1.9 Document organization

Section 1. Discusses the need for and purpose of the proposed action, issues, authorities, and document scope. Section 2 describes the alternatives. Section 3 describes the affected environment. Section 4 describes the potential environmental consequences of the alternatives. Section 5 lists the preparers and reviewers. Section 6 lists agencies, organizations and persons provided with copies of the environmental assessment. Section 7 provides a list of references cited and is followed by the appendices. Appendix A is a glossary.

1.10 Scope of the environmental assessment

This environmental assessment (EA) evaluates the potential environmental effects of implementing an interim visitor services plan at the Midway Atoll. It evaluates the program in its entirety and considers the short-term, long-term, and cumulative effects. It provides a systematic analysis of programmatic activities and will be used to determine whether such activities would have a significant effect on the quality of the physical, biological, and human environment and whether a formal environmental impact statement is required. It will aid FWS compliance with the National Environmental Policy Act.

Section 2. Alternatives Including the Proposed Action

2.1 Early planning and development of the alternatives

The proposed interim visitor services plan for Midway Atoll was developed by FWS to meet the requirements of FWS policy, ensure compatibility with the purposes of the refuge and the mission of the Refuge System, and describe the major components of the overall visitor program. An infrastructure contract provides for infrastructure and airfield support. The proposed visitor services plan is briefly summarized in section 2.4.2. See FWS (2006) for the complete interim visitor services plan.

As a result of experience gained during Midway Atoll's public use program from 1996 to 2002 and public interest in visiting a portion of the newly created Papahānaumokuākea Marine National Monument, FWS has determined a need to establish compatible wildlife-dependent recreational opportunities for visiting public and atoll residents. The program from 1996 to 2002 made it possible to monitor patterns of public use, including compliance with regulations. This experience provided the basis for the development of stipulations to ensure that permitted activities remain compatible with refuge purposes.

2.2 Alternatives considered but not included for analysis

Only actions, uses, and programs that are legal (i.e., consistent with Federal statute, Executive orders, Presidential proclamations, regulations, etc.) and are consistent with relevant policy were considered in the development of the Midway Atoll interim visitor services plan.

Because of the expected 5-year or less life span of this plan, FWS did not fully explore the myriad possible permutations of a visitor services program at this time. Rather we focused on a basic, compatible program that would not overtax the limited infrastructure available on Midway while allowing FWS to gradually re-introduce a formal visitor services program to the island. Also, due to the constraints of making this a financially self-sustaining program, a smaller re-entry into the market is appropriate, allowing a gradual building of infrastructure, staffing, programs, activities, and events while ensuring adequate monitoring of impacts on natural and historic resources as well as program quality. After an adequate period to evaluate this minimal visitor services program alternative and the completion of a overarching monument management plan that meets FWS planning requirements for a comprehensive conservation plan, the Midway visitor services program will be adjusted as necessary through provisions in the overarching plan or through development of a longer term visitor services plan.

For example, an alternative with an expanded visitor services program could include diving as a means to enjoy and photograph aquatic wildlife and sunken historic artifacts. However, a safe dive program would minimally require:

- acquisition and installation of an approved recompression chamber and a certified chamber operator;
- engagement of FWS-approved staff and/or guides to lead dive tours;

- acquisition of a suitable vessel and operator for transporting divers;
- acquisition of either or both rental dive equipment and facilities in which to cleanse gear used elsewhere to prevent the spread of alien marine species; and
- installation of mooring buoys at key dive sites.

These key components of a safe dive program require considerable and up front investment of capital not currently available. While a valid alternative for future consideration, it is simply not economically viable for FWS at this time, and for the sake of timeliness and efficiency was not given detailed analysis in this plan. Although our agency partners may be able to address some of these visitor services program needs while simultaneously addressing operational needs, all of these components must be in place in order to conduct safe diving at Midway.

In addition to various alternatives with differing levels of visitor services, different implementation models also are available. Appendix B contains the conclusions and recommendations from the Visitor Program Market Analysis and Feasibility Study completed by Pandion Systems, Inc., in 2005, which evaluated three different visitor services program models. These three alternatives included a visitor program run solely by the FWS, a program coordinated by FWS working with one concessionaire to run the program, and lastly, a program coordinated by FWS working with multiple specialty concessionaires. The Pandion report contains an in-depth analysis of each model, including an economic analysis. That report recommends FWS implement the third model, also clearly stating that type of program usually takes up to 12 months to develop and implement the numerous contractual arrangements needed. Due to previous commitments to bring visitors back to Midway in 2007, FWS elected not to implement Pandion's recommended model for this interim plan, but will fully evaluate that model during the monument management planning process.

2.3 Features common to each alternative

The proposed action and no action alternatives would continue to allow implementation of approximately the same level of natural resources management through current refuge management programs at Midway Atoll. There would be refuge employees on Midway Atoll under either alternative but under the proposed action, four refuge employees would be added over time to fully implement the visitor program. Visitors would come to Midway Atoll under either alternative, but under the proposed action, there could be as many as 300 overnight visitors per year, compared to fewer than 30 under the no action alternative. These visitors would typically remain on the island for a week-long stay. Under the no-action alternative current visitation by cruise ships would continue with 1 to 3 ship visits per year for an 8-12 hour period and a small number of visitors arriving via sailboat. Under both alternatives, occasional special events would be held with an undetermined number of visitors.

2.4 Description of the alternatives

This EA evaluates two alternatives. Under the no action alternative, refuge management would continue to be conducted under an approved refuge management plan. Occasional visitors

arriving by sailboat, aircraft, or cruise ship would continue. The proposed action would initiate a visitor services program accommodating visitors arriving at the refuge by regular airplane flights and occasional sailboats or cruise ships to participate in wildlife-dependent recreational opportunities.

2.4.1 Alternative 1, No Action. Operate the refuge in its current status with occasional visitors and no formal visitor services plan.

Alternative 1, the No Action alternative, evaluates the environmental effects of maintaining the *status quo*. Under alternative 1 FWS would not initiate a formal visitor services program. Refuge management would continue to be conducted under an approved refuge annual work plans. Occasional visitors by sailboat or cruise ship might continue to arrive if they met the requirements for a monument permit, but no visitors could be accommodated on existing refuge-chartered aircraft. Since few aircraft can fly round trip to Midway without refueling and Midway Atoll does not sell fuel, the number of visitors would be very limited.

Refuge visitors for 2005 and 2006 totaled 650 and 268, respectively. These came primarily by cruise ship, 580 in 2005 and 250 in 2006, and small boats. Since FWS no longer sells fuel to the general public, i.e., transient aircraft, no visitors are received through this means. It is expected that this general level of use would continue for the 5-year operational period of this plan.

Sailboat visitors and cruise ship visitors do not do the same activities during their stay at the refuge. Cruise ship visitors, as described in the visitor services plan, participate in a very tightly controlled tour of the developed part of Sand Island. They do not have the chance to walk the beaches, go snorkeling, walk trails, ride bikes, or many of the activities as do visitors who stay on the island overnight. They do remain together as a group (they walk their tour in groups of 25-50 with a guide) and are given interpretive talks on topics of historical and biological interest. They do have a chance to take pictures and observe albatross and other bird species which use the interior of Sand Island. During their boat ride to the island they may have the chance to observe monk seals on the beach of Spit Island (from a viewing distance of more than 500 feet) or green sea turtles (possibly close to their boat or the pier). Sailboat visitors, in contrast, have ample time to walk trails and the beach, interact with refuge staff, observe wildlife throughout the open areas of the island, and take photos. Like cruise ship visitors, they do not have the opportunity to go snorkeling on the reef, but they are welcome to snorkel at the Cargo Pier. The typical cruise ship visitor is on the refuge for about 4 hours while the average sailboat visitor remains about 5 days.

Under the No-Action alternative, there would be a low level of public education opportunities.

2.4.2 Alternative 2. Operate the refuge with a formal visitors services plan (the proposed alternative).

Under alternative 2, FWS would implement its interim visitor services plan to allow compatible public uses at Midway Atoll. Compatibility determinations for all permitted uses under the visitor services plan have been completed. The interim visitor services plan would be supervised

by FWS working with its monument co-trustees. The objective of the program at Midway is to provide high quality, compatible wildlife-dependent or history-related education and recreational experiences. The refuge visitor services manager would make recommendations for refinements to the program based on feedback from visitors and staff, and data on the impact of public use on wildlife resources gathered from field monitoring. FWS would occasionally allow the number of visitors to exceed the 40-person cap for overnight visitors to accommodate scheduled academic programs. As in the No Action Alternative, visitors would continue to visit the refuge via sailboats and cruise ships and those visitors would participate in short duration, carefully managed activities. Alternative 2 starts from that base and adds the visitors who would come to Midway via the chartered aircraft and generally remain overnight for a period of 1 week. During that time they would participate in numerous guided walks of historical or biological interest, take self-guided walks on trails and the open beach, have a chance to go snorkeling or kayaking, or just relax. A majority of them would also participate in volunteer programs to reduce invasive species or marine debris. The interim visitor services plan, in Chapter 4, more fully describes the activities planned for refuge visitors under this alternative.

A number of means to avoid adverse effects to refuge natural resources were designed into the interim visitor services plan. FWS would provide adequate resources to implement the visitor services plan and ensure that the program is environmentally sensitive and minimizes human disturbances to wildlife. This would be done by: (1) providing sufficient staffing; (2) defining permitted activities; (3) providing guidelines for uses; (4) designating open and closed areas; (5) providing a high level of public information (previsit packets, staff and visitor orientations, lectures, brochures, guided tours, and static displays); (6) restricting access to and within sensitive wildlife areas; (7) systematically monitoring visitor impacts on wildlife and implementing visitor program changes as determined necessary by the refuge manager; and (8) coordinating with other natural resource agencies in the development and implementation of the visitor program.

General description of the proposed refuge interim visitor services plan

Implementation of the interim visitor services plan would be overseen by FWS. The plan was developed by visitor services specialists in close coordination with refuge managers and biologists and in consultation with the monument co-trustees. The objective of the visitor services plan at Midway is to provide high quality, compatible wildlife-dependent or historic related education and recreational experiences. The visitor services plan would include the following activities:

(1) Wildlife observation and photography
(2) Environmental education and interpretation
(3) Participatory management/research program
(4) Airport operation (for nonadministrative purposes)
(5) Nonwildlife-dependent beach use
(6) Nonwildlife-dependent outdoor sports
(7) Amateur radio operation

Consistent with relevant law, FWS grants compatible wildlife-dependent public uses, including fishing, special consideration on national wildlife refuges. When determined compatible, wildlife-dependent public uses receive priority consideration over all other uses of a refuge. Midway Atoll is managed not just as a national wildlife refuge but as part of the Papahānaumokuākea Marine National Monument. In accordance with the Presidential proclamation establishing the monument, the Secretaries of Commerce and the Interior must prohibit "removing, moving, taking, harvesting, possessing, injuring, disturbing, or damaging; or attempting to remove, move, take, harvest, possess, injure, disturb, or damage any living or nonliving monument resource" without a permit. Although the proclamation allows the Secretaries to issue special ocean use or recreational permits, activities authorized by such permits must be "conducted in a manner that does not destroy, cause the loss of, or injure monument resources."

A catch-and-release sportfishing program operated at Midway Atoll from 1996 to 2001. Although it was believed to be a compatible activity at that time, NOAA-Fisheries personnel documented apparent declines in the frequency occurrence of large jacks (*Caranx ignobilis* and *C. melampygus*), likely "related to one or several ecotourism activities (recreational catch-and release fishing, sport diving)" at Midway (F. Parrish, NOAA, pers. comm..). FWS staff have also estimated about 30 percent mortality with the catch and release of moi (*Polydactylus sexifilis*), even when using one barbless hook. A more detailed analysis of sportfishing data is under development, and further research into human induced alterations in fish behavior and possible physiological impacts of a lengthy capture process on fishes could be conducted. However, existing information strongly suggests that sportfishing, including catch-and-release fishing, results in injury to monument resources, which is contrary to direction in Proclamation 8031 establishing the monument. Therefore, sportfishing will not be authorized at Midway Atoll.

In order to ensure protection of wildlife and a safe and enjoyable visitor experience, the total number of overnight visitors allowed on the refuge will be limited to 30 people at one time in 2007 and 40 people at one time in 2008 and beyond. This number may be exceeded for short duration (less than a day) prearranged visits by ocean vessels or aircraft. In these cases, visitor activities are closely supervised and primarily consist of guided tours or participation in commemorative events.

For the next 5 years (2007-2011), visitor programs will operate from November through July, which coincides with the albatross season on Midway. The months of August through October are reserved for planned construction activities. Very few rooms will be available during these months due to the number of contractors on island, and aircraft capacity will be needed both for contractors and supplies. To ensure the safety of visitors and enhance their experience on Midway, visitor programs will be concentrated in this 9-month timeframe.

The goals and objectives for the interim visitor services plan at Midway Atoll are summarized in the table below. More detailed information, including strategies, is discussed under the visitor services standards within the interim visitor services plan.

Provisions to address environmental concerns. The refuge staff will constantly monitor visitor impacts on wildlife and historic resources. Based on FWS experience from 1996-2002, when up to 100 overnight visitors were allowed on Midway at any one time, we anticipate few impacts as long as visitors comply with refuge rules and regulations. The refuge manager has the authority to close areas, halt activities, or restructure visitor programs if necessary to protect wildlife or historic resources.

2.5 Comparative evaluation of the alternatives

A comparison of the alternatives is summarized in Table 2-1.

Table 2-1. Comparison of the Alternatives

Refuge Management Concerns	**Alternative 1**. No action.	**Alternative 2**. Implement Visitor services plan
Protection and management of endangered and threatened species	Human disturbance limited to current occasional public use under ongoing restrictions	Increase in the amount of human activities. Regulations would avoid or minimize disturbance to species
Management of migratory birds	Human activities are controlled to prevent adverse effects on migratory birds or their habitats	New activities would be carefully directed to avoid adverse impacts to migratory birds or their habitats
Conservation of native biodiversity	Controls protect resources. Public participates in conservation work	Strict controls protect resources. Public participates in conservation
Biological monitoring and other research	Opportunities exist for long-term biological monitoring and diversified research at Midway	Limits on location and manner of visitor services will allow continuation of monitoring and research
Habitat management	Restoration efforts would continue at current levels of effectiveness	Habitat management would continue at slightly higher levels to mitigate impacts of visitors and due to their volunteer contributions
Nonnative species control	Control efforts would continue at present levels	Control efforts would continue at slightly higher levels due to visitor involvement

Refuge Management Concerns	**Alternative 1**. No action.	**Alternative 2**. Implement Visitor services plan
Public education and natural and historic resources interpretation	Continue present level of education and interpretation	Would increase opportunities for high quality compatible public use, education, and interpretation
Preservation of historic sites	Historic properties are protected under the Historic Preservation Plan	Historic properties would continue to be protected at slightly higher levels, with assistance from visitors
Wildlife-dependent public recreation	Current public use offers limited compatible recreational opportunities	Interim visitor services plan will provide additional compatible recreational opportunities

Section 3. Affected Environment

This section discusses the components of the environment relative to the alternatives. The present status of the wildlife species and their habitats will serve as the baseline against which to measure the effects of the no action and selected alternatives.

3.1 General

The affected area includes the public lands and waters of Midway Atoll. The atoll is located in the Northwestern Hawaiian Islands at 28 North latitude and 177 West longitude. Sand Island, the occupied current operational center, is 1.8 miles long by 1.2 miles wide, encompassing about 1,117 acres. Unoccupied Eastern Island is located 1 mile east of Sand Island and is approximately 336 acres. Spit Island (15 acres) is a small islet between the two larger islands and is generally off limits except for infrequent visits by refuge staff for management purposes.

3.2 Infrastructure

Much of the infrastructure found at Midway Atoll during the Navy era was removed or modified as part of the closure of Naval Air Facility Midway Island in 1996. A moderate amount of infrastructure remains on Sand Island and consists of an airfield, hangars, operational areas, fuel tank farm, boat harbor, paved roads and trails, a power plant, utility poles and lines, a bulk waste landfill, a sewage and drainage system, and a rainwater collection and distribution system. Buildings include offices, housing, a medical clinic, a dining hall, a cold storage facility, warehouses, shops, and recreational facilities. A number of the buildings retained by FWS are of historic significance. All historic properties are protected and managed under a Programmatic Agreement with the Advisory Council on Historic Preservation (ACHP, 1996) and consistent with the refuge's Historic Preservation Plan, completed in 1999. This plan is being revised and incorporated into the monument management plan.

The airport supports use by the U.S. Coast Guard, and the FAA works cooperatively with FWS to maintain a certified airfield (14 CFR Part 139.3337) to act as an emergency landing strip for commercial twin-engine jets transiting the Pacific Ocean. On Sand Island, most residents and visitors rely on bicycles for transportation, with only a limited number of other vehicles including golf carts, automobiles, trucks, vans, small buses, cranes, mowers, bulldozers, and machinery to support refuge operations. Water transport is provided by a number of outboard motorboats, skiffs, and a beach landing craft. Eastern Island has only one small building and a pier remaining, but does have a number of historic sites and artifacts.

3.3 Physical environment

3.3.1 General

Sand Island and Eastern Island are low-lying coral islands no higher than 46 feet above sea level. The islands were extensively modified and enlarged by the military, which dredged up coral rubble from the lagoon. A thin layer of organic material overlies some of the highly permeable sand and coral substrate. Most of the soil has been imported. The climate is semitropical and

generally influenced by moderate northeastern trade winds. The summers are warm, humid, and sunny with occasional showers; winters have lower temperatures, frequent rains, and high winds. Fresh water is limited to what can be stored by catchments, although a small brackish groundwater lens exists below the surface of both Sand and Eastern Islands. Air quality and noise levels are influenced by emissions and sounds from shops, power generators, boilers, solid waste burning, automobiles, small motors, airplanes, and power boats.

3.3.2 Public use areas

The interim visitor services plan designates areas that are both open and closed to the public. Closed areas ensure public safety and maximum protection for wildlife. Most roads are open to the public. Trails are listed as closed, open by guided tour only, or open. Trails generally follow existing paths, roads, or the edges of aircraft runways (Fig. 3.1). Facilities for snorkeling and sailboat anchorages are based in the inner harbor area. The single swimming and beach recreation area is located on the north side of Sand Island adjacent to the visitor housing area. Other beaches are closed to public use to protect wildlife. Visitors are free to walk on paved and gravel roads, walkways, and marked trails, but areas such as the fuel farm and pier, power plant/utility building complex, construction and rehabilitation sites, and aircraft runways and service areas are off limits to visitors. Also, the public is prohibited from entering burrowing seabird colony areas that are marked "Birds Only" and from beaches that are marked closed.

3.3.3 Historic Resources

A study of Midway's heritage resources was initiated in 1986 by the National Park Service when it conducted a survey of World War II-era properties eligible for designation as a National Historic Landmark. Nine structures, all defensive positions on the west side of Sand Island, were identified on Midway that convey a close association with the pivotal Battle of Midway, including ammunition magazines (ARMCO huts), a pillbox, and gun emplacements. Later that year, the nine defensive positions on Sand Island identified as eligible by the National Park Service and surrounding buffer areas were designated as a National Historic Landmark.

Between 1992 and 1994, the Navy sponsored studies of the Naval Air Facility on Midway, including archival research, interviews, and field surveys. The initial field effort consisted of an architectural history survey of the structures, buildings, and objects located on Sand and Eastern Islands. A military historian specializing in Cold War history performed archival research and surveyed resources constructed after 1945. The historian concluded that none of the Cold War facilities at Midway were eligible for the National Register of Historic Places because they lacked the exceptional importance necessary for resources less than 50 years old.

In addition to the nine National Historic Landmark structures, 69 buildings, structures, and objects associated with the 1903-1945 historic period on Sand and Eastern Islands were determined eligible according to criteria established for the National Register of Historic Places. The properties evaluated as significant are associated with three major themes: colonization, initial years of base construction and the Battle of Midway, and 1942-1945 base construction.

Archaeological surveys of Sand and Eastern Islands were conducted in 1992 and 1994. Surface inspections, 68 subsurface core samples, and 5 shovel-test units revealed no evidence of

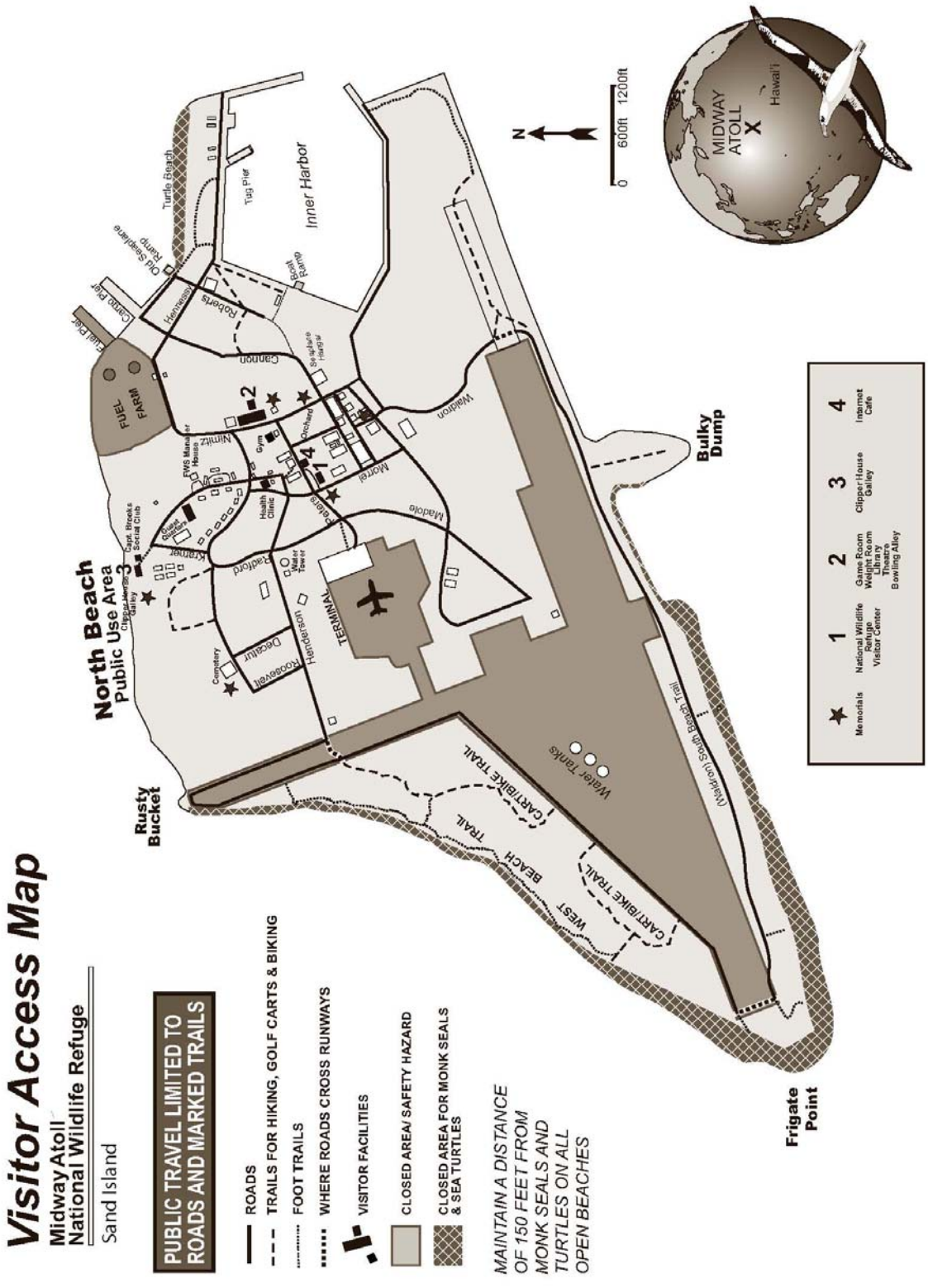

Figure 3.1 Midway Atoll Visitor Access Map

Polynesian/Hawaiian or pre-1900 historic period cultural remains. A literature review of Hawaiian legends found numerous references to distant low-lying islands with abundant birds and turtles but no clear tie to Midway. However, like many low islands and atolls in the Northwestern Hawaiian Islands, Midway may have been visited by Polynesians/Hawaiians in their extended travels. Even prior to extensive military-era construction, these islands were periodically scoured by storms and high winds that may have removed or buried evidence of use.

3.4 Social and economic environment

3.4.1 General

In the decade prior to June 1997, the population of Midway Atoll averaged approximately 250 to 300 persons including FWS employees, volunteers, Navy personnel, and contractors involved with the base closure and support operations. From July 1997 to April 2002, the island population numbered no more than 250 people, including 30 FWS employees and research cooperators, 120 contractor employees, and 100 visitors. In the first year of the public use program, the number of paying guests on the refuge rarely exceeded 25. In the second and third years of operation, the average number of visitors increased and, on a few occasions, temporarily exceeded the 100-visitor cap. The visitor services plan calls for an average human population at Midway of approximately 120 (10 FWS, 10 NOAA, 10 cooperating researchers, 50 contractor employees, and a maximum of 40 visitors). All residents of Midway are Federal employees, employees of FWS' contractor or their subcontractors, or sponsored transients. There is no established local economy and no tax revenue. Land use at Midway Atoll consists of operation of the Midway Atoll National Wildlife Refuge, with its associated visitor program and infrastructure operations.

Portions of Midway Atoll have been designated as critical habitat for the endangered Hawaiian monk seal, including all beach areas, sand spits and islets, including all beach crest vegetation to its deepest extent inland, lagoon waters, inner reef waters, and ocean waters out to a depth of 20 fathoms (except for Sand Island and its harbor) (50 CFR, Part 226, Vol. 53, No. 102, May 28, 1988).

The atoll is within the Papahānaumokuākea Marine National Monument, which extends out to 50 nmi, and the 200-nmi U.S. Exclusive Economic Zone within which fishery resources are managed and human use is regulated. A 1991 declaration by the Western Pacific Regional Fishery Management Council established a 50-mile radius Protected Species Zone closed to commercial longline fishing to protect monk seals, sea turtles, and seabirds (Western Pacific Regional Fisheries Management Council et al. undated). Under refuge regulations, all waters within the refuge boundary are closed to commercial fishing.

The Navy identified 78 sites (buildings, structures, and other archaeological or historical resources) that are now included or eligible for inclusion on the National Register of Historic Places (Yoklavich and Reinman 1993, Yoklavich et al. 1994). An agreement between the Navy, the national Advisory Council on Historic Preservation, and FWS provided for the demolition of

15 of these structures and the protection of the remaining significant historic resources (Advisory Council on Historic Preservation et al. 1996).

3.4.2 Public use

Public use at Midway Atoll has been administered by FWS under an approved 1996 Public Use Plan. From 1996 to 2002, FWS and its cooperator managed a low level of outdoor use by guests including diving, snorkeling, sport fishing (lagoon and ocean), swimming, hiking, and beach recreation. Under the 1996 Public Use Plan and Final EA, shorebased fishing, lobstering, spear fishing, net fishing, and recreational boating were not specifically permitted. However, because Navy rules allowed shorebased fishing, lobstering, and recreational boating, these uses were allowed to continue until June 30, 1997, when the Navy and its contractors departed Midway Atoll. These uses have been continued, under more stringent guidelines, since the Navy left. Lobstering was banned beginning in September 2004. All recreational fishing was terminated in June 2006 following designation of the Papahānaumokuākea Marine National Monument.

All beaches on Sand Island (other than South Beach) were left open to island residents and visitors until June 30, 1997. As per provisions in the 1996 Public Use Plan, on July 1, 1997, all beaches except those on the northern shore of Sand Island were closed to residents and visitors.

FWS currently provides on-island orientations, lectures, and information displays to visitors (occasional sailboat, cruise ship, or airplane) and conducts a volunteer program on the refuge. For outreach and education, FWS allows a limited number of people access to the refuge for guided wildlife photography, journalism, education, private research, and outdoor recreation.

3.5 Biological environment

3.5.1 Terrestrial Resources

Humans have greatly changed Midway Atoll from its original form. Only Spit Island has the general terrestrial habitat characteristics of an undisturbed atoll, though it was probably enhanced as an unintended result of channel dredging. Although the combined effects of dredging and filling, seawall construction, and importation of soil and many nonnative plant species has greatly expanded and altered the original acreage of Midway, it is still a wildlife habitat of worldwide importance.

The earliest botanical descriptions of Midway were made in 1902. Since then, 355 different plant species have been identified (Starr and Martz 1999; FWS unpub. data). Twelve species are native and 2 are questionably indigenous to the Hawaiian Islands. One plant species, *Cenchrus agriminoides* var. *laysanensis*, is listed as endangered, although it has not been observed at Midway in recent times (Starr and Martz 1999). Ecological restoration efforts are underway to eradicate the worst invasive plants (e.g., *Verbesina encelioides*), control others (e.g., *Casaurina* spp.), and revegetate with native species (e.g., *Eragrostis variabilis*).

Since the first insect (a moth) was described from Midway in 1894, more than 300 species of arthropods and land snails have been found on Midway, most introduced aliens.

Almost 2 million breeding seabirds of 18 species make Midway one of the most important breeding areas of seabird conservation in the Pacific. Midway hosts the world's largest populations of both Laysan albatross (398,529 nesting pairs in 2006) and black-footed albatross (24,887 nesting pairs). Midway's breeding populations of white terns (*Gygis alba*), black noddies (*Anous minutus*), and red-tailed tropicbirds (*Phaethon rubricauda*) constitute the largest colonies in the Hawaiian archipelago. After eradication of rats in the mid-1990s, the Bonin petrel (*Pterodroma hypoleuca*) colony at Midway is rebounding to more than 32,000 pairs. One or two endangered short-tailed albatross generally visit Midway each year, although none have nested yet.

In 2004, 20 endangered Laysan ducks were transported to Midway from their home at Laysan Island in the Hawaiian Islands National Wildlife Refuge. Biologists hope to establish a second "insurance" population of this endemic duck. The birds adapted well to Sand Island, and surprised biologists by breeding during their first year on Midway, with 12 ducklings successfully fledging. An additional 22 ducks were transported to Midway in 2005, most of which were introduced to Eastern Island. In 2006, 60 ducklings fledged bringing the total population to 101.

Midway also serves as an overwintering area for several arctic migrant shorebirds, including the rare bristle-thighed curlew (*Numenius tahitiensis*). The availability of predator-free islands on which this large shorebird can spend its nonbreeding season is essential, because they become flightless during their molt. Many other migratory birds also visit Midway, some regularly and some rarely.

Nonnative species exist as one of the greatest threats to Midway Atoll's native biodiversity, and preventing additional establishments is one of the primary management concerns. Some of these include: mice (*Mus musculus*), myna birds (*Acridotheres tristis*), canaries (*Serinus carius*), and several hundred species of plants and insects. Nonnative species can out compete and displace native plants and animals.

3.5.2 Marine Resources

Midway Atoll is the northernmost coral atoll in the National Wildlife Refuge System, presenting a unique opportunity to study the effect of colder waters on the growth, development, and ecology of coral reefs. The atoll drops off steeply outside the barrier reefs, making it possible to observe in a relatively small area the different organisms and communities associated with pelagic, reef crest, ocean reef slope, deep reef, and lagoon habitats.

The lagoon is filled with dense networks of linear reticulated and circular reefs that block circulation in much of the lagoon and trap sand washed over the northeastern reefs. These sediments limit coral development in much of the lagoon, except in the central lagoon where a modest amount of finger coral gardens exist. Seagrass meadows are common in the lagoon, as are rock-boring urchins, calcareous green algae, and brown turban algae.

Massive spurs and grooves high in coralline algal cover face the open ocean along the northwest to southwest perimeter reefs and offer evidence of the importance of coralline algae as a major

reef builder in the far end of the Northwestern Hawaiian Islands. Corals are more abundant elsewhere on some ocean facing reefs and especially on shallow back-reefs and lagoon pinnacles.

A total of 29 species of coral have been recorded at Midway, mostly *Pocillopora*, *Porites*, and *Montipora* species. Blue encrusting coral tentatively identified as *Montipora* cf. *turgecens* occurs in spectacular formations in the lagoon and back reef habitats and may be endemic to the Northwestern Hawaiian Islands.

The first systematic marine invertebrate survey was conducted at Midway in 1997. It documented 316 invertebrate species, 250 of which had not been previously recorded at Midway. Crustaceans were the dominant macroinvertebrates, composing 46 percent of the total species.

More than 100 species of algae are known from Midway, including 35 new records for Midway and 1 seaweed species new to science, *Dudresnaya babbittiana*. One alien algae, one alien fish (blueline snapper), and four alien marine invertebrate species are established at Midway as found in 2000-2003 surveys. In addition, incidental observations of three other introduced species, bluestriped snapper, blacktail snapper (toau, *L. fulvus*) and bluespotted grouper (roi, *Cephalopholis argus*), have occurred at Midway in the last decade (FWS unpub. data).

A total of 266 species of fish, including 7 pelagic species, have been recorded at Midway. Some of these species are either not found in the main Hawaiian Islands or are very rare. Despite its low species diversity, Midway's reef fish biomass is higher than in the main Hawaiian Islands, largely due to lower fishing pressures. Midway and its neighboring atolls have the highest rates of endemic reef fishes within the archipelago, in some cases reaching 52 percent (Friedlander and DeMartini 2004).

Many Midway species grow to larger than average size. All trophic levels are well represented, including jacks and four species of sharks. Several species of fish found elsewhere only in deep waters are found at shallow diving depths at Midway, including the only endemic Hawaiian grouper, the hapuupuu (*Epinephelus quernus*).

Threatened green sea turtles are frequently seen inside the lagoon and basking on beaches. No turtle nesting had been documented until successfully hatched eggs were discovered on Spit Islet in July 2006 (FWS unpub. data). High surf uncovered the eggs which probably hatched the year before. Endangered hawksbill sea turtles (*Eretmochelys imbricata*) are infrequently seen in the lagoon. About 65 endangered Hawaiian monk seals are usually present at Midway at any one time, and pupping levels have increased significantly since 1996, with a record number of 17 in 2004. However, survivorship of juveniles is low and the species is highly endangered.

Approximately 200-300 Hawaiian spinner dolphins (*Stenella longirostris*) rest within Midway's lagoon and forage outside its reef. Bottlenose (*Tursiops truncates*), striped (*Stenella coeruleoalba*), spotted (*Stenella attenuate*), and rough-toothed dolphins (*Steno bredanensis*) may

be occasionally seen in the open ocean as well as Cuvier's beaked (*Ziphius cavirostris*), pilot (*Globicephala macrorhynchus*), and endangered humpback whales (*Megaptera novaeangliae*).

Section 4. Environmental Consequences

This section evaluates the effects of the alternatives on the environment described in section 3 with the topics presented in the same order. Table 4-1 provides a summary of the effects of the alternatives on the physical, biological, social, and economic environment. Environmental effects of the current program are described in the second column, and the effects of proposed action relative to the No Action alternative are described in the third column.

Table 4-1. Summary of Environmental Consequences of the Alternatives

Resource or Issue	**Alternative 1**. No Action. Continue present public uses	**Alternative 2**. Implement interim visitor services plan
Soils	Erosion prevented through native plant restoration	No additional appreciable change
Water quality	Potential for effects from vessel traffic and use	No additional appreciable change
Air quality	Some emissions	No additional appreciable change
Population	No more than 80 persons	Generally, no more than 120 persons
Employment	Approximately 60 jobs	Approximately 70 jobs
Land use	High level refuge management	Slight additional increase in refuge management
Public use	Very limited program for those who find their own way to Midway	Wider variety of programs offered to public and increased number (approximately 300 overnight visitors
Historic resources	Limited opportunities for public viewing and interpretation	Increased level of preservation and interpretation
Native natural communities	Long term protection and enhancement	Slight additional improvement with visitors assisting staff
Endangered and threatened species and critical habitat	Long term protection and good potential for recovery	No additional appreciable change
Control of harmful nonnative species	Long term effective control	Slight additional improvement with visitors assisting staff
Public safety	Medical and emergency response available	Slight improvement due to refuge law enforcement officer
Relationship of short-term uses and long-term productivity	High level of management would protect native wildlife and biodiversity over the long term	Slight additional improvement with visitors assisting staff
Irreversible and irretrievable commitments of resources	No change	No additional appreciable change
Cumulative effects	No change	No appreciable negative effects.

4.1 Effects on the physical environment

Under the No Action alternative, soils and water quality are conserved through refuge management. Under the proposed alternative, soil erosion as a result of the use of a trail system would not increase greatly because of the nature of the sandy soils found at Midway Atoll. The design of the trail is simple and relatively noninvasive and native ground cover plants along each side of trails help prevent erosion. Restrictions on the locations of the activity, use of gear, and the methodology would mitigate impacts on terrestrial and marine environments. Neither alternative would involve any appreciable impacts on the water resources or air quality of Midway Atoll.

Current island residents generate approximately 2 cubic feet of burnable, nonrecyclable trash per person per day. Implementation of this plan will increase this waste load by an estimated 1 cubic foot per person per day. This extra up to 40 cubic feet of trash per day, depending on the visitor count, is within the limits of the refuge's incinerator capability, therefore no impact will occur.

Water use by current island residents is approximately 323 gallons per day per person for all uses, both potable and nonpotable. An increase in the island population by up to 40 people per day during periods of visitor use will increase water consumption requiring an increase in treated water generation and a corresponding increase in wastewater generation. It is estimated that refuge visitors will use 200 gallons per day for their personal use and for water used on their behalf, such as cooking. The refuge's existing infrastructure (multiple filters for domestic water use) and wastewater treatment are capable of handling this increased load without any modifications.

Island power generation uses diesel like fuel called JP5 to generate electricity. Current island residents consume about 141 kW per person per day. To generate this amount of electricity requires about 10.5 gallons of fuel per person per day. It is anticipated that each refuge visitor will use slightly less electricity per person as the basic island infrastructure has certain fixed functions that will not increase due to their presence. If each visitor used an estimated 100 kW per person per day, the increase in electrical demand would be up to 4,000 kW, depending on the visitor load. This demand is within the design criteria for the new power generators recently installed on Midway, therefore, no impact is expected beyond the fuel used to generate the power.

4.2 Effects on the social and economic environment

The human population of Midway would number approximately 80 people under no action alternative and would not ordinarily exceed 120 people under the proposed alternative. The no action alternative would involve about 60 jobs and proposed alternative, approximately 70 jobs. These population levels would include refuge and contractor positions, volunteers, researchers, and up to 40 visitors at any one time. Visitor numbers would occasionally exceed this cap for structured academic programs and/or for very short term, prearranged visits by aircraft or vessels. This increase in population size is within the number for which the Sand Island infrastructure was planned and, therefore, is not significant. Minimum costs to implement the

proposed alternative will be approximately $340,000. These funds only reflect the direct costs of known infrastructure, equipment, and personnel costs. Fees paid by visitors will cover the majority of personnel costs, but not expensive long term capital equipment such as boats. With no local community to directly benefit from this increase in economic activity, most associated benefits will accrue to Hawaii, primarily Honolulu. Although certain business may see an increase in sales to Midway (e.g., commercial food sales), the overall change to Honolulu's economic status will be minimal.

Substantially increased opportunities for leisure recreation and enjoyment of the natural and cultural resources at Midway would be offered under the proposed alternative. A trail system would bring people to additional locations where the value of wildlife and marine resources and the significance of historic sites could be interpreted for the public. Recreational activities involving the marine environment would bring the public close to the resources and also provide an opportunity for education on the intrinsic and practical values of these resources. As the "window to the monument," Midway also serves as the public's only opportunity to recreate within and learn firsthand about the Northwestern Hawaiian Islands..

4.3 Effects on the biological environment

The proposed alternative includes numerous uses that have been found to be appropriate and compatible and for which use of mandatory stipulations will ensure continued compatibility. These are discussed in detail in Appendix F, Compatibility Determinations.

4.3.1 Airport operation (for nonadministrative purposes)

The two million seabirds that use Midway during the peak breeding season make aircraft flights to the island potentially hazardous to both the birds and the aircraft. Albatrosses, both Laysan and black-footed, use the airport runway as a soaring area as they travel on feeding forays during the day. Bird use of the runway declines dramatically at night (363 versus 6 seabird runway crosses per minute, Dolbeer and Arrington 1996), reducing the risk of bird strikes on the aircraft (Kenyon et al. 1958). During the primary albatross season, November through July, flights are scheduled to arrive and depart after dark, thus minimizing impacts to albatross and other seabirds (Klavitter 2004). During the months of August, September, and October flights arrive during the day and may occasionally hit a white tern or brown noddy (*Anous stolidus*, FWS, unpub. data). It is not possible to reduce the bird strike risk at Henderson Airfield to zero at any time of day or year short of suspending all administrative and nonadministrative flight operations. However, the small number of annual flights to the island and the requirement of night flights for most of the year make the overall impact to refuge resources minimal.

Extensive use of lights at the airport hangar causes problems for seabirds, especially Bonin petrels. These birds are disoriented by the bright floodlights at the hangar and as a result frequently fly into the side of the building and roof. During peak petrel season, this activity can result in death or injury of up to six birds per night (FWS, unpub. data). Currently, this type of use and impact occurs during night arrivals in the months from November through May. The frequency of aircraft arrival at Henderson Airfield will go up upon implementation of this plan to

from the current 3 per month to as many as 8 per month at full operation, potentially causing the death or injury of up to 25 Bonin petrels per month (175 per year).

Proper operation of the fuel truck presents no hazards to refuge resources. In the event of a spill, fuel containment supplies and equipment are stored at the airport hangar for immediate response.

In light of the relatively low number of annual flights to Midway Atoll and the various measures taken to reduce impacts to wildlife (see discussion above and Stipulations to Ensure Compatibility in Appendix F.4) such as night flights, management of lights, advisory to pilots regarding flight paths, and runway clearing, the proposed alternative will have only limited and acceptable adverse impacts on refuge and monument resources, notably seabirds.

4.3.2 Nonwildlife-dependent beach use

Minimal to no negative impacts to refuge resources are expected from this activity. Visitors could displace resting monk seals from preferred beach areas if visitor guidelines regarding beach use are not followed. Since no seabird or Laysan duck nesting occurs in the areas used for this activity, no impacts to albatross, petrels, shearwaters, Laysan ducks or other birds are expected. If a monk seal has hauled out in an area frequently used by visitors, the area will be signed as temporarily closed until the seal changes locations, thereby preventing disturbance to the seal.

With proper oversight by refuge staff, an understanding of the rules by visitors, and incorporation of the Stipulations to Ensure Compatibility as outlined in Appendix F.5, the proposed alternative will have minimal or no impacts on refuge and monument resources.

4.3.3 Amateur radio operation

The antennae for transmitting the radio signal is the only aspect of this use that has potential for impacting refuge resources. The high density of nesting seabirds on Sand Island makes installation of additional tall antennae, even for a short period, a concern as they are a strike hazard for flying birds. Shorter antennae, locations away from primary flight lanes, attachment to large objects avoided by the birds (e.g., the water tower) and time of year are all means to reduce this impact.

As discussed more fully in the Stipulations to Ensure Compatibility in Appendix F.7, the proposed alternative will effectively allow this use to occur with limited to no negative impacts on refuge and monument resources.

4.3.4 Wildlife observation and photography

Possible impacts from visitors involved in wildlife observation and/or photography include (1) disturbance to nesting seabirds, (2) disturbance to Hawaiian monk seals and/or green sea turtles swimming or resting on beaches, (3) disturbance to spinner dolphins, and (4) disturbance to fish and marine invertebrates. Visitor programs will be designed and managed to minimize or eliminate these impacts. However, even with proper management and execution of a well run program, certain behavioral responses may occur that are not easily observable.

Stress reactions (elevated heart rate, elevated levels of corticosterone, and behavioral responses) have been documented in several species of nesting seabirds at several ecotourism locations as a result of human activities in nesting colonies (Jungius and Mirsch 1979, Fowler 1995, Nimon et al. 1995 and Kataysky et al. 2003). Studies, however, have not been conducted to document long-term cumulative effects of human disturbance. Albatrosses in the developed part of Sand Island are clearly acclimated to the presence of people, but may still have elevated stress hormone levels. When visitors are observing albatrosses, terns, boobies, Laysan ducks, or other species in the less visited areas, they will have the potential of greatly elevating stress hormone levels if the duration of the disturbance is excessive. Studies have shown (Kitaysky et al. 2003) that short term disturbance, however, has only minor, temporary effects. Observation periods for any particular bird or group of birds away from the town area of Sand Island will be kept to 15 minutes or less. Observance of the rare, short-tailed albatross, for example, will be managed under this guideline.

Increased use of refuge waters also increases the potential for interaction with or disturbance by boats, kayaks, or snorkelers/divers with monk seals, sea turtles, and spinner dolphins. Any action of pursuit or annoyance from boats potentially disturbs marine mammals in the wild by causing disruption of their behavioral patterns or displacement from preferred habitat areas, especially if the dolphins or seals are in a rest phase. Snorkel/dive operations also include the added risk of damage to living coral on the refuge. Improper boat operation or visitor behavior could result in localized impacts to the coral reef from repeated anchoring, touching, standing, or other avoidable physical disturbance to the coral.

As described more fully in Appendix F.1, a series of stipulations will be in place to ensure that negative impacts on wildlife resources are minimized or eliminated. These include visitor education and orientation, law enforcement patrols, closure of all beaches except North Beach, approach distances to wildlife, boat operation procedures, invasive species inspections, improved signing, and close supervision of groups by FWS-approved staff and/or guides. These actions will ensure that the proposed alternative has minimal or no impacts on refuge and monument resources.

4.3.5 Participatory management/research program

Seabird population monitoring. Minimal impact is anticipated from activity of participatory research volunteers within nesting seabird colonies. Potential impacts include destroying nesting burrows of Bonin petrels or wedge-tailed shearwaters (*Puffinus pacificus*), temporary disturbance to nesting birds, or disturbing a resting monk seal or green sea turtle from a nearby haulout location. Stress reactions (elevated heart rate, elevated levels of corticosterone, and behavioral responses) have been documented in several species of nesting seabirds at several ecotourism locations as a result of human activities in nesting colonies (Jungius and Mirsch 1979, Fowler 1995, and Nimon et al. 1995). Studies, however, have not been conducted to document the long-term cumulative effects of this human disturbance. Another study on Xantus's murrelets (*Synthliboramphus hypoleucus*) documented an increased stress response when birds were handled for a longer period during research activities (Newman et al. 1997). Short-term participatory research volunteers will initially be working at a slower pace than a trained FWS biologist or volunteer, potentially increasing the amount of disturbance to nesting seabirds involved in the study or in the area.

Habitat restoration. Minimal to no impact to nesting seabirds found within the targeted habitat restoration area is anticipated. Impacts include temporary disturbance to surface-nesting adults or chicks or injury or death of Bonin petrel or wedge-tailed shearwater adult/egg/chick after collapsing a burrow. See above (1) for seabird/human disturbance concerns.

Historic site preservation. Minimal to no impact on nesting seabirds from actions to stabilize historical structures or to remove invasive trees and shrubs.

The proposed alternative, incorporating the three participatory programs described above, will have minimal to no impact on refuge and monument resources. For a more detailed review of the stipulations necessary to ensure compatibility of this use see Appendix F.3.

4.3.6 Nonwildlife-dependent outdoor sports

Occasional disturbance to nesting albatross or albatross chicks may occur around the outdoor volleyball court, but the court has a nest-free margin of 30 feet giving the birds an adequate buffer from court activity and stray balls. The court area is free of petrel or shearwater burrows, so no impacts will occur to those ground nesting birds. The court area is at the extreme edge of the typical beach use area by monk seals (300 feet from the water's edge) so direct or even indirect impacts to seals from volleyball in this location are unlikely. Bicycling and jogging will also result in little or no impact on wildlife because bikers and joggers will remain on paved roads or marked trails. Joggers will be directed to stay on the paved/gravel roads due to the high risk of stepping into or collapsing a petrel burrow.

The proposed alternative includes Stipulations to Ensure Compatibility which are detailed in Appendix F.6. Use of these stipulations, which include wildlife approach distances, closed

areas, hours of use, and restrictions to paved roads for certain sports, ensures that the proposed alternative will have minimal or no negative impacts on refuge or monument resources.

4.3.7 Environmental education and interpretation

Environmental Education

Impacts from visitors attending scheduled workshops, participating in walking or biking interpretive tours, or self-guided tours on Sand Island will be minimal. All of these activities will occur on hard-surfaced roads with very limited wildlife disturbance.

Minimal to no impact on refuge purposes is anticipated from off-site programs, since educational demonstrations will be conducted or supervised by trained FWS-approved staff and/or guides.

Interpretation

Minimal impact to refuge purposes is anticipated as described in the above "guided walks and bicycle tours" section. Additional potential impact to nesting seabirds, monk seals, and threatened green sea turtles may occur if visitors and residents wander off self-guided interpretive walks. Impacts include destroying nesting burrows of Bonin petrels or wedge-tailed shearwaters; injuring or killing an egg, chick, or adult by stepping on a bird or nest; decreasing nesting success of breeding birds; or disturbing or deterring a resting monk seal or green sea turtle from a preferred haulout or pupping location. Studies conducted in seabird colonies with ecotourism operations have documented that birds located away from frequently visited areas react strongly to any human activity. Birds were observed to habituate to high levels of constant visitation, but not to less constant (although regular) visitation (Fowler 1995). Therefore, birds located far from trails are most likely to be disturbed from wandering visitors or residents. Monk seal research has documented that pregnant females would abandon preferred pupping locations due to human disturbance (Kenyon 1972).

Cruise ships that visit Midway Atoll are required to remain outside the harbor entrance channel and to ferry their passengers to shore via ship's tenders. Possible damage to coral could occur if the ship anchored in shallow water or drifted into coral areas. Anchoring will be addressed through the monument permitting process, but FWS will also explore opportunities for cruise ships to maintain their position offshore without anchoring. Additional damage could occur from the prohibited discharge of gray or black water from the ship during the anchorage period at Midway. However, all such discharges are prohibited under Presidential Proclamation 8031 and its implementing regulations at 50 CFR Part 404.

Regularly scheduled "field talks" at selected locations by FWS-approved staff and/or guides

There will be minimal to no anticipated impacts on refuges purposes associated with regularly scheduled "field talks." Talks will be located near seabird colonies, but leaders and participants will not enter into the main area of the colony for these talks. Keeping the group at the edge of

the colony will limit stress to the few birds actually closest to the group. Studies have shown that birds adapt to repeated disturbance, so selection of an area where the birds are regularly passed by residents and visitors on town roads will minimize the impact of this activity.

Potential impacts include brief disturbance to nesting seabirds when entering colonies. Only trained FWS-approved staff and/or guides conducting the talk will be entering nesting colonies.

Evening programs at various indoor locations.

No anticipated impacts are anticipated due to indoor locations.

Eastern Island tours.

Minimal impacts include disturbance to nesting birds (primarily Laysan and black-footed albatrosses and sooty and gray-backed terns (*Sterna fuscata* and *S. lunata*, respectively)) along tour routes. Tours will be restricted to the historic runways, limiting the disturbance to shrub and burrow nesters such as the red-footed booby (*Sula sula*), great frigatebird (*Fregata minor*), and Christmas shearwater (*Puffinus nativitatis*). During the sooty tern nesting season, tours will be adjusted as needed to minimize disturbance to nesting sooty terns on runways. Impacts will also be associated with the increased number of boat landings on the island. Boat landings (boat and people noise) may occasionally disturb resting endangered Hawaiian monk seals and threatened green sea turtles on Eastern Island beaches as well as those that are prospecting safe haulout locations (Kenyon 1972).

Please refer to the informal Section 7 consultations prepared for FWS and NOAA-Fisheries for findings on threatened and endangered species for this current EA (Appendix H). Visitor services were designed to avoid or prevent adverse effects to threatened and endangered species.

The development of an expanded designated trail system should have beneficial impacts on the environment as it will minimize indiscriminate wandering by the public that might cause trampling of native vegetation and disturbance to nesting wildlife. The trail will be a simple dirt/sand track and aligned to prevent disturbance of closed monk seal beaches, ground nesting seabird colonies, and native plants. There may be minor and temporary disturbance to the soil, vegetation, and wildlife during the placement and marking of the trail, installation of signs or markers, and creation of shielded viewing sites. Native vegetation will be used to restrict access to the beach from the viewing site. Experience gained during the 1996 - 2002 public use program suggests the need to more regularly monitor use of the trail to ensure compliance with the "stay on the trail" policy and to enforce regulations designed to minimize disturbance of wildlife.

As described above, the proposed alternative includes many activities with potentially harmful effects to fish and wildlife resources on the refuge and monument if done improperly. Careful integration and use of the Stipulations to Ensure Compatibility outlined in Appendix F.2 will substantially reduce the probable impacts from this use. Close supervision of groups, closed area restrictions, viewing and approach distances from wildlife, small group size, group orientation

and education, improved signing, cruise ship specific regulations, and invasive species inspections are all means to ensure that the proposed alternative has minimal or no negative impacts to marine or terrestrial resources of the refuge and monument.

Airport operation (for nonadministrative purposes), nonwildlife-dependent beach use, amateur radio operation, wildlife observation and photography, participatory management/research program, nonwildlife-dependent outdoor sports, and environmental education and interpretation represent an intrusion by people into the natural environment, but the activities will have clearly prescribed use areas, regulatory controls, and viewing protocols to protect the resources. Potential adverse effects will be minimized by regulating the activities; monitoring to assess interactions with nesting seabirds, monk seals, sea turtles, dolphins, and other natural resources; and changing rules where warranted.

4.4 Other effects

4.4.1 Cumulative effects

Because of program guidelines and constraints, neither alternative would have adverse cumulative effects. Cumulative effects would be beneficial as they assure long-term protection of natural and historic resources while permitting increased public visibility that results in greater support and funding for FWS programs at Midway as well as other sites in the Papahānaumokuākea Marine National Monument. Biological monitoring, interagency cooperation, and the means to adjust the program to ensure that there are no adverse cumulative effects are assured.

4.4.2 Public safety

Under both alternatives, public safety has been designed into the public use program. On-island medical services are in place for residents and visitors at Midway Atoll. Safety risks associated with visitor use will be further reduced through requirements established in other operational plans required under the visitor services plan. One law enforcement officer will be added in the future making Midway Atoll a safer environment.

Section 5. List of Preparers and Reviewers

5.1 Preparers

Environmental Assessment

Name	Position	Degree(s)	Years of Experience
Barry Christenson	Project Leader, Midway Atoll National Wildlife Refuge	MS, Wildlife Management BS, Wildlife Management	31
John Klavitter	Wildlife Biologist, Midway Atoll National Wildlife Refuge	MS, Wildlife Science BS, Animal Ecology	15
Barbara Maxfield	External Affairs Chief, Pacific Islands External Affairs and Visitor Services	BS, Business Administration/Marketing	27
Barry Stieglitz	Project Leader, Hawaiian and Pacific Islands National Wildlife Refuge Complex	MPA, Public Administration BS, Forestry and Wildlife Management	19

Persons acknowledged for special project assistance, coordination, and information

Phyllis Ha, U.S. Fish and Wildlife Service, Honolulu, HI.

5.2 Reviewers

This environmental assessment incorporates the special expertise of refuge managers, visitor services specialists, recovery biologists, natural resources managers, marine biologists, marine mammal specialists, fisheries experts, ornithologists, researchers, and educators. Through their reviews and discussions, the following persons contributed substantially to the environmental assessment:

U.S. Fish and Wildlife Service:
- Ben Harrison, Pacific Region Division of Conservation Planning and Visitor Services
- Kevin Kilbride, Pacific Region Division of Natural and Cultural Resources
- Steve Moore, Pacific Region Division of Natural and Cultural Resources
- Fred Paveglio, Pacific Region Division of Natural and Cultural Resources

NOAA:
- Sean Corson, Papahānaumokuākea Marine National Monument
- Arlene Pangelinan, Pacific Islands Regional Office, NOAA-Fisheries

Section 6. List of Agencies, Organizations, and Persons Consulted

The draft environmental assessment was distributed to the following agencies and organizations: In addition, 6,274 individuals submitted comments regarding the draft interim visitor services plan, including this draft environmental assessment.

6.1 Federal agencies

Marine Mammal Commission
NOAA-National Marine Fisheries Service, Protected Species Division
NOAA- Papahānaumokuākea Marine National Monument
Western Pacific Regional Fishery Management Council

6.2 Hawaii State and County Agencies

Department of Land and Natural Resources, State of Hawaii
Waikiki Aquarium

6.3 Private Conservation Organizations

Friends of Midway Atoll National Wildlife Refuge
Oceanic Society
Marine Conservation Biology Institute
Hawaii Wildlife Fund
American Bird Conservancy
The Ocean Conservancy
Environmental Defense
Conservation Council for Hawaii
Defenders of Wildlife
Earth Island Institute
Greenpeace
'Ilioulaokalani Coalition
KAHEA: The Hawaiian-Environmental Alliance
National Wildlife Federation
Ocean Mammal Institute
Sierra Club
Hawaii Audubon Society
Northwestern Hawaiian Islands Hui

6.4 Others

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Appendix A. Glossary

Biological diversity or **biodiversity**. The full range of variety and variability within and among living organisms and the ecological complexes in which they occur. Biological diversity encompasses ecosystem processes, species diversity, and genetic variation. (ORS 273.563) Biological diversity of native species is discussed in this environmental assessment.

Ecology. The study of the interrelationships which exist between organisms and their environment.

Ecosystem. An assemblage of animals and plants and its interaction with the environment.

Ecotourism. Tourism specifically targeted at gaining an increased understanding and appreciation for an area's natural resources.

Endangered species. A species officially recognized by Federal or State agencies to be in immediate danger of extinction throughout all or a significant portion of its range.

Environment. The sum of all external conditions and influences affecting the development and life of organisms.

Habitat. The physical environment in which a plant or animal lives.

Native species. A species that occurs naturally in a particular locality. Includes endemic and indigenous species.

Natural community. An assemblage of plants and animals occurring together at a site. Because of unique environmental requirements and direct and indirect interactions among species, natural communities can be quite distinctive. Classification of native natural communities are generally based on moisture regime, canopy closure and height, and dominant species and constituent species. See Wagner et al. (1990) for a formal summary of the Hawaiian Natural Community Classification. "Native" natural communities are based on a composition of at least 60 percent native plants. Nonnative natural communities are based on a composition of only 40 percent native plants.

Population. A group of organisms occupying a specific geographic area.

Species. A taxonomic category ranking immediately below a genus and including closely related, morphologically similar individuals which actually or potentially interbreed.

spp. An abbreviation for more than one species.

Subspecies. [ssp.] A geographically defined grouping of local populations which differs taxonomically from similar subdivisions of species.

Threat. Any one of a number of situations or actions that causes harm.

Threatened species. A species officially recognized by Federal or State agencies to be in immediate danger of extinction throughout all or a significant portion of its range.

var. An abbreviation for a variety.

Variety. A taxonomic group or category inferior in rank to a subspecies.

Wildlife. Plant and animal components of the environment.

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