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LAND
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JUN 23

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 22, 2009

Ms. Katherine Kealoha
Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

RE: Final Environmental Assessment and Finding of No Significant Impact (FONSI) for the Ka'ena Point Ecosystem Restoration Project, TMKs 8-1-001-006; 8-1-001-022; 6-9-001-030; 6-9-002-004; 6-9-002-009; 6-9-002-013, Island of O'ahu

Dear Ms. Kealoha,

The Department of Land and Natural Resources, Division of Forestry and Wildlife has reviewed the comments received during the 30-day public comment period (which began on December 23, 2007) for the above project and has prepared the Final Environmental Assessment (Final EA). For the reasons set forth more fully in the Final EA (pages 51-54), the agency has determined that this project will not have significant environmental effects and hereby issues a FONSI. Please publish this notice in the next available OEQC Environmental Notice.

We have enclosed a completed OEQC Publication Form, two copies of the Final EA, and a CD containing one copy of the document in pdf format and an electronic copy of the publication form (which includes the project summary). Please contact Emma Yuen, at Emma.Yuen@hawaii.gov or (808) 587-4170 if you have any questions.

Sincerely,

Laura H. Thielen
Chairperson, Department of Land and Natural Resources

FINAL ENVIRONMENTAL ASSESSMENT

KA‘ENA POINT ECOSYSTEM RESTORATION PROJECT

Wai‘anae and Waialua Districts
Island of O‘ahu

In accordance with
Chapter 343, Hawai‘i Revised Statutes

Proposed by:

Division of Forestry and Wildlife
Division of State Parks
Department of Land and Natural Resources
1151 Punchbowl Street, Ste. 325
Honolulu, Hawai‘i 96813
(808) 587-0166

May 2009

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I. SUMMARY

Project Name	Ka‘ena Point Ecosystem Restoration Project
Project Location	Ahupua‘a of Keawa‘ula and Ka‘ena Wai‘anae and Waialua Districts Island of O‘ahu TMKs 8-1-001-006; 8-1-001-022; 6-9-001-030; 6-9-002-004; 6-9-002-009; 6-9-002-013
Land Use Designations	Conservation District, Resource and Limited Subzones Special Management Area
Applicant	State of Hawai‘i Department of Land and Natural Resources Division of Forestry and Wildlife Division of State Parks
Landowner	State of Hawai‘i
Approving Agency	State of Hawai‘i Department of Land and Natural Resources
Anticipated Determination	Finding of No Significant Impact
Agencies & Organizations Consulted	
Federal:	Federal Aviation Administration US Air Force, Ka‘ena Point Satellite Tracking Station US Army Garrison, Hawai‘i US Coast Guard, District 14, Office of Aids to Navigation USDA Animal and Plant Health Inspection Service, Wildlife Services USDA Natural Resources Conservation Service US Fish and Wildlife Service, Pacific Islands Office US Fish and Wildlife Service, O‘ahu National Wildlife Refuge Complex US Geological Survey, Biological Resources Discipline, Pacific Island Ecosystems Research Center NOAA Fisheries, Pacific Islands Regional Office, Protected Resources Division

US Army Museum of Hawai‘i

State:

Department of Agriculture
Department of Business, Economic Development, and Tourism, Office of Planning
Department of Defense
Department of Education
Department of Hawaiian Home Lands
Department of Health, Environmental Planning Office
Department of Land and Natural Resources
- Division of Aquatic Resources
- Division of Conservation and Resources Enforcement
- Division of Forestry and Wildlife
- Division of Historic Preservation
- Division of State Parks
- Land Division
- Office of Conservation and Coastal Lands
- Public Information Office

Department of Transportation, Airports Division
Land Use Commission
Natural Area Reserves Commission
O‘ahu Island Burial Council
Office of Environmental Quality Control
Office of Hawaiian Affairs
Office of Hawaiian Affairs: Native Hawaiian Historic Preservation Council
University of Hawai‘i, Environmental Center
University of Hawai‘i, Botany Department
Senator Colleen Hanabusa
Senator Robert Bunda
Representative Michael Magaoay
Representative Maile Shimabukuro

County of Honolulu:

Board of Water Supply
Department of Planning and Permitting
Office of the Mayor
Councilmember Todd Apo
Councilmember Donovan Dela Cruz

Other Organizations:

‘Ahahui Mālama I Ka Lōkahi
Ahupua‘a Action Alliance
American Bird Conservancy
Bishop Museum, Hawai‘i Biological Survey
Conservation Council for Hawai‘i

Earthjustice
Hawaiian Civic Club of Waialua
Hawaiian Civic Club of Wai‘anae
Hawaiian Railway Society
Hawai‘i Audubon Society
Hawai‘i Bicycling League
Hawai‘i Conservation Alliance
Hawai‘i’s Thousand Friends
Hawai‘i Trail and Mountain Club
Hawai‘i Fishing News
Historic Hawai‘i Foundation
Ho‘omau Ke Ola
Hui Mālama I Na Kupuna O Hawai‘i Nei
Hui Mālama o Mākua
‘Ike ‘Āina
‘Īlio‘ulaokalani Coalition
KAHEA – The Hawaiian-Environmental Alliance
Kai Makana
Kamehameha Schools
Kokua Hawai‘i Foundation
Life of the Land
Mālama Hawai‘i
Nani ‘O Wai‘anae
Native Hawaiian Legal Corporation
North Shore Environmental Coalition
North Shore Kupuna
North Shore Neighborhood Board
O‘ahu Game Fish Club
O‘ahu Invasive Species Committee
Pacific Islands Fisheries Group
Polynesian Voyaging Society
Sierra Club, Hawai‘i Chapter, O‘ahu Group
The Nature Conservancy of Hawai‘i
The Outdoor Circle
The Wildlife Society, Hawai‘i Chapter
Waialua Boat Club
Waialua Community Association
Wai‘anae Boat Fishing Club
Wai‘anae Coast Coalition
Wai‘anae Coast Neighborhood Board
YMCA of Honolulu, Camp Erdman Branch
John D. Bennett
Thomas T. Shirai, Jr.
Mary Ikagawa
Lara Reynolds
Cynthia Rezentes

Summary of Action

The Ka‘ena Point Ecosystem Restoration Project is the result of a partnership between the Department of Land and Natural Resources, Divisions of Forestry and Wildlife and State Parks, the U.S. Fish and Wildlife Service, and the Hawai‘i Chapter of The Wildlife Society. Ka‘ena Point Natural Area Reserve (NAR) hosts one of the largest seabird colonies in the main Hawaiian islands, contains several populations of endangered plants, and receives frequent visits by basking monk seals. Under current management, nesting seabirds and native plants are under constant threat from predatory animals; more than 100 ground-nesting seabirds were killed by dogs in 2006 despite on-going predator control activities. The proposed project involves the construction of predator-proof fencing (2 meters tall) to prevent feral predators such as dogs, cats, mongoose, and rats from entering into 59 acres of coastal habitat within Ka‘ena Point Natural Area Reserve. The exclusion and removal of these predatory animals is anticipated to result in an increase in the existing population of nesting seabirds, encourage new seabird species to nest at Ka‘ena Point, enhance regeneration of native plants, and benefit monk seals by reducing the risk of disease transmission. The Ka‘ena Point Ecosystem Restoration Project is expected to have primarily positive effects on the resources protected in the NAR. No significant adverse effects are anticipated with regard to the environment, archaeological features, cultural practices, viewplanes, or public access or use of this area during or after construction of the proposed fencing.

II. PROJECT PURPOSE AND NEED

In 1970, Hawai‘i became one of the first states in the country to recognize the importance of its unique natural resources by establishing the Natural Area Reserves System (NARS). The NARS were created to “...preserve in perpetuity specific land and water areas which support communities, as relatively unmodified as possible, of the natural flora and fauna, as well as geological sites, of Hawai‘i.” (Hawai‘i Revised Statutes § 195-1). The system presently consists of nineteen reserves on five islands, encompassing more than 109,000 acres.

Ka‘ena Point NAR was established in 1983, by Executive Order 3162, to protect a portion of the most extensive remnant dune system on O‘ahu from damage and degradation caused by off-road vehicle use, erosion, and the spread of invasive species. At the time the NAR was created, these factors had largely destroyed most of the native vegetation within the NAR, making it unsuitable for use by nesting seabirds. After the establishment of the NAR, vehicular access to most of the reserve was blocked, and recovery of native vegetation has been significant, with increasing numbers of endangered plants such as ‘ohai (*Sesbania tomentosa*) and recovery of the rare coastal naupaka (*Scaevola sericea*) community.

As the coastal habitat has improved, and predator control has been initiated, increasing numbers of ‘ua‘u kani, or wedge-tailed shearwaters (*Puffinus pacificus*), and Laysan albatrosses, or mōlī (*Phoebastria immutabilis*), began to breed in the NAR. Wedge-tailed shearwater chicks hatching at Ka‘ena have increased in number from zero in 1995 to over 1,500 in 2007. Laysan albatross alone have increased from zero pairs in 1989 to approximately 60 nesting pairs in 2007. The reserve also acts as refuge for the endangered Hawaiian monk seal or ‘īlioholoikauaua (*Monachus schauinslandi*), and honu or green sea turtles (*Chelonia mydas*), koholā or humpback whales (*Megaptera novaeangliae*), and nai‘a or spinner dolphins (*Stenella longirostris*) are often viewed just offshore.

Current management to protect the valuable natural and cultural resources within Ka‘ena Point include maintaining the existing boulder barricade, removal of invasive habitat-modifying weeds, and predator control. In cooperation with the U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services, the State Division of Forestry and Wildlife conducts regular small predator control, primarily using baited traps and shooting, that has decreased the size of feral predator populations within Ka‘ena Point NAR. However, with unlimited opportunities for entry, predator control requires constant effort and expense and does not provide a consistent level of protection for the native plants and animals within the NAR. Despite ongoing predator control, the rates of predation (up to 15% per year) are too high to allow the long-term recovery of the existing seabird populations and are likely preventing other seabird species from colonizing the area.

The devastating impacts of non-native mammals such as dogs, cats, mongoose, rats, and mice on island ecosystems are well-documented. Predation by invasive species is second only to habitat loss as the leading cause of avian extinctions and declines on islands, with rats and domestic cats implicated in most (72%) avian extinctions caused by invasive predators. Despite existing predator control efforts at Ka‘ena, attacks by cats and dogs continue to occur. For example, in 2006, 113 fledgling wedge-tailed shearwater chicks were killed in a single incident at Ka‘ena by a pack of dogs. Other high-mortality attacks at Ka‘ena include a 2005 incident in which a dog killed approximately twenty shearwaters, and a 1996 incident where forty nesting shearwaters were killed in one night.

While not as well-publicized, invasive rodents (rats and mice) constitute a greater threat to native species, contributing to extinctions and ecosystem-level changes. Worldwide, rats are considered a significant threat to seabirds, particularly those that nest in burrows or rock crevices. In Hawai‘i, rats have been documented to prey on ground-nesting seabirds, forest birds (including the endangered O‘ahu ‘elepaio), and the Laysan finch. In addition, as omnivorous feeders, rats are also known to eat the seeds, fruits, leaves, and shoots of Hawaiian plants, such as chewing the apical and lateral buds of naupaka (*Scaevola sericea*), stripping the bark of koa (*Acacia koa*) saplings, and eating

loulu (*Pritchardia* sp.) seeds. These actions either kill the plant outright, make it more susceptible to disease, or prevent natural reproduction. The precise impact of rats and mice on the seabirds and vegetation at Ka‘ena is unknown, but is thought to be a continuing threat despite existing predator control efforts.

Finally, the predators found at Ka‘ena act as carriers of leptospirosis, morbilli virus (distemper), and toxoplasmosis. The recently published Recovery Plan for the Hawaiian Monk Seal identifies the transfer of these diseases as one of the threats to monk seal survival. Despite existing predator control efforts, the possibility of exposure continues as long as predators can enter the reserve.

The proposed predator-proof fence is a relatively recent technology developed in New Zealand. The fencing excludes non-native predatory animals as small as a two-day old mouse, and prevents these animals from digging under or climbing over the fence. The use of the predator-proof fencing is anticipated to increase the effectiveness of existing predator control efforts, shifting the focus from reducing predator numbers to eradication. The fencing will make it feasible to remove all non-native predatory animals from within the fenced unit and to focus control efforts on two entry points along the shoreline rather than across the entire peninsula.

Biologists familiar with these fences in New Zealand stated that “far more has been achieved at a far greater pace than expected” (Day, 2007). Benefits included a noticeable improvement in ecosystem function, a documented increase in the number and density of native invertebrates, and an increase in the diversity of plant vegetation. In one installation, the results projected to occur within 10 years of construction were observed in 18 months.

As the first full-scale predator-proof fence in Hawai‘i, the proposed fencing project provides an opportunity to prove the effectiveness of this new technology in Hawaiian coastal environments. Based on the experiences in other locations, the benefits of removing predators from Ka‘ena Point are anticipated to be extremely positive. The fencing will prevent the sporadic, high-mortality events caused by a feral dog in one night, but based on results from other island eradications, the removal of rodents may turn out to provide even greater conservation benefits than excluding dogs and cats.

Anticipated benefits are increases in the breeding Laysan albatross and wedge-tailed shearwater populations; the establishment of new seabird breeding populations, such as the ka‘upu or black-footed albatross (*Phoebastria nigripes*) and the ‘ou or Bulwer’s petrel (*Bulweria bulwerii*); a greater understanding of the impact of rodents on coastal ecosystems; improved health and function of the coastal strand plant community; improved natural regeneration or the re-introduction of the 11 endangered plant populations historically found at Ka‘ena; reduced risk of disease transfer to basking monk seals; and a demonstration area for residents and visitors to observe what the Hawaiian

islands might have been like in their natural state before the introduction of invasive mammals and to develop a greater appreciation of the value of the natural and cultural resources of Ka‘ena Point. Over the long-term, protecting the nesting area at Ka‘ena is of particular importance to vulnerable seabirds, as most of their nesting areas are located on atolls and islands at greater threat by rising sea levels than Ka‘ena.

The project area is situated on State land, within the Conservation District. As such, the project requires that an Environmental Assessment be prepared in accordance with Chapter 343 of the Hawai‘i Revised Statutes.

III. PROJECT DESCRIPTION

The Department of Land and Natural Resources proposes the construction of a predator-proof fence, to enclose approximately 59 acres of the peninsula of Ka‘ena Point. Figure 1 illustrates the area and the preferred fence alignment.

Figure 1. Aerial view of Ka‘ena Point with preferred fence alignment superimposed.

The predator proof fence uses technology that has been used with great success in New Zealand in both coastal and forested areas. Trial predator-proof fences

were constructed on the slopes of Mauna Loa, on Hawai‘i, demonstrating their effectiveness in excluding rats, cats, and mongoose and allowing the development of methods to exclude mice on ‘a‘ā substrate. Ka‘ena Point will be the first project-level fence of its type constructed in Hawai‘i. The project presents an exciting opportunity to utilize a fencing technology that may prove useful in other areas of Hawai‘i.

The proposed action can be divided into three phases: (1) fence corridor preparation and fence platform construction; (2) fence installation; and (3) predator eradication from within the fenced area.

The fencing corridor will be approximately four meters (13 feet) wide and 625 meters (2000 feet) long. The fencing alignment largely follows a World War II-era roadbed that skirts along the bottom of the hill behind Ka‘ena Point, above the sand dunes. By following this track at the base of the slope, the alignment places the fence along the least visually intrusive area of the point, so that the greatest area might be enclosed while minimizing interference with viewplanes. On the Wai‘anae side, the fencing will contour down from the roadbed on the loose rock slope, cross the old railway easement (avoiding the railway retaining wall), and extend out towards the ocean along a rocky outcropping.

On the Mokulē‘ia side, two alignments were initially under consideration: the first runs along the roadbed to the existing boulder barricade, then crosses the old railway easement and extends to the ocean along a rocky outcropping; the second turns off the roadbed towards the ocean approximately 150 meters (500 feet) short of the boulder barricade, crosses the old railway easement and extends to the ocean along a rocky outcropping. The primary difference between the two alignments is that the first option encloses the culturally significant site, Leina a ka ‘Uhane (Soul’s Leap), within the fencing, while the second option does not.

Figure 2. Aerial view of Ka‘ena Point illustrating alignment options initially under consideration.

After publication of the Draft EA, consideration of public comment, and further consultation with cultural practitioners and lineal descendants from the Wai‘anae and Mokulē‘ia communities, a decision was made to extend the fence to the boulder barricade following the first option presented, and add a third access door immediately mauka of the Leina a ka ‘Uhane. This alignment will have less visual impact than the alternative due to the proximity to the existing boulder barricade, will protect more habitat for endangered birds and plants, and will reduce the potential for bird strikes as seabird populations increase over time. Minor changes to the alignment are possible based on terrain considerations and permit requirements. Most of the length of the fencing alignment is within the boundaries of the NAR, but a small portion at the southern end (Wai‘anae side) will cross State Parks land as the fencing leaves the loose rock slope, crosses the railway easement, and extends to the ocean.

The existing roadbed that forms the main portion of the fence corridor is fairly level, and as a result, limited grading and little to no vegetation clearing will be required to make it suitable as a fence platform. Where the fencing leaves the existing roadbed, the corridor will be cleared of vegetation and some earthworks will be created to form the fencing platform. Ground preparation will involve the use of a bulldozer and excavator to move soil or rocks to form a level stable platform and to gently contour the ground so that rain water moves away from the fencing. No material would be imported from off-site; only soil and rock

from within the planned fence corridor will be utilized. Overall, less than one acre of land area will be disturbed.

The fence design has three main elements: base fence, predator-proof mesh and skirt, and predator-proof rolled hood. The base fence provides the structural strength and framework on which predator-proof components may be added, and will be made of anodized aluminum posts and stays, with stainless steel wires and fastenings.

Fence materials and equipment will either be flown in by helicopter or driven and carried to the fence corridor. A container will be temporarily placed on-site, either in a disturbed area near the boulder barricade on the Mokulē‘ia side or along the existing roadbed near the middle of the proposed fencing, to provide secure storage for materials, tools, and equipment and to act as an on-site base of operations. Portions of the boulder barricade may be temporarily moved to facilitate the transportation of equipment, materials, and supplies.

Anodized aluminum posts will be set into the ground three meters (9.8 feet) apart. One meter (3.3 feet) of the post will be buried, while two meters (6.5 feet) remains above ground. Marine grade stainless steel mesh with an aperture of 6 x 25 millimeters (0.2 x 1.0 inches) is attached to the entire face of the base fence, and is also used to form a skirt of horizontal mesh at ground level, to prevent predators from tunneling under the fencing. The mesh extends from the top of the posts to just below ground level, while the skirt will extend 300 millimeters (1 foot) from the fence, and will be pinned to the ground where possible.

Due to the largely rocky substrate found at Ka‘ena Point, the standard technique of pinning the mesh skirt into soft ground will likely prove ineffective. As such, a proven alternative strategy will likely be utilized:

- All overlapping skirt sections will be laced together using stainless steel tie wire.
- The leading edge of the mesh skirt will be positioned snugly against existing substrate.
- A dry mix of three parts fine rock particles to one part cement will then be applied over the skirt edge, holding the edge in place. If necessary, water may be applied to aid setting of the mix.

A rolled hood sits at the top of the fencing and extends 330 millimeters (1.1 feet) on the outside of the fencing. The hood is made of smooth sheet steel and prevents predators from climbing over the fence due to its slipperiness and width. The hood is supported by a series of brackets that give the hood structural strength without aiding predator movement.

Access doors are to be incorporated at locations where the fencing crosses existing trails and immediately mauka of Leina a ka ‘Uhane. To minimize the

opportunity for predator incursion if doors are propped open, a double-door system is planned where both doors cannot be open at the same time. Instead, a person accessing the reserve must wait for the first door to close before the second door may be opened. An emergency over-ride button will be incorporated into the design, on the interior of the fencing, so that individuals will not be trapped inside the reserve if someone props the outside door open. The area between the doors will be constructed with the same quality and design as the rest of the fence and will be large enough that up to nine people may enter together or so that a person can enter with a bicycle or fishing pole.

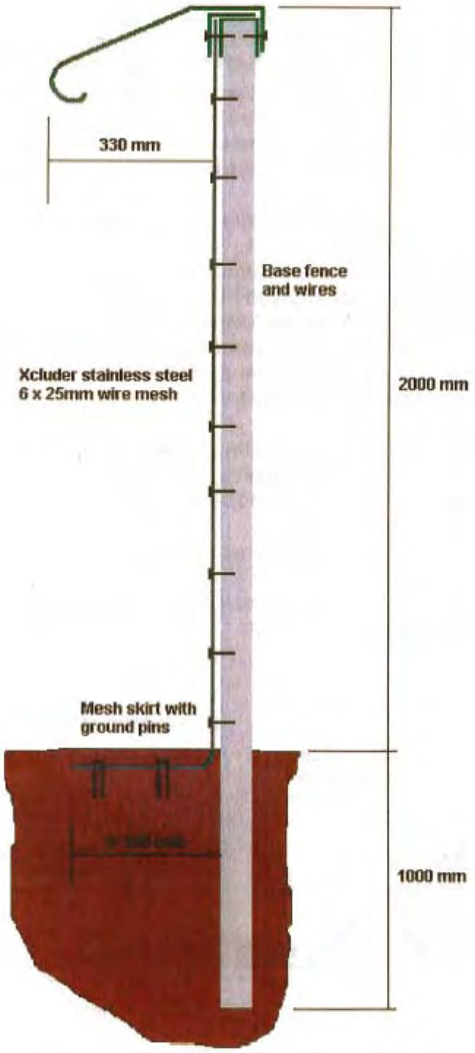

Figure 3. Schematic of proposed fencing.

Figure 4. Sample fencing and double door access system.

Figure 5. Front and side views of predator-proof fence on rocky terrain in New Zealand.

Figure 6. Predator-proof fence in coastal environment in New Zealand.

The fencing is planned to stop at approximately the high tide line, to avoid additional maintenance costs or damage due to rough seas or storm events. As a result, there may be a gap between the fencing and the ocean of up to fifteen

feet, depending on tide and sea-state, which will require ongoing monitoring and control to capture any predators that enter. The alignment on each end, utilizing rocky outcroppings, is specifically selected to present the optical illusion that the fence goes into the ocean without a gap, to discourage any potential predators from trying to cross into the reserve along the tideline.

Due to the potential for vandalism in this remote area, extra fence materials will be ordered and kept on-hand for repairs. The mesh size is too small to fit wire cutters through and too strong to be damaged by needle-nosed pliers, reducing the frequency and potential for damage to the mesh. Doors will be constructed of solid stainless steel with few moving parts to minimize potential for vandalism. If vandalism proves to be a large problem, the possibility exists to incorporate a monitoring system, using radios, cameras, and solar cells, to monitor activity near the fencing.

Upon completion of the fencing, dogs, cats, mongoose, rats and mice will be removed from the fenced area to achieve the objective of a predator-free area. Pre-construction monitoring of both the native biological resources (seabirds, plants, and invertebrates) and of non-native biological resources (dogs, cats, mongoose, rats, and mice) has already been implemented. The information provided by monitoring native resources will be crucial for demonstrating and measuring the benefits and effectiveness of the predator-proof fence. Monitoring non-native resources will provide information on approximate size and location of non-native species' populations and help determine the appropriate eradication method.

The techniques required to accomplish the goal of removing all dogs, cats, mongoose, rats, and mice from inside the fencing will vary according to the target species. In general, the techniques used will be those that have proven successful at eradicating vertebrates from other islands. It is assumed that large mammals (remnant hooved animals and dogs) will leave the area before fences are complete and that most cats and mongoose will escape the area by climbing out the fence (the hood acts as a one-way barrier to prevent entry, but allow exit by non-native species). Surveys will be conducted to confirm the absence of these animals and any remaining animals will be shot, or trapped and humanely euthanized using existing protocols.

Due to their small size and small home ranges, rodents are likely to remain within the fenced area after construction. The toxicants under consideration for use in this project are diphacinone and brodifacoum. Both the anticoagulant rodenticide diphacinone (0.005% active ingredient) and the anticoagulant brodifacoum (0.0025% active ingredient) have been approved for conservation use by the U.S. Environmental Protection Agency (EPA). Both toxicants come in small pellet form suitable for broadcast.

We are currently analyzing pre-eradication pest species monitoring data to determine which would be the most appropriate and most effective toxicant for the project. Distribution of the bait will likely be done by hand-broadcast at up to four separate intervals as determined by the final approved toxicant use permit. The operation will be conducted during the winter months (December through February) when the rat population is low, few if any new rats are born, native non-target migratory bird species are not present or present in low numbers, and outside monk seal pupping season. Bait will only be applied during optimal weather conditions (low rain and winds <35mph). In shoreline areas, bait will be placed by hand directly in burrows or other areas deemed to be high quality rat habitat to minimize risk of bait being swept or blown in the ocean and/or coming into contact with monk seals, sea turtles or migratory shorebirds.

The selection of toxicant and the appropriate method of delivery will be explored further as the timing for the rodent eradication nears, and appropriate approvals from regulatory agencies such as the Environmental Protection Agency and appropriate state agencies will be secured as needed to eradicate the rodents remaining within the fenced area. All use of toxicants will be in conformance with Federal and State regulations, and delivery methods will be selected to minimize impacts to non-target native species in the area, such as monk seals, fish, and seabirds.

Intensive eradication efforts and monitoring will continue until predator-free status has been achieved on the peninsula. At that point, predator control at key locations along the coastal entrances and near the access doors will continue to prevent or minimize re-introduction of predators into the fenced area. Regular monitoring of the entire fenceline will be a part of normal management for the area, to detect breaches for repair and regular monitoring of the interior and to detect ingress of any predator. In addition to monitoring for impacts to native species during construction and during predator eradication activities, this project will incorporate long-term monitoring so that the benefits of a predator-proof fence can be documented.

Weed control, outplanting of rare plants, and related habitat restoration efforts at Ka‘ena Point are ongoing and will continue after fence construction. Ka‘ena Point currently acts as an outdoor classroom where many students on O‘ahu come to learn about native species, and this activity is expected to continue. Additional signage at entry points, explaining why the fence was built and the importance of the natural resources protected by it, will be installed so that interaction with the fencing provides an opportunity for education.

Fence construction is planned to occur once all permissions and approvals have been received. Related conservation actions, such as predator control, weed control, outplanting, and outreach/education, are ongoing. The preferred window for fence construction is October-early November or July-August, to

avoid the Laysan albatross nesting season (November through June) and avoid the initial nesting period (April through June) and the primary fledging periods (September through October) for wedge-tailed shearwaters. However, after additional observation of nesting seabirds and due to the distance between the fence alignment and core nesting habitat, construction may take place at any time during the year and would not interfere with seabird flight corridors. Construction is anticipated to take approximately four to five weeks, weather-dependent. Fence crews will work during weekdays to avoid the majority of foot traffic that occurs on weekends. Construction may involve temporary closures to the NAR, or portions of the NAR, for safety.

The fence is anticipated to cost approximately $250,000-$300,000 to construct. The total costs associated with predator control after the completion of fencing will depend on the success of initial control methods and the total amount of time it takes to remove predators from within the fenced unit. After predators have been removed, ongoing control activities along the edges of the fencing are anticipated to be about $10,000 per year.

Funding for this project is primarily through a grant awarded by the U.S. Fish and Wildlife Service to The Wildlife Society, Hawai‘i Chapter. The State is providing in-kind donations of staff time during the planning and permitting process. In addition, ongoing conservation management at Ka‘ena Point is made possible by State funds, primarily through the Natural Area Reserve Special Fund. The University of Hawai‘i is anticipated to provide in-kind donations by coordinating and implementing the monitoring of natural resources before and after construction. The predator-proof fencing is a cooperative effort of the State Department of Land and Natural Resources’ Division of State Parks and Division of Forestry and Wildlife, the U.S. Fish and Wildlife Service, and The Wildlife Society, Hawai‘i Chapter.

IV. SUMMARY DESCRIPTION OF AFFECTED ENVIRONMENT

Location and Physical Characteristics of the General Area

Ka‘ena Point is a wilderness area known for its unspoiled natural beauty, located on State land at the western corner of O‘ahu, in the ahupua‘a of Ka‘ena and Keawa‘ula. Ka‘ena Point Natural Area Reserve, established in 1983, forms the westernmost tip of this peninsula, and is entirely surrounded by Ka‘ena Point State Park lands.

The area contains shoreward basalt benches with numerous tidepools and a diverse intertidal flora and fauna, rare coastal sand dune communities, and rare coastal dry shrub and grasslands. Offshore from Ka‘ena is habitat for reef and pelagic fish, sea turtles, seabirds, and cetaceans.

The rugged, wind-swept peninsula consists of a low platform that extends 2100 feet beyond the base of high, wave-cut cliffs that converge like the prow of a

ship behind Ka‘ena Point. The shore at the point is of black lava, mixed with white fragments disgorged from ancient coral reefs, and rises immediately to the heavily salt-spray influenced coastal strand and a band of sand dunes, before rising gently into rockier, less salty coastal zone shrublands at the base of the slope.

Above the low coastal platform, basalt-talus slopes tower above, rising to an elevation of 969 feet at Pu‘u Pueo directly above the point, with steep cliffs to the north and south. Though Kuaokalā Ridge, the westernmost extension of the Wai‘anae Mountain Range, descends relatively gently to the point compared with the steeper cliffs, it requires less than half a mile to gain nearly 1000 feet. To the south of Ka‘ena, steep cliffs extend unbroken, past the beaches of Keawa‘ula (Yokohama) Bay, and into Mākua Valley. To the north of the point, the cliffs of Mokulē‘ia extend to the east, broken by ‘Ālau and Manini gulches, before continuing towards Dillingham Airfield.

The elevation in the project area ranges from sea level to approximately 100 feet. The project area is relatively dry; rainfall averages less than forty inches per year, with most occurring during winter. The landscape here is generally harsh, being heavily influenced by wind-blown salt spray and unsheltered from the sun, with consistent northeasterly tradewinds and an annual temperature range from 62-89°F.

Geology

The Island of O‘ahu was formed by the coalescence of two volcanoes, Ko‘olau to the east and the older Wai‘anae to the west, which may have built upon a still older volcanic mass. The Wai‘anae Volcano is thought to be approximately four million years old, while Ko‘olau is around 2.75 million years in age. The younger lava flows of Ko‘olau are banked against the slope of Wai‘anae, forming the broad Schofield Plateau. An erosional unconformity between rocks of the two volcanoes may be found along Kaukonahua Gulch, at the eastern foot of the Wai‘anae Range, where Wai‘anae lavas with a slope of 10-15° to the northeast are overlain by Ko‘olau flows dipping 5° northwest. Both volcanoes are now referred to as mountain ranges, as extensive erosion has formed the once-great shield volcanoes into what are essentially long, narrow ridges. What remains of Ko‘olau is the western half of the original volcano, as the entire eastern half slid cataclysmically into the ocean. This slide, known as the Nu‘uanu Slide, included much of the Kailua-area summit caldera. Massive fragments are strewn over the ocean floor as far as 100 miles to the northeast of O‘ahu. Wai‘anae Volcano was also subject to a massive slide, the southwest-trending Wai‘anae Slump. The Wai‘anae caldera was in the region west of Kolekole Pass, extending for about nine miles from the northern side of Mākaha Valley to the head of Nānākuli Valley.

The volcanoes of O‘ahu, as well as the majority of volcanoes in the main Hawaiian Islands – excluding Haleakalā on Maui and the Hawai‘i Island

volcanoes other than Kohala – are considered to be dormant volcanoes in the rejuvenation, or renewed volcanism, stage. Though unlikely, renewed volcanic eruptions have been known to occur as late as five million years after emergence. Renewed volcanism eruptions usually consist of temporally and spatially limited episodes of isolated volcanic activity that occur on the heavily eroded slopes of old volcanoes, and generally show little relation to the orientation of earlier volcanic rift zones. Numerous examples of renewed volcanism episodes may be found on O‘ahu in association with Ko‘olau Volcano. These renewed eruptions began about 0.8 million years ago, with the most recent possibly occurring as recently as 6000 years ago. Resulting features may include cratered cones resulting from ash and cinder eruptions, such as Diamond Head (Lē‘ahi), Punchbowl (Pūowaina), and Koko Crater (Kohelepelepe), or may be eruptions with lava flows and ash production, such as those that formed Mount Tantalus (Pu‘u ‘Ōhi‘a) and Round Top (Pu‘u ‘Ualaka‘a).

Fossilized coral reefs also comprise an important component of the geology of the Hawaiian Islands, and the emerged reefs found on O‘ahu are more extensive than on any of the other islands. The Honolulu and ‘Ewa Plains, as well as much of the rest of the southern edge of O‘ahu, are underlain by a broad, elevated coral reef. These emerged reefs are generally formed during interglacial sea level highstands. Most of the fossil reefs of southern O‘ahu are about twenty-five feet above current sea level, but evidence exists to indicate that, during the past two million years, eustatic sea level changes in Hawai‘i may have been as great as 250 feet above present levels and as low as 300 feet below current sea levels. At Ka‘ena Point, fossiliferous conglomerate is found eighty-nine feet above sea level, with loose coral cobbles as high as 100 feet up on Pu‘u Pueo, indicating a highstand of about ninety-five feet above present sea level. This highstand, known as the Ka‘ena Highstand and estimated to have begun between 423-362 thousand years ago, was one of the most significant interglacial highstand events of the past million years, and may have lasted approximately 60,000 years.

Ka‘ena Point itself is rich in fossil reef deposits, and has been referred to as a “geological museum” whose layers of fossilized reef are a “natural archive of global change” (Chip Fletcher; Honolulu Advertiser 1998). The oldest reef found here is the one associated with the Ka‘ena Highstand, some 100 feet above sea level. A lower stratum along the shoreline includes giant molluscs and coral heads and is about 130,000 years old. Fossilized reefs descend down the underwater extension of Kuaokalā Ridge to a vertical wall 100 feet deep, known as the Mākua Shelf.

The slopes of Pu‘u Pueo, as well as the underlying substrate in the Ka‘ena area, is composed of shield-building lava flows of the Kamaile‘unu Member of the Pliocene-era Wai‘anae Volcanics. There are also numerous sedimentary deposits of more recent vintage in the area, including the Holocene dune

deposits of Ka‘ena Point, which are interspersed with smaller patches of calcareous reef rock and marine sediment – O‘ahu is the only island where these emerged reef deposits are exposed subaerially. The point itself is largely composed of dunes overlying fossil reefs and lava flows, as discussed above, but other sedimentary deposits on shores nearby include Holocene beach deposits and alluvium, which are composed chiefly of unconsolidated sediment, and are found along the coast and in drainages, respectively.

Soils in the project area are primarily characterized as beach (BS) and as rock lands (rRK). Beaches are described as sandy, gravelly, or cobbly areas washed by ocean waves, while rock lands are characterized as areas where exposed rock covers 25-90% of the surface, with rock outcrops of basalt and andesite and shallow soils being the main characteristics. Beaches are considered highly suitable for recreational uses and resort development, while rock lands are suitable for pasture, wildlife habitat and water supply.

Groundwater beneath the project area is generally described as being basal (freshwater in contact with seawater), unconfined (not confined under pressure beneath relatively impermeable socks or soil), and within a sedimentary type aquifer. The aquifer is classified as a portion of the North aquifer sector, Mokulē‘ia system. The groundwater here is considered replaceable, not of importance either ecologically or as drinking water, and saline and, as such, is of limited importance.

Land Use

Both the State Park and the Natural Area Reserve are located in the Conservation District. The project area falls partially in the Resource Subzone (where the fencing joins the coastline) and partially in the Limited Subzone (along the old roadway). The area is zoned by the County as P-1 Restricted. The project area is located entirely within the County Special Management Area. A portion of the fencing project along the coastline is located within the tsunami evacuation zone.

Historically, the Ka‘ena coast may have supported small villages in the 1800s and early 1900s. The O‘ahu Railway and Land Company began operating a railway around the Point in 1898 to service sugarcane operations. The Coast Guard constructed a passing light for navigation purposes in 1920. Because of its strategic location, Ka‘ena Point was actively used by the military for coastal defense after World War I through World War II. Military use declined after World War II and the railway ceased operation in 1947. In 1971, the State Department of Transportation developed plans for a two-lane paved road around Ka‘ena Point. Due to significant opposition from the public, the concept was withdrawn. However, every so often, the idea of a road connecting the North Shore and Wai‘anae coast through Ka‘ena is raised again at the Legislature, most recently in 2000 (SCR 160). Continued public opposition, combined with

the estimated high cost of the project, has prevented the road from becoming a high transportation priority.

During the 1970s, the State began to purchase lands in the area for a proposed Ka‘ena Point State Park. In 1978, a Ka‘ena Point State Park Conceptual Plan was completed. Ka‘ena Point NAR was established in 1983, composed of twelve acres on the leeward side of the point. In 1986, an additional twenty-two acres on the windward side were added to the NAR.

The project area is one of the last relatively wild areas on O‘ahu and has been valued as a natural escape from the pressures of urban life. Ka‘ena Point NAR is accessible to the public by foot or bicycle, and its primary uses include recreation, hiking, nature study, education, and the observation of wildlife. Shore fishing, spear fishing, and gathering of marine resources have traditionally been important uses of the Ka‘ena coast. A site ½ mile off of Ka‘ena Point is used by surfers, and during rare combinations of winter conditions, rideable 50-60 foot surf has been seen.

Flora

The area of Ka‘ena Point is generally affected by sun, salt spray, and seawater, and is limited by the sandy, rocky substrate. This sort of challenging, coastal strand environment is usually dominated by low shrubs and perennial herbs, vegetation that is adapted for such conditions. Farther uphill in the coastal zone, where the influence of salt and wind is less acute, arid shrublands are generally found. Appendix B includes a partial inventory of the flora and fauna found at Ka‘ena Point. Two native natural communities are found in Ka‘ena Point Natural Area Reserve, the rare Naupaka (*Scaevola sericea*) Mixed Coastal Dry Shrubland and an ‘Ilima (*Sida fallax*) Coastal Dry Mixed Shrub and Grassland. Though naupaka itself is not rare, this community type was classified by the Hawai‘i Heritage Program to be critically imperiled globally, meaning that there are 1-5 occurrences worldwide. The ‘ilima community is considered to have a restricted range, of 21-100 occurrences.

Naupaka Mixed Coastal Dry Shrubland dominates the point. This community occurs on dunes and fossil reefs from the high-water mark throughout the coastal strand, and is generally dominated by a dense but non-continuous canopy of naupaka kahakai (*Scaevola sericea*). In the Reserve, the naupaka canopy is generally 2-4 feet in height, and opens to a varied cover of low grasses and shrubs that includes ‘aki‘aki (*Sporobolus virginicus*), pōhinahina (*Vitex rotundifolia*), hinahina kū kahakai (*Heliotropium anomalum* var. *argenteum*), and pā‘ū o Hi‘iaka (*Jacquemontia ovalifolia* subsp. *sandwicensis*). With the absence of off-road vehicles, this community is recovering well.

The ‘Ilima Coastal Dry Mixed Shrub and Grassland community covers the gentle alluvial slopes above the sand dunes in the Reserve as a thin strip, rarely exceeding eighty feet in elevation. This community is capable of withstanding

extreme drought conditions. The dominant ‘ilima is a shrub that can be prostrate or upright to more than three feet. In addition to ‘ilima, there may be a variety of codominant native shrubs and grasses. The prostrate vine pā‘ū o Hi‘iaka is the most frequent codominant with the ‘ilima in the Reserve. Taller native shrubs, such as naupaka and naio (*Myoporum sandwicense*), are scattered throughout the community. Other shrubs include alena (*Boerhavia repens*) and ‘ōhelo kai (*Lycium sandwicense*). Pili grass (*Heteropogon contortus*) and the upright shrub ma‘o (*Abutilon incanum*) are locally common in the upper reaches of the community and nehe (*Wollastonia integrifolia*) nearer the point. Also found near the point is an endangered variety of ‘akoko endemic to Ka‘ena (*Chamaesyce celastroides* var. *kaenana*). Invasion by non-native plants presents a serious problem for this community.

Other notable native plants found within the Reserve include the endangered species ‘ohai (*Sesbania tomentosa*) and one of the only known occurrences of the endangered *Schiedea kealiae*. In total, eleven endangered plant species have been recorded at Ka‘ena Point, and the area is designated as critical habitat for seven of those species. Also known from the area is Hawaiian cotton, called ma‘o or huluhulu (*Gossypium tomentosum*). A full list of notable species of flora and fauna thought to occur in or near the project area is including in Appendix A.

Other native plant communities are found nearby outside the Reserve. The rare Alahe‘e (*Psydrax odorata*) Mixed Lowland Dry Shrubland exists in relatively dry regions of basaltic slopes, and is found from 50-800 feet in elevation on the windward slopes from ‘Ālau Gulch to Manini Gulch. Alahe‘e growth is densest on the upper talus slopes and the lower cliff edges, with canopy height from 3-10 feet, depending on wind exposure. Common native shrubs of the understory include ‘ilie‘e (*Plumbago zeylanica*) and ‘ilima, and native vines such as koali (*Ipomoea indica*, *I. cairica*) and huehue (*Cocculus trilobus*) are common. During the wet winter season, the annual native vine ‘ānunu (*Sicyos pachycarpus*) is profuse. Other native vegetation associated with this community are the grasses pili, kāwelu (*Eragrostis variabilis*), and kākonakona (*Panicum torridum*), the herb ‘ala‘ala wai nui (*Peperomia leptostachya*), and kumuniu (*Dryopteris decipiens*), a fern. In the Ka‘ena area, the alahe‘e shrublands are severely degraded, with weed cover exceeding 50% in most areas.

Kāwelu Coastal Dry Grassland typically occurs on basaltic coastal cliffs, and is found in the Ka‘ena region on steep windward cliffs and the upper reaches of talus slopes. The grasslands attain their best development closest to Ka‘ena Point at about forty feet in elevation, but extend east to ‘Ālau Gulch and up to 800 feet in elevation near the cliff tops. Kāwelu grasslands tend to form a low cover – generally less than twenty-five inches – and reach a maximum on slopes exposed to the prevailing winds. Distributed among the kāwelu are other native grasses, such as kākonakona and pili, and native shrubs such as ‘ilima. A

scattering of taller shrubs, such as naio and alahe‘e, often project above the short canopy. Largely bare rock faces amidst kāwelu often support the shrub hinahina kuahiwi (*Artemisia australis*). An interesting phase of this community may be found near the point, where ‘akoko (*Chamaesyce* sp.) is codominant with kāwelu in a small area. Non-native grasses and shrubs are invading to various degrees.

Naio Coastal Dry Shrubland, also considered a rare community, is known only from a few areas in the Hawaiian Islands, including the Ka‘ena coast. These shrublands cover extensive areas of the windward side from near the point to beyond Manini Gulch. Starting on the gentle alluvial fans at the base of the talus slopes, the shrublands extend up the slopes, sometimes onto the basalt ledges. This community is characterized by scattered, rounded naio shrubs, from 3-8 feet tall, with other shorter shrubs and grasses between. The most common are ‘ilima and a rare nehe (*Wollastonia lobata* var. *lobata*), with occasional patches of native grasses, such as pili, kāwelu, and kākonakona. The native shrub alahe‘e is also common. The naio shrublands at Ka‘ena are highly degraded by non-native species.

Non-native plants in the area compete with native vegetation, especially in areas outside the Reserve. Koa haole (*Leucaena leucocephala*) dominates many of the dry slopes near Ka‘ena on the leeward side, forming a non-native community referred to as Koa haole Mixed Coastal Dry Shrubland. Koa haole typically covers 70-90% of drier leeward slopes and 25-50% of windward slopes, but had shown a decline in the late-1980s due to the introduction of a non-native psyllid, *Heteropsylla cubana* (Psyllidae), resulting in emergence of native shrubs such as ma‘o and ‘ilima in some formerly infested areas. Within koa haole shrublands a variety of non-native grasses, shrubs, and herbs exist. Guinea grass (*Panicum maximum*) heavily infests the flats near the road and on the lower slopes, and kiawe (*Prosopis pallida*) is intermittent on the lower slopes and flats, with 5-10% coverage on the windward side. Other abundant weeds are the grasses swollen fingergrass (*Chloris barbata*), with up to 25% coverage of roadside areas and mid-slopes, and sourgrass (*Digitaria insularis*), which is found in the flats and open areas near the road and dominates open areas around koa haole stands. Buffel grass (*Cenchrus ciliaris*) is another common non-native grass. Vegetation along the proposed fencing corridor is primarily non-native.

Fauna

Both Laysan albatrosses and wedge-tailed shearwaters have re-established breeding colonies in the Reserve. Currently, approximately 60 pairs of Laysan albatross nest at Ka‘ena Point, along with over 1,500 pairs of wedge-tailed shearwaters.

The success of a breeding population of Laysan albatross at Ka‘ena Point is of particular importance, as it is one of only three communities in the main

Hawaiian Islands. Considered a species of concern vulnerable to extinction by the World Conservation Union (IUCN), populations of Laysan albatrosses have not fully recovered from widespread feather hunting that took place in the early 1900s, and now face threats from longline fisheries and lead poisoning of the major population at Midway. Laysan albatrosses, or mōlī (*Phoebastria immutabilis*), spend the majority of their lives at sea, coming ashore only for breeding purposes. The birds, which can live at least fifty years, mate for life. At 7-10 years in age, birds begin courtship rituals, involving elaborate dancing and calls. Breeding pairs will return to the same nest site every year. While the breeding season runs from November through June each year, birds usually begin to arrive in October, and the last chicks may not leave until July. As ground nesting birds, Laysan albatross are particularly vulnerable to predation.

The wedge-tailed shearwater, or ‘ua‘u kani (*Puffinus pacificus*), is relatively abundant at Ka‘ena Point. Populations in Hawai‘i historically numbered in the tens of millions; they are now considered “common” seabirds with an estimated population of only 40-60,000 pairs in the main Hawaiian Islands. The Hawaiian name for the bird means moaning petrel, and refers to the various strange nocturnal moans, groans, and wails heard from a nesting colony. These shearwaters are also pelagic birds, spending the majority of their lives at sea, and will usually depart the colony before dawn and return after dusk. Adults usually arrive in March, and females lay a single egg in June. As ground nesting birds, shearwaters face threats from feral predators at nesting sites and also easily disoriented by urban lights.

White-tailed tropicbirds, or koa‘e kea (*Phaethon lepturus*), have also been known to nest at Ka‘ena Point in small numbers. Other seabirds, including red-footed (*Sula sula*), brown (*S. leucogaster*), and masked (*S. dactylatra*) boobies, collectively known as ‘ā; brown (noio kōhā, *Anous stolidus*) and black noddies (noio, *Anous minutus*); ‘ou or Bulwer’s petrel (*Bulweria bulwerii*), red-tailed tropicbirds or koa‘e ‘ula (*Phaethon rubricauda*), red-billed tropicbirds (*Phaethon aethereus*), and an occasional ka‘upu or black-footed albatross (*Phoebastria nigripes*), have been observed from the point. Great frigatebirds, or ‘iwa (*Fregata minor*); and grey-backed (pākalakala, *Sterna lunata*), sooty (‘ewa‘ewa, *S. fuscata*), and white (manu-o-Kū, *Gygis alba*) terns have been observed at Ka‘ena on occasion, and any number of other seabirds could potentially be seen here. Migratory shorebirds, including the wandering tattler (‘ūlili, *Heteroscelus incana*); Pacific golden-plover, or kōlea (*Pluvialis fulva*); the sanderling (hunakai, *Calidris alba*); and ruddy turnstone (‘akekeke, *Arenaria interpres*) may also be seen. All of the seabirds and shorebirds found at Ka‘ena Point are federally protected under the Migratory Bird Treaty Act of 1918. Hawaiian short-eared owls, or pueo (*Asio flammeus sandwichensis*), have been seen in the Reserve, and it is possible that they may nest in the Reserve or nearby.

It is possible that, with the protection afforded by the predator-proof fence, one or more of the species of seabirds currently observed flying in the area will establish nesting colonies at Ka‘ena Point. Bulwer’s petrels have been observed in the area and might have unsuccessfully attempted to nest in shearwater burrows, and the removal of rats could result in their return. Black-footed albatrosses and red-tailed tropicbirds are thought to have been observed ‘prospecting’ for nesting sites. The FWS has just initiated the review process to consider listing the black-footed albatross as threatened or endangered, and is considered by the IUCN to be globally endangered, on the basis of a projected 60% population decline over the next fifty years due to incidental mortality in longline fisheries.

The reserve also acts as a refuge for the endangered Hawaiian monk seal, or ‘īlioholoikauaua (*Monachus schauinslandi*), and for honu, or green sea turtles (*Chelonia mydas*). The subtropical monk seal genus (*Monachus* sp.) is one of the most highly endangered groups of animals in the world. Only three species are known from modern times. Of these, the Caribbean monk seal is now extinct, the Mediterranean monk seal is considered by the IUCN to be critically endangered, and the Hawaiian monk seal is listed as endangered by both the USFWS and the IUCN. Observations of the Hawaiian monk seal, or ‘īlioholoikauaua (*Monachus schauinslandi*), sunning on the beach or the rocks at the point have increased over the past decade. Several individuals are regulars at Ka‘ena Point, and a female seal gave birth to and successfully raised a pup there in 2006.

Honu, or green sea turtles (*Chelonia mydas*), are known to utilize the shallow waters of Ka‘ena Point for resting and feeding, and are federally listed as a threatened species in Hawai‘i. Humpback whales (koholā, *Megaptera novaeangliae*), listed as an endangered species, are commonly seen in the waters off the point during the winter breeding season. Hawaiian spinner dolphins (nai‘a, *Stenella longirostris*) may also be seen in the waters near Ka‘ena Point.

Little documented information exists regarding native invertebrates within the reserve. Native bees of the genus *Hylaeus* (Colletidae) are thought to pollinate the rare native plant ‘ohai (*Sesbania tomentosa*). A native Succineid land snail is known from Ka‘ena. Non-native invertebrates are common in the reserve, and an unstudied entomofauna is known to exist in association with seabirds.

Non-native birds are commonly seen in the Reserve. These include the red-crested cardinal (*Paroaria coronata*), bulbul (*Pycnonotus* sp.), common myna (*Acridotheres tristis*), Japanese white-eye (*Zosterops japonicus*), spotted dove (*Streptopelia chinensis*), zebra dove (*Geopelia striata*), house finch (*Carpodacus mexicanus*), Northern mockingbird (*Mimus polyglottos*), red avadavat (*Amandava amandava*), grey francolin (*Francolinus pondicerianus*), and Erckel’s francolin (*Francolinus erckelii*).

Non-native predators are also present in varying numbers within the reserve, and these are the primary motivation for the proposal of a predator-proof fence. Problem animals for the reserve include feral dogs (‘īlio, *Canis lupus familiaris*) and cats (pōpoki, *Felis silvestris catus*), as well as the black rat (*Rattus rattus*), Polynesian rat (‘iole, *R. exulans*), house mouse (*Mus musculus*), and Indian mongoose (*Herpestes javanicus*).

Significant and Sensitive Habitats

The State considers Ka‘ena Point to be significant and sensitive habitat for a variety of reasons.

Ka‘ena Point is considered by many to be the last wild stretch of coastline on O‘ahu. By restricting vehicular access into the Natural Area Reserve, damage to the coastal dunes, the surrounding terrain, cultural sites, and vegetation was halted and the ecosystem has demonstrated remarkable recovery. Despite their recovery, these coastal resources remain fragile and coastal dunes remain rare across the State.

The project area is also designated critical habitat for seven endangered species of plants: ‘ohai (*Sesbania tomentosa*), ‘āwiwi (*Centaurium sebaeoides*), ‘akoko (*Chamaesyce celastroides* var. *kaenana*), *Vigna o-wahuensis*, pu‘uk‘aa (*Cyperus trachysanthos*), ma‘o hau hele (*Hibiscus brackenridgei*), and *Schiedea kealiae*. Ka‘ena Point provides important habitat for nesting seabirds, in particular the Laysan albatross, and is commonly used by the endangered Hawaiian monk seal.

Finally, Ka‘ena Point was proposed as a Natural National Landmark in a 1981 National Park Service survey of the Hawaiian Islands.

Archaeological Sites and Cultural Practices

The following steps were taken to determine the cultural and historical significance of the project area: (1) field inspections by the Division of State Parks archaeologist; (2) review of State reports and documents available in the State Parks and State Forestry and Wildlife files; (3) literature review for sources with information relevance to the project area; (4) preparation of a Summary of Known and Possible Historic Properties at Ka‘ena Point by the Division of State Parks archaeologist (included as Appendix C); (5) sending of pre-consultation letters to a wide variety of agencies and organizations that might be interested in the project or have relevant information about archaeological or historic sites or cultural practices, including: US Air Force, Ka‘ena Point Tracking Station, US Army Museum of Hawai‘i, State Historic Preservation Division, Office of Hawaiian Affairs, Department of Hawaiian Home Lands, O‘ahu Island Burial Council, ‘Ahahui Mālama I Ka Lōkahi, Ahupua‘a Action Alliance, Hawaiian Civic Club of Waialua, Hawaiian Civic Club of Wai‘anae, Hawai‘i Railway Society, Historic Hawai‘i Foundation, Ho‘omau Ke Ola, Hui Mālama I Nā Kūpuna O Hawai‘i Nei, Hui Mālama o Mākua, ‘Ike ‘Āina, KAHEA – The Hawaiian-Environmental Coalition, Kai

Makana, Nani ‘O Wai‘anae, Native Hawaiian Legal Corporation, North Shore Kūpuna, and Polynesian Voyaging Society; and (6) meetings with identified groups or individuals connected to the area. A summary of the archaeological and cultural resources found at Ka‘ena Point is presented below.

The Ka‘ena Point area was traditionally separated into different land divisions, with the north side belonging to the Ka‘ena ahupua‘a of the Waialua moku, and the south side of the point belonging to the Keawa‘ula ahupua‘a of the Wai‘anae moku. Ka‘ena, which literally translates as ‘the heat,’ is thought to have been named for a brother or cousin of Pele. Other sources note that Ka‘ena means ‘the end point,’ underlining the area’s cultural significance as a sacred place where the spirit goes after death. Keawa‘ula translates to ‘the red harbor;’ the name comes from the great schools of muhe‘e (cuttlefish) that came into the bay in such numbers, the reddish color of their back under the water gave the water the appearance of being reddish.

Ka‘ena Point itself is a culturally significant landscape. There is a strong relationship in Native Hawaiian culture between the people and the land on which they live. The ‘āina (land), wai (water), and kai (ocean) formed the basis of life and established the spiritual relationship between the people and the environment. This relationship is demonstrated through traditional mele (songs), pule (prayer chants), genealogical records, and stories about particular areas, celebrating the qualities and features of the land. The relationship to the land is also shown through the strong attachments of kama‘āina to their ancestral homelands. For example, Thomas Shirai Jr. traces his genealogy in Waialua at least seven generations, was raised in Mokulē‘ia, and remains active in the Waialua moku. His ancestors, including his great-great-grandfather Kaaemoku Kakulu, his great-great-grandmother Annie Keahipaka, and his great-grandfather David Keao, provided information about Ka‘ena during previous endeavors to record traditional Hawaiian knowledge (Handy’s The Hawaiian Planter and McAlister’s Archaeology of Oahu). Mr. Shirai continues the tradition by sharing family stories that illustrate the importance of Ka‘ena for marine resources.

Mr. Shirai shared that he and his grandparents would periodically go to Ka‘ena to gather shellfish (‘opihi and pipipi), seaweed (limu kohu), sea cucumber (loli), sea urchin (wana, hā‘uke‘uke, and hāwa‘e), and other resources, and that they would make pa‘akai (salt) on a parcel of land his family owned at Ka‘ena. His grandfather was a taro farmer and lobster fisherman, who used Ka‘ena as one of his fishing grounds. His grandfather learned his skills from his grandfather, Kaaemoku Kakulu, the last konohiki of Kawaihāpai, located between Waialua and Ka‘ena.

In an article published in the Hawai‘i Fishing News, Mr. Shirai connected old family stories to modern events. After relaying a family version of the story of how the Pōhaku o Kaua‘i was formed (repeated below), he tells a story of how

Maui caught a huge red fish (kūmū) at Ka‘ena and dragged it to Kuakala Heiau, where the menehune found it, named it Kumunuiakea, and cut it into small pieces. When the sea covered the land, pieces of the fish went back into the ocean, and since then kūmū at Ka‘ena are small. Mr. Shirai then recalls a 1994 Hawai‘i Fishing News story remembering how three scuba divers discovered a pristine kūmū fishing ground, catching many of this species, but of an average size of five pounds, back in 1957.

Mr. Shirai shared a third story, about an octopus called Kakahe‘e that lived at Ka‘ena. Piikoi-a-ak-Alala and his father were traveling to O‘ahu where they sighted a huge octopus. They took aim and shot at Kakahe‘e with a bow and arrow, then landed at Waiakaaiea and proceeded to beat it to death. Kakahe‘e is reported to have shared the same fate as Kumunuiakea, thus creating an abundance of he‘e (octopus). Mr. Shirai then notes that the State record for largest octopus was caught at Ka‘ena, and that the February 1994 issue of Hawai‘i Fishing News featured a fisherman who caught a large octopus at Ka‘ena.

Mr. Shirai further shared his thoughts that Ka‘ena could have further importance as the birthplace of the Hawaiian islands, based on one mo‘olelo of the demigod Maui. Maui went fishing with his brothers, and with his fishing hook Manaiakalani, Maui caught something large. They paddled hard to land it, but when one brother looked back, the line snapped, the hook disappeared beneath the ocean, and the islands of Hawaii remained above water. As discussed further below, there are other versions of this mo‘olelo (that explain how Maui attempted to join Kaua‘i and O‘ahu, forming the Pōhaku o Kaua‘i), and there are other versions of the story detailing the creation of the Hawaiian islands; thus the relationship of Ka‘ena to the birth of the Hawaiian islands is a rich area for further discussion and research.

These stories provide invaluable information about Ka‘ena and connect historic events with present use. There are likely many other residents of Wai‘anae and Waialua with similar stories and recollections. While most likely involve the rich marine resources of Ka‘ena, many of the native plants found at Ka‘ena are also associated with traditional cultural practices and may have been used by previous families. ‘Ilima papa vines were used for basketry, the flowers for lei, and parts of the plant for medicinal and ceremonial purposes; hinahina was used for lei and medicinal purposes; and naio provided hard durable wood and was used for medicinal purposes. Likewise, seabirds have cultural significance as well: observations of flight paths and behaviors of certain seabirds were used to predict weather and to reveal schools of fish and to locate islands when navigating, seabirds provided food through their meat and eggs, seabirds provided feathers for kāhili (feather standards), ‘ahu‘ula (feather capes), and lei, and several expressions and legends reference seabirds (e.g., Pōhai ka manu maluna, he i‘a ko lalo. *When the birds circle above, there are fish below.*

‘Ōlelo No‘eau, M.K. Pukui 1983, No. 2667, as referenced in *Ko Hema Lamalama,* Kahoolawe Island Reserve 2008).

Sites of O‘ahu (1978) identifies several archaeological sites in the Mokulē‘ia-Ka‘ena region. In Kamananui, on the slopes of the Wai‘anae Mountain Range behind the old Waialua Sugar Company mill, the remains of a heiau were found along with stone piles and burial caves. Makai of these sites, along the coastline, were found a fishing shrine, or ko‘a, and skeletal remains. In western Mokulē‘ia, a heiau site and a ko‘a – both now destroyed – as well as extensive terracing have been recorded. Further into the valley area are sites that indicate that there was once a significant Hawaiian settlement there, including house sites, old coconut trees or dead trunks, and terracing. In Kawaihāpai, between Waialua and Ka‘ena, a heiau, ahu, ko‘a, and extensive terracing were recorded, as well as the four ‘hidden waters,’ the legendary streamlets Ulunui, Koheiki, Ulehulu, and Waiaka‘aiea that Hi‘iaka, one of the sisters of Pele, discovered at Ka‘ena and at which she quenched her thirst. The Keālia Trail, which zigzags up into the Wai‘anae Mountain Range from the coast, provided easy access to the Mokulē‘ia plateau. The Moka‘ena heiau in Kuaokalā, situated on the ridge at 1200 feet in elevation overlooking Ka‘ena Point and Keawa‘ula Bay, has the highest location of any heiau on O‘ahu. At Ka‘ena, the now-destroyed Ulehulu heiau was also located on the mountain ridge.

Historic properties identified so far at Ka‘ena Point within or near the project area fall within one of the following four major time-periods and uses: (1) Native Hawaiian subsistence and cultural uses; (2) Pasturage and ranching; (3) O‘ahu Railway and Land Company (OR&L); and (4) Ka‘ena Point Military Reservation. The following information is based on the Summary of Known and Possible Historic Sites; the full report, with photos, is included as Appendix C.

To date, a total of five extant historic properties that are considered native Hawaiian properties have been documented at Ka‘ena Point. Together they form the Ka‘ena Complex, which was listed on the Hawai‘i Register of Historic Places in 1988. Major features of the Ka‘ena Complex include cultural deposits in the sand dune area, two stone platforms, Pōhaku o Kauai, and Leina a ka ‘Uhane (Soul’s Leap).

The oldest of these properties are the subsurface cultural deposits and burials in the sand dune area near the actual point. These sites were first documented in 1971, and recorded in more detail during a 1982 recovery effort prompted by deterioration of the sand-dune knoll due to off-road vehicle use. As part of the 1982 effort, two partial burials exposed by erosion were removed and placed in a more stable reburial site for protection. Additional data recovery work was conducted in 1989. Prior to 1989, the site was described as having remnant walls constructed of water-worn basalt stones and two distinct buried cultural layers. The two cultural layers were marked by dark, charcoal-stained sand containing coral and basalt ‘ili‘ili (water-worn pebbles), pit features, a few

artifacts, and midden composed of bird and fish bone, crab, sea urchin, kukui nut fragments, marine shells, and charcoal pieces. The stone walls had been reduced to foundation alignments in 1982 and 1989, and the upper cultural layer was no longer intact by 1989. An analysis of the lower layer in 1989 indicated the long-standing importance of fishing and marine resources in this dry environment, and the presence of habitation features suggested a sustained use of the area, whether on a permanent or recurrent basis. Spatially, the cultural deposits extend over an area approximately 30 by 50 meters, and surface midden scatters and darkened sand exposure indicate that the deposits could extend an additional 300 meters to the east and 30 meters to the south.

The two stone platforms included in the Hawai‘i Register complex are thought to have been constructed for religious purposes. One was described in 1988 as a partially buried basalt boulder platform with coral pieces scattered among the boulder paving of the platform. The presence of coral and the location of the platform on a distinct rise above the sand dunes indicate that it could be a fishing ko‘a (shrine or triangulation point). It is possible, but not confirmed, that this could be Alau‘iki, a fishing shrine recorded in 1930 by McAllister.

The second stone feature is upslope from Leina a ka ‘Uhane (Soul’s Leap), above the proposed fence alignment. It has been described as a “small rectangular platform of basalt cobbles, with scattered coral on the surface.” Its possible religious function is suggested by its size, the presence of coral, upright stones along the edge of the platform, and its vantage point. The possible ritualistic nature of these two features is consistent with the prevalence of known fishing shrines in the area and with the richness of its fisheries. McAllister recorded eight named ko‘a between Keawa‘ula and Mokulē‘ia.

Two natural formations compose the remaining two features of the Ka‘ena Complex: Pōhaku o Kaua‘i and Leina a ka ‘Uhane (Soul’s Leap). Both should be considered traditional cultural properties; the identification and evaluation of these otherwise natural features rely on known native Hawaiian traditions and beliefs. Pōhaku o Kaua‘i marks the end of a series of partially submerged rock outcrops that form the westernmost extent of O‘ahu. According to several recorded traditions, this rock formation was once part of Kaua‘i. In one tradition, the demigod Maui attempts to join Kaua‘i and O‘ahu by standing at Ka‘ena Point and using his hook, Manaiakalani[1], to pull Kaua‘i towards O‘ahu. When he pulled the hook, only a single, huge rock from Kaua‘i fell at his feet, to become known as the Pōhaku o Kaua‘i. The hook was attached to ‘ie‘ie cordage, which ended up in Ka‘ie‘ie Channel (between Kaua‘i and O‘ahu) and

[1] Mr. Shirai further relates that Manaiakalani is also the middle name of an important Hawaiian historian, Samuel Manaiakalani Kamakau, who was born on October 29, 1815 at Mokuleia, Waialua. Samuel Manaiakalani Kamakau was recognized by the 2005 Legislature as one of Hawaii’s greatest historians of Hawaiian culture and heritage, for his actions and passion in accurately recording native Hawaiian history, preserving this information for current and future generations.

the hook landed in Pālolo Valley, hollowing out a crater. In a related version told by Annie Keahipaka, a lineal descendant of the area, Maui had many helpers pulling the line. When one disobeyed orders and looked back at Kaua‘i as they pulled it towards O‘ahu, the line broke and Kaua‘i slipped back into the ocean, with only the fragment Pōhaku o Kaua‘i remaining as proof of Maui’s great effort. In a third tradition, a Kaua‘i chief named Ha‘upu hurled a huge boulder from Kaua‘i to O‘ahu to forestall what he thought was a fleet of O‘ahu warriors about to invade Kaua‘i. The group was, in fact, driving fish towards nets laid off-shore of O‘ahu. When the boulder fell, it killed the chief Ka‘ena who was leading the drive and many of his followers. From then on, the point bore the name of this chief and the rock was called Pōhaku o Kaua‘i. Pōhaku o Kaua‘i is also mentioned incidentally in other traditions, demonstrating that it was a commonly known landmark.

Leina a ka ‘Uhane (Soul’s Leap) is a limestone formation approximately 150 meters (500 feet) from the existing boulder barricade, perched between the existing trail and the ocean. It forms a tangible representation of native Hawaiian traditions and beliefs that identify Ka‘ena Point as a place where the fate of departing souls is determined as death nears. Departing souls either passed into one of several spirit realms or were returned to the body to continue life. The fate of these souls often depended on the help or absence of friendly ‘aumakua (ancestral family or personal god) that would guide a soul to the appropriate realm: ao kuewa, a place of wandering souls, ao ‘aumakua, where the soul could be reunited with the souls of ancestors, or au milo or pō pau ‘ole, a place of eternal night. In another version of what happens to souls after death, a soul wanders to Leina a ka ‘Uhane if all its earthly obligations are fulfilled (if they are not, the soul returns to the body), where it is thrown into a pit know as Lua ahi a Kehena, at which time death actually occurs to the body.

A road, following the traditional Wai‘anae-Waialua trail, was constructed through the area and around the point sometime in the 1860s-70s. Several small fishing villages are thought to have existed in the area during this period. A settlement called Nēnēle‘a is documented as being about a mile east of Ka‘ena Point, and several house foundations, measuring 14 x 20 feet, are documented from the area. An 1832 census listed the population of the Ka‘ena ahupua‘a at forty-nine individuals. Based on the known fishing shrines, recorded interviews, and the number of stories, fishing was an important activity. Ka‘ena is noted as an excellent fishing ground, and one story describes how Maui caught a huge red fish, which left a trail from Pōhaku o Kauai to Kuakala heiau (up in the mountains) as he dragged it. The menehune found the fish and cut it into small pieces, which went back in the ocean when the sea covered the land, and is the reason why kūmū (goatfish, *Parapeneus porphyreus*) are now small.

Based on historic accounts and recorded traditions, there may be additional as-yet unidentified historic properties at Ka‘ena Point and would most likely reflect uses and customs associated with the area’s rich fisheries and the lack of

any other dominant land use in this waterless hot area. These could include additional ko‘a, the remnants of shelters and settlements for fishermen, burials, canoe landings, and salt-making sites. However, later uses of the area (described further below) have significantly reduced the probability of these properties surviving on the flatter portions of the Point or along lower ridge slopes.

The first reference to lands at Ka‘ena being used for pasturage appear in survey notes by J.S. Emerson for 5 Royal Patent Grants. These government grants reflect a district-wide attempt by Waialua residents to secure land for pasturage and may also provide evidence that permanent settlements were absent along this coast in 1850. Most of the government lands and private lands at Ka‘ena were leased for ranching during the second half of the 1800s and the first half of the 1900s. When the privately-owned lands along the coast were acquired by the State of Hawai‘i in the 1970s to create Ka‘ena Point State Park, all were owned by ranching interests or by families with ranching interests in the area. Despite references to Ka‘ena Point and adjacent lands being used for pasturage, none of the stone features or sites generally associated with grazing or ranching have been identified at the Point or within the project area. There are no stone wall enclosures or corrals, nor do the boundaries of the grants appear to have been walled to contain grazing cattle or horses.

The former alignment and features of the O‘ahu Railway and Land Company (OR&L) railway are among the most visible historic properties at Ka‘ena Point. Completed in 1898, the railway connected Honolulu to Kahuku, via Wai‘anae and Waialua. It was meant to serve plantation towns and ranches, but also became a scenic tour. Railway service ended and the railway was abandoned in 1947, after damage by a 1946 tsunami and a decline in railroad use caused by the increase of personal vehicles. The main railway bed is still visible through its route through Ka‘ena, but no traces of the tracks or railroad ties remain. Today, the railway bed forms the primary path used by visitors hiking out to the Point. Rock-work features associated with the railway such as bridge foundations, culverts, and rock retaining walls can still be observed along the railroad track. In addition to the main railway line, a 15-car siding track once ran from the northern side of the bend to the Point and is depicted on 1929 and 1940 USGS topographic maps. No physical evidence of this siding was apparent during the field inspection.

Finally, Ka‘ena contains historic features associated with its military use. Ka‘ena Point Military Reservation was established in 1923; construction of military defense facilities began in 1924 and continued through 1946, capitalizing on the strategic location of Ka‘ena Point. Four complexes of structures and associated features still exist within or near the project area, and a fifth could be identified with additional field inspections. These include a fire control and base end stations built on a ridge knoll (above Ka‘ena Point) in 1924 and 1934, a radar station used in the 1940s (located on the ridge above

Ka‘ena Point), a search light position established in 1942, a cantonment established in 1942 for military personnel manning the various operations (“Camp Ka‘ena,” located on the flat area down at Ka‘ena Point), and a battery begun in 1943. The concrete structures associated with the fire control and base end station remain intact, the concrete foundations of Camp Ka‘ena remain recognizable, and concrete structures associated with a radar station remain visible.

The battery, BCN-409, was designed to support two 8-inch naval guns and army M1 barbette cartridges. It involved the construction of a tunnel complex and was 60% complete when the project was abandoned in 1945, after studies determined that batteries of this type could not withstand modern air attack. Given the elevation of the tunnel entrances, a substantial amount of cut and fill was needed to create the appropriate grade for an access road and maneuvering area in front of the tunnel entrance. Tailings from tunnel excavations were used as fill for the road and terrace, and gunite was pressure-sprayed over the ridge cuts at each tunnel entrance to stabilize the rock face. Much of the components of BCN-409 are still recognizable; while the tunnel entrances have been sealed, the access road and terrace features and the piles of tailings that form the faces of the terrace are intact. Military use of Ka‘ena Point declined after World War II, with use primarily consisting of small-size maneuvers.

The Ka‘ena Passing Light, operated and maintained by the U.S. Coast Guard, was constructed at Ka‘ena Point in 1920. Initially consisting of a sixty-five foot tall concrete tower, the light was replaced in 1990 by a new beacon on a thirty-foot steel pole. The old light tower, a historic structure, was toppled and lies in the sand at Ka‘ena Point, north of the new beacon.

After the railway closed, a rough track followed the rail grade. A nine-mile dirt road was constructed around the point from 1954-1956, using prison labor. In 1971, the State Department of Transportation developed plans for a two-lane paved road around Ka‘ena Point. Due to significant opposition from the public, the concept was shelved and efforts shifted towards protection of this area. During the 1970s, the State began to purchase lands in the area for a proposed Ka‘ena Point State Park. In 1978, a Ka‘ena Point State Park Conceptual Plan was completed. In 1984, a portion of Ka‘ena Point Military Reservation was declared excess property and deeded to the State for park purposes.

Ka‘ena Point NAR was established in 1983, composed of twelve acres on the leeward side of the point. In 1986, an additional twenty-two acres on the windward side were added to the NAR. Degradation by off-road vehicle use was significant, and the primary management for the new NAR was to close the area to motorized vehicles. Erosion of the roadbed on the Wai‘anae side of the point prevented vehicular entry, and a boulder barricade was erected for this purpose on the Mokulē‘ia side. The results of prohibiting vehicles are positive and

noticeable, with the regeneration of native coastal plant communities and the re-establishment of breeding populations of seabirds.

Visual Resources

The remote undeveloped nature of Ka‘ena provides stunning views of coastal sand dunes, cliff faces, the natural shoreline, and the ocean. Ka‘ena Point is unique in that one has views of both the Wai‘anae coast and the Mokulē‘ia coast from one vantage point. The Wai‘anae Sustainable Communities Plan (2000) identifies the protection of scenic views as a priority, including the green valleys, steep walled ridges and mountains, and the ocean, but makes no specific mention of Ka‘ena. The North Shore Sustainable Communities Plan (2000) identifies the preservation of scenic views as a priority, while generally identifying coastal cliffs, the coastline, and the Pacific Ocean as scenic views to be preserved. The plan specifically identifies stationary views from the shoreline between Ka‘ena Point and Makaleha Beach as views to be preserved.

The North Shore viewshed, from Ka‘ena Point to Crozier Drive, and the Mākua viewshed, from Ka‘ena Point to Kepuhi Point, are both recognized as Type I viewsheds by a 1987 Coastal View Study commissioned by the City and County of Honolulu. Type I viewsheds is considered highly intact, a description used to indicate the integrity of visual patterns and the extent to which the landscape is free from visually encroaching features.

From Ka‘ena Point, looking towards Wai‘anae, the view extends seven miles towards Mākaha to Kepuhi Point. Kea‘au Beach Park, Mākua Valley and Mākua Beach, and Keawa‘ula (Yokohama Beach) can all be observed, along with views of the Wai‘anae mountains. From Ka‘ena Point, looking towards Mokulē‘ia, the view includes much of the north shore coast, and part of the Ko‘olau mountains can be observed to the north, sloping towards Waimea.

V. ALTERNATIVES CONSIDERED

Two project alternatives are described: the construction of predator-proof fencing followed by removal of all predators from within the fenced unit (preferred alternative); and conservation management without the fencing (status quo, or the no-action alternative).

Alternative #1: Construct predator-proof fence, followed by feral predator eradication, to create a pest-free protected area on Ka‘ena Point peninsula (preferred alternative)

The preferred alternative is to construct a predator-proof fence, followed by aggressive predator control, to create a protected area at Ka‘ena Point. The construction of the fencing will make it possible for Ka‘ena Point to become a predator-free nesting area for seabirds. Since closing the point to motorized

vehicles, numbers of nesting Laysan albatrosses and wedge-tailed shearwaters have increased dramatically. Other species of seabirds may begin to nest at Ka‘ena in the future, if a safe haven is created. Rare native plants may also benefit with the removal of rats and mice, as their seeds will be safe from rodent predation. Biologically, eradication of predators is anticipated to provide greater conservation benefit than the existing program of ongoing control. From a cost perspective, while construction of predator-proof fencing has significant up-front costs, over the long-term the costs of fencing with predator control at the sea-ends is estimated to be less than the cost of the existing predator control program throughout the Reserve. The fencing is also anticipated to have a public education component. As Ka‘ena Point is accessible and highly visited by tourists and residents, the predator-proof fence may act as a demonstration project that increases overall appreciation for the natural resources protected by the fencing and improves understanding of conservation management.

Alternative #2. No action.

The no-action alternative is the status quo – continued predator control without fencing. This alternative fails to take advantage of existing funding opportunities to construct a predator-proof fence at Ka‘ena Point and requires sustained predator control actions. Moreover, despite the current predator control program, seabird predation by dogs, cats, and other mammals is still a significant problem. Under the no-action alternative, seabird populations are not anticipated to increase significantly, additional seabird species are not anticipated to be attracted to the area to breed, and native plants will continue to be impacted by seed predation by rodents. Over the long-term, the no-action alternative does not provide the same benefits to native species and contributes less to the long-term conservation needs of these species.

Further, when evaluated over time, the no-action alternative is projected to cost more. For this assessment, costs of the fencing alternative include the initial costs of fence construction and pest eradication, shown above, the annual costs of fence inspection and maintenance (estimated at 5% of capital fence cost), and the annual cost of managing a pest buffer zone at the sea ends of the fence (estimated at 30% of current annual pest control). The fence lifespan is estimated to be 25 years, with full fence replacement included every 25 years. Ongoing pest management for the no-fence alternative is estimated at $32,000 per year.

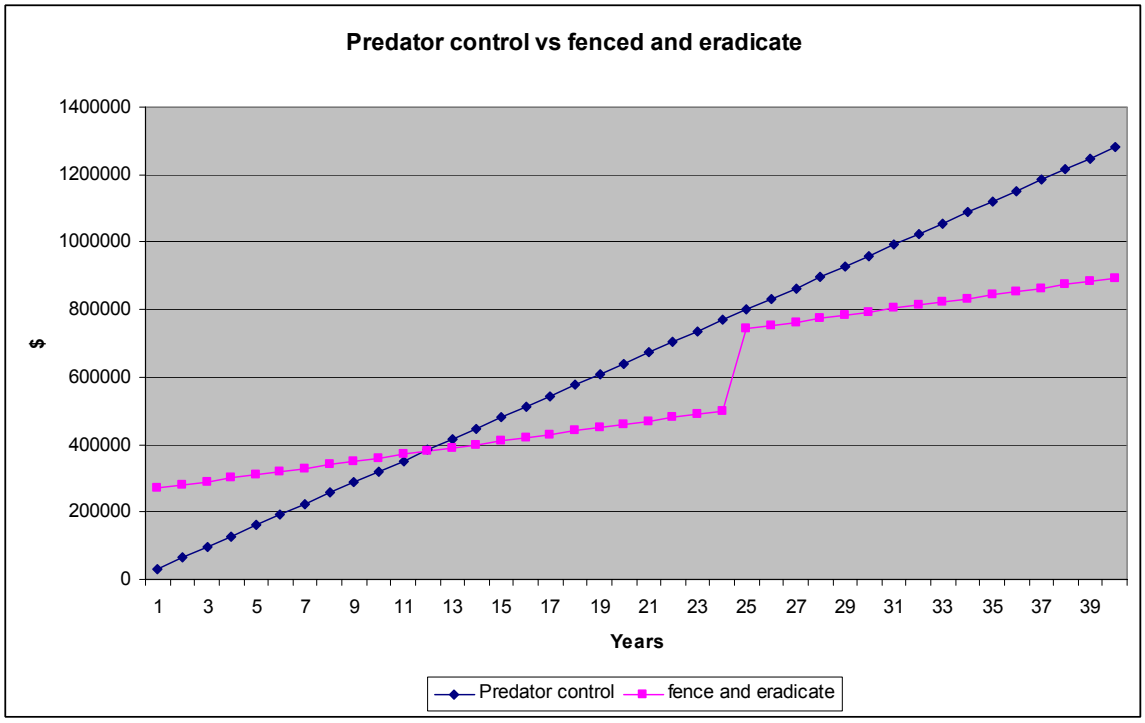

Figure 7. Cost comparison of preferred alternative (eradication) with the no-action alternative (control).

VI. ANTICIPATED IMPACTS OF THE PREFERRED ALTERNATIVE AND PROPOSED MITIGATION MEASURES

Vegetation: Construction of fencing would result in the disturbance and destruction of limited amounts of alien vegetation within a fencing corridor up to fifteen feet wide as a result of the minimal clearing and grading needed to facilitate construction. The fence corridor outside the roadbed has been preliminarily surveyed for endangered plants and the final alignment will be surveyed again to ensure all areas with sensitive biological resources will be avoided.

Rare species protocols will be implemented to avoid impact to any rare plant species (e.g., *Chamaesyce* or *Cyperus*) that may be located in or near the fence corridor. Specifically, in addition to the plant survey to be conducted in advance of construction, any rare plants found will be flagged and a buffer zone of at least 15 feet will be maintained from the plants. In addition, DOFAW will provide a botanist on-site before construction to review the locations of rare plants and discuss protocols with the fence crew to prevent unintentional harm to any rare plant in the fence corridor.

It is anticipated that the benefit to both listed and non-listed native coastal plants provided by the protection from rodents will more than compensate for any unavoidable damage caused during construction.

Alien species: The disturbance to the ground surface and vegetation involved with fence construction may create conditions suitable for the establishment of weedy plants, and workers, their equipment, and the fence materials could be agents for the unintentional introduction of invasive species. The following practices will be implemented to minimize the introduction of alien plants and insects and to reduce the possibility of establishment. First, boots, equipment and materials will be inspected for seeds, eggs, larvae, etc., prior to delivery and/or entry into the project area, and cleaned as necessary. Any heavy equipment used during construction will be inspected and cleaned as needed, following appropriate alien species prevention protocol recommended by DOFAW and USFWS. All construction workers will be instructed on specific procedures to prevent the spread or introduction of noxious alien plants in the project area. In addition, precautions will be taken to prevent spreading alien plants already found in the project area, all tools, gear, and construction scrap will be removed upon completion of work, and all food and trash will be removed from the project area on a daily basis.

Immediately after fence completion, alien mammals within the fenced unit would essentially be penned in. This could result in a short period of amplified damage to listed species. However, due to the relatively small size and open nature of Ka‘ena, it is unlikely that large predators, such as dogs, would be trapped within the completed fence. Any cats or mongoose trapped inside would have a limited impact on plants since they are not herbivorous, and timing construction to avoid nesting season should minimize impact on nesting seabirds. Moreover, due to the placement of the hood on the outside, climbing predators cannot get into the fenced area, but could get out if their home range is disrupted by the fencing. Rats and mice would likely be trapped inside, but due to their small home ranges, it is unlikely that the fencing will trap in many rodents that would normally have been outside the fence or exclude many rodents that would have tried to get out. Under the circumstances, no significant increase in the density of pest species is anticipated.

Native birds: Noise and activities associated with the construction of fencing may temporarily disrupt the activities of seabirds nesting within the NAR. The preferred window for fence construction is October-early November or July-August, to avoid the Laysan albatross nesting season (November through June) and avoid the initial nesting period (April through June) and the primary fledging periods (September through October) for wedge-tailed shearwaters. However, construction may take place at any time during the year. Based on additional observation of nesting seabirds and due to the distance between the fence alignment and core nesting habitat, the impact on nesting seabirds during construction is anticipated to be low. Because wedge-tailed shearwaters typically takeoff before dawn, and return to the colony at dusk, the chance that any shearwater will be impacted by construction activities during takeoff or landing is remote.

After construction, the presence of the fencing is considered unlikely to disorient seabirds. The fencing alignment has specifically been selected based on information from ongoing research on Laysan albatross to maintain a significant buffer zone from nest sites identified during past breeding seasons. In addition, the alignment was selected so that the fence is sufficiently distant from bird use areas to minimize any opportunity for collisions on takeoffs or landings. Monitoring is planned to ensure that disruption to seabirds is minimized during fencing activities, and after fence construction to ensure that the fencing is visible to seabirds. If necessary, the top portion of the fence could be colored or reflective tape used to increase visibility of the fencing to seabirds.

Based on existing information about nesting habits of Laysan albatross and wedge-tailed shearwaters, and the planned timing of construction, it is highly unlikely that any bird will actually be nesting within the fence alignment, which is largely rocky, but activities will cease in the event nesting activity is discovered and consultation with appropriate agencies will occur to determine the appropriate course of action to minimize impact to the birds.

During the rodent eradication phase of the project, the use of toxicants is not anticipated to negatively impact native bird populations[2]. First, rodent eradication will take place during the winter months (December through February) when native non-target migratory bird species are not present or present in low numbers.

Second, birds can be exposed to rodenticide in two ways: they can eat the bait pellets (direct ingestion) or they can eat prey organisms that have been contaminated by eating rodenticide (indirect ingestion). The primary birds at Ka‘ena are seabirds, which do not generally eat things they find on land, but feed on fish and marine organisms caught in the open ocean. As discussed further below (<u>marine species</u>), marine organisms are not anticipated to be affected by the use of toxicants, and so it is highly improbable that adult seabirds would feed on or bring fish with rodenticide residues back to their chicks.

For native birds present at Ka‘ena that do forage on land (e.g., Pacific golden plover and wandering tattler), it is unlikely that these birds would forage on pellets, given their normal feeding behavior and the low density of pellets in the intertidal area due to the planned delivery method of hand placement of bait adjacent to the shoreline. Further, previous studies on the effects on birds of

[2] The analysis of impacts from the use of toxicants on native fauna relies heavily on the recently completed Draft Supplemental Environmental Assessment for the Lehua Island Ecosystem Restoration Project (2008). For the convenience of the reader, this Draft Supplemental EA is included as Appendix E of this document. The full EA is also available at http://oeqc.doh.hawaii.gov/Shared%20Documents/EA%20AND%20EIS%20ONLINE%20LIBRARY/Kauai/2008-07-08%20KA%20DSEA%20Lehua%20Island%20Ecosystem%20Restoration.pdf.

direct and indirect ingestion of bait indicate that it is physically impossible for birds to eat enough diphacinone pellets or tainted prey to cause death.

Finally, the native pueo has been observed on occasion at Ka‘ena (two sightings in 10 years). Its diet consists of rats, mice, small mongoose, and possibly small birds; as a result, it is unlikely to directly ingest bait pellets. However, they could eat rats or mice carrying rodenticide residues in their tissues prior to dying. Using the analysis contained in the Lehua Final Supplemental Environmental Assessment for barn owls, the risk of mortality when using diphacinone is nearly zero, due the large numbers of rats that would have to be ingested (81 lbs) and the few numbers of pueo seen at Ka‘ena. The use of brodifacoum would create a greater risk to pueo due to its higher toxicity to owls. Should brodifacoum be selected as the preferred toxicant, additional review on the potential effects on pueo will be conducted and specific mitigation measures implemented in consultation with the USFWS to ensure that there is no significant adverse impact on the pueo.

In conclusion, no negative impacts to native birds are anticipated as a result of the use of toxicants. However, as an additional precaution, because albatross chicks are known to be curious about objects near their nest and could inadvertently pick up and ingest pellets, if any broadcast of rodenticide pellets occurs after Laysan albatross chicks hatch, bait will not be distributed in a 6 foot buffer zone around the nest so that chicks, which are not yet mobile, cannot play with, or ingest bait pellets accidentally.

The primary motivation for this project is to create the first “predator-free” area in the State and allow for expansion of native species populations. Over time, this action facilitates the recovery of the ecosystem to its original condition (a condition without non-native predators) and provides an opportunity for visitors to experience the type of natural ecosystem found in the Northwestern Hawaiian islands. The short-term disruptions due to construction are expected to be generously offset by the anticipated long-term benefits provided by the removal of predators, from dogs to rodents.

<u>Monk seal</u>: Because monk seal haul-out locations are over 500 meters from the proposed fencing corridor, construction noise is not anticipated to affect them. Should helicopters be used to transport materials to the sites, the contractor will be instructed to select a flight path that avoids direct flights over or near the seal haul-out sites.

Predator control activities that involve the use of firearms may present a risk of disturbance to seals from the sounds of gunfire and a risk of injury from stray bullets. To minimize this risk, current protocols involve surveys of the area before conducting any shooting, for public safety reasons, and will include surveys for monk seals. This risk is further reduced by the fact that the majority of animals dispatched with firearms are at least 200 meters away from

the shoreline, on the mauka side of the sand dunes, and are dispatched with buckshot (rather than bullets), which minimizes disturbance and risk of injury to monk seal populations. Moreover, the use of a suppressor is used on occasion during predator control and may further reduce the possibility of disturbance to seals, if use of firearms is unavoidable during pupping season.

Rodent control activities involve the use of toxicants and are not anticipated to negatively impact monk seals for the following reasons. The operation will be conducted during winter months, outside the monk seal pupping season. In shoreline areas, bait will be placed by hand directly in burrows or other areas deemed to be high quality rat habitat to minimize risk of bait being swept or blown in the ocean and/or coming into contact with monk seals. If any monk seals are present during the eradication operations, crews conducting hand broadcast of rodenticide pellets will maintain a 100-foot buffer from all seals.

Continued communication with NOAA's Marine Mammal Response Coordinator throughout the implementation of this project is planned to further minimize impacts to monk seals. Proposed conservation activities are likely to benefit monk seals, by removing predators that act as carriers of diseases identified as threats to monk seal survival.

Marine species: Based on the location of the fencing, activities associated with fence construction are not anticipated to impact marine fish, marine invertebrates, or sea turtles.

During the rodent eradication phase of the project, the use of toxicants is not anticipated to negatively impact marine fish, marine invertebrates, or sea turtles. Marine organisms can generally be exposed to rodenticides in three ways: they can eat bait pellets; they can eat prey that have accumulated rodenticide in their tissue; or they can absorb rodenticides that have dissolved in seawater through the skin.

In shoreline areas, bait will be placed by hand directly in burrows or other areas deemed to be high quality rat or mouse habitat to minimize risk of bait being swept or blown in the ocean and/or coming into contact with monk seals, sea turtles or migratory shorebirds. This planned delivery method will reduce the amount of actual bait ending up in the water, minimizing risks to marine invertebrates, fish and turtles.

Both toxicants under consideration (diphacinone and brodifacoum) have low solubility in water and bind tightly to organic material in soil. Water sampling conducted after aerial application of diphacinone pellets to Mokapu island in February 2008 found no diphacinone residues in any of the seawater samples. Water quality data collected in New Zealand after a massive brodifacoum spill into nearshore waters (20 tons of bait spilled into the ocean at a single point), finding that brodifacoum levels were no longer detectable 36 hours after the

spill. This low water solubility decreases the likelihood of exposure of marine organisms to dissolved rodenticides.

Direct ingestion of bait and consumption of contaminated prey is also unlikely. Data from field trials in other locations, including in Hawai‘i at Lehua and Mokapu, indicates that nearshore fish are unlikely to be attracted to bait pellets. Moreover, sampling results at Mokapu after aerial drops found no detectable rodenticide residues in marine tissues of limpets and fish after two diphacinone applications, and tests after the 20-ton brodifacoum spill (which would exceed any potential exposure at Ka‘ena by several orders of magnitude) noted above found unexpectedly low rodenticide levels in marine organisms.

As a result, the impact to marine species at Ka‘ena Point is anticipated to be minimal, based on the planned delivery method in shoreline areas to minimize the possibility of bait ending up in the ocean, the fact that the Mokapu aerial drops did not result in detectable rodenticide residues, and the low levels of contamination resulting from a worst-case (20-ton) brodifacoum spill.

Archaeological Sites or Cultural Resources: In general, construction of the fencing primarily on top of the existing gravel road (constructed in the 1940s for military purposes) minimizes the impact to archaeological resources in the project area. This road provides a level, previously-disturbed foundation for the fence and its position on the slope of the ridge avoids the sand dunes and sandy soils in which subsurface cultural deposits and burials are a high probability. Construction and use of the road from 1943 to 1945 would have destroyed other sites or features associated within preceding periods or uses, and this corridor avoids cultural sites such as fishing shrines or heiau previously documented at Ka‘ena.

Construction of the fencing may, however, have an impact on the following cultural or historic features: Leina a ka ‘Uhane (Soul’s Leap), the OR&L Railway bed and associated features, and the Battery Construction No. 409 (BCN-409).

Leina a ka ‘Uhane (Soul’s Leap) is located near the northern end of the gravel road where the road turns east. While the formation itself can easily be avoided by the fencing, the precise location of the fencing in relation to the formation and the proximity of the fencing to this traditional cultural property may affect cultural beliefs and practices associated with Leina a ka ‘Uhane. Under either fencing alignment, the fence would have a visual impact on this cultural feature due to proximity. In addition, some stakeholders indicated that having the Leina a ka ‘Uhane (Soul’s Leap) enclosed within the fenced unit would prevent souls from coming down from the mountain and leaping off into the next world. Other stakeholders disagreed, feeling that souls can move easily through walls and buildings and so would easily pass through the fencing. Additional consultation, including multiple site visits, with cultural practitioners and lineal

descendants of the area led to the compromise of adding a third access door in the fencing, just mauka of the Leina a ka ‘Uhane. Several members of the community commented that this addition would provide accommodation for souls coming down the mountain to the Leina, and at the same time would reduce the visual impact of the fencing by moving the fencing further away from this cultural feature. While visual and cultural impacts cannot be completely eliminated, the construction of a third gate appeared to address the concerns raised by the stakeholders initially opposed to enclosing the Leina.

The fencing must cross the OR&L Railway bed at the northern and southern ends. At both ends, sections of the railway bed were found during field inspections that can be crossed without altering any of the character-defining features constructed to create the desired grade of the bed (e.g., raised railway bed, trenches, stone retaining walls) or any of the segments with paving slabs. Crossing at these areas would minimize the effect of the fence on the historic integrity of the railway bed and its associated features. On the southern end, the fence would need to breach a low stone wall which parallels the railway bed. The length of the wall and its location make it impossible to avoid. The breach would, however, remove only one relatively small section of the wall, and not a segment that is particularly unique or exemplary. To mitigate the impact of the fencing, the wall will be mapped and photographed, to allow restoration if the fencing is ever removed.

The selected fence alignment is on top of a gravel road that is itself a historic property, as it is over 50 years old and part of the BCN-409 complex. The road itself is not particularly unique or exemplary nor is it a key feature of the BCN-409 complex. The fence is not anticipated to irreparably alter the integrity of this complex as the installation will not disturb the complex’s significant components (e.g., the tunnel entrances, gunnite-coated facings, terrace retaining walls). In addition, construction requires minimal grading and so will not alter the fundamental formation or foundation of the road, which is made of excavated fill and tailings. Road sections will be documented as a form of mitigation, and the manner of fence installation will allow the road’s general appearance to be readily restored if the fence is removed at some point in the future.

Ka‘ena Point itself also has great cultural significance, apart from the individual cultural sites. During the previous public discussions on the concept of a road connecting the North Shore to the Wai‘anae coast through Ka‘ena, it is clear that many Native Hawaiians value the area and would consider any major changes or developments, such as a road, to be a sign of disrespect for the place. As a result, there are some individuals who believe that the proposed fence will have a negative impact on the cultural landscape despite the anticipated benefits. On the other hand, there are individuals who believe that the natural resources are cultural resources, and that a project designed to enhance seabird

and native plant populations, without limiting public access, will have a positive impact on cultural resources.

Finally, there are some individuals who believe that the fencing will impact their cultural practices, primarily access for fishing. This belief seems based upon their inability to drive directly into the project area and fish from their vehicles, notwithstanding that vehicular access has been prohibited for over twenty years. Given the continued ability to walk into the fenced area with fishing equipment through accommodations built into the fencing design, without more specific information, the proposed fencing is not anticipated to impact cultural practices related to fishing.

Based on a review of the circumstances, including the distance from the dune area likely to contain cultural deposits, the disturbed condition of the railway and the military road, the limited permanent impact of the fencing on the remaining historic features, the anticipated benefit to natural resources, the importance of these resources from a cultural perspective, the continuation of public access into the area, the ability to modify the fencing alignment and fencing design through the addition of a third access door to minimize the impact on cultural features, specifically the Leina a ka ‘Uhane, the proposed action is not expected significantly impact archaeological or historic sites or significantly impact Native Hawaiian traditional and cultural practices.

A section 106 consultation has been initiated by the USFWS with SHPD for this project because of the Federal funding. Any mitigation requirements resulting from the section 106 consultation will be incorporated into the project and implemented before or during construction, as appropriate.

While archaeological features or cultural sites are not anticipated to be significantly impacted by the proposed action, should evidence of any archaeological or cultural properties be encountered during construction, vegetation clearing and fence construction would immediately cease and the appropriate parties would be consulted immediately. If necessary, the fence alignment will be adjusted to reduce or eliminate impact to any features located during surveys or construction or as recommended during Section 106 consultation to be conducted for this project.

Viewplanes: The remote, undeveloped nature of Ka‘ena Point, with views of the cliffs, coastal sand dunes, the natural shoreline, and the ocean, is one of the primary attractions to those visiting the areas. The planned fence alignment and design is designed for minimal interference with the ocean and shoreline views. The marine grade mesh used in the fencing is painted carraca green at the factory based on field tests by the manufacturer concluding that this color blends best into a diverse range of landscapes. In addition, the green fence is less reflective than traditional stainless steel fences, making it less visible from the ocean.

Coming from the Mokulē‘ia side, the fence alignment is largely hidden behind the existing boulder barricade that prevents vehicular access to the point. As one crosses the boulder barricade into the core of Ka‘ena Point NAR, the fencing will interfere with the spectacular views of the point, sky, and sea that lie in front for only a short distance (less than 10 yards) until one reaches the fencing. Once one passes through the double-door system, the impact of the fence on the scenic vista looking towards the Point and the Lighthouse will cease.

As one reaches the point and turns back to view the land, the fence will be visible, but should not interfere with the eye's focus on the cliffs that tower above, dwarfing the fence. The fence, some six feet tall, will lie almost ½ mile inland at its greatest distance from the point, nearer the base of the cliffs. There is an existing white sign approximately four feet high within the fence corridor that is largely invisible from the point. Based on the difficulty of picking out this white sign and the photo simulations (below), it is anticipated that the visual impact of a green mesh fence two feet higher will be minimal. The fencing is anticipated to blend into the background due to the color and the ability to see through the mesh.

Coming from the Wai‘anae side, the fence alignment is largely hidden by the topography and curves of the cliff. After crossing the existing washout, the fencing will obstruct views of the point for only a short distance (less than 20 yards) until one reaches the fencing. Once one passes through the double-door system, the impact of the fence on the scenic vista looking towards the Point and the Lighthouse will cease.

Digital simulations were developed for the project by Turner & deVries, Ltd. to illustrate the anticipated impact of the fencing on the viewplanes. The first view is from just after the washout on the Wai‘anae side, looking towards the point. The second view is from the point, looking back towards the mountains. The third view is taken from the boulder barricade on the Mokulē‘ia side and illustrates the anticipated visual impact of the alignment not selected. The visual impact of this unselected alignment was anticipated to be greater than the one selected, due to the distance over which one could view the fencing as one approached the point.

Figure 8. Simulation of fencing, Wai‘anae side, view towards Ka‘ena Point.

Figure 9. Simulation of fencing, view from Ka‘ena Point.

Figure 10. Simulation of fencing, Mokulē‘ia side, view towards Ka‘ena Point (Simulation of alignment not selected).

The design and alignment of the fencing is consistent with the applicable guidelines contained in the 1987 Coastal View Study commissioned by the City and County of Honolulu as follows:

1. Guideline 1.1 recommends that “building forms should neither encroach into nor penetrate the ridgeline of significant land forms or descending ridges, nor should buildings be sited that create silhouettes against the seaward horizon…” The fencing as planned does not extend above existing ridgelines nor create silhouettes against the horizon.
2. Guideline 1.2 recommends that “existing continuous views from the coastal highway should remain unobstructed.” The fencing as planned will not be visible at all from the coastal highways due to the distance and the relatively short height of the fence.
3. Guideline 1.3 recommends that “alteration to existing natural features such as coastal land forms, drainage patterns, and stands of existing trees should be discouraged…” Alteration to existing features is not planned; the fencing will be constructed on an existing World-War II era roadbed then contour down a loose rock slope. There are no stands of existing trees within the planned fence alignment and no drainage patterns will be altered.
4. Guidelines 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, 4.3, 4.4, 5.1, and 5.2 are not applicable to this project as it is not located along a coastal highway or in a highly urbanized area, landscaping in the traditional sense would not be appropriate in this natural area, and the fence project is not a development in the sense meant in Principle 5.

While some interference with the scenic vistas at Ka‘ena Point may be unavoidable, the fence’s role in helping to improve the wild and natural, predator-free character of the point is anticipated to outweigh these impacts. Continued consultation with appropriate agencies and groups will occur to

minimize the visual impact of the fence upon cultural features at the point, such as Leina a ka ‘Uhane.

Public access: Public access is not anticipated to change significantly due to the construction of predator-proof fencing. Access doors are to be incorporated at locations where the fencing crosses the primary trail into and out of the Point, from both the Mokulē‘ia and Wai‘anae sides. This trail is the point of entry by which people bike or hike across Ka‘ena Point or access the shoreline within the project area. On rare occasions, visitors access Ka‘ena Point from the military bunkers along a ridge trail; access for these visitors will be maintained by maintaining a clear path along the outside of the fence alignment to either of the two access doors, a detour of less than 400 meters in either direction, and one which minimizes human disturbance of the best seabird nesting habitat. Access along the shoreline is not anticipated to be affected as the fencing will stop at or before the high tide line. The double-door system will be constructed with the same quality and design as the rest of the fence and will be large enough that up to nine people may enter together or so that a person can enter with a bicycle or fishing pole. As a result, the impacts on public access are not anticipated to be significant.

Soil and water: Short term soil disturbance is unavoidable, but no lasting changes to normal patterns of runoff or percolation are expected. To minimize the potential for erosion, at locations along the fenceline where natural drainage channels exist or where surface water is likely to collect, the ground will be prepared to move water away from the fencing. All ground preparation will be consistent with the normal runoff pattern of the roadbed, where stormwater runs off to the sides of the road. Best Management Practices will also be incorporated into the project to minimize the potential for soil erosion and include planning the construction phasing to reduce exposed ground areas, minimizing the length and steepness of disturbed areas, and avoiding earthwork during inclement weather. Due to the methods of fence construction planned, the underlying soil characteristics, the lack of streams, and the generally arid nature of the project area, no noticeable impacts are expected.

Due to the remote nature of Ka‘ena Point, there are few water quality studies of the near-shore waters. Moreover, the recently completed *Atlas of Hawaiian Watersheds* includes no discussion of the watershed within the project area – primarily as there are no perennial streams in the area. Because of the limited development and the characteristics of the land adjacent to the ocean as a restored coastal ecosystem, it is assumed for the purposes of this assessment that near-shore water quality is pristine. Due to the methods of fence construction planned, the underlying soil characteristics, the lack of streams, and the generally arid nature of the project area, no run-off is anticipated to occur into near-shore waters and no noticeable impacts are expected as a result of fence construction.

Both toxicants under consideration (diphacinone and brodifacoum) for use during the rodent eradication phase of the project have low solubility in water and bind tightly to organic material in soil. Based on data from extensive laboratory and field trials (information reported during the rodenticide registration process), diphacinone is anticipated to have no negative impacts on marine waters. Water sampling conducted after aerial application of diphacinone pellets to Mokapu island in February 2008 found no diphacinone residues in any of the seawater samples. Based on water quality data collected in New Zealand after a massive brodifacoum spill into nearshore waters (20 tons of bait spilled into the ocean at a single point), finding that brodifacoum levels were no longer detectable 36 hours after the spill, brodifacoum is not anticipated to have a negative impact on marine waters.

Ka‘ena Point Natural Area Reserve is undeveloped, and there are no public facilities, such as restrooms, within the project area. Thus, there is no current method disposal of liquid and solid wastes. Because most visitors hike in and out of the area for short visits, rather than remain in the area for extended camping stays, human waste is not currently a problem within this reserve. Because of the extended hours on-site and the distance to the nearest toilet facility, we do intend to have the fence contractor provide a port-a-potty for use by laborers during construction.

Air pollution: Limited air pollution from vehicles, equipment, and small power tools will be unavoidable during fence construction. Use of this equipment is temporary and is not anticipated to have a significantly negative contribution to the overall air quality in the region. Fugitive dust may be created on the Wai‘anae side, when creating the fence platform on the loose soils contouring down the hill. Best Management Practices will be incorporated into the project to minimize the impact of fugitive dust as needed. Given the remote location of the project site and the narrow width of the fencing corridor to be disturbed, the impacts of fugitive dust are not anticipated to be significant.

Air traffic: FAA Advisory Circular 150/5200-33B (“Hazardous Wildlife Attractants On or Near Airports”) recommends a 5 statute-mile distance from the Dillingham Airfield’s air operations area and a hazardous wildlife attractant if the attractant could cause hazardous wildlife movement into or across the approach or departure airspace. The construction of fencing designed to protect nesting seabirds and encourage increases in populations could be perceived to fall within this advisory circular, as the fencing is just less than five miles (4.18 miles) from the edge of Dillingham Airfield. Dillingham Airfield is a general aviation joint-use facility. Daytime activities include civil general aviation traffic (by small single-engine and light twin-engine aircraft, sailplanes, ultra-light aircraft, and helicopters), and occasionally, the military conducts night training operations from Dillingham.

The actual increase in hazards due to the proposed fencing is unknown since a Wildlife Hazard Assessment does not appear to have been conducted for Dillingham Airfield. However, DLNR believes that it is possible that rather than increasing hazards for aircraft operating at Dillingham Airfield, this project will reduce hazards, by providing a more attractive nesting location, drawing birds away from the existing nest locations that are closer to Dillingham. Moreover, because the type of air traffic at Dillingham utilizes a distance shorter than five miles for approach and departure patterns and because the fencing project is almost at the recommended distance of five miles away, DLNR considers it unlikely that the proposed fencing will cause hazardous wildlife movement into or across the approach or departure space actually used.

Social impacts: Periodic noise from potential helicopter flights, power tools, and other activity associated with fence building will be unavoidable during the construction period. In addition, there will be short-term impacts associated with temporary closures of portions of the NAR (area under construction) for safety purposes. Any closures that impact the ability of the public to access the interior of Ka‘ena Point will be publicized in advance and will be limited in duration and location only to the extent necessary for public safety. Due to the remote nature of the project area, the temporary nature of any closures, and the planned concurrent educational outreach efforts explaining the purpose of the fencing, negative social impacts resulting from the project are not anticipated to be significant.

Economic Impacts: The proposed action involves the expenditures of funds necessary to construct the fencing, including the purchase of fencing materials, the hiring or contracting of crews, and the purchase or rental of equipment including helicopters, and, after fence construction, to remove predators from within the fenced unit. Current funding for the project includes funds provided by the U.S. Fish and Wildlife Service and the State.

The project is not expected to have any major negative economic impacts. Positive economic impacts will result from the release of project funds into the State economy and the opportunities for training in the methods for building predator-proof fences. Staff of other conservation agencies interested in constructing predator-proof fencing will have an opportunity to observe the construction in progress, possibly reducing the need for future contracting of these services, while the contractor will hire a limited number of local residents as part of the fence construction crew, providing these short-term employees with a new skill. The proposed action may attract additional funding for habitat restoration, predator control, research, or monitoring activities because of the presence of a predator-proof fence.

VII. ANTICIPATED DETERMINATION

It is not expected that this project will have a significant negative impact on the environment, and a Finding of No Significant Impact is anticipated.

VIII. FINDINGS AND REASONS SUPPORTING ANTICIPATED DETERMINATION

The goal of the proposed action is to create a predator-free environment on 59 acres at Ka‘ena Point through the use of predator-proof fencing and predator removal. The permanent removal of predators from the Ka‘ena Point peninsula is anticipated to provide a long-term benefit to nesting seabirds and to native plants. Without fencing, sustained predator control efforts must continue in order to maintain the status quo of low levels of predators, and predation by feral animals on nesting seabirds and native vegetation will remain a significant problem.

The anticipated Finding of No Significant Impact is based on the evaluation of the project in relation to the following criteria identified in the Hawai‘i Administrative Rules §11-200-12:

1) Involves an irrevocable commitment to loss or destruction of any natural or cultural resource.

The proposed action does not involve an irrevocable commitment to loss or destruction of any natural or cultural resource. Instead, the goal of the proposed action is to benefit the natural environment by facilitating the eradication of predators from Ka‘ena Point, important habitat for seabirds and rare plants.

2) Curtails the range of beneficial uses of the environment.

The proposed action will not curtail beneficial uses of the environment. Instead, the project will enhance protection of important habitat for nesting seabirds by facilitating the removal of a range of non-native predators. Public access will not be impacted, and public appreciation of the natural resources supported at Ka‘ena Point is likely to increase.

3) Conflicts with the state’s long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders.

The proposed action is consistent with the environmental policies established in Chapter 344, Hawai‘i Revised Statutes (HRS) and contributes to the conservation of threatened and endangered species, as covered by Chapter 195D, HRS. It is also consistent with Section 3 of the City and County of Honolulu General Plan (1992), which sets goals and policies for maintaining O‘ahu’s

natural environment, and with Chapter 3 of both the North Shore and Wai‘anae Sustainable Communities Plans, which concerns land use policies, principles, and guidelines. Finally, protection of habitat at Ka‘ena Point implements the Hawai‘i Comprehensive Wildlife Conservation Strategy (2005), the USFWS Recovery Plans for O‘ahu Plants (1998), the Multi-Island Plants (1999), the Maui Plant Cluster (1997), and for *Panicum fauriei* var. *carteri* (1993), the North American Waterbird Conservation Plan (2002), and the USFWS Regional Seabird Conservation Plan (2005). In addition, both Laysan albatrosses and wedge-tailed shearwaters are federally protected under the Migratory Bird Treaty Act of 1918.

4) Substantially affects the economic or social welfare of the community or state.

The proposed action will not adversely affect the economic or social welfare of the community or state. The ecosystem-related goals of the project will directly benefit the economic, cultural, educational, and social interests of the community and the State by helping to facilitate the continued restoration of the natural environment at Ka‘ena Point.

5) Substantially affects public health.

The proposed action is not anticipated to substantially affect public health. The proposed action may have a positive impact on public health by protecting coastal habitat, thus encouraging more people to hike and appreciate the natural resources of the area.

6) Involves substantial secondary impacts, such as population changes or effects on public facilities.

The proposed action is not anticipated to result in any substantial secondary impacts, such as population changes or effects on public facilities. The proposed action does not involve any changes in population, as no people reside at Ka‘ena Point, and the only public facility within the project area, a U.S. Coast Guard Aid to Navigation, will not be impacted by the project.

7) Involves a substantial degradation of environmental quality.

The proposed action does not involve a substantial degradation of environmental quality. Instead, environmental quality is anticipated to improve with the implementation of the proposed action. Construction of predator-proof fencing, followed by aggressive predator control, will enhance environmental quality of the project area by improving the quality of protected nesting seabird and rare plant habitat.

8) Is individually limited but cumulatively has considerable effect upon environment or involves a commitment for larger actions.

The proposed action involves the construction of predator-proof fencing at Ka‘ena Point. The proposed fencing is anticipated to have only cumulatively beneficial effects upon the environment, and does not involve a commitment for larger actions, other than ongoing fence maintenance and predator control.

9) Substantially affects a rare, threatened or endangered species, or its habitat.

There are no known rare, threatened, or endangered plants within the planned fencing corridor; however, globally rare seabirds and several species of rare native plants will benefit from the protection this fencing will provide from non-native predators. Exclusion of dogs, cats, mongooses, rats, and mice will provide significant protection to the ground-nesting seabirds that utilize Ka‘ena Point. Predator proof fencing should significantly reduce the number of seabirds killed each year by small mammals and encourage an increase in the breeding population. Native plants are also anticipated to benefit from the removal of seed-eating rodents. Thus, it is not anticipated that the project will negatively affect a rare, threatened or endangered species, or their habitat.

10) Detrimentally affects air or water quality or ambient noise levels.

The proposed action will have no detrimental effects on air quality, water quality, or noise levels. The area is remote, and construction noise and air quality impacts are expected to be localized and temporary.

11) Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters.

The project area is located on the coastal peninsula of Ka‘ena Point. There is the possibility that portions of the fencing could be damaged by extreme surf conditions, storms, tsunami, or coastal erosion. Previous experiences in New Zealand indicate that these fences can withstand winds up to 180 km/hr (over 100 mi/hr). The value of predator-proof fencing that enhances seabird survival and promotes habitat restoration for rare plants and seabirds rates outweighs the potential costs associated with loss of fencing due to damage. The planned fencing has a lifespan of approximately 25 years, and it is anticipated that the benefits of the fencing and predator removal will be visible almost immediately. The proposed action will not damage or adversely affect any environmentally sensitive areas.

12) Substantially affects scenic vistas and view planes identified in county or state plans or studies.

The North Shore Sustainable Communities Plan (2000) identifies the preservation of scenic views as a priority, while generally identifying coastal cliffs, the coastline, and the Pacific Ocean as scenic views to be preserved. The plan specifically identifies stationary views from the shoreline between Ka‘ena Point and Makaleha Beach as views to be preserved. The Wai‘anae Sustainable Communities Plan (2000) also identifies the protection of scenic views as a priority but, while mentioning several significant stationary views, makes no mention of Ka‘ena. A 1987 Coastal View Study commissioned by the City and County of Honolulu recognizes the North Shore viewshed, from Ka‘ena Point to Crozier Drive, and the Mākua viewshed, from Ka‘ena Point to Kepuhi Point, as Type I viewsheds. Type I viewsheds is considered highly intact, a description used to indicate the integrity of visual patterns and the extent to which the landscape is free from visually encroaching features.

The proposed action will not affect the viewplane from any existing roadway or residential area. However, the proposed fencing may affect the scenic vista for visitors to Ka‘ena Point. The planned fencing corridor utilizes topography to minimize views of the fencing to hikers as they approach Ka‘ena Point from either the Wai‘anae side or the Mokulē‘ia side and as they look backwards from the Point. The fence will be visible for a short period as visitors approach it after crossing the boulder barricade on the Mokulē‘ia side and for a short period after visitors round the edge of the hill past the washout on the Wai‘anae side. When looking mauka from the Point, the fence will be visible but is anticipated to be largely inconspicuous against the cliffs. The fence, some six feet tall, will lie almost ½ mile inland at its greatest distance from the Point, nearer the base of the 1,000 foot tall cliffs. While the proposed action may have some impact on the scenic views at Ka‘ena Point, because of the placement of the fencing, it is not expected that scenic vistas will be substantially affected.

13) Requires substantial energy consumption.

The proposed action does not require substantial energy consumption, but instead will consume small amounts of energy during fence construction through the use of small power tools and transportation of materials and crews.

IX. LIST OF PERMITS REQUIRED FOR PROJECT

Construction of the project is anticipated to require the following approvals and permits:

Permit	Issuing/Approving Agency
Special Management Area Use Permit - Major	City and County of Honolulu, Department of Planning and Permitting (DPP)
Shoreline Setback Variance	DPP
Shoreline Certification	State Department of Land and

	Natural Resources, Land Division
Grading permit	City and County of Honolulu, DPP
NPDES (dependent on total area disturbed)	State Department of Health

Based on conversations with staff from the DLNR Office of Conservation and Coastal Lands, a new Conservation District Use Application will not be required for this project. Instead, the project is permitted under existing CDUA No. SH-2/26/82-1459, associated with the creation of the Natural Area Reserve.

X. ENVIRONMENTAL ASSESSMENT PREPARATION INFORMATION

This Environmental Assessment was prepared by:

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APPENDIX A

Notable Species of Native Flora and Fauna Thought to Occur In or Near the Project Area or Potentially Affected by the Proposed Conservation Management

Birds
Laysan albatross (*Phoebastria immutabilis*)***
Wedge-tailed shearwater (*Puffinus pacificus*)
Black-footed albatross (*Phoebastria nigripes*)***

Plants
Achyranthes splendens var. *rotundata**
‘Āwiwi (*Centaurium sebaeoides*)**
‘Akoko (*Chamaesyce celastroides* var. *kaenana*)**
Pu‘uka‘a (*Cyperus trachysanthos*)**
Ma‘o hau hele (*Hibiscus brackenridgei*)**
Kulu‘ī (*Nototrichium humile*)*
Carter’s panicgrass (*Panicum fauriei* var. *carteri*)*
Dwarf naupaka (*Scaevola coriacea*)*
*Schiedea kealiae***
‘Ohai (*Sesbania tomentosa*)**
*Vigna o-wahuensis***

Mammal
Hawaiian monk seal (*Monachus schauinslandi*)*

Rare Natural Communities
Naupaka (*Scaevola coriacea*) Mixed Coastal Dry Shrubland

* = Federally listed Endangered Species
** = Endangered Species, Ka‘ena Point designated as Critical Habitat
***= Federal species of concern

APPENDIX B

PARTIAL INVENTORY OF FLORA AND FAUNA OF THE KA‘ENA AREA

Status:

USFWS
END Endangered
T Threatened
C Candidate species
SOC Species of Concern (unofficial designation)

WORLD CONSERVATION UNION (IUCN)
CR Critically endangered
EN Endangered
VU Vulnerable
NT Near threatened
LC Least concern

X Presumed extinct

Affinity:

N Non-native
P Polynesian introduction
I Indigenous
E Endemic

Family	Taxon	Common/Hawaiian name	Affinity	Status
I. Flora				
Pteridophyta (ferns and fern allies)				
Pteridaceae	*Doryopteris decipiens*	kumuniu	E	
Magnoliophyta (angiosperms)				
Liliopsida (monocots)				
Agavaceae	*Agave* sp.	century plant	N	
Poaceae	*Cenchrus ciliaris*	buffelgrass	N	
Poaceae	*Chloris barbata*	swollen fingergrass	N	
Poaceae	*Chloris radiata*	radiate fingergrass	N	
Poaceae	*Cynodon dactylon*	mānienie	N	
Cyperaceae	*Cyperus trachysanthos*	umbrella sedge	E	END
Poaceae	*Dactyloctenium aegyptium*	beach wiregrass	N	
Poaceae	*Dicanthium aristatum*	wilder grass	N	
Poaceae	*Digitaria ciliaris*	Henry’s crabgrass	N	
Poaceae	*Digitaria insularis*	sourgrass	N	
Poaceae	*Eragrostis variabilis*	kāwelu	E	
Cyperaceae	*Fimbristylis cymosa*	mau‘u ‘aki‘aki	I	
Poaceae	*Heteropogon contortus*	pili	I ?	
Poaceae	*Panicum fauriei* var. *carteri*	Carter’s panic grass	E	END
Poaceae	*Panicum maximum*	Guinea grass	N	
Poaceae	*Panicum torridum*	kākonakona	E	
Poaceae	*Setaria gracilis*	yellow foxtail	N	

Poaceae	*Setaria verticillata*	bristly foxtail	N	
Poaceae	*Sporobolus virginicus*	‘aki‘aki	I	
Magnoliopsida (dicots)				
Malvaceae	*Abutilon grandifolium*	hairy abutilon, ma‘o	N	
Malvaceae	*Abutilon incanum*	ma‘o, hoary abutilon	I ?	
Fabaceae	*Acacia farnesiana*	kolū	N	
Amaranthaceae	*Achyranthes splendens* var. *rotundata*	round chaff-flower	E	END, CR
Asteraceae	*Ageratum conyzoides*	maile hohono	N	
Asteraceae	*Artemisia australis*	‘āhinahina, hinahina kuahiwi	E	
Acanthaceae	*Asystasia gangetica*	chinese violet	N	
Chenopodiaceae	*Atriplex semibaccata*	Australian saltbush	N	
Asteraceae	*Bidens amplectens*	ko‘oko‘olau	E	C, VU
Nyctaginaceae	*Boerhavia coccinea*		N	
Nyctaginaceae	*Boerhavia glabrata*	alena	I	
Nyctaginaceae	*Boerhavia repens*	alena	I	
Capparaceae	*Capparis sandwichiana*	maiapilo	E	SOC, VU
Lauraceae	*Cassytha filiformis*	kauna‘oa pehu	I	
Casuarinaceae	*Casuarina equisetifolia*	common ironwood	N	
Gentianaceae	*Centaurium sebaeoides*	‘āwiwi	E	END, CR
Euphorbiaceae	*Chamaesyce celastroides* var. *kaenana*	‘akoko	E	END, EN
Euphorbiaceae	*Chamaesyce degeneri*	‘akoko	E	
Euphorbiaceae	*Chamaesyce hirta*	hairy spurge	N	
Chenopodiaceae	*Chenopodium oahuense*	‘āheahea, ‘āweoweo	E	
Menispermaceae	*Cocculus trilobus*	huehue	I	
Cuscutaceae	*Cuscuta sandwichiana*	kauna‘oa	E	
Asteraceae	*Emilia sonchifolia* var. *javanica*	Flora’s paintbrush	N	
Fabaceae	*Erythrina sandwicensis*	wiliwili	E	
Malvaceae	*Gossypium tomentosum*	ma‘o, huluhulu, Hawaiian cotton	E	
Boraginaceae	*Heliotropium anomalum* var. *argenteum*	hinahina, hinahina kū kahakai	E	
Boraginaceae	*Heliotropium curassavicum*	kīpūkai	I	
Malvaceae	*Hibiscus brackenridgei*	ma‘o hau hele	E	END, EN
Fabaceae	*Indigofera* sp.	indigo	N	
Convolvulaceae	*Ipomoea cairica*	koali ‘ai	I ?	
Convolvulaceae	*Ipomoea indica*	koali ‘awa	I	
Convolvulaceae	*Ipomoea pes-caprae*	pōhuehue	I	
Convolvulaceae	*Ipomoea tuboides*	Hawaiian moon flower	E	
Convolvulaceae	*Jacquemontia ovalifolia* subsp. *sandwicensis*	pā‘ū o Hi‘iaka	I	
Brassicaceae	*Lepidium bidentatum* var. *o-waihiense*	‘ānaunau	I	SOC
Fabaceae	*Leucaena leucocephala*	koa haole	N	
Campanulaceae	*Lobelia niihauensis*		E	END
Solanaceae	*Lycium sandwicense*	‘ōhelo kai	I	

Convolvulaceae	*Merremia aegyptia*	hairy merremia, koali kua hulu	N ?	
Myoporaceae	*Myoporum sandwicense*	naio	I	
Solanaceae	*Nicotiana glauca*	tree tobacco	N	
Amaranthaceae	*Nototrichium humile*	kulu‘ī	E	END
Amaranthaceae	*Nototrichium sandwicense*	kulu‘ī	E	
Piperaceae	*Peperomia leptostachya*	‘ala‘ala wai nui	I	
Asteraceae	*Pluchea indica*	Indian fleabane	N	
Asteraceae	*Pluchea symphytifolia*	sourbush	N	
Plumbaginaceae	*Plumbago zeylanica*	‘ilie‘e	I	
Portulacaceae	*Portulaca lutea*	‘ihi	I	
Portulacaceae	*Portulaca oleracea*	pigweed	N	
Portulacaceae	*Portulaca pilosa*	purslane	N	
Fabaceae	*Prosopis pallida*	kiawe, algaroba	N	
Rubiaceae	*Psydrax odorata*	alahe‘e	I	
Asteraceae	*Reichardia picroides*		N	
Asteraceae	*Reichardia tingitana*		N	
Santalaceae	*Santalum ellipticum*	‘iliahialo‘e, ‘iliahi, coast sandalwood	E	
Goodeniaceae	*Scaevola coriacea*	dwarf naupaka	E	END
Goodeniaceae	*Scaevola sericea*	naupaka kahakai	I	
Caryophyllaceae	*Schiedea kealiae*	ma‘oli‘oli	E	END
Fabaceae	*Senna gaudichaudii*	kolomona	I	
Fabaceae	*Sesbania tomentosa*	‘ohai	E	END
Aizoaceae	*Sesuvium portulacastrum*	‘ākulikuli	I	
Cucurbitaceae	*Sicyos pachycarpus*	kūpala, ‘ānunu	E	
Malvaceae	*Sida fallax*	‘ilima	I	
Asteraceae	*Sonchus oleraceus*	pualele	N	
Asclepiadaceae	*Stapelia gigantea*	giant toad plant	N	
Malvaceae	*Thespesia populnea*	milo	I ?	
Boraginaceae	*Tournefortia argentea*	tree heliotrope	N	
Zygophyllaceae	*Tribulus cistoides*	nohu	I	
Asteraceae	*Verbesina encelioides*	golden crown-beard	N	
Fabaceae	*Vigna marina*	mohihihi	I	
Fabaceae	*Vigna o-wahuensis*		E	END
Verbenaceae	*Vitex rotundifolia*	pōhinahina, kolokolo kahakai	I	
Sterculiaceae	*Waltheria indica*	‘uhaloa	I ?	
Asteraceae	*Wollastonia integrifolia*	nehe	E	
Asteraceae	*Wollastonia lobata* var. *lobata*	nehe	E	
Asteraceae	*Wollastonia remyi*	nehe	E	SOC
II. Fauna **Chordata** **Aves** **Charadriiformes**				
Sternidae	*Anous stolidus*	brown noddy, noio kōhā	I	LC
Sternidae	*Anous minutus*	black noddy, noio	I	LC
Scolopacidae	*Arenaria interpres*	ruddy turnstone, ‘akekeke	I	LC

Sternidae	*Gygis alba*	white tern, manu-o-Kū	I	LC
Sternidae	*Sterna fuscata*	sooty tern, ‘ewa ‘ewa	I	LC
Sternidae	*Sterna lunata*	grey-backed tern, pākalakala	I	LC
Charadriidae	*Pluvialis fulva*	kōlea, Pacific golden-plover	I	LC
Scolopacidae	*Heteroscelus incana*	wandering tattler	I	LC
Columbiformes				
Columbidae	*Geopelia striata*	zebra dove	N	
Columbidae	*Streptopelia chinensis*	spotted dove	N	
Galliformes				
Phasianidae	*Francolinus erckelii*	Erckel’s francolin	N	
Phasianidae	*Francolinus pondicerianus*	grey francolin	N	
Passeriformes				
Sturnidae	*Acridotheres tristis*	common myna	N	
Estrildidae	*Amandava amandava*	red avadavat	N	
Fringillidae	*Carpodacus mexicanus*	house finch	N	
Mimidae	*Mimus polyglottos*	Northern mockingbird	N	
Emberizidae	*Paroaria coronata*	red-crested cardinal	N	
Pycnonotidae	*Pycnonotus cafer*	red-vented bulbul	N	
Pycnonotidae	*Pycnonotus jocosus*	red-whiskered bulbul	N	
Zosteropidae	*Zosterops japonicus*	Japanese white-eye	N	
Pelecaniformes				
Fregatidae	*Fregata minor*	great frigatebird, ‘iwa	I	LC
Phaethontidae	*Phaethon aethereus*	red-billed tropicbird	I	LC
Phaethontidae	*Phaethon lepturus*	white-tailed tropicbird, koa‘e kea	I	LC
Phaethontidae	*Phaethon rubricauda*	red-tailed tropicbird, koa‘e ‘ula	I	LC
Sulidae	*Sula dactylatra*	masked booby, ‘ā	I	LC
Sulidae	*Sula leucogaster*	brown booby, ‘ā	I	LC
Sulidae	*Sula sula*	red-footed booby, ‘ā	I	LC
Procellariiformes				
Diomedeidae	*Phoebastria immutabilis*	Laysan albatross, mōlī	I	SOC, VU
Diomedeidae	*Phoebastria nigripes*	black-footed albatross, ka‘upu	I	SOC, EN
Procellariidae	*Puffinus pacificus*	wedge-tailed shearwater, ‘ua‘u kani	I	LC
Strigiformes				
Strigidae	*Asio flammeus sandwichensis*	pueo, Hawaiian short-eared owl	E	
Mammalia				
Carnivora				
Canidae	*Canis lupus familiaris*	domestic dog, ‘īlio	P	
Felidae	*Felis silvestris catus*	domestic cat	N	
Herpestidae	*Herpestes javanicus*	Indian mongoose	N	
Phocidae	*Monachus schauinslandi*	Hawaiian monk	E	END,

		seal, ‘īlioholoikauaua		EN
Rodentia				
Muridae	*Mus musculus*	house mouse	N	
Muridae	*Rattus exulans*	Polynesian rat, ‘iole	P	
Muridae	*Rattus rattus*	black rat	N	
Reptilia **Testudines**				
Cheloniidae	*Chelonia mydas*	honu, green sea turtle	I	T
Arthropoda **Insecta** **Hymenoptera (bees, wasps, and ants)**				
Colletidae	*Hylaeus anthracinus*	yellow-faced bee	N	
Colletidae	*Hylaeus longiceps*	yellow-faced bee	N	
Mollusca **Gastropoda (snails, slugs, etc.)** **Pulmonata**				
Achatinidae	*Achatina fulica*	East African land snail	N	
Succineidae	*Succinea caduca*	amber snail	E	
Stylommatophora				
Endodontidae	*Cookeconcha* sp.		E	
Spiraxidae	*Euglandina rosea*	cannibal snail	N	
Veronicellidae	*Laevicaulis alte*	black slug	N	

APPENDIX C

Summary of Known and Possible Historic Properties at Ka‘ena Point

Summary of Known and Possible Historic Properties at Ka`ena Point

Ka`ena Point Fence and Ecosystem Restoration Project

Ka`ena Point Natural Area Reserve and Ka`ena Point State Park
Ka`ena, Waialua and Keawa`ula, Wai`anae, Oahu
TMK: (1) 6-9-02: 4, 9, 13, 14 and 8-1-01: 6.

State of Hawai`i
Department of Land and Natural Resources

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July 2007

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Introduction

The Natural Area Reserve System (NARS), Department of Land and Natural Resources (DLNR) and its partners are considering a proposal to install a predator proof fence at Ka`ena Point Natural Area Reserve (Ka Lae Loa o Ka`ena[1]) and, once established, to pursue an ecosystem restoration project. The Division of State Parks (State Parks) has prepared the following report to assist NARS in the planning process for this project. The report is primarily a summary of known and potential historic properties at Ka`ena Point and, more particularly, those found within the potential project area. Also discussed are actions needed to determine how the project will affect these historic properties and how these effects can be avoided or minimized. As proof of compliance with federal historic preservation laws and regulations will be needed, the report also includes recommendations on fulfilling these requirements. At least one section of the proposed fence line, the southern extent of the alignment, would cross a portion of Ka`ena Point State Park.

This historic properties summary is based primarily on field inspections conducted on January 27 and June 30, 2007 and on a review of reports and other sources available in State Parks files. During the field inspections, State Parks staff was able to examine potential fence alignments with NARS staff and other parties involved in the project and to locate previously recorded historic properties. This allowed us to assess, at least to a preliminary level, the kinds of historic properties that need to be considered during the historic preservation review process and to propose potential fence alignments that would avoid or minimize damage to historic properties. Given the height of the fence and the materials being used, it will be a prominent feature in an otherwise open and scenic landscape and the visual effects of the fence on historic properties and their setting also needs to be taken into account. This could include properties located a considerable distance from the fence.

Information used in the following discussions was drawn initially from four primary sources. The first is a report of archaeological work conducted in the immediate vicinity of the beacon light near the point (Yent 1991a). This report complimented another study conducted at Keawa`ula, Wai`anae located southeast of the current project area (Yent 1991b). The second is the National Register of Historic Places Registration Form prepared in 1988 to support listing of "Kaena Complex" in the Hawai`i Register of Historic Places (Bath and Napoka 1988). A portion of the probable project area lies within the boundaries of the complex. In the third source, a member of the Coastal Defense Study Group, John Bennett, presents a historical overview of the Ka`ena Point Military Reservation and the various structures and buildings constructed by the U.S. Army within the reservation from the 1920s through 1945 (Bennett 2005). The fourth major source is the standard reference *Sites of Oahu* (Sterling and Summers 1978). Originally published in 1962, *Site of Oahu* is a compilation of information on archaeological sites and traditionally significant places culled from Bishop Museum files and records.

[1] The point is called "ka lae loa o Kaena" in John S. Emerson's survey notes which were written in the Hawaiian Language (Emerson 1854).

Project Description

As currently conceived, the project entails the installation and maintenance of a fence that would create a 500-meter long (0.3 mile) and six-foot high barrier along the eastern edge of the point (Figs. 1, 2, and 3). To be effective it needs to run continuously along the lower edge the steep, western slope of Kuaokala Ridge from point's northern to southern shorelines. The fence would be constructed of closely-spaced aluminum posts and a stainless steel wire mesh with an aperture small enough to exclude potential predators of all age ranges. A rolled hood at the top of the fence prevents predators from crossing over the fence.

Installation of the fence would include ground disturbance, mostly grading, and the excavation of post holes along the chosen route. The alignment needs to be leveled and an earthen or gravel "platform" (4 to 5-meters or 13 to 16 feet wide) created to provide a secure base for the fence that can be maintained and kept free of vegetation. Posts would be buried to a depth of 3 feet (100 cm). The wire mesh skirt needs to be buried beneath the ground surface. An excavator and/or bulldozer would be used during fence installation.

If the Fish and Wildlife Service grant for this project includes other activities, then the potential effect of these actions on historic properties should also be considered in the planning process. One summary of the project indicates that funds remaining after fence construction would, in part, be used to remove or eradicate predators inside the fenced area.

Compliance Framework

As the project grant is from a federal agency and entails the expenditure of federal funds, the granting agency will probably ask to see proof of Section 106 compliance at some point in the grant oversight process. Section 106 of the National Historic Preservation Act and its implementing regulations require all federal agencies to consider the effects of a project on historic properties and to propose measures that will avoid or mitigate these effects. Generally federal law supersedes state law where the federal and state laws are comparable and both could apply. In this case, Section 106 compliance can be conducted in a manner that generally parallels that required under state law and regulations (§6E-8, HRS, and chapter 13-275, HAR).

Under the Section 106 regulations, the federal agency is to enter into a Memorandum of Agreement (MOA) with the State Historic Preservation Officer and project participants if a project will have an effect on significant historic properties. The MOA commits to measures that will avoid or minimize these effects. A MOA will probably be needed for this project. The entity within the U.S. Fish and Wildlife Service that will take on these signatory responsibilities needs to be identified and informed of this possibility. It is not always readily apparent which entity within an agency oversees historic preservation compliance when federal funds are distributed as grants through external programs or non-profit organizations.

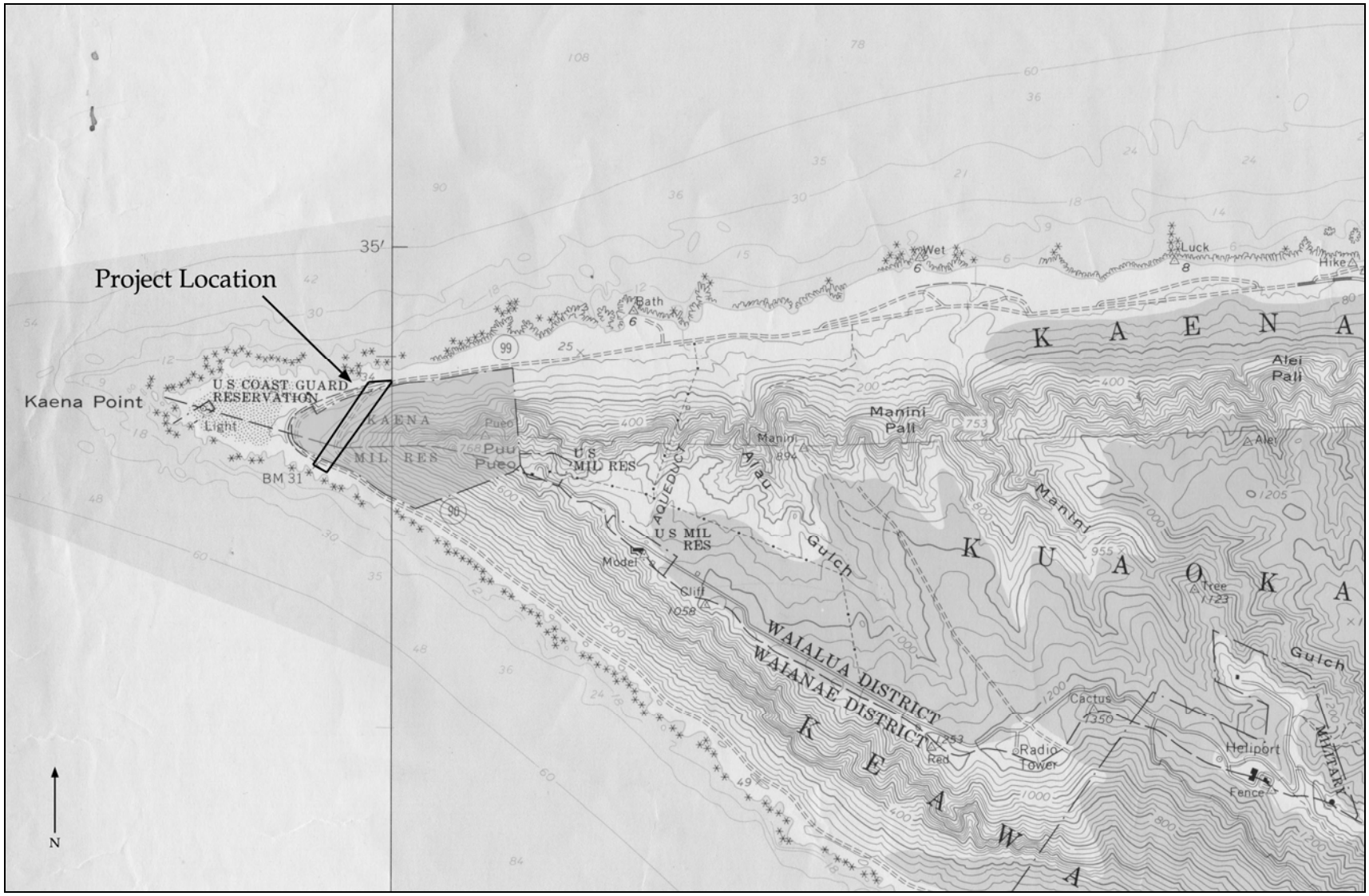

Fig. 1: General Location of Proposed Ka`ena Point Fence Project, Ka`ena and Keawa`ula on USGS Quadrangle (Scale 1:24,000 ft., Kaena, Hawaii Quad., 1983). Ka`ena Point Military Reservation is highlighted.

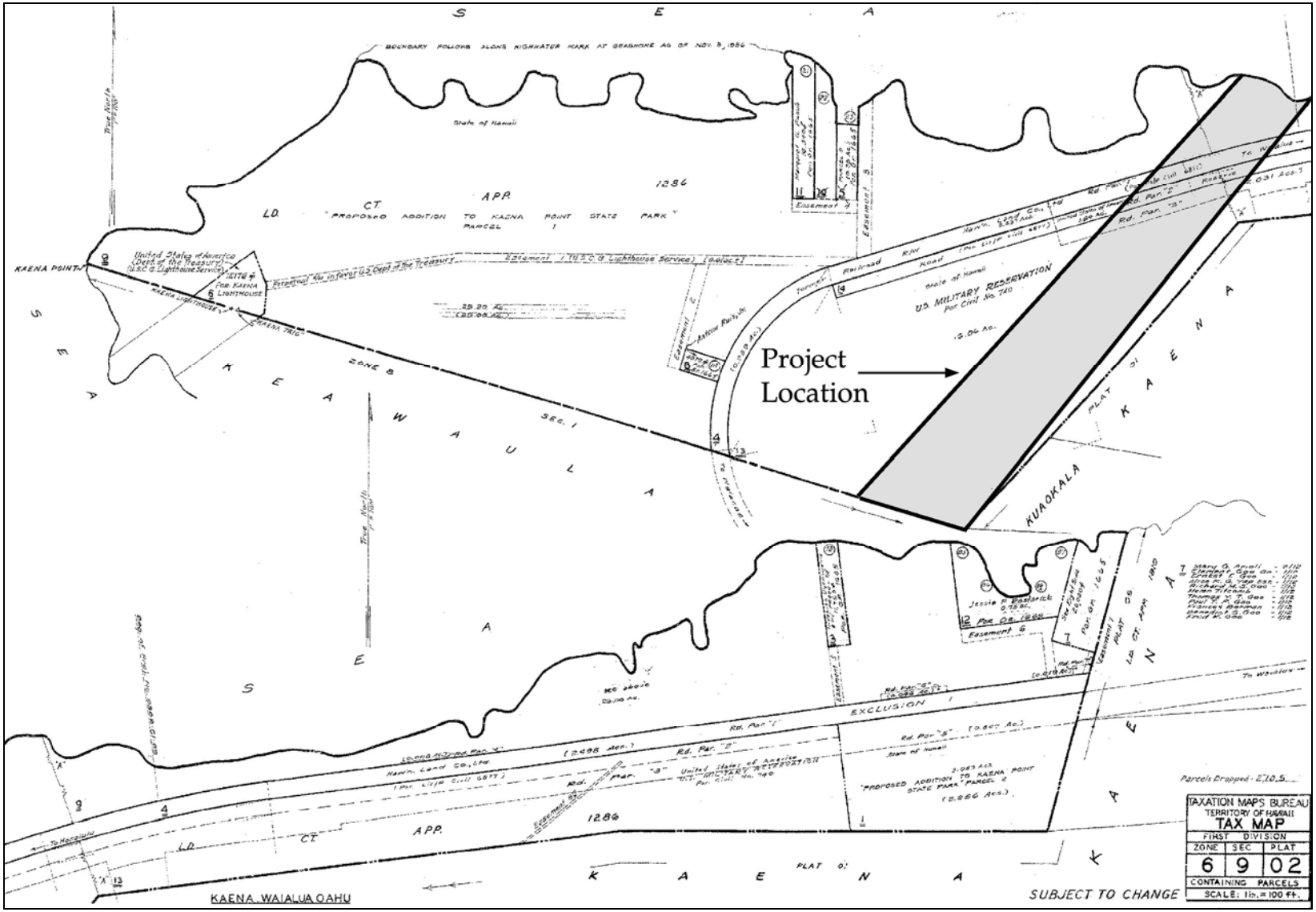

Fig. 2: General Location of Proposed Ka`ena Point Fence Project, Ka`ena, Waialua [TMK: (1) 6-9-02: 4, 9, 13, 14] on Realty Atlas, State of Hawaii, 32nd Edition, 1998.

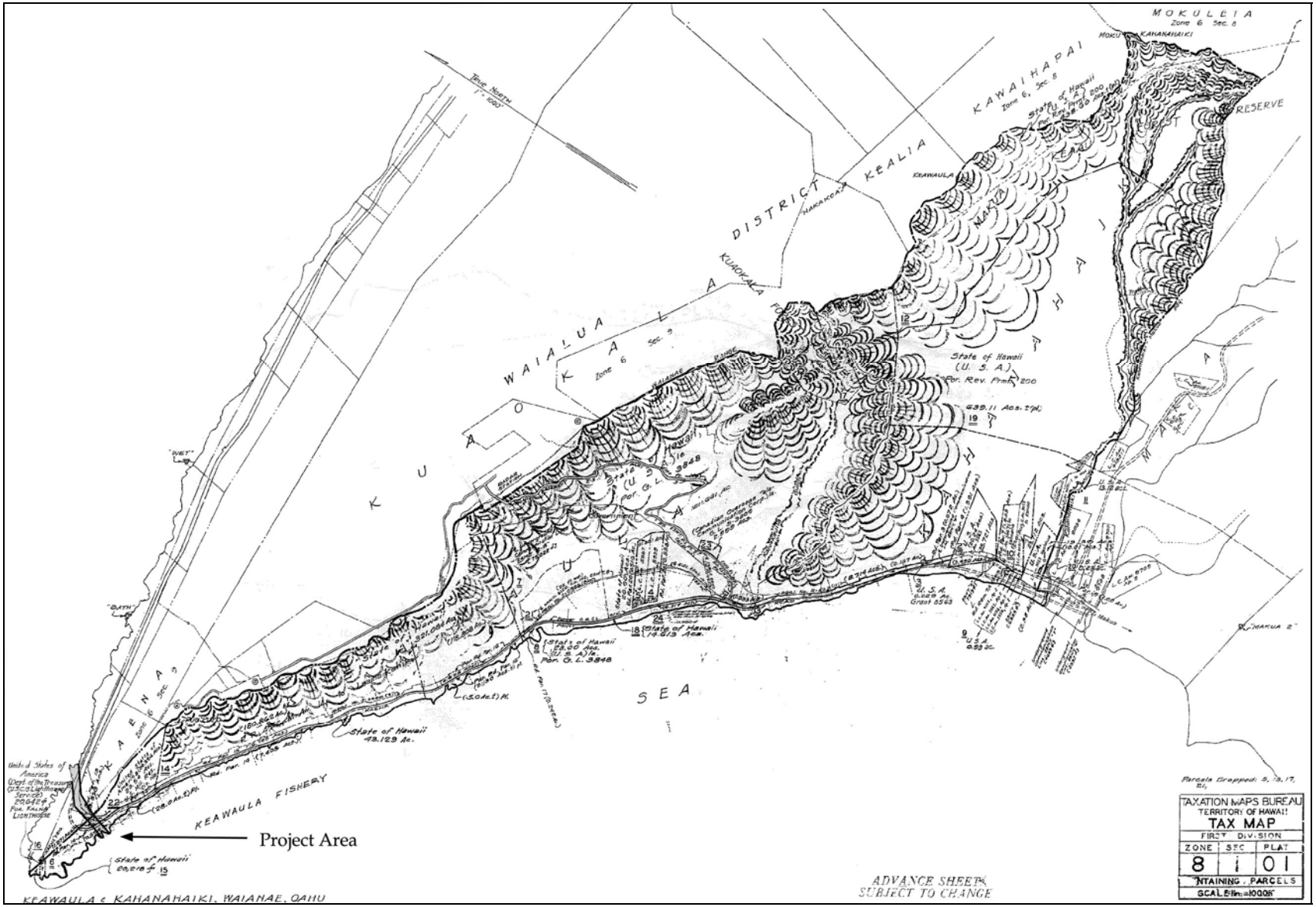

Fig. 3: General Location of Proposed Ka`ena Point Fence Project, Keawa`ula, Wai`anae [TMK: (1) 8-1-01: 6] on Realty Atlas, State of Hawaii, 32nd Edition, 1998.

Known and Possible Historic Properties at Ka`ena Point

Historic properties identified thus far at Ka`ena Point and within the probable project area represent one of the following three, and possibly four, major time-periods and uses:

- Native Hawaiian Subsistence and Cultural Uses: The earliest properties are associated with native Hawaiian subsistence and cultural uses and include pre-contact cultural deposits and burials sites, two stone features probably used for ritual purposes, and landscape features that are significant because of their association with known traditions.

- Pasturage and Ranching: The second grouping potentially reflects grazing or ranching activities that occurred in the area from the 1850s through the 1940s. To date, however, no structural features or other historic properties that could be uniquely or definitively tied to activities from this period were found during previous surveys or during the field inspections.

- Oahu Railway and Land Company (OR&L): The third grouping of historic properties includes those landscape modifications and stone features created during construction and use of the OR&L railway from 1897 to 1947.

- Ka`ena Point Military Reservation: The final grouping is associated with coastal defense facilities constructed by the United States military within the Ka`ena Point Military Reservation which was established in 1923. Constructed between 1923 and 1945, these facilities reflect technological changes in defense systems and strategies that were occurring between World War I and World War II and then the rapid escalation in defense constructed during World War II.

Native Hawaiian Pre-Contact and Early Historic Period Properties

To date, a total of five extant historic properties have been documented at Ka`ena Point which are considered native Hawaiian properties because they represent use of the area prior to Western contact or during the early historic-period (prior to 1850) when predominantly native Hawaiian cultural uses of the area prevailed.

Cultural Deposits and Features

The oldest of these properties may be the subsurface cultural deposits and burial sites located within the prominent sand-dune knoll near the point (Figs. 4 to 7). The cultural deposits were first documented in 1971 during the Statewide Survey of Historic Sites (Site No. 50-80-03-1183) (Bath and Napoka 1988; Yent 1991a: 8). Exposed deposits and remnant stone surface features were recorded in more detail during a 1982 recovery effort prompted by the obvious deterioration of the sand-dune knoll (Yent 1991a: 8). This deterioration was primarily attributed to off-road vehicle use (e.g., four-wheel drive, dune buggies, and motorbikes) which reduced vegetation cover and, in turn, prompted an

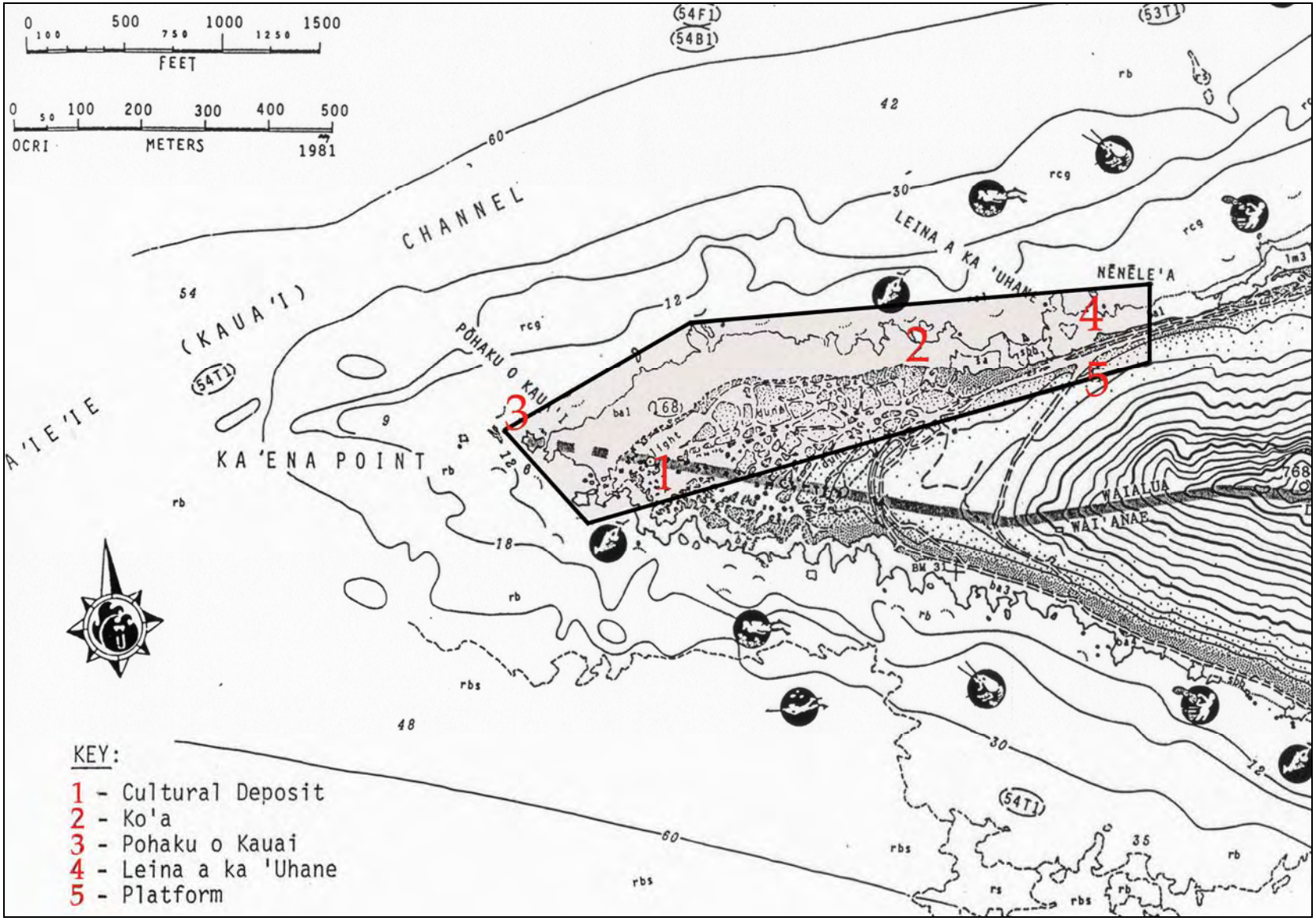

Fig. 4: Location of Ka`ena Complex (Site No. 50-80-03-1183) Boundaries and Major Contributing Features (adapted from Yent 1991a: 8).

Fig 5: Sand Dune Formation Covering West and North Portions of Ka`ena Point (Facing West). Note beacon light in distance.

Fig. 6: Raised Sand Dune Knoll Containing Cultural Deposits and 1989 Beacon Light. Note downed historic 1920 beacon tower to right of beacon (Facing West).

Fig. 7: Exposed Darkened Cultural Layer Near Beacon Light in Sand Dune (Facing South).

Fig. 8: Limestone Formation Named Leina a ka `Uhane or Soul's Leap (Facing West).

increase in wind erosion. Additional data recovery work was conducted in 1989 to mitigate the potential effects of installing the current beacon light and the continued deterioration of the dune remnant (Yent 1991a). The U.S. Coast Guard owns the parcel on which the lighthouse and most of the deposits are found.

Prior to 1989, the site was described as having remnant walls constructed of water-worn basalt stones and two distinct buried cultural layers exposed along the eroding faces of dune remnants (Yent 1991a: 8). The stone walls described on the north and east sides of the knoll in 1971 had been reduced to foundation alignments in 1982 and 1989. This also coincided with an increase in water-worn boulders scattered over the knoll by 1982. The two cultural layers were marked by dark, charcoal-stained sand containing coral and basalt *`ili`ili* (water-worn pebbles used as paving), pit features, a few artifacts (e.g., fishhook fragments, cut mammal bone, volcanic glass, coral and sea urchin files), and midden composed of bird and fish bone, crab, sea urchin, *kukui* nut fragments, marine shells, and charcoal pieces and flecks (Yent 1991a: 8, 12). In 1982, two partial burials exposed by erosion were removed and placed in a more stable reburial site for protection (Yent 1991a: 8).

When data recovery work was conducted in 1989, the upper cultural layer was no longer intact but excavation of the lower cultural layer provided a detailed description of the layer and its variability. An analysis of materials excavated from three test pits in this layer indicates the long-standing importance of fishing and marine resources in this dry, often wind-swept environment. The presence of habitation features in the cultural layer (e.g. living surfaces, *`ili`ili* paving, fire hearths, pits, and distinguishable levels) further suggests a sustained use of the area whether it be on a permanent or recurrent basis (Yent 1991a: 35, 37, 38).

Spatially, the primary cultural deposits on the knoll (Feature 1) extend over an area measuring approximately 30 by 50 meters (98 by 164 feet). Surface midden scatters and darkened sand exposures suggest that the deposits could extend an additional 300 meters (198 feet) to the east and 30 meters (98 feet) to the south of the primary knoll (Yent 1991a: Fig. 5, 12). While no similar deposits have been reported elsewhere in the dune system stretching along the western and northern shoreline of Ka`ena Point (Fig. 5), this site clearly establishes the possibility of cultural deposits and burials being in other sandy areas. This pattern of cultural deposits and burials in the surviving dune remnants, mostly stable knolls or raised, has been documented along the shoreline east and west of Mokuleia.

Stone Platforms

The two stone platforms included in the Hawai`i Register complex are thought to have been constructed for religious purposes (Fig. 4) (Bath and Napoka 1988, Yent 1991a: Fig. 4). Feature 2 was described in 1988 as a partially buried basalt boulder platform with coral pieces scattered among the boulder paving of the platform (Bath and Napoka 1988). The presence of coral and its location on distinct rise above the sand dunes suggested that it could be fishing *ko`a* (shrine or triangulation point). It was suggested that this could be

Fig. 9: Low Stone Platform Located on Rocky Knoll (Facing West). Site may be that labeled Feature 2 of Ka`ena Complex (Site No. 50-80-03-1183).

Fig. 10: Rocky Knoll with Stone Platform and Possible Fishing Shrine (Facing North). Site may be Feature 2 of Site No. 50-80-03-1183.

Fig. 11: Small Rectangular Platform and Possible Shrine Located on Slope above Leina a ka `Uhane (Facing West). Site is Feature 5 of Ka`ena Complex (Site No. 50-80-03-1183).

Fig. 12: View from Possible Shrine to Leina a ka `Uhane (Facing North). Gravel road and railway bed now separate the two features.

Alau`iki, a fishing shrine, recorded by McAllister in his 1930 survey of historic sites on O`ahu. He described Alau`iki as a "group of stones near the edge of the water, no different from other stones in the vicinity" (McAllister 1933: 127). Another map places Alau`iki farther east (Sterling and Summers 1978: 97). The feature shown in Figures 9 and 10 is in the general location of Feature 2 (Figs. 4).

The second stone feature, Feature 5, was described as a "small rectangular platform of basalt cobbles, with scattered coral on the surface" and as being 150 meters (492 feet) upslope (south) of the limestone formation called Leina a ka `Uhane (Soul's Leap) (Figs. 11 and 12) (Bath and Napoka 1988). Its possible religious function is suggested by its size, the presence of coral, upright stones along the edge of the platform, and its vantage point. The ritual nature of Features 2 and 5 are consistent with the prevalence of known fishing shrines in the area and the richness of its off-shore fisheries. McAllister recorded eight named *ko`a* between Keawa`ula and Mokule`ia (McAllister 1933: 124-129; Yent 1991a: 42).

Pohaku o Kaua`i and Leina a ka `Uhane

The two natural formations identified as part of the Hawai`i Register complex, Features 3 and 4 (Fig. 4), should be considered and treated as traditional cultural properties during the federal historic preservation review process. The identification and evaluation of these otherwise natural features rely entirely on known native Hawaiian traditions and beliefs. Feature 3 is a large, partially submerged rock outcrop named Pohaku o Kaua`i (*Lit.* Stone of Kaua`i) (Figs. 13 and 14) and the other a large limestone formation named Leina a ka `Uhane (*Lit*. Leaping Place of Ghosts) (Figs. 8 and 12).

Pohaku o Kaua`i marks the end of a series of partially submerged rock outcrops that form the westernmost extent of O`ahu Island (Fig. 14). As such, it is the westernmost piece of land on O`ahu and that which is closest to the Island of Kaua`i. According to two recorded traditions, this rock formation was once a part of Kaua`i (Bath and Napoka 1988). In one tradition, the heroic demigod Maui attempts to join the islands of Kaua`i and O`ahu by standing at Ka`ena Point and using his famous hook, Manaiakalani, to pull Kaua`i towards O`ahu (Sterling and Summers 1978: 92-93). When he pulled the hook, only a single, huge rock from Kaua`i falls at his feet. This rock then became known as Pohaku o Kaua`i.

In the other tradition, a Kaua`i chief named Ha`upu, a chief known for great feats of strength, hurled a huge boulder from Kaua`i towards O`ahu to forestall what he thought was a fleet of O`ahu warriors about to invade Kaua`i (Sterling and Summers 1978: 93-94). The group was, instead, driving fish towards nets laid off-shore of O`ahu. When the huge boulder fell, it killed the chief Ka`ena who was leading the fishing drive and many of his followers. From then on, the point bore the name of this chief and the large rock was called Pohaku o Kaua`i. Pohaku o Kaua`i is mentioned in other traditions but plays only an incidental role in their story lines (Sterling and Summers 1978: 93-94, 96). The fact that it is mentioned at all demonstrates that it was a commonly known landmark and one worthy of weaving into traditions with a broader scope.

Fig 13: Basalt Rock Formation Named Pohaku o Kaua`i (Facing West). The named rock is the most distant formation in the photograph.

Fig 14: Alignment of Partially Submerged, Rocky Outcrops Forming the Western Point of O`ahu with Pohaku o Kaua`i in the Distance (Facing West).

The limestone formation called Leina a ka `Uhane (Figs. 8, 12, 19, 36) is now the most recognizable and tangible representation of native Hawaiian traditions and beliefs that identify Ka`ena Point as a place where the fate of departing souls is determined as death nears. Departing souls would either pass into one of several spirit realms or be returned to the body to continue life. The fate of these souls often depended on the help or absence of friendly *`aumakua* (ancestral family or personal god) that would guide a soul to the appropriate realm. Such places were said to be on each of the islands (Kamakau 1964: 49).

The earliest reference to definitively associate these beliefs with this particular limestone formation appears in a 1933 newspaper article. It describes Leina a ka `Uhane as the "stratified and overhanging mass of granular limestone between the track and the sea, near No. 63 culvert as the railroad begins to straighten out after the bend" (Sterling and Summers 1978: 94). In another account, one that describes an 1899 trip to the Hale`iwa Hotel on the railway, the train whistle blows at Ka`ena Point and then the passengers saw "Leina-kahuna" (Laina-kauhane) (Sterling and Summers 1978: 94).

The most detailed account of a soul's progression towards spirit realms or a return to life is from S.M. Kamakau in two 1870 newspaper articles (Kamakau 1964: 47-49). He describes the "*leina a ka `uhane* on Oahu" as being "close to the cape of Ka`ena, on its right (or north, *`akau*) side, as it turns toward Waialua, and near the cutoff (*alanui `oki*) that goes down to Keaoku`uku`u." He also depicts this *leina a ka `uhane* as having boundaries. One boundary was at "Kaho`iho`ina-Wakea, a little below Kakahe`e" (probably somewhere within the vicinity of Camp Erdman and the Dillingham Airfield[2]) and the other at "the leaping place (*kawa-kai*) of Kilauea at Keawa`ula" (near the southwestern side of today's Yokohama Bay[3]). At these boundary places, the "helpful *`aumakua*" might bring the soul back to life or guide them to the realm of the *`aumakua*. Places "within these boundaries" were "where souls went to death in the *po pau `ole*, endless night." These boundaries, if correctly located, create an area stretching 4 miles east of the point along the northern shoreline and 3 miles to the southwest of the point along the southwestern shoreline.

Also describing these beliefs as a progression with thresholds of passage is Holokala, McAllister's informant, in 1930. As the soul wanders from an individual nearing death, it comes first to the fishing shrine named Hauone (Site 189; McAllister 1933: 57, 124, 126). At this point, the soul either returns to the body to fulfill its obligations on earth or

[2] The estimated location of Kakahe`e is based on the relative positions of four villages visited by the missionary Levi Chamberlain prior to 1849 (Sterling and Summers 1978: 89) and Emerson's 1896 map (Fig. 16). After turning O`ahu's western point, Chamberlain mentions four villages: Nenelea, Kahakahee, Aukuu, and Mokuleianui. Emerson's map shows a survey point called Nenelea and Mokuleianui probably corresponds to Mokule`ia Ahupua`a. If these settlements are proportionately spaced, Kakahe`e would be in the vicinity of Camp Erdman and the Dillingham Airfield. This also assumes that Kakahe`e is a contraction of Kahakahee.

[3] Two other references mention a Kilauea at Keawa`ulu. McAllister calls the exit of Poha Cave "Kilawea" which he locates at Yokohama Bay (McAllister 1933: 124; Site 184; Yent 1991b: Fig. 3). The "sea cove of Kilauea" is mentioned before the train reaches Ka`ena Point in an 1899 newspaper account of a trip to the Hale`iwa Hotel (Sterling and Summers 1978: 94).

wanders on to "Leina Kauhane at Kaena Point" where "two minor gods" throw the soul into a "pit known as Lua ahi a Kehena" (McAllister 1933: 126). Death occurred when the soul is thrown to the pit. The fishing shrine Hauone was located between Camp Erdman and the western end of Dillingham Air Field (Fig. 16). This coincides broadly with the northeastern boundary described by Kamakau as being at Kakahe`e. Neither Holokala nor McAllister mention the limestone formation and McAllister places the site number of "Leina Kauhane," Site Number 186, at the western extent of Ka`ena Point.

Potential Native Hawaiian Historic Properties

Based on historic accounts and recorded traditions, yet to be identified historic properties are most likely to reflect uses and customs associated with the area's rich fisheries and the lack of any other dominant land uses on a coastal flat consistently described as "waterless" and known for its stifling heat (McAllister 1933: 127). Such unidentified properties could include additional *ko`a* (fishing shrines), the remnants of shelters and settlements for fisherman, burials, canoe landings, and salt-making sites. Historic-period uses of the point have, however, significantly reduced the probability of these properties surviving on the flatter portions of the point or along lower ridge slopes. Much of this area was altered by construction of the railway in 1897 and military coastal defense structures beginning in 1923.

The routine importance of fishing and salt making for native Hawaiians of the region is captured by John .S. Emerson in his 1854 survey notes (Emerson 1854). The notes were submitted to verify the purchase of five government grants stretching from Ka`ena Point eastward along the north coast of Waialua (Figs. 15 and 16). Emerson asks that the government reserve "a right to fisherman & to land [and to] dry & mend nets & to all who wish to make salt as in former days" (Emerson 1854)[4]. He warns that "many persons may be vexed for a lack of a privilege" if it should be conveyed, exclusively, with the purchase of a government grant.

In addition to a right to fish, the survey note confirms the importance of other activities associated with fishing and a perception that access to places suited to these activities might be curtailed when privately-owned parcels were established along the coast. Fishing would be hampered if canoes could not land in customary locations, if fishermen could not use areas suitable for drying and mending nets, or if salt could not be made, in part, to salt and thus preserve fish and other marine resources. Favorable canoe landings might be identified today based on shoreline characteristics and knowledge of in-shore waters, but it would be more difficult to identify specific places where nets were dried and mended or salt was made. These activities would probably take advantage of natural features that did not necessarily require constructed features or landscape modifications.

[4] Under one grant Emerson wrote this requested reservation in Hawaiian: *"Koe i na kanaka lawaia kahi e komo ai na waa a e maloo ai na upena a me kahi e koau ai kapaakai ma na aa pohaku.*"

Fishing and Fisherman Camps and Settlements

The nature and value of the off and near-shore fisheries at Ka`ena Point are also conveyed in recorded traditions and customs. The origins of some of these rich fishing grounds are explained in the legend of Mikoha. One of the legend's characters, Kaihukoa, moves to Wai`anae where she marries a chief named Ka`ena and transforms herself into the fishing grounds located "directly out from the Kaena Point" (Sterling and Summers 1978: 87). She brings with her the "the *ulua*, *kahala*, and the *mahimahi*." Keawa`ulu, the *ahupua`a* of Wai`anae District which extends into the southern third of the point (Figs. 1 to 3), was known for its *aku* and *ahi* fishing grounds (Ii 1959: 98). The coastal fisheries were also noted as particularly productive when submerged, woven basket traps (*hina`i*) were used to catch *kala* and *hinalea*. When describing basket traps in general, Kamakau notes a particular pattern and size of basket trap that was made for *kala* fish at Ka`ena, O`ahu. He also states that Ka`ena was said to be "a land abounding in kala fishs" and describes in detail the methods, rituals, prohibitions, and communal effort involved in making and using basket traps fashioned specifically for *kala* (Kamakau 1976: 82). There were also "plenty of *hinalea* caught by setting traps from the water (*wai*) of Kumalaekawa to the cape of Ka`ena–so many that a stench arose from the racks where they were drying" (Kamakau 1976: 82). Basket traps for catching *hinalea* were also made in strict adherence to particular *kapu*.

Fisherman settlements and camps near Ka`ena Point were first described by the missionary Levi Chamberlain during his trip along the Wai`anae and Waialua coastline sometime prior to 1849 (Sterling and Summers 1978: 60, 89). He traveled northwest by canoe from the village of Keawa`ula (today's Yokohama Bay) to a "cove," presumably a canoe landing, at the southeastern side of Ka`ena Point. In "front of the little cove" was "a cave used by fishermen occasionally for a residence" which was about 30 feet high and had dimensions of 30 and 15 paces (Sterling and Summers 1978: 60). The cave is described as being at "nearly the west point of the island" and south of the Wai`anae and Waialua District boundary which dissects Ka`ena Point in an east-west direction (Fig. 1). He traveled from the cave "a short distance over a very rough path along the shore and came to the mokuna (boundary) of the large divisions of the island Wainai and Waiarua" (Sterling and Summers 1978: 60). This may be the cave called "Ke Ana Moe of Ka`ena" by an informant in 1954 which was said to be used by travelers from Makua to Waialua (Sterling and Summers 1978: 86). This cave may have been obscured by construction of the railway bed.

As Chamberlain heads east of Ka`ena Point, he describes passing "Nenelea a settlement of fisherman and a convenient place for hauling up their canoes" (Sterling and Summers 1978: 89). Based on a labeled survey point (Fig. 16) (Emerson 1896), Nenelea is probably about a mile east Ka`ena Point. Another indication of fishermen settlements may be the "few old house foundations" described by McAllister as being located inland of the railway at Ka`ena Point in 1930. They were rectangular and measured approximately 14 by 20 feet (McAllister 1933: 124). The population of Ka`ena, presumably the entire *ahupua`a*, was listed as 49 individuals for the year 1831 to 1832 (Yent 1991a: 5). This would include all those living on lands from the end of Dillingham

Field to Ka`ena Point (Fig. 16). The boundary between Waialua and Wai`anae Districts divides the point with Ka`ena Ahupua`a taking the northern three-quarters and Keawa`ula Ahupua`a the southern quarter (Figs. 1 to 3).

This emphasis on fishing suggests that additional *ko`a* (fishing shrines) could still be identified along the shoreline or upslope given their known prevalence in the area. McAllister's informants in 1930 identified at least eight named *ko`a* between Keawa`ula and Mokuleia (Yent 1991a: 42; 1991b: 7, Fig. 8). These shrines may not, however, be readily identified as some were no more than several, otherwise indistinct, stones (McAllister 1933: 127).

Salt-Making

A document other than Emerson's survey notes refers to Ka`ena Point as being an important source of salt. In discussing squid (probably octopus) caught off of Mokuleia, a 1905 article in Thrum's Annual notes that salt used in preparing squid likely came from Ka`ena Point "from salt water evaporation in the holes of rocks so plentiful on that stormy coast" (Sterling and Summers 1978: 96). Future surveys should try to identify any areas appearing to be particularly amenable to salt making or having a concentration of holes serving this purpose.

Trails

Other activities described at Ka`ena Point are those associated with the major trail that linked settlements along the Wai`anae coast with those of Waialua on O`ahu's north shore. In portraying the major trails on O`ahu in the early 1800s, John Papa Ii emphasizes the timing of travel at Ka`ena so that the worst of the region's heat can be avoided. He advises that if travelers arrived at Ka`ena in the morning, "they escaped the heat, for they were cooled by the Moae breeze" (Ii 1959: 98). They subsequently went on to Waiakaaiea where they rested "until afternoon, and then continued traveling along the level places of Kawaihapai and Mokuleia." Waiakaaiea is located approximately 1.7 miles east of Ka`ena Point and is also mentioned in the legend of Pikoi-a-ak-Alala as being a canoe landing[5] (Sterling and Summers 1978: 95).

Levi Chamberlain's account emphasized the roughness of the trails. That from Keawa`ula to the point was described as "three or four miles of very rough road laying along the base of the mountain and over rugged lava washed by the sea" and the segment from the canoe landing to the Wai`anae-Waialua District boundary was "a very rough path" (Sterling and Summers 1978: 60). Both accounts mention alternatives. Chamberlain's account demonstrates a preference for travel by canoe which avoids the rugged trail if sea conditions allow. Ii mentions routes that cross the mountain ridge and thus avoid the longer walk around the point and the heat. One route ran from Makua "up

[5] A survey point labeled Kawaiakaaiea on Emerson's 1896 map indicates the approximate location of Waiakaaiea. This is generally consistent with a 1954 informant who places it at a "dry stream past Camp Erdman" (Sterling and Summers 1978: 91).

the mountain and down to Kawaihapai" and the other from Mokule`ia to Makaha (Ii 1959: 98).

A subsequent account suggests that the trail had not improved much by 1880. The four miles between Kawaihapai and Ka`ena were described as "by no means pleasant riding" with the "barren tract, full of boulders large and small, and for the traveler on horseback the route is simply abominable." The "splendid view" at the point, however, did compensate for the "weariness of the barren and rocky road" (Bowser 1880: 490). The five mile stretch from Ka`ena to Makua was worse and deemed "one of the most rugged roads to be found in Oahu." Travel was described as being more "wearisome than dangerous" and proceeding at an "exasperatingly-funeral pace" as the trail "skirts the sea" (Bowser 1880: 490-01).

No remnants of this trail or associated features have been identified. In some sections, the railway and unpaved roads may have obliterated traces of earlier trails if they followed the same route. Features or places potentially associated with the early trail could include trail markers or curbstone alignments, named resting places (*o`io`ina*), shelters, or stone paving used to stabilize the trail. The 1929 and 1940 quadrangle maps of Ka`ena Point (Fig. 17) (Unites States Geological Survey 1929, Army Corps of Engineers 1940 ) and aerial photographs taken in 1939-1940 show a trail or unimproved road paralleling the railway alignment. Some trail segments visible upslope of the railway alignment in Keawa`ula could still be intact (Fig. 35).

Kuaokala Heiau

Another potential historic property to consider when assessing the project's visual effects is a *heiau* once located on the upper crest of the ridge west of Pu`u Pueo. A survey point on Emerson's 1896 map[6] is labeled, in pencil, "Kuaokala Heiau" (Fig. 16) (Hammatt, Shideler, and Borthwick 1993: 8-9). In his 1907 list of *heiau* on O`ahu, Thrum places "Kuokala" Heiau at "Waianae, overlooking Kaena Point" and attributes its construction to settlers from Kaua`i (Hammatt, Shideler, and Borthwick 1993: 10). He notes it was in "ruins." In 1906, Emma Nakuina identifies a *heiau* "at Kuaokala, Waianae" as one of two *heiau* dedicated to "sun-worshiping."

Two other sources reference a "temple at the top of the mountain" (Sterling and Summers 1978: 95) and "the remains of an old *heiau*, or temple of the *native* gods" on "top of a hill near Kaena Point" (Bowser 1880: 491). In first reference, the great fish Kumunuiakea, is dragged to this *heaiu* with its tail leaving a mark on the landscape. In the second, a 1880s guide for travelers, describes the temple as measuring 40 by 20 feet and having walls eight feet tall. It is not clear that all the sources cited refer to the same *heiau* or to that

[6] The 1896 Register Map (1784) is attributed J.S Emerson. This could refer to John S. Emerson or to his son, Joseph S. Emerson. John S. Emerson surveyed the boundaries of the government grants depicted on the map in the 1850s but died in 1867 (Sahlins 1992: 6). His son Joseph worked for the Hawaiian Government Survey from 1877 to 1904 (Moffat and Fitzpatrick 1995: 31).

located by Emerson[7]. Kuaokala is the name of the ridge forming the western terminus of the Wai`anae Mountain range and a land division that encompasses the relatively flat and broad crest of this ridge which is bounded by Ka`ena to the north, Keawa`ula to the southwest, and the *ahupua`a* of Kealia to the east (Figs. 1 and 2). This land division may be an *`ili* of Ka`ena *ahupua`a* as only Ka`ena, not Kuaokala, is listed when lands were divided among the chiefs during the 1848 Mahele. In many cases, *heiau* carry the name of the land on which they are located. The existence of this *heiau*, or any remnants of it, has not been confirmed. After reviewing available information, Hammatt, Shideler, and Borthwick (1993: 8-10) believed that McAllister in his 1930 survey mistakenly assumed that the "Kuakala heiau" mentioned in the literature was the same as Mokaena Heiau. Mokaena Heiau is located to the southwest and primarily overlooks Yokohama Bay.

Pasturage and Ranching (1850s–1922)

The first reference to lands at Ka`ena Point being used for pasturage appears in survey notes prepared by J.S. Emerson for Royal Patent Grants 1804, 1805, 1806, 1807 and 1665 (Emerson 1854) (Figs. 15 and 16). Grant 1665 covers most of the point and the project area. Emerson notes that individuals receiving these five government grants only wished to use the land for pasturage ("Pasturage is all they now profess to desire") and that the customary right to fish and make salt was "a privilege which these men have not paid for" when purchasing the grants.

These five government grants not only reflect a district-wide attempt by Waialua residents to secure land for pasturage, but they may also provide evidence that permanent settlements were absent along the western-most stretch of this coastline in 1850. These particular grants are five of 12 issued in Ka`ena Ahupua`a and five of 290 issued to native Hawaiians in the *ahupua`a* from Kamananui to Ka`ena (Emerson 1896, Sahlins 1992: 168-69). More government grants were issued to native Hawaiians in these *ahupua`a* than in all government-held *ahupua`a* on O`ahu combined.

Several factors contributed to these high numbers. First the *ahupua`a* of Kamananui, Mokule`ia, Kawaihapai, Kealia, and Ka`ena all became government lands in 1848 which made them eligible for sale after 1850. Chiefess Victoria Kamamalu, a granddaughter of Kamehameha I and sister of Kings Kamehemeha IV and V, inherited Waialua District from her mother Kinau in 1839 (Sahlins 1992: 46, 167; Alameida 2003: 40). Kamamalu then relinquished the lands from Kamananui to Ka`ena to Kamehameha III during the Mahele of 1848 and he subsequently designated them government lands. The second factor was John S. Emerson, the American Board of Commissioners for Foreign Missions (ABCFM) missionary assigned to Waialua, who was tireless in his attempts to help the mostly native Hawaiian residents of Waialua obtain fee-simple title to lands during the mid-1800s when customary land tenure was being converted to one of private ownership (Sahlins 1992: 168, Moffat and Fitzpatrick 1995:54-55, and Alameida 2003). The third factor centers on conflicts that became acute during the 1840s over the use of *ahupua`a*

[7] The location of the *heiau* described by Bowser is somewhat ambiguous. He says it is located on top of a hill near Ka`ena Point but only describes it after reaching Makua in the account of his travels. He does not mention it when describing Ka`ena Point or when passing through Ka`ena.

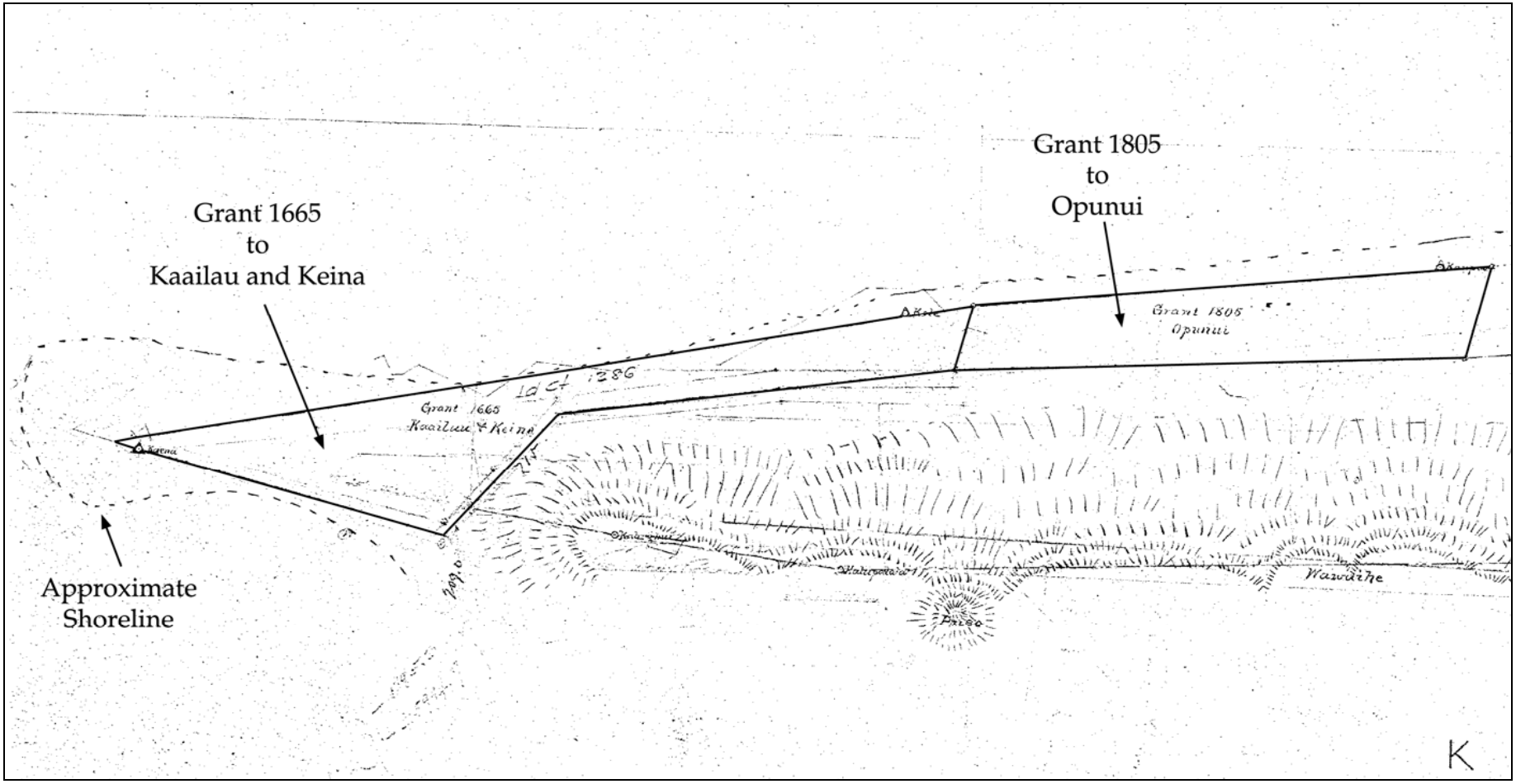

Fig. 15: Location of Grants 1665 and 1805 as Shown on 1896 Map Surveyed by J.S. Emerson (Emerson 1896). Grant boundaries and shoreline were darkened. Grants were obtained primarily for pasturage.

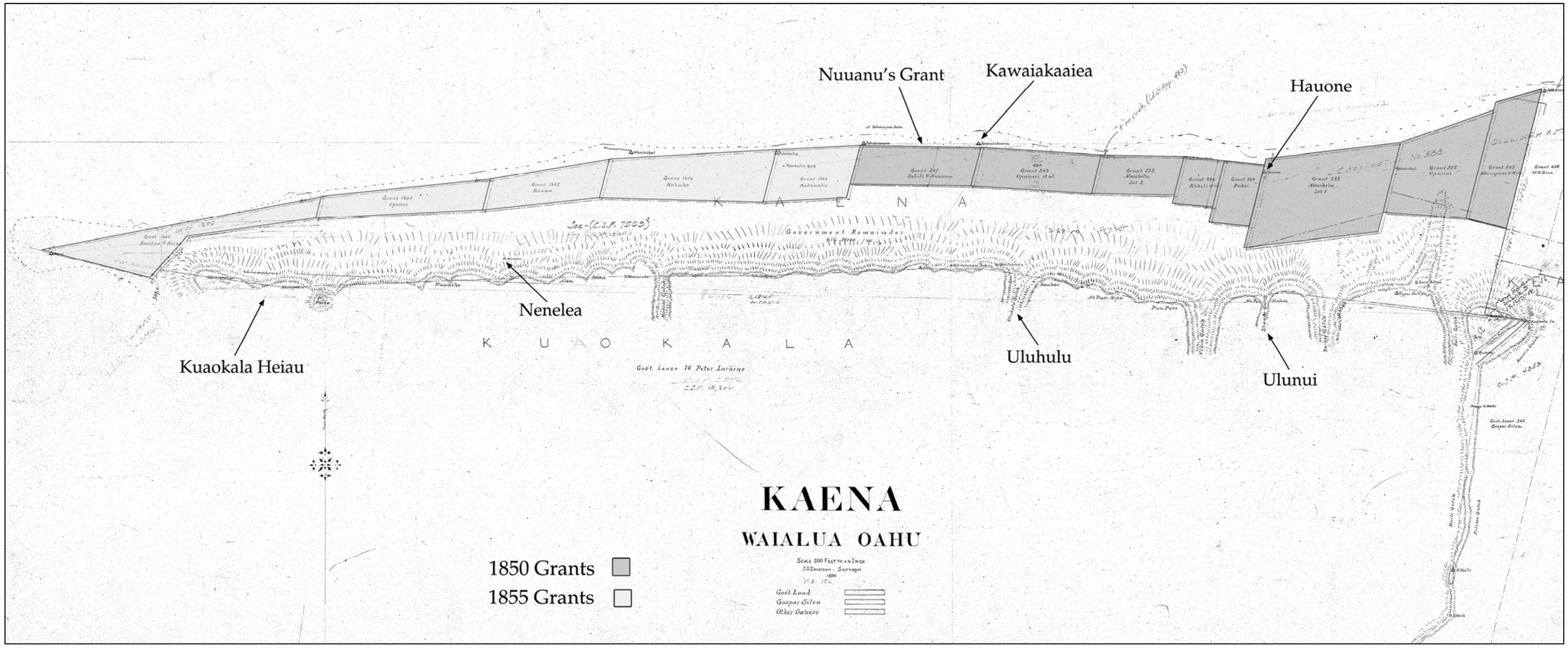

Fig. 16: Location of Government Grants Surveyed and Mapped by J.S. Emerson between 1850 and 1855 as shown on 1896 Map (Reg. Map 1784). Shading distinguishes grants issued in 1850 from those issued in 1855. Annotated places names are discussed in the text.

grasslands and uncultivated lands for pasturage. The *ali`i* who controlled the large *ahupua`a* began to use these lands to graze large herds or to lease them to foreigners for pasturage. Uncontrolled herds were entering cultivated fields of the residents and damaging their crops and were also depleting their source *pili* grass which was essential for thatching (Sahlins 1992: 136, 148-49, 167, and 168). The residents of Waialua also complained that the *ali`i* landholder or agents were denying them use of uncultivated grasslands for grazing as the residents themselves began to acquire their own animals. Access they formerly had to grasslands and other resources of an *ahupua`a* was gradually being denied or diminished.

There were two mechanisms by which *ahupua`a* residents could obtain fee-simple title to land at that time. They could submit claims to the Board of Commissioners to Quiet Land Titles (Land Commission) between 1848 and 1854 and they could purchase government lands which were called Royal Patent Grants (Sahlins 1992: 9, 14, 136, 168; Alameida 2003: 42-43). Lands claimed by native tenants before the Land Commission could only be those that were in active use as house lots or were under cultivation. There were no such restrictions for government grants which allowed the acquisition of much larger parcels and, in some cases, parcels the grantee had not been using or did not previously possess. Emerson actively encouraged tenants of Kamananui, Mokule`ia, Kawaihapai, Kealia, and Ka`ena to withdraw claims made before the Land Commission and to purchase, individually or in a *hui* (a collective), government grants which would be much larger and of sufficient size to compensate for the pasturage and other resources they were being denied in the *ahupua`a* as a whole (Sahlins 1992: 168; Alameida 2003: 42-43). At least 73 claims before the Land Commission were withdrawn in these *ahupua`a* (Sahlins 1992: 168; Alameida 2003: 32). Emerson asked to be and was appointed the government land agent for the district to help process the purchase and mapping of the grants.

The 12 government grants sold in Ka`ena Ahupua`a broadly conform to these generalizations. A significant number were purchased collectively by multiple individuals. Five of the 12 grants in Ka`ena were purchased by two, three or four individuals (Table 1). At least one individual, Nuuanu, withdrew claims submitted to the Land Commission in 1848 and subsequently purchased, along with Kahili, a grant in Ka`ena (Fig. 16). This 30-acre grant appears, in part, to encompass inherited lands which were therefore probably in his possession prior to 1848. His Land Commission claim included six dispersed parcels that were all within Ka`ena (Board of Commissioners to Quiet Land Titles 1848: Vol. 4: 543). One parcel was for a house lot, three were for *lo`i* (irrigated taro patches), one included a single *lo`i* and small piece of *kula* (non-irrigated land), and one was a small piece of *kula*. As the house was from his parents and he calls the parcel with 10 *lo`i* "ancient," use of these lands extends, at a minimum, back to the late 1700s or early 1800s. Some ties between his Land Commission claims and his grant can be traced through place names. Four of the five places named in his Land Commission claims can be matched to names on Emerson's 1896 map (i.e., Kaaiea is probably Kawaiakaaiea; Wehulu is Uluhulu; and Ulunui is identical to Ulunui) (Fig. 16). Emerson's bench mark named Kawaiakaaiea is immediately seaward of Nuuanu and

Kahili's grant and probably confirms that his grant encompassed at least two of his claims[8]. The other two named areas are within a mile of the grant to the east.

The five western-most grants at Ka`ena, Grants 1804, 1805, 1806, 1807 and 1665, are likely examples of grants purchased in Waialua primarily for pasturage and ones that were not in the grantee's possession prior to 1848 (Fig. 16). This is most strongly supported by Emerson's explicit statement that the grantees only wished to use the parcels for pasture (Emerson 1845) and by the fact that he did not mention house lots (*pahale*) or cultivated fields in his survey notes although he clearly raises the issue of customary rights. No 1848 Land Commission claims for house lots or cultivated plots were recorded in this area as occurred farther east along the coast. The rates these grantees paid for the lots also indicate their use for grazing. The rates for these five parcels ranged from 48 to 74 cents per acre with the average rate being 59 cents. According to Emerson's correspondence, the going rate for good, cultivatable lands was $2 per acre; 37½ cents for good *kula* in which the grantee had a previous right; 25 cents for poor *kula* in which the grantee had a previous right; and 50 cents per acre for *kula* in which the grantee had no previous right (Sahlins 1992: 168). The five parcels appear to fall within this last category in which the purchaser had no specific or previous rights to the purchased *kula* lands.

These five western grants were also purchased five years after the seven grants covering the eastern half of the Ka`ena coastline (Table 1). The 1850 grants probably encompass areas in which grantees, such as Nuuanu, had ancestral ties and were using the land for residential and agricultural purposes (Fig. 16). In the 1930s, 20 *lo`i* with stone facings below Uluhulu Gulch were still evident in the eastern half of Ka`ena Ahupua`a as was the spring providing water for irrigated *lo`i* (Handy and Handy 1972: 467). Sweet potato had been the principle crop cultivated along the narrow strip of land between the shoreline and the abrupt cliff faces of the ridge. The agricultural potential of the land diminished westward towards the point.

Most of the government lands and private lands at Keawa`ula and Ka`ena were leased for ranching during the second half of the 1800s and first half of the 1900s. A major portion of Keawa`ula became government land after Laamaikahiki[9] relinquished "½" of the *ahupua`a* to the King during the 1848 Mahele and the King then designated it government land (Yent 1991b: 5; Barrère 1994: 395). The 218.75 acres Laamaikahiki received (R.P. 4522) was hardly half of the *ahupua`a* and also seems to have been some

[8] Nuuanu's 1848 claim was for: A "house lot, which is an old one, from the makuas;" ten *lo`i* at Keokuukuu which was from ancient times; one *lo`i* at Kaaiea 1; one *lo`i* at Kaaiea 2; one *lo`i* and a small *kula* at Wehulu, and a small *kula* at Ulunui (Board of Commissioners to Quiet Land Titles, Native Register Vol. 4: 543).

[9] Little is known about Laamaikahiki although he was of sufficient status to be one of the 252 "Konohiki" to be in possession of large land divisions in 1848. This was the only *ahupua`a* he held (Barrère 1994: 395).

Table 1: Summary of 13 Royal Patent Grants Issued to at Least 18 Individuals, Ka`ena, Waialua. Grants are listed in order from Ka`ena Point west. Names from condemnation papers may indicate families with ancestral ties to Ka`ena.

Grant Number	Grantee	Year Granted	Acres	Place Names Potentially Associated with Grant Based on 1896 Map	Names Listed in Court Condemnation Papers
1665	Kaailau Keina	1855	32	Kole (benchmark); Pueo (hill, inland); Haliipalaia (survey point inland);	
1805	Opunui	1855	26	Wawaihe (inland); Kaupoo (benchmark)	Annie Maunalaahia Billsborough; Kahakauwila; Kauakahiakua
1807	Kauwa	1855	23.10	Nenelea (survey point inland); Alau (inland)	Amia (k)
1806	Kahuhu	1855	43	Keekee (inland); Manini Gulch; Maninikai (benchmark); Maniniuka (survey point inland)	Kekuawae
1804	Kahunalii (k)	1855	25	Koleakaahia (survey point inland)	
247	Kahili Nuuanu[10]	1850	30	Aleu (inland); Kawaiakaaie (benchmark); Holoihonuamea Rocks (inland); Pohakumana (benchmark and rocks)	
248	Opunui Moa Mokunanea Kama	1850	30	Mailekiekie (survey point inland); Uluhulu (inland); Kauhao (inland)	Kahakauila; Kahaule, Gaspar Sylva; Kaiohema; Nailima; Kahuhu; James Finney; Henry Opunui; Daniel Pohakahi; Kenneth K. Hann
232 (Lot 2)	Naaihelu Wahinaemaikai Maili	1850	89 (part)	Na Puu Kipe (inland)	John Ii
246	Kahili	1850	12	Puu Pueo (inland)	Kahanana; Mahaoe; Gaspar Sylva; Opunui, Kahau; Kanewahine
244	Puaki	1850	16	Nihoa Gulch (inland)	Kahiwa; Luhea; Kuahu; Laioha; John Kahuakai; Gaspar Sylva
232 (Lot 1)	Naaihelu Wahinaemaikai Maili	1850	89 (part)	Ulunui Gulch (inland); Keekee Gulch (inland); Aeakukui (survey point on boundary)	
228	Opunui	1850	43	Aeakukui (survey point on boundary)	
243	Hoonapuni Kila	1850	34	Halii Gulch (inland); Kalehu (benchmark)	

[10] Nuuanu submitted a claim to the Land Commission in 1848 (LCA #10360) but later withdrew his claim.

of the least accessible and usable land in the *ahupua`a*[11]. His parcel spanned the rocky slope and shoreline northwest of Yokohama Bay to the Waialua-Wai`anae District boundary that divides Ka`ena Point. In 1873, Samuel Andrews leased both Laamaikahiki's and the government's lands at Keawa`ula for ranching (Yent 1991b 6; Hammatt, Shideler, and Borthwick 1993: 15). He transferred the lease in 1901 to L.L. McCandless who continued to lease the government lands until 1925 when he lost a bid for the lease to Frank Woods. Woods, however, signed the lease over to McCandless after only two years and McCandless continued ranching these lands until his death in 1940 (Yent 1991: 6). At some point, McCandless acquired Laamaikahiki's portion of Keawa`ula.

On the Ka`ena side, Peter Larken began leasing Kuaokala for ranching in 1868 but turned over the lease to Samuel Andrews in 1873 (Hammatt, Shideler, and Borthwick 1993: 15). In the 1880s, Mrs. Kamealani received a government lease for the "Kaena Palis" but did not hold the lease for more than 10 years (Hammatt, Shideler, and Borthwick 1993: 16). McCandless had acquired the lease to Kuaokala as well by early the 1900s. When the privately-owned lands along the coast were acquired by the State of Hawai`i in the 1970s to create Ka`ena Point State Park, all were owned by ranching interests or by families with ranching interests in the area. The Keawa`ula section of the point was owned by Elizabeth Marks who inherited McCandless Ranch and the Ka`ena section was owned by three Dillingham Family heirs (Mary-Mae Wild Bond, Walter Frear Wild, and Urban Earl Wild, Jr.). Mokule`ia Ranch had gained clear or partial title to most of the government grants along the Ka`ena coastline.

Despite references to Ka`ena Point and adjacent lands being used for pasturage, none of the stone features or sites generally associated with grazing or ranching have been identified at the point or within the project area (Yent 1991: 6). There are no stone wall enclosures or corals nor do the perimeters of the 1855 grants appear to have been walled to contain and control grazing cattle or horses. This could indicate that grazing animals in the area were free-roaming despite mapped grant boundaries or that areas were fenced. The only stone wall features found appear to be directly associated, mostly by proximity, with construction of the railway.

Oahu Railway and Land Company (OR&L) (1897-1947)

The former alignment and remnant features of the OR&L railway are among the most visible historic properties at Ka`ena Point (Figs. 17). Given the railway's continuous alignment, the proposed fence and project area must, at some point, cross its former route. When completed in 1898, the new railway provided an important means of transporting passengers, goods, equipment, and produce to and from its many stops along the route from Honolulu to Kahuku by way of Wai`anae and Waialua (Yent 1991a 5-6). It was meant primarily to serve plantation towns and ranches but it also became

[11] The richness of this off-shore fishery may have compensated for the apparent poverty and inhospitable terrain of Laamaikahiki's awarded land. In 1905, a 1570-acre Konohiki Fishery was officially recognized for Laamaikahiki's portion of Keawa`ula (Judgment C.C. No. 5166; Land Office Deed No. 1493). It extended one mile from the shoreline.

celebrated as a scenic tour ending at the Hale`iwa Hotel which was also built by Benjamin F. Dillingham, the founder and owner of the OR&L. The segment around Ka`ena Point to Hale`iwa was completed in 1897. Constructing the railway entailed acquiring a predominately 40-foot right-of-way that was sufficient for the 3-foot wide, narrow gauge rail line and to provide areas for sidings (i.e., auxiliary track permitting trains to pass on the main line) and stations. Services ceased and the railway was abandoned in December 1947. Railroad use waned after World War II when heavy use by the military during the war and post-war periods began to decline and use of the railway was eclipsed by motorized vehicles and improved public roads. Another contributing factor was damage caused by the 1946 tsunami (Yent 1991a: 6). Damage to the tracks and supporting infrastructure were particularly severe at Ka`ena (Fig. 18).

Alignment of the main railway bed is still visible throughout its route as it crosses Ka`ena Point and takes a major turn to round the point (Fig. 17). No traces of the tracks or railroad ties remain. Most of the distinct remnant features of the railway bed were constructed to maintain the shallow or level grade of the railway. In some sections the bed was raised with earth and coral fill (Fig. 19) while in other sections the ridge slope was cut and the fill faced with stone retaining walls (Figs. 27 and 28). Another major feature is a deep cut excavated through the lower slope of the ridge where the railway alignment bends to round the point (Fig. 23). Tailings from this excavation are still visible, either spread or heaped, along the *makai* side of the cut (Fig. 24). Also remaining intact are several sections that were paved with stones or limestone slabs to help stabilize the bed and support the tracks (Fig. 26). Culverts or small bridges, some with stone-work facings, were also constructed along raised sections of the railways bed where it crossed natural drainages.

A number of stone walls also line segments of the railway alignment. Some appear to serve as retaining walls and were variously constructed of water-worn stones taken from the beach (Fig. 21), talus boulders (Fig. 20), or angular stones that could have been extracted from the excavated trench (Fig. 22). A low, free-standing wall parallels some fairly lengthy stretches of the railway alignment both at Ka`ena Point and west of the point (Fig. 25). The function of these walls is not clear. Alone they are not high enough to exclude cattle, horses, or goats that may have been grazing near the track. They may have simply defined the edge of the right-of-way.

In addition to the main railway line, a 15-car siding track once ran from the northern side of the bend towards the point. It is depicted on the 1929 and 1940 topographic maps of Ka`ena (Figs. 17) (U.S. Geological Survey 1929, Army Corps of Engineers 1940) and was presumably used as a supplemental track to allow trains to pass or to temporarily park railroad cars. No physical evidence of this siding was apparent during the field inspection nor can a route resembling it be found on recent aerial photographs. The bed for the siding and any associated features may have been obscured by use of a similar easement that provided access to the Coast Guard Reservation established for the point's beacon light.

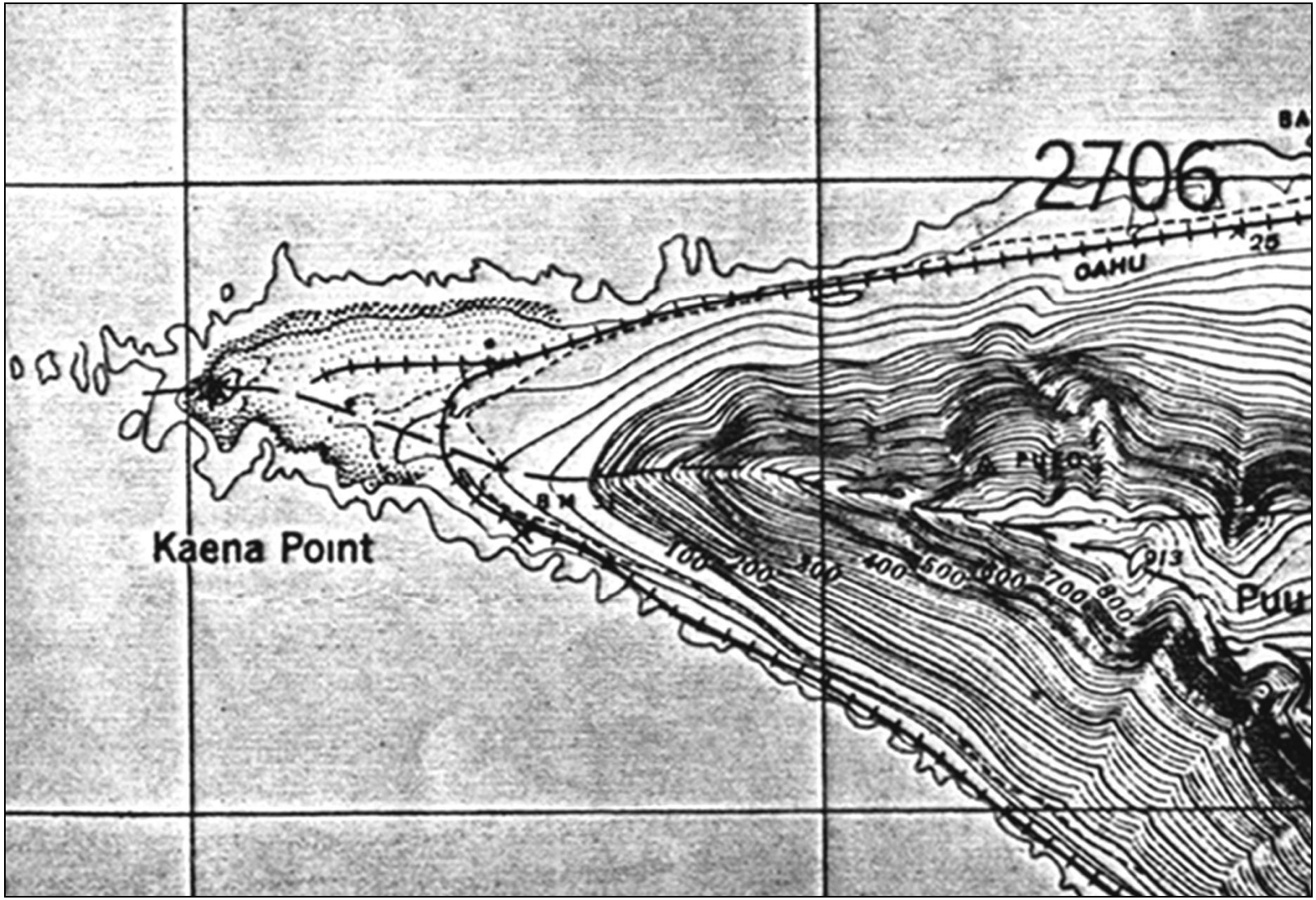

Fig. 17: Route of OR&L Railway as Shown on 1940 Kaena Quadrangle (Army Corps of Engineers 1940). Note siding track extends west of the primary railway alignment and a trail or unimproved road parallels the railway. Depiction of railway and trail are almost identical to that shown on the 1929 Kaena Quadrangle (U.S. Geological Survey 1929).

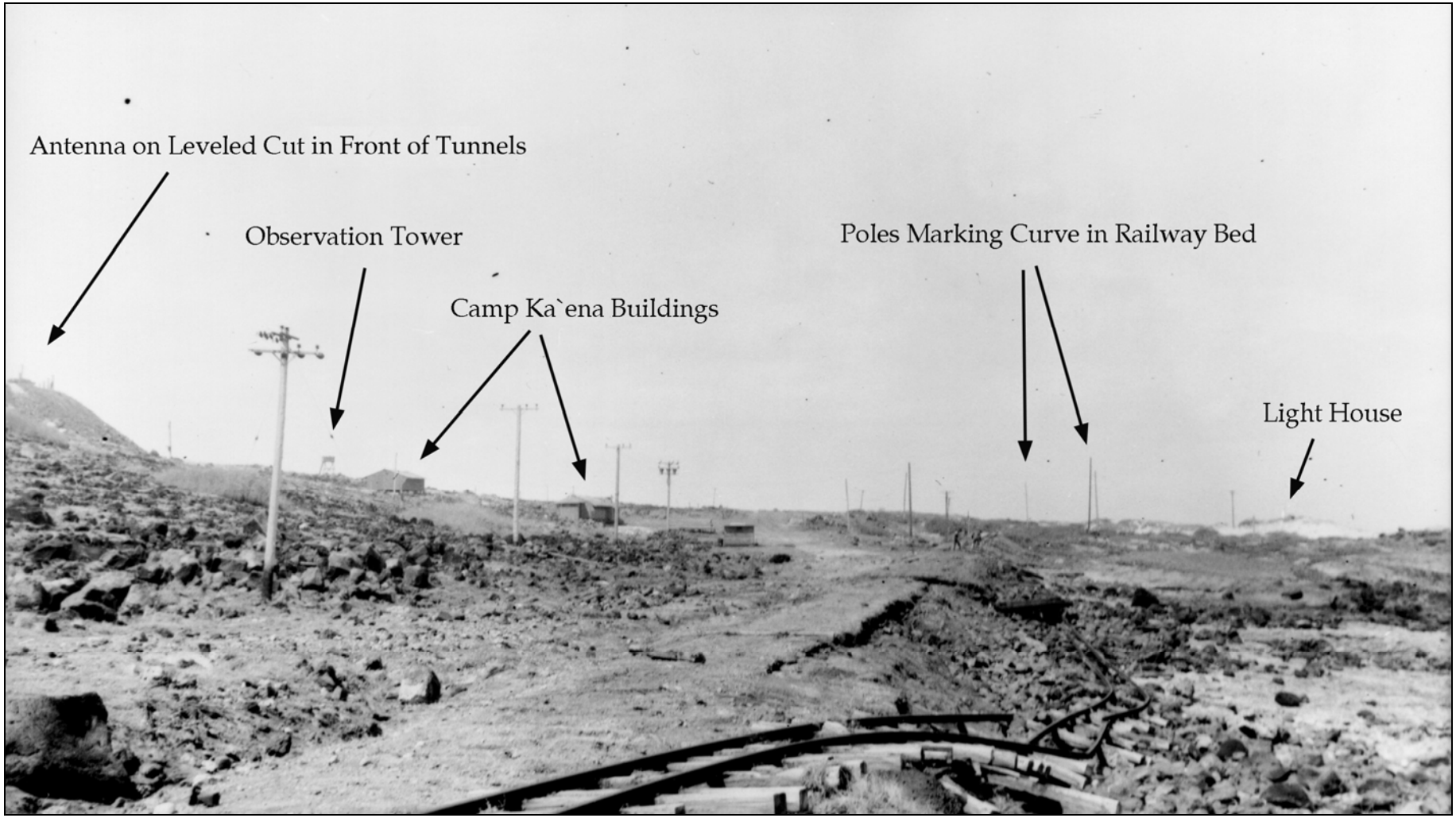

Fig. 18: 1946 Tsunami Damage to Railway at Ka`ena Point (Facing Southwest). Photograph by Kent W. Cochrane (Bishop Museum Neg. No. CN47052). Annotations identifying various features added.

Fig. 19: Raised Railway Bed Alignment near Northeastern Extent of the Project Area (Facing Northeast)

Fig. 20: Low Rock Wall Paralleling Railway Alignment near Southern Extent of Project Area (Facing Southeast). Note gravel tailings from tunnel construction upslope and white gunite coating the BCN-409 Southern Tunnel entrance.

Fig. 21: Rock-Faced Retaining Wall for Railway Bed Southeast of the Project Area (Facing Northwest)

Fig. 22: Close-Up of Rock Retaining Wall for Railway Bed (Facing Southeast).

Fig. 23: Railway Bed Cut at Major Bend in the Right-of-Way (Facing North).

Fig. 24: Tailings from Railway Alignment Cut (Facing North).

Fig. 25: Limestone Slab Pavement on Railway Bed near Southern Extent of Project Area (Facing Southwest).

Fig. 26: Rock Retaining Wall along *Mauka* Edge of Railway Bed near Northern Bend in the Alignment (Facing Northwest). Note use of water-worn stones.

Fig. 27: Rock Retaining Wall along Edge of Railway Alignment near Northeastern Extent of the Project Area (Facing Southeast).

Fig. 28: Rock Retaining Wall along *Makai* Edge of Railway Bed near Northern Bend in the Alignment (Facing North). Note use of angular stones.

At least one individual, Robert L. Meyer, was living at Ka`ena Point after the railway began operating in 1897. He, his wife, and son were said to live "in a shack he built near a rock called Leina Kauhane" (McGrath, Brewer, and Krauss 1973: 84; Hammatt, Shideler, and Borthwick 1993: 17). An expert throw-net fisherman, Meyer would give the railroad engineers fish in exchange for water or other necessities. No remnants of his house site have been found to date but it remains a possibility.

Ka`ena Point Military Reservation (1923 to 1964)

The greatest and most lasting impacts on Ka`ena Point's landscape can be attributed to construction of military defense facilities beginning in 1924 and continuing through 1946 (Bennett 2005). The strategic location of the island's western-most point and its well-positioned promontories were recognized as coastal defense plans were being prepared after World War I and when defense outposts were rapidly intensified and expanded after the 1941 attack on Pearl Harbor. The remnant military structures and altered landscape features at Ka`ena Point represent both major phases in the development of O`ahu's defense infrastructure. Of these, four complexes of structures and associated features still exist within or near the project area and a fifth might be identified with additional inspections. These include fire control and base end stations built on a ridge knoll in 1924 and 1934; a search light position established in 1942; an early-warning radar station that was in operation by 1942; a cantonment established in 1942 for military personnel manning the various operations, and a battery begun in 1943. These complexes are a testament to advances made in defense technologies and strategies over a 22-year period and to their sometimes rapid obsolescence. Use of what became the Ka`ena Point Military Reservation declined after World War II when it was used primarily for "squad and company-sized maneuvers" (Bennett 2005: 100). In 1984, a portion of the Reservation was declared excess property and deeded to the State of Hawai`i for park purposes.

Fire Control Station "S"

The first defense feature constructed at Ka`ena Point was the fire control station designated Station "S" (Figs. 29 and 30). Built in 1924, this reinforced-concrete station with observation slits (8 feet wide; 13 feet deep) was located below Pu`u Pueo at an elevation of 573 feet (Bennette 2005: 75). Station "S" was part of a network of artillery fire control stations established around O`ahu on various ridges and promontories. Observations from these stations were used to triangulate and plot the position of enemy ships which would then be conveyed to the assigned Coast Artillery battery for firing. As part of the Coast Artillery District's Coastal Defense of Pearl Harbor, position data from Station "S" were transmitted to Battery Williston, Fort Weaver, on the west side of Pearl Harbor's entrance channel (Bennette 2005: 75). Telephone communication wires, probably buried within the railway easement, were used to transmit data from Station "S" to Battery Williston and to other stations within the system. Mules were used to haul construction materials to the site given the absence of suitable roads.

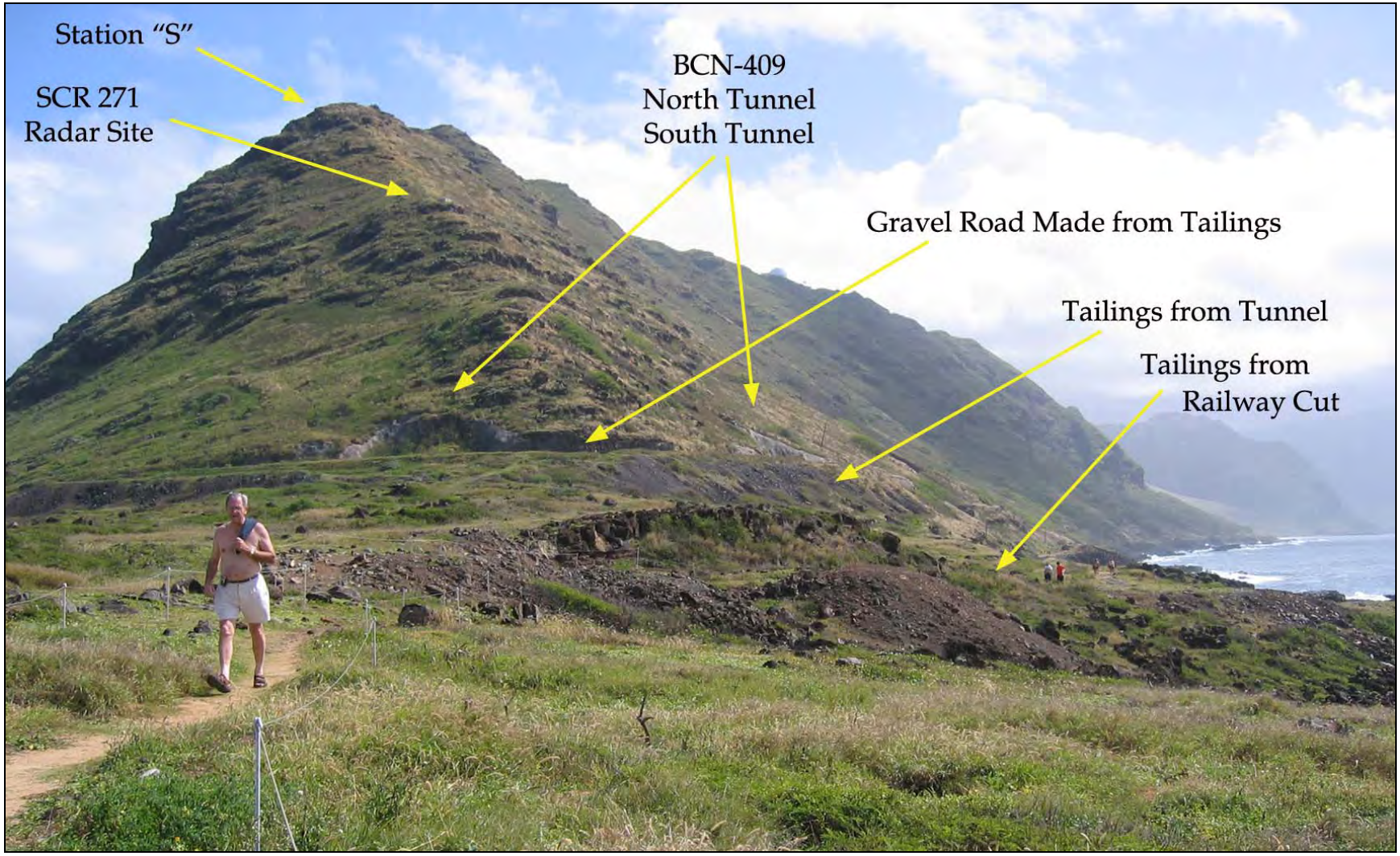

Fig. 29: Major Military Structures and Landscape Modifications and Tailings from Railway Cut (Facing East).

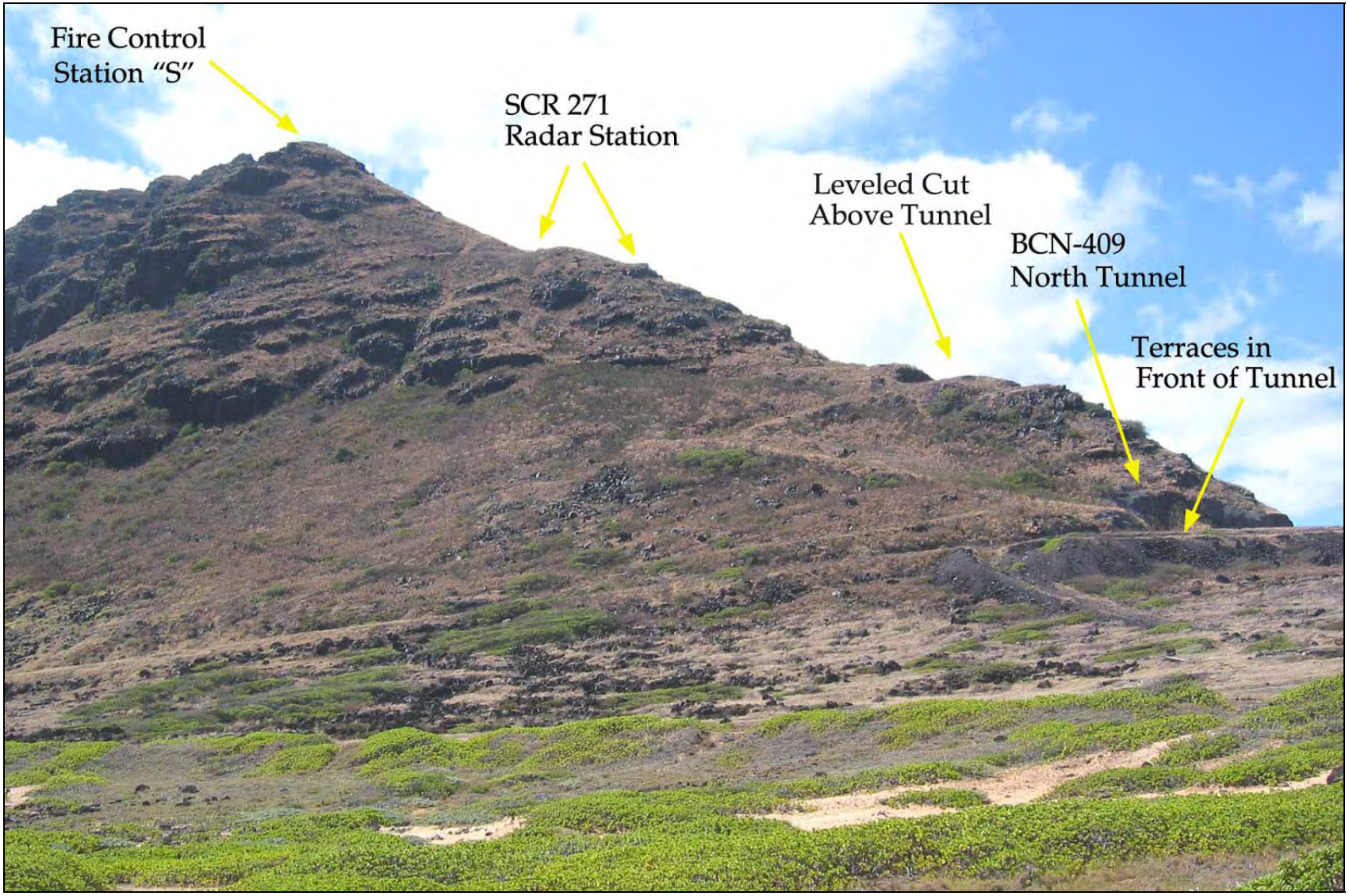

Fig. 30: Locations of Major Military Structures and Landscape Modifications (Facing Southeast).

Construction of Station "S" was part of a larger plan to expand and upgrade O`ahu's coastal defense systems prompted by accelerated technological advances in armament and firepower made during World War I (Thompson 1980: 71). As with earlier defense systems, some constructed on O`ahu as early as 1907, these plans focused primarily on protecting Honolulu Harbor and Pearl Harbor and were conceived to defend from attacks by sea (Dorrance 1995). These harbors were viewed as vital to the United States military presence in the Pacific and, given Hawai`i's relatively new status as a Territory, were considered potentially vulnerable to attack. This plan also included establishing a Ka`ena Point Military Reservation in 1923 (Bennette 2005: 75). After being expanded in 1924, the 114-acre Reservation included that portion of the point that lies between the railway easement and a ridge promontory (approximately 800-feet above sea level (Fig. 1).

Station "S" was expanded in 1934 when a double base end station was constructed directly below the original Station "S" fire control station (Bennette 2005: 76). This single story, reinforced-concrete station (16 feet wide, 15 feet deep) was built below ground and housed two observing instruments (i.e., depressed position finders) positioned to operate through three narrow observation slits under the roof overhang. Similar observing instruments and bunks were added to the original fire control station in 1936. The 1934 base end station was to send position data to the artillery unit at Battery Hatch, Fort Barrette, on Pu`u Kapolei until 1942 when it was reassigned to artillery positions at Batteries Brodie and Opaeula located inland of Hale`iwa. The concrete structures of the 1924 control station and the 1934 base end station apparently remain intact.

Camp Ka`ena

After the attack on Pearl Harbor on December 7, 1941 and the commencement of World War II, military personnel were almost immediately stationed at Ka`ena Point to man gun and searchlight positions (Bennett 2005: 79-82, 93-100). Defending the beaches from invasion and anti-aircraft defense became a priority in addition to supporting artillery fire aimed at off-shore vessels. In 1942, the initial military encampments became a more formalized cantonment (i.e., temporary or semi-permanent military quarters) with the construction of wooden structures and a water tank. Called Camp Ka`ena, the cantonment was located on the northeast side of the point in a relatively flat area inland of the railway (Figs. 18, 31, 35). At least four sets of concrete slab foundations from these buildings are still intact (Fig. 31) as is the foundation of a cylindrical, wooden water tank located upslope on the ridge (Bennett 2005: 79-80). Water was piped into the tank from the east along the OR&L easement. The cantonment supported not only detachments assigned to searchlight and gunnery positions, but housed infantrymen patrolling the beaches.

Searchlight Positions

A searchlight position was manned at Ka`ena Point between January 1942 and January 1945 by three sequentially assigned battery detachments (Bennett 2005: 93). During World War II, searchlights were primarily installed in case of night attacks by enemy aircraft. They also provided fire control data during night attacks by sea or could

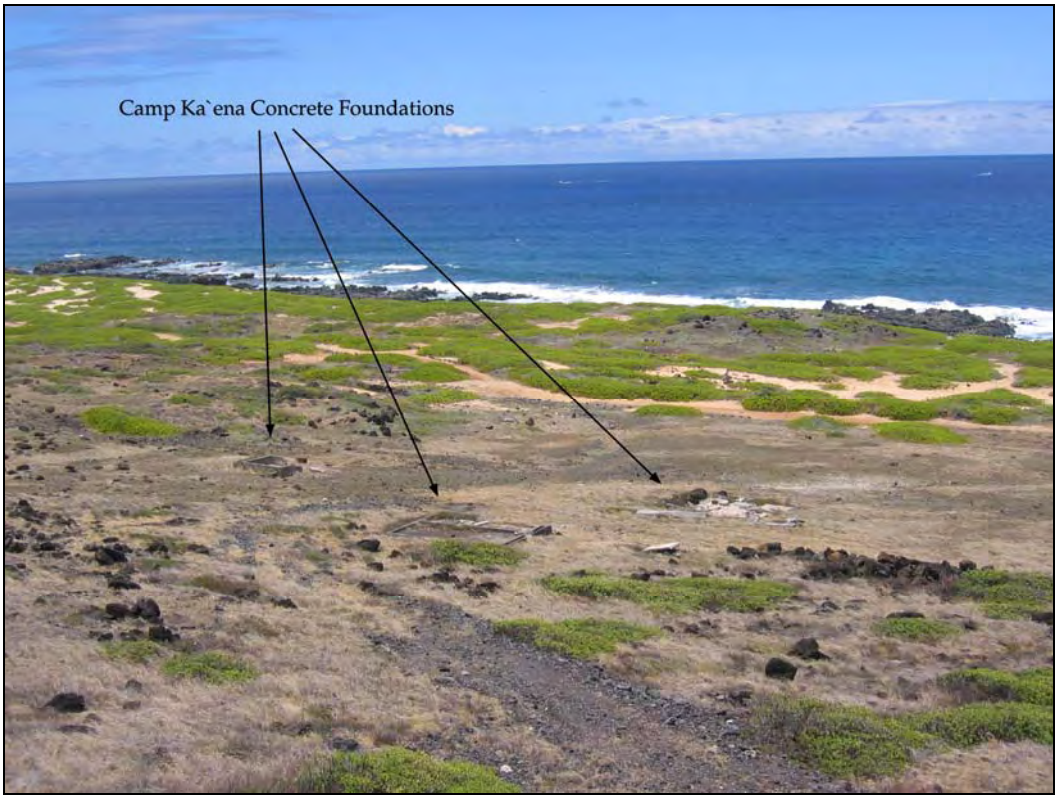

Fig. 31: Concrete Foundations for Camp Ka`ena Structures First Established in the 1920s (Facing Northwest).

Fig. 32: Sealed Entrance to BCN-409 Northern Tunnel (Facing Northeast). Note Ridge Cuts Stabilized with Pressure-Sprayed Gunite.

Fig. 33: Edge of Terraced, Cut and Fill Road Bed Stabilized with Pressure-Spray Gunite (Facing Southeast).

Fig. 34: Gunite-Coated Retaining Wall along Cut and Fill Gravel Road Beyond BCN-409 Southern Tunnel (Facing Northwest).

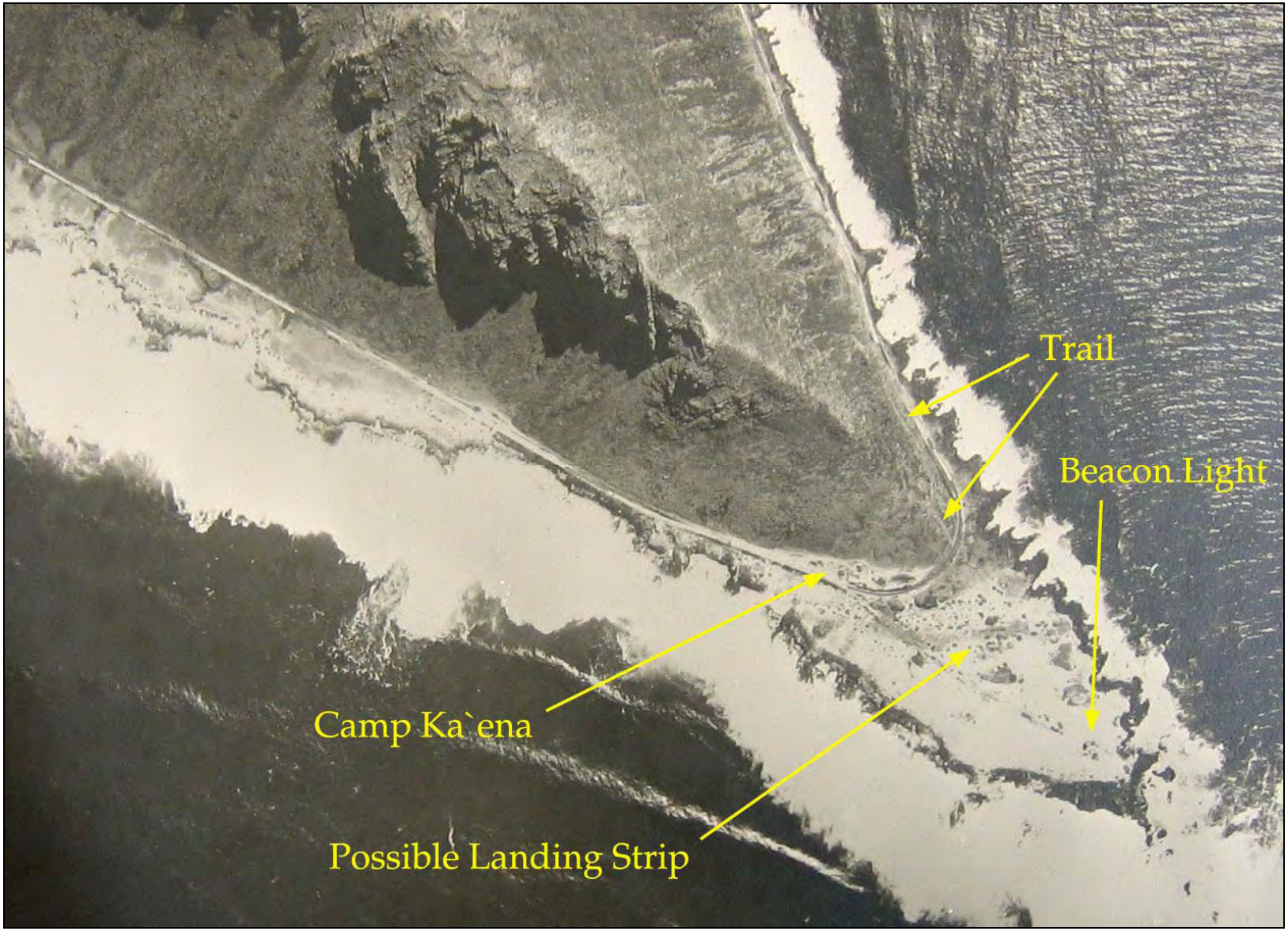

Fig. 35: Location of Possible Landing Strip, Trail, Camp Ka`ena and Beacon Light on 1939-1940 Aerial Photograph of Ka`ena Point.

artificially light areas during night battles. The positions of incoming plans or ships could be determined through triangulation when pairs of searchlights were spaced at known distances from each other. Plans were prepared in 1940 for a "Searchlight Position Trail" at Ka`ena Point, but it isn't clear that the "Trail" was constructed as designed. The "Trail" was to be 750 feet long and 10 feet wide with two shelves (21 by 21 feet) for the mobile 60-inch, 800 million-candle power lights (Bennett 2005: 93). When in position, the searchlights were placed in concrete slabs bound by low walls.

Two ancillary buildings were also planned. One was to be "a single, story; two room reinforced-concrete controller booth" and the other a concrete shelter for the generator powering the lights (Bennett 2005: 93). The "Trail" was to be located at an elevation of 100 feet. Additional field work is needed to determine if any altered areas or remnant features matching these descriptions can be found between the railway and the BCN-409 tunnels and gravel road.

Radar Stations

A temporary radar station (SCR-268 radar set) was established at Ka`ena Point soon after the attack on Pearl Harbor. The 14 man-crew assigned to the station stayed in "a makeshift rock shelter built with a 6 by 12 inch beam as a ridge pole and corrugated iron roof paneling, covered with sand and rock" (Bennett 2005: 94). An additional hut was erected for the commanding 1st Lieutenant. Radar sets generally operated along side antiaircraft searchlights and gunnery positions. The unit was moved to Fiji by May 1942.

By October 1942, a permanent early-warning radar station had been constructed into the ridge approximately midway between Station "S" and the future site of the BCN-409 Battery (Figs. 29 and 30). Bomb proof tunnels were constructed to house the SCR-271A fixed radar and other equipment needed to run the station (Bennett 2005: 94-100). The primary operations tunnel (15 ft wide; 10 ft high; 100 ft long) was reached by an access tunnel (6 ft wide; 6 ft high; and 50 ft long) and was ventilated by a vertical shaft (4 feet square; 50 feet high). Communications cables were run through the vertical shaft to the radar antenna placed on top of a "100-foot latticed-steel tower affixed to four large reinforced-concrete piers" (Bennett 2005: 95) and to external communications equipment. The reinforced concrete housing unit and its pyramid-shaped roof that protects the vertical shaft are still visible along the ridge line from the northeastern side of the point. Also part of the complex is a 120 square feet, reinforced-concrete structure used for the station's communications equipment. As access to the station was difficult, a steel cableway was installed to carry materials and equipment to the site. The station was manned at least to 1949.

Battery Construction No. 49 (BCN-409)

By far the most ambitious and complex project undertaken at Ka`ena Point was construction of a battery designated "Battery Construction No. 409" (BCN-409) (Bennett 2005: 89-92). Begun in mid-1943, the facility was designed to support two 8-inch naval guns and army M1 barbette carriages. In general, these guns were intended to strengthen

coverage of coastal defense positions along the north and west shores of O`ahu. In particular, they were to defend against coastal landings and to provide additional protection for the Lualualei Ammunition Depot and Mokule`ia Airfield. BCN-409 was only 60% complete when the project was abandoned in 1945. A May 31, 1945 study of seacoast battery requirements determined that batteries of this type could not withstand attack by "modern" air or naval bombardment. Given technological advances made during World War II, the design of these batteries did not provide sufficient overhead protection for the guns and they were therefore unable to meet the needs of a seacoast defense system of the time (Bennett 2005: 91).

The design of BCN-409 called for construction of two gun emplacements; a tunnel complex excavated into the ridge at an elevation of 125 feet; a gravel access road and level work areas; and a battery commander's station. The tunnel complex, designed to house all support operations, powder magazines, and electrical generators and compressors, was composed of two access tunnels connected internally by two traverse tunnels. All chambers were 15 feet high and 15 feet wide. The northern access tunnel was the longest at 200 feet; the southern access tunnel extended underground for 40-50 feet; and the two traverse tunnels were 75-85 and 100 feet long (Bennett 2005:89-90). The tunnel entrances were spaced 300 feet apart and were accessed by an 18 foot-wide, 2,483 foot long gravel road that approached the tunnels from the northwest (Figs. 29, 30, 32, 36 and 37).

Given the elevation of the tunnel entrances on the ridge slope, a substantial amount of cut and fill was needed to create an appropriate grade for the access road and to provide a level maneuvering area in front of the tunnel entrances (Fig. 29 and 30). This resulted in an artificial terrace being formed along much of the ridge face and a second, lower terrace just northwest of the north tunnel entrance (Fig. 33). Tailings from tunnel excavations were used as fill for the road and terrace. Some terrace segments were faced with stone retaining walls coated with gunite (Fig. 33 and 34) and gunite was pressure-sprayed over the ridge cuts at each tunnel entrance to stabilize the exposed faces and minimize rock fall (Fig. 32).

According to the plans, the two guns were to be placed on open concrete pads at an unknown distance from the tunnel entrances (Bennett 2005: 89-90). The concrete gun aprons were apparently completed before suspension of the project but construction was never started on the reinforced-concrete underground magazines needed to support each emplacement. The battery commander's station, located "some distance above BCN-409's tunnels," was also not completed although the floor and walls of the station were installed (Bennett 2005: 90).

Most of the completed project components of BCN-409 are still recognizable and basically intact. The tunnel entrances have been sealed and the gunite coating on the slope cuts at the tunnel entrances is deteriorating and beginning to crumble (Bennett 2005: 100). The access road and terrace features created to provide access to the tunnels and level working areas near tunnel entrances are intact as are the piles of tailings that also form the sloping faces of the terrace (Figs. 29 and 33). Additional field inspections

would be needed to locate the concrete gun aprons for the 8-inch guns and the completed floor and walls of the battery commander's station.

Emergency Landing Strip and Other Activities

Bennett's document review of military activities at Ka`ena Point also indicates that significant portions of the point could have been altered by activities that did not leave clearly identifiable or facility specific features. This was particularly true just before and during World War II. One example is an emergency landing strip apparently staked out prior to World War II (Bennett 2005: 78). Construction was not completed but a cleared strip on 1939-1940 aerial photographs may represent these initial efforts (Fig. 35). This strip and the once clear easement to the beacon light have been obscured over time by sand and vegetation. Most of the ground disturbing activities at Ka`ena Point can probably be attributed to activities associated with camps and the routine operations of troops stationed at the point to run established defense facilities or to work on construction projects.

Beacon Light

In 1920, three years before the Ka`ena Point Military Reservation was established, the U.S. Lighthouse Service installed a beacon light at Ka`ena Point (Yent 1991a: 1). Also called a "Passing Light," the rotating beacon was placed on top of a 65-foot, reinforced concrete, white pyramidal tower that was constructed on the elevated sand knoll near the point (Yent 1991: 1; Bennett 2005: 100). It was replaced in 1990 by a new beacon placed on top of a 30-foot steel pole. The concrete tower supporting the original beacon was toppled and now lies directly north of the new beacon (Fig. 6). Being 77 years old, the toppled concrete tower is a historic property. The United States Coast Guard maintains the beacon and has jurisdiction over the one-acre parcel on which it sits (TMK: 6-9-02: 9) (Fig. 2 and 3).

Recommendations

Available information and the field inspections clearly demonstrate that there are significant historic properties within or near the proposed predator control fence and within the probable "area of potential effect" [36 CFR 800.4(a)(1)]. It was also clear during field inspections that the initially proposed fence alignment does avoid many of the identified historic properties at Ka`ena Point and could be routed to minimize its effect on other properties (Tables 2, 3 and 4). This assessment, however, can only be finalized after consultation with those individuals and organizations that may better understand the significance of these historic properties and can help determine which mitigation measures, if any, are appropriate.

The following is intended to provide guidance for determining the final fence alignment, for identifying those agencies, organizations and individuals that should be consulted, and for addressing two particularly critical steps in the federal historic preservation

Table 2: Summary of Identified Native Hawaiian Historic Properties and Project Identification and Mitigation Measures

Known Native Hawaiian Historic Properties		Known and Potential Locations	Project Identification and Mitigation Measures
Cultural Deposits or Scatters (midden, artifacts)		Known: Sand dunes near point Possible: Sand dunes and sandy soils Scattered deposits could be on rocky flats and slopes	Project avoids sandy areas Survey project area for cultural deposits or scatters Determine mitigation if found (e.g., avoid, record, data recovery)
Burials		Known: Sand dunes near point Possible: Sand dunes and sandy soils Burials in platforms and small caves on rocky slopes	Project avoids sandy areas Survey project area for platforms or caves inland Avoid if found (contingent on §6E-43, HRS)
Stone Wall Foundations		Known: Sand dunes near point Possible: Sandy areas or on rocky slopes	Survey project area for walls Determine mitigation if found
Fishing Ko`a (stone platforms)		Known: Rocky knoll near shoreline and inland on rocky slope Possible: Along shoreline or on slopes May be difficult to identify without knowledgeable individuals	Survey project area for small platforms or upright stones Avoid if found Minimize project's visual and cultural effects
Pohaku o Kaua`i (traditional cultural property)		Known: Partially submerged off-shore rock forming western-most point of O`ahu	Probability of property being affected by project low given distance from project area
Leina ka `Uhane (traditional cultural property)		Known: Limestone formation near shoreline	Near proposed fence line Avoid visual and cultural effects to extent possible

Table 3: Summary of Potential Native Hawaiian Historic Properties and Project Identification and Mitigation Measures

Potential Native Hawaiian Historic Properties		**Potential Locations**	**Project Identification and Mitigation Measures**
Fisherman Shelters and Caves		Known: Historic accounts (*See* house foundations; cultural deposits) Possible: Along shoreline or inland; particularly near canoe landings	Survey project area to identify evidence of shelters and settlements Determine mitigation if found (e.g., avoid, record, data recovery)
Canoe Landings		Known: Historic accounts Possible: Along shoreline where topography and in-shore conditions favorable	Identify potential landings by examining shoreline topography and user knowledge Avoid if definitively identified
Salt-Making Areas		Known: Historic accounts Possible: Rocky shoreline areas amenable to salt collection and drying (within range of sea spray; cluster of crevices and depressions)	Identify rocky areas suited to salt collection with knowledgeable users Avoid if definitively identified
Net Mending and Drying Areas		Known: Historic accounts Possible: Possibly flat, open areas along shoreline near canoe landings or areas suited to net fishing	Identify potentially used areas with knowledgeable fisherman Difficult to identify with certainty
Fishing Basket Locations		Known: Historic accounts Possible: Submerged areas on rocky off-shore bench suited to basket traps and *kala* and *hinalea* habitat	Identify suitable areas with knowledgeable fisherman Probably outside project area
Trails		Known: Historic accounts Possible: Routes parallel coastline along ridge slope or cross point to link desired destinations; may be obscured by subsequent uses (roads, railway, modern trails)	Survey project area to identify trail segments and associated features Probability low given subsequent uses of similar routes Determine mitigation if found
House Foundations		Known: 1930 account places foundations inland of railway Possible: Lower ridge slopes; areas subsequently modified by military use	Survey project area to identify house site remnants Probably destroyed by military use Determine mitigation if found
Heiau (Kuaokala)		Known: Historic documents place on knoll along high ridge overlooking Ka`ena Point; it may no longer exist	Low probability of being affected by project given distance and height above project area

Table 4: Summary of Known and Potential Post-1850 Historic Properties and Project Identification and Mitigation Measures

Associated Historic Period or Use		Known and Potential Historic Properties or Component Feature	Project Identification and Mitigation Measures
Pasturage and Ranching (1850-1940s)		Known: None; historic accounts Possible: Walls, walled enclosures, corrals Fences, fence posts, fencing wire, gates	Survey project area for remnant ranching structures and objects Determine mitigation if found (e.g., avoid, record, data recovery)
OR&L Railway (1897-1947)		Known: Continuous railway bed alignment and siding Raised railway bed (rock, earth or coral fill) Retaining walls (on slope cuts or fill embankments) Stone and limestone slab paving Trenched railway bed cut and tailings from excavation Ridge cut and fill formations Rock wall paralleling railway Possible: Culverts Bridge foundations Railway ties or rails Shack (Meyer residence near railway)	Project sited to cross railway alignment where character-defining structures or modifications are absence Survey project area to verify absence of railway features
Ka`ena Point Military Reservation (1923-1965)		Known: Fire Control Station ""S" and back end station (concrete structure; fixtures) Camp Ka`ena (concrete foundations) SCR 271 Radar Station (concrete structures; excavated tunnels) BCN-409 Battery Excavated tunnels and fixtures Tunnel entrances with gunite coating Gravel access road made of tailings and fill Terraced operations areas by tunnel entrance Tailings from tunnel excavation Bulldozed tracks and leveled areas Passing Light (beacon, concrete pyramidal tower) Possible: Searchligh positions Various camp sites Miscellaneous operations sites, maneuver areas Landing strip	Most known historic military features are outside the proposed project area Project will affect BCN-409 Battery directly and indirectly Survey final fence alignment to determine features affected Document gravel access road, tailing slopes, and terraced features if crossed by the fence prior to installation Provide interim protection for tunnel entrances and terrace features during construction Minimize visual effect on BCN-409

review process. Both steps are important to generate a record demonstrating compliance with Section 106 of the National Historic Preservation Act.

Recommended Fence Alignment and Mitigation Considerations

In preliminary project proposals, the preferred alignment for the predator control fence primarily follows the broad gravel road constructed between 1943 and 1945 to provide access to the BCN-409 battery tunnels (Figs. 36 and 37). This road is convenient for several reasons. It already provides a level, previously-disturbed foundation for the fence line and its position on the lower, rocky slope of the ridge avoids the sandy deposits and soils where the sea birds nest. Its relatively straight north-south alignment along the lower ridge slope would effectively cutoff most of the point for predator control purposes (Fig. 1 and 3).

In terms of historic properties, this alignment is also advantageous because much of it was highly disturbed during World War II and it avoids the sand dunes and sandy soils in which subsurface cultural deposits and burials are a higher probability. Construction and use of the road from 1943 to 1945 would have destroyed other sites or features associated with preceding periods or uses. The following historic preservation issues, however, need to be addressed if this preferred alignment, or a modified version of it, is to be used.

- Leina a ka `Uhane: The limestone formation named Leina a ka `Uhane is located near the northern end of the gravel road where the road turns east (Fig. 36). While the formation itself can be avoided, increasing the distance between the fence line and the formation will be constrained by the steep slope immediately inland (Figs. 8 and 12). The fence line will have a visual effect on this traditional cultural property and its setting and may also affect cultural beliefs and practices associated with Leina a ka `Uhane. These effects need to be considered during the review process. Another constraint is posed by the possible shrine located upslope of the formation (Feature 5, Site No. 50-80-03-1183) (Figs. 11 and 12).

- OR&L Railway Bed: The fence line needs to cross the OR&L Railway bed near the shoreline at its northern and southern extent. At both ends, sections of the railway bed were found that can be crossed without altering any of the character-defining features constructed to create the desired grade of the bed (e.g., raised railway bed, trenches, stone retaining walls) or any of the segments with paving slabs (Fig. 38). Using these identified segments would minimize the effect of the fence on the historic integrity of the railway bed and its associated features.

- Stone Wall Paralleling Railway Bed: On the southern end of the proposed alignment, the fence would need to breach a low stone wall which parallels the railway (Fig. 39). The length of the wall and its location make it impossible to avoid. The breach would, however, only remove one, relatively small section of the wall and not a segment that is particularly unique or exemplary. The wall should be mapped and photographed as a mitigation measure if breached.

Fig. 36: Gravel Road Constructed during World War II to Provide Access to BCN-409 Tunnels (Facing Northeast). Proposed fence would follow road bed. Note Leina a ka `Uhane in the background.

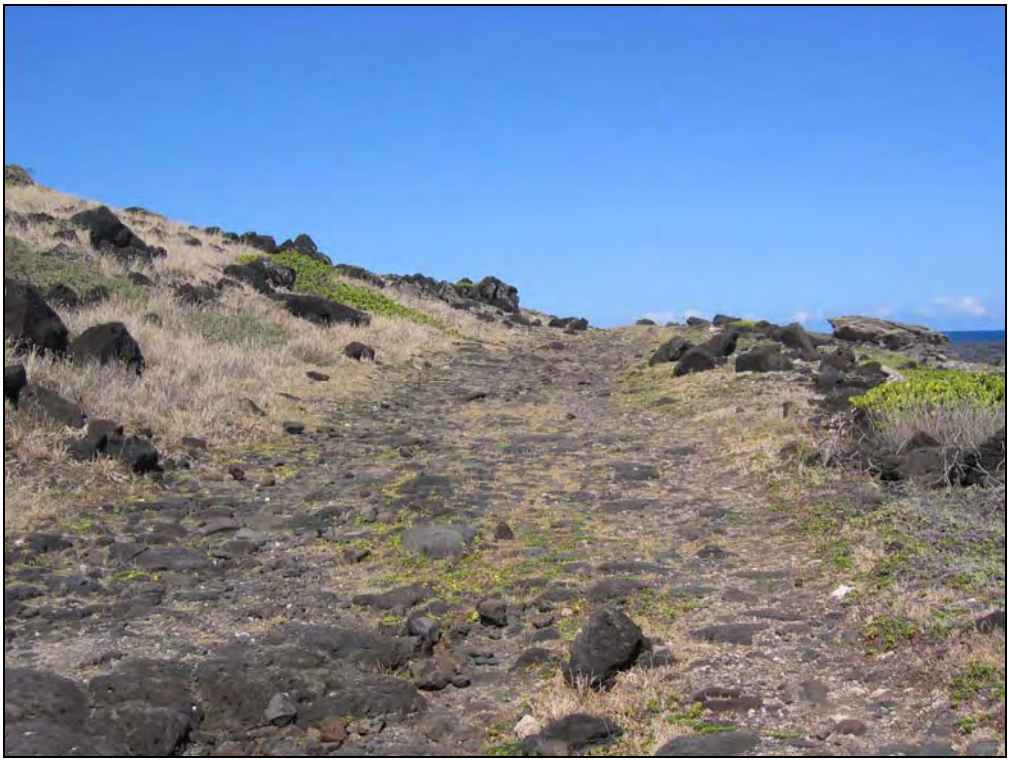

Fig. 37: World War II Gravel Road near Northeastern Extent of Proposed Fence (Facing Southwest). Note Leina a ka `Uhane to the left of photograph

Fig. 38: Down-Slope View of Potential Fence Alignment on Southern Shoreline (Facing Southwest). Crossing the railway at this point avoids modified railway bed.

Fig. 39: Up-slope View of Potential Fence Alignment on Southern Shoreline (Facing North). Installation would require breaching of low stone wall.

Battery BCN-409: The gravel road is itself a historic property in that it is over 50 years old and is part of the Battery BCN-409 complex which is the dominant expression of Ka`ena Point's military history. The fence, however, would not irreparably alter the integrity of this complex if installed in a manner that does not disturb the complex's significant components (e.g., the tunnel entrances, gunite-coated facings, terrace retaining walls) and does not alter the fundamental formation or foundation of the road which is made of excavated fill and tailings. Where disturbance is unavoidable, road sections or features should be documented as a form of mitigation. Ideally, the fence should be installed in a way that allows the road's general appearance to be readily restored if the fence is removed at sometime in the future.

Consultation

Regulations implementing Section 106 of the National Historic Preservation Act (36 CFR Part 800) require an agency (or those acting on its behalf) to consult with a number of parties concerning the potential effects of a project on historic properties. Recommendations concerning consultation for this project are outlined below:

- Hawai`i State Historic Preservation Office (SHPO): The SHPO needs to be consulted throughout the Section 106 review process. At this stage, a letter should be sent to SHPO inviting it to comment on the project and on historic properties in the area. This summary report could be submitted with the letter as background.

- Native Hawaiian Organizations: In Hawai`i, federal agencies are required to consult with any Native Hawaiian organization that "attaches religious and cultural significance to historic properties that may be affected by an undertaking" [36 CFR 800.2(c)(2)(ii)]. As with the SHPO, a letter inviting comment or participation in the process should be sent to the Office of Hawaiian Affairs and any other appropriate native Hawaiian organization identified during the project outreach effort. This summary report could be submitted with the letter as background.

- Knowledgeable and Concerned Parties: Consultation should also occur with a range of individuals, organizations, or agencies that may have knowledge of the project area and its history. The current outreach effort being undertaken for this project provides a good opportunity to identify such parties. A record of your outreach efforts and the historic preservation issues raised during this process will help characterize the consultation effort.

- Hawaiian Railway Society: The Hawaiian Railway Society should be contacted for their expertise on the history of Hawaii's railways and any insight members may have on the function or uniqueness of features associated with the railway at Ka`ena Point.

- Coastal Defense Study Group: John Bennett, a member of the Coastal Defense Study Group and author of the article summarizing Ka`ena Point Military Reservation's history, should be contacted. His assessment of the significance or uniqueness of the remaining military features at Ka`ena Point would be invaluable. He may also know other individuals that are interested in the point's military history or have specific expertise to offer.

Inventory Survey and Memorandum of Agreement

If the project proceeds, the following two steps in the historic preservation process are of particular importance when planning the overall project. They broadly encompass many, but not all, of the technical steps needed to complete the Section 106 compliance process.

- Conduct Inventory Survey of Final Alignment: Once the final preferred alignment is determined, a historic properties inventory survey should be conducted of that alignment and all areas that will or could be disturbed during installation of the fence. This includes all ground disturbing activities needed to create the fence foundation, to install the fence, and to stage equipment and machinery. The survey should verify which historic properties will be directly affected by these construction-related actions and should provide sufficient information on these sites to evaluate their significance and propose appropriate mitigation measures (e.g., avoidance, documentation, monitoring, stabilization, etc.).

- Section 106 Memorandum of Agreement: Under the regulations that implement Section 106 (NHPA), the agency is to enter into a MOA with the State Historic Preservation Office and other parties involved in the project if that project will adversely affect significant historic properties. Other interested parties or organizations may be included as concurring parties. Such adverse effects appear to be unavoidable in this case because the most feasible route for the fence, at a minimum, runs through a historic military complex and passes near a significant traditional cultural property. Stipulations in the MOA define what steps will be taken to avoid or reduce these effects and to document those properties or features of a complex that will be altered. In this case, it is particularly important to address what measures will be taken to address the visual impact of the fence because altering the setting of a historic property or interrupting associated view plans can diminish the historic integrity of the property.

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APPENDIX D

Brochure: Ka‘ena Point Natural Area Reserve Ecosystem Restoration Project

How can I help?

There are a number of ways you can help:

- Keep pets at home when visiting the reserve
- Stay on the trail
- Keep motorized vehicles out of the reserve
- Pack all trash out
- Respect cultural sites
- Volunteer on service projects for trail maintenance and weed pulling
- Give us your input and ideas about a predator-proof fence to kaenapoint@yahoo.com

Black-footed Albatross and Red-tailed Tropicbirds are two species that could return to Ka`ena

For more information on this project please e-mail:
kaenapoint@yahoo.com

Or Write:
DLNR Natural Area Reserves System
1151 Punchbowl St
Honolulu, HI, 96813

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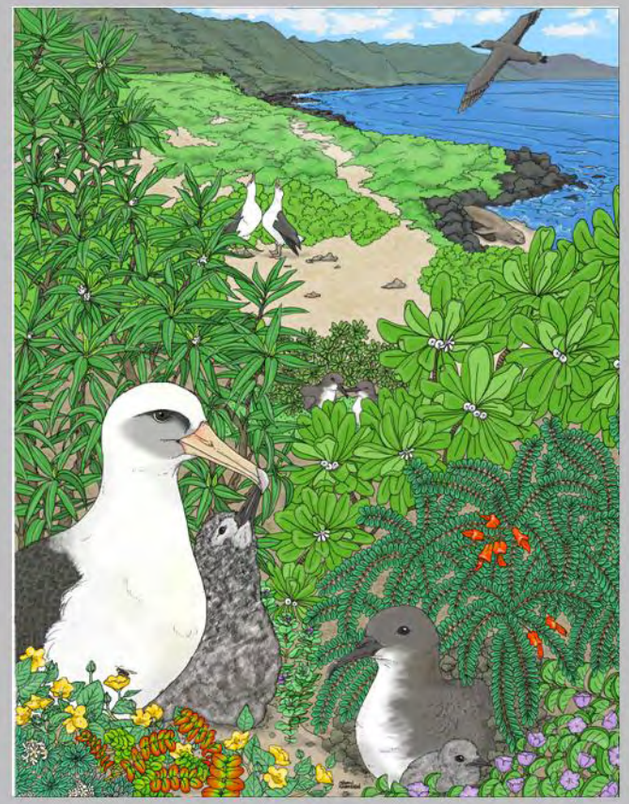
KA`ENA POINT
Natural Area Reserve

Ecosystem Restoration Project



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THE WILDLIFE SOCIETY
HAWAII CHAPTER

Forever Ka`ena

Ka`ena Point is located at the very northwest tip of the island of O`ahu. It is about 10 miles west of Waialua on the North Shore and 10 miles north of Wai`anae on the leeward coast. Within this area is the 59-acre Ka`ena Point Natural Area Reserve, owned and managed by the Hawai`i Department of Land and Natural Resources.

Ka`ena Point Natural Area Reserve as seen from above

Island of O`ahu, Hawai`i

A cultural resource

People have been a part of Ka`ena Point for generations. Many trace their ancestors to this special place. Within the reserve is leina a ka `uhane (Spirit Leap), which is considered to be a wahi pana, a celebrated legendary place. Early Hawaiians used Ka`ena Point for fishing and feather collecting. Today, people of various cultures visit Ka`ena Point for fishing, hiking, bicycling, and other recreational and educational activities.

The wildlife of Ka`ena

Ka`ena Point is an excellent example of the type of ecosystem that can be found in Northwestern Hawaiian Islands. The difference is that anyone on O`ahu can drive to Ka`ena Point to see this spectacular display of plants and animals.

- It is home to nesting seabirds, monk seals, and other native coastal species.
- One of the largest seabird colonies in the eight main Hawaiian Islands is found here. Recent surveys have estimated approximately 2,000 seabirds use Ka`ena Point as their breeding grounds, and many more than that use the area as a place of refuge.
- With adequate protection, it has the potential to become a safe haven for many more species of Hawai`i's seabirds, plants, and insects that cannot survive elsewhere.

Threats to wildlife at Ka`ena

What is threatening the wildlife at Ka`ena?

Rats and Mice: Observations from Hawai`i and around the world have shown that rats will eat seabird eggs and chicks, and even attack adult birds. Scientists estimate that rats have caused 40-60% of all bird and reptile extinctions on islands worldwide. Rats and mice also eat native plants and seeds.

Sandalwood seeds eaten by Rodents at Ka`ena Point

Shearwater chick killed by rats

Mongoose, Cats, and Dogs: At Ka`ena Point in 2006 15% of Wedge-Tailed Shearwater chicks were killed by these predators, and in 2007 13% of Laysan Albatross chicks were also killed. These birds nest on the ground and are extremely vulnerable, especially if they cannot yet fly.

Over 100 Wedge-tailed Shearwaters killed by dogs and cats in 2006 at Ka`ena Point

Despite intensive efforts to control predators such as rats, mice, mongoose and others they continue to threaten nesting seabird populations. Without our help, seabird and native plant communities at Ka`ena Point will continue to be attacked by these alien predators.

Plants and Animals of Ka`ena

Nesting seabird species:

Laysan Albatross (Moli)

Wedge-Tailed Shearwater (`Ua `u kani)

White Tailed Tropicbird (Koa`e `ula)

Hawaiian Short-eared Owl (Pueo)

Other seabirds observed:

Black-footed Albatross

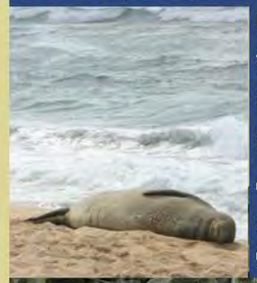
Great Frigatebird (`Iwa)

Red-footed, Brown and Masked Boobies (`A)

Red-tailed Tropicbird (Koa `e`ula)

Grey-backed (Pakalakala), Sooty (`Ewa `ewa) and White Terns (Manu-o-kū)

Black Noddy (Noio)



Migratory shorebirds:

Wandering Tattler (`Ulili)

Ruddy Turnstone (`Akekeke)

Pacific Golden Plover (Kōlea)

Other animals:

Hawaiian Monk Seal (`Īlioholokiauaua)

Native Plants:

Many coastal plants such as naupaka, `ilima & naio

Eleven federally endangered species such as `ohai and `akoko (a species found only at Ka`ena Point)

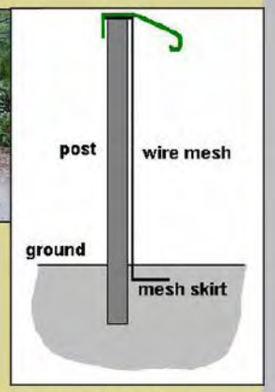
Is there a solution to predation?

Ecosystem restoration through fencing

The goal of ecosystem restoration is to provide a safe place for Hawai`i's native seabirds, plants, and insects by removing destructive alien species and allowing the native species to rebound. New technology in pest-proof fencing holds promise. A pest proof fence could effectively keep out all kinds of mammalian pests- from large animals such as pigs and dogs, to small animals such as mongoose and rats.

A fence with a combination of features– built approximately 6.5 feet high with a rolled hood at the top, fine mesh between the fence posts, and a skirt buried underground -- prevents animals from jumping, climbing, squeezing through or digging their way around the fence and into the protected area. This type of pest proof fence was developed in New Zealand and has been used very successfully.

An example of a pest proof fence in New Zealand



If this method were used, there would be two steps: first fence construction followed by predator removal. Compared to the current cost of protecting native seabirds and plants from alien species at Ka`ena Point, a fence would start to save money by eliminating the need to constantly remove alien species.

If constructed, this will be the first pest proof fence not only in Hawai`i, but in the United States. It would be a great example of the people of Hawai`i showing leadership in protecting and restoring their unique natural resources.

How could the project affect me?

How would a fence affect

Access?

People would still be allowed to visit the reserve both during and after construction. There would be unlocked gates that would allow people on foot and on mountain bikes to enter the reserve at the existing entrances on both the North Shore and West side.

Views?

The fence would run along the base of the Wai`anae Mountains following the existing upper roadbed. It would come down to the high tide line at either end where the existing entrances to the Natural Area Reserve are, but will not fully encircle the reserve. The fence would be designed to blend into the hillside.

What a pest proof fence may look like at Ka`ena

The future of Ka`ena Point?

By removing alien species from Ka`ena Point, two main things would happen.

- existing populations of seabirds and native plants would increase.

- species that could use the Ka`ena Point ecosystem, but were unable to when predators were present, would start to return, or would be transplanted there.

As a result, larger populations, and more types of plants and wildlife would be found within the reserve. By removing alien species from Ka`ena Point we have the opportunity to restore this rare ecosystem to its natural state and preserve a precious piece of Hawai`i for future generations.

APPENDIX E

Final Supplemental Environmental Assessment for the Lehua Island Ecosystem Restoration Project

Final Supplemental Environmental Assessment
Lehua Island Ecosystem Restoration Project

October 2008

Lead Agencies:

U.S. Department of Interior, U.S. Fish and Wildlife Service
Hawai‘i Department of Land and Natural Resources, Division of Forestry and Wildlife

Cooperating Agency:

U.S. Department of Homeland Security, U.S. Coast Guard

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Prepared in compliance with the National Environmental Policy Act and Hawai’i HRS 343 and all associated regulations.

Cover photo courtesy of Kenneth Wood

Executive Summary

Lehua is an uninhabited island in Kaua‘i County, Hawai‘i located approximately 150 miles north-northwest of Honolulu, less than a mile north of Ni‘ihau, and approximately 20 miles west of the island of Kaua‘i. Its three-dimensional surface area is approximately 310 acres, although a variety of lower acreage figures are cited, likely based on estimates from 2-dimensional maps and images. The island is Federal property administered by the U.S. Coast Guard, which maintains a solar-powered navigational beacon near the 702-foot summit. It is also a state-designated Seabird Sanctuary managed by the Hawai‘i Department of Land and Natural Resources (DLNR), and is zoned as Conservation land.

The U.S. Fish and Wildlife Service and the Hawai‘i Department of Land and Natural Resources, Division of Forestry and Wildlife, in cooperation with the U.S. Coast Guard, propose to restore native species on Lehua Island by eradicating invasive rats using aerial application of bait pellets containing the anticoagulant rodenticide diphacinone (0.005% active ingredient). Bait with the anticoagulant brodifacoum (0.0025% active ingredient) would be considered for use if diphacinone failed to eradicate rats. The objective is to create suitable conditions for restoration of native seabirds, plants and other species by exposing all rats on Lehua to a lethal dose of rodenticide, thus eradicating rats from the island. The operation will be conducted during the winter months (January through March) when the rat population is low, few if any new rats are born, and native nontarget migratory species are not present or present in low numbers. Diphacinone has been shown to be an effective toxicant for rats in Hawaii and elsewhere and is preferred because of the reduced impacts to nontarget species, especially birds, both through consumption of bait (direct impacts) and/or through consumption of prey that has consumed the bait (secondary impacts).

In September 2005, the U.S. Fish and Wildlife Service and the Hawai‘i Department of Land and Natural Resources Division of Forestry and Wildlife, as joint lead agencies, and the U.S. Department of Homeland Security, U.S. Coast Guard, as the cooperating agency published the *Final Environmental Assessment for the Lehua Island Ecosystem Restoration Project*, (Finding of No Significant Impact (FONSI) dated 09/30/05). As documented in the FONSI, the U.S. Fish and Wildlife Service Assistant Regional Director, Ecological Services, Region 1 selected the proposed action, Alternative 2, which included the following:

1) Eradication of the introduced alien European rabbit (*Oryctolagus cuniculus*) and Polynesian rat (*Rattus exulans*) on Lehua Island, as these species prevent or suppress ecological regeneration, followed by implementation of a long-term ecological restoration strategy;

2) Adoption of a preventive strategy to reduce the potential for invasive species to be accidentally reintroduced to Lehua Island during and after restoration activities occur (island biosafety/quarantine strategy);

3) Reintroduce appropriate native species that cannot effectively recolonize on their own; and

4) Monitor project actions for effectiveness and overall restoration success.

Alternative 2 of the 2005 EA for Lehua included aerial and hand broadcast of bait pellets containing rodenticide in the summer months. The rodenticide proposed for use was diphacinone (50 ppm), with potential to use brodifacoum (25 ppm) as a backup the following year, but only if it could be determined that any eradication failure is due entirely to the use of diphacinone rodenticide and not other factors.

Following completion of the 2005 Final EA for ecological restoration of Lehua Island, European rabbits were eradicated from Lehua through intensive hunting efforts in 2005 and 2006. Therefore, rabbit eradication will not be addressed in this document.

Since the FONSI was signed in 2005, several important modifications to the rat eradication operation on Lehua Island associated with Alternative 2 have been determined to be more effective for rat eradication while also minimizing and/or avoiding adverse impacts to birds and humans. Therefore, the USFWS and DLNR, as joint lead agencies, have determined that the original 2005 EA should be supplemented to evaluate the impacts associated with these modifications. The purpose of this supplement is to describe the rat eradication operation for Lehua Island in detail as modified and evaluate the effectiveness and impacts associated with the entire operation, including the modifications.

The modifications include:

- Changing the season of starting rat eradication from mid-summer to mid-winter (January through March) in order to:
    - increase efficacy of the operation by exposing the rats to rodenticide during winter when breeding ceases or slows, the rat population is at a minimum, and there is a lower probability that young rats in underground burrows will not be exposed to rodenticide,
    - substantially decrease exposure of nontarget bird species to rodenticide since fewer birds are present in winter,
    - avoid exposure of fishermen, limpet-pickers, and tourists, who rarely if ever use the area during winter,
    - reduce chances of helicopter bird strikes, since fewer seabirds will be present at that time, and
    - avoid all federally listed threatened and endangered seabird species, which are not present on Lehua during the winter.
- Improving effectiveness of bait distribution to all rats on Lehua by modifying or deleting those operational activities and mitigation actions that are not necessary to protect marine organisms, based on the extremely low risk and toxicity of bait to marine organisms as shown by the literature and by marine sampling results from the February 2008 Mokapu Island rat eradication near Moloka‘i. Specifically:
    - The deflector originally proposed for the bait applicator will not be used. Such deflectors, as currently designed, make it difficult for pilots to distribute bait pellets uniformly and frequently cause the bait applicator to malfunction;
    - To give the helicopter pilot and project manager discretion to distribute bait in the most effective pattern, the pilot will not be required to fly only from the coastline toward the ridgeline as originally proposed; and
    - The project manager and pilot will not be excluded from applying bait adjacent to coastlines, thus ensuring a uniform and complete distribution of pellets in shoreline areas used by rats.
- If any broadcast of rodenticide pellets occurs after black-footed and/or Laysan albatross chicks hatch, then all pellets within 6 feet of the nest will be manually collected so that

chicks, which are not yet mobile, cannot play with or ingest them accidentally. All albatross nesting is localized near and at the top of the northwestern portion of the inner crescent, facilitating such removal.

This document also analyzes impacts of diphacinone and brodifacoum related to the modified operation, including:

- transport of rodenticides through soils and water
- impacts of rodenticides on terrestrial and marine invertebrates through ingestion
- impacts on nearshore fish from ingestion of rodenticide bait and ingestion of marine invertebrates potentially having rodenticide residues in their tissues
- impacts on human health
- impacts on birds present on Lehua in the winter, including certain species of native seabirds, nonnative passerine birds, the nonnative barn owl, and two native shorebirds
- impacts on sea turtles, monk seals, and humpback whales.

The National Marine Fisheries Service determined that the operation, as modified, will not adversely affect ESA-listed marine species, including Hawaiian monk seals, sea turtles, and humpback whales. The USFWS made the same internal determination regarding three rare species of seabirds observed on Lehua.

The State Office of Planning determined that the actions described in this document are consistent with the enforceable policies of the Coastal Zone Management Act. The County of Kaua‘i Planning Department also determined that the project is consistent with the goals and policies of the County of Kaua‘i General Plan. The State Historic Preservation Officer has determined that the project will have no adverse effects on historic properties, provided that all mitigation measures are completed. Permits from the Hawaii DLNR and Department of Agriculture will be required.

A Finding of No Significant Impact (FONSI) per NEPA is appropriate based on analysis in Chapter 3 and no significant impacts have been determined per HRS 343.

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Appendix A: Introduction to Rodenticides and Rodenticide Hazard Analysis with Special Reference to Birds

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Appendix D: 2008 Informal Endangered Species Act Section 7 Consultation with National Marine Fisheries Service

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1.0 PURPOSE AND NEED

1.1 Description of Lehua Island and the Need for Rat Eradication

Lehua is an uninhabited island located approximately 150 miles north-northwest of Honolulu, less than a mile from Niʻihau, and approximately 20 miles west of the island of Kauaʻi. Its three-dimensional surface area is approximately 310 acres. Lehua is Federal property administered by the U.S. Coast Guard, which maintains a solar-powered navigational beacon near the 702-foot summit. It is also a state-designated Seabird Sanctuary managed by the Hawaiʻi Department of Land and Natural Resources (DLNR), and the land is zoned as a Conservation District. Ecological restoration of Lehua Island was identified as a goal in the USFWS Pacific Region Seabird Conservation Plan (USFWS 2005) and by the Offshore Islet Restoration Committee, which is a working group of Hawaiʻi conservation organizations and agencies. The Hawaiʻi State Comprehensive Wildlife Conservation Strategy (Mitchell 2005) identifies Lehua as one of two islands offshore of Kauaʻi (Kaula is the other) that are very important for seabird breeding.

An unidentified species of rat was first recorded on Lehua Island by Caum (1936), who reported that lighthouse personnel saw rats as early as 1931. Polynesian rats were positively identified during surveys conducted on Lehua in 2003 and 2004 (Wood et al. 2006) and voucher specimens were placed at Bishop Museum.

Polynesian rats are the smallest of the three alien rats introduced to Hawaiʻi. They eat a wide variety of foods, including fleshy fruit, seeds, flowers, stems, leaves, roots and other plant parts (Atkinson and Atkinson 2000). They also eat earthworms, centipedes, the larvae of butterflies and moths, ants, beetles, cicadas, snails and spiders. Rats scavenge and may also kill vertebrate prey, including birds and their eggs (Drummond 1960, Norman 1970, Fall et al. 1971, Jackson 1982, Atkinson 1985, King 1990, Navarette and Castilla 1993, Sugihara 1997, Drever and Harestad 1998, Hobsen et al. 1999, Cole et al. 2000, Innes 2001, Stapp 2002, Dunlevy and Scharf 2008). As reported in Tomich (1986), Polynesian rats in Hawaiʻi may prey upon Bulwer's petrel (*Bulweria bulwerii*), Laysan albatross (*Phoebastria immutabilis*) and burrow-nesting species such as the wedge-tailed shearwater (*Puffinus pacificus*), and the Bonin petrel (*Pterodroma hypoleuca*). Atkinson and Atkinson (2000) also reported detrimental effects of rats on burrowing petrels in Hawaiʻi and New Zealand and on red-tailed tropicbirds (*Phaethon lepturus*). Rat eradication on Midway Atoll resulted in dramatic increases of Bonin petrels, whose population had been declining due to rat predation (Seto and Conant 1996). In the two years immediately following the control of black rats on Mokoliʻi near Oʻahu, nesting success for wedge-tailed shearwaters increased rapidly, from only one chick fledging in the three years prior to rat eradication to 185 chicks fledging the second year after eradication (D. Smith, Hawai'i DOFAW, pers. comm.). Rats have also been documented to feed on endemic crickets and weevils (F. Howarth unpublished data, pers. comm.), as well as the seeds, bark, fruits, leaves and shoots of native Hawaiian plants.

Native seabirds, insects, coastal plants and marine species are becoming increasingly rare in the main Hawaiian Islands and have limited opportunities to recover due to alien species invasions, coastal development, and other human activities. Surveys conducted on Lehua Island in 1931 (Caum 1931) identified that European rabbits and Polynesian rats were the two main causes of native plant community degradation and the resulting dominance of nonnative plants there. Currently, about 23 native species, generally in very low numbers, have been able to survive

both rat and rabbit predation. Subsequent biological surveys have documented the extirpation or near extirpation of several species of native plants, insects, and seabirds by rats, rabbits, and other alien species, such as barn owls (*Tyto alba*) and cattle egrets (*Bulbucus ibis*) (Wood et al. 2004, VanderWerf et al. 2007). Guilds of native crickets, earwigs, mites, and spiders that were directly dependent on large numbers of breeding seabirds have disappeared from most islands due to eradication of large seabird colonies and the introduction of ants and other alien insects. Although rats have extirpated or diminished populations of several of the smaller, ground-nesting seabirds, Lehua still stands out as one of the largest and most diverse seabird colonies in the main Hawaiian Islands. Recent surveys documented over 25,000 breeding pairs of seabirds and up to 11 species nesting or attempting to nest on Lehua (VanderWerf et al. 2007).

Wedge-tailed shearwaters are the most numerous species on the island, but Lehua has the largest brown booby (*Sula leucogaster)* colony and one of the largest red-footed booby (*Sula sula*) colonies in Hawai‘i. Lehua and possibly Kaula are the only two nesting locations in the main Hawaiian Islands for rare black-footed albatross (*Phoebastria nigripes*), which were first documented nesting on Lehua in 2001 (Wood et al. 2004). Laysan albatross, another species rarely seen in the main Hawaiian Islands, also nest on Lehua. Another exciting discovery was the presence of rare band-rumped storm-petrels (*Oceanodroma castro*), threatened Newell’s shearwaters (*Puffinus auricularis newelli*), and endangered Hawaiian petrels (*Pterodroma sandwichensis*) (VanderWerf et al. 2007). All three species have been seen returning to and circling Lehua in the evening. Biologists also found the body of a juvenile Newell’s shearwater that was too young to fly, demonstrating that this rare and declining species is attempting to nest on Lehua but without much success. Species apparently extirpated from Lehua include the brown noddy (*Anous stolidus pileatus*), masked booby (*Sula dactylatra*), Bonin petrel, sooty tern (*Sterna fuscata*), gray-backed tern (*Sterna lunata)*, and blue-gray noddy (*Procelsterna cerulea*).

Once restored, Lehua Island can provide a safe haven for a diverse and abundant suite of coastal species. Despite its problems, including presence of alien rats (and formerly rabbits) since at least the 1930s, if not earlier, Lehua still supports a large seabird colony, including small numbers of very rare seabird species. Restoration of rare, threatened or endangered bird, plant and invertebrate species on Lehua will help to accomplish restoration goals outlined in multiple federal species recovery plans. Restoration also offers opportunities to inform the public about Hawai‘i’s native species and efforts to conserve them.

Lehua can serve as a model for demonstrating restoration techniques which will have applications in other areas. Restoring unpopulated islands is one of the most cost-effective and lasting types of habitat restoration. Islands are a manageable size for intensive restoration projects, especially when eradication of an alien species is involved. Eradicating alien species in large areas can be very expensive, logistically challenging, and subject to risks of re-invasion from adjacent areas outside the restoration zone. Lehua, however, is small enough that the rats and the worst of the alien plant species can be completely removed. Furthermore, Lehua’s isolation and difficult access help protect it from reinvasion by alien species after restoration has begun. While reinvasion will always be a major concern, it is much easier and cheaper to protect and manage uninhabited islands like Lehua than similar habitats on the larger, populated islands in Hawai‘i.

1.2 Purpose of This Supplemental EA

1.2.1 Description of Selected Alternative in the 2005 EA

Alternative 2, the selected alternative in the FONSI for the original 2005 EA, involved the following actions for meeting the stated goals and objectives:

1) Complete eradication of alien European rabbits using hunting and trapping techniques, followed by

2) removal of Polynesian rats using aerial broadcast of the rodenticide diphacinone (50 ppm active ingredient), with an option to use the rodenticide brodifacoum (25 ppm active ingredient) as a followup the following year, but only if it could be shown that the sole reason for eradication failure was due to the use of the rodenticide diphacinone and no other factor, followed by

3) native plant restoration using a plant restoration and reintroduction plan considering appropriate sources of plants, population genetics, and historic ranges of plants.

4) Throughout the project, efficacy and impact monitoring would occur, as well as implementation of a plan to avoid reintroduction of alien plants and animals.

Both diphacinone and brodifacoum have been approved for conservation use by the U.S. Environmental Protection Agency (EPA). Diphacinone for conservation use in the small, ½" pellet formulation required for Lehua Island has been approved by the Hawai‘i Department of Agriculture. The approved labels for diphacinone and brodifacoum are included as Appendix A. Use of brodifacoum for conservation purposes is considered for this project only if any eradication failure can be attributed directly to the use of diphacinone and not to any other factors. See Chapter 2 for more detailed descriptions of the modified operational plan for eradication of Polynesian rats from Lehua Island and Chapter 3 and Appendix A for more information on diphacinone and brodifacoum and their comparative impacts.

The proposed action for rat eradication as described in the 2005 final EA involved the following actions and mitigation measures. These measures include those required in the July 5, 2005, informal Section 7 consultation with the National Marine Fisheries Service, which resulted in their determination that the project "may affect but is not likely to adversely affect" Hawaiian monk seals (*Monachus schauinslandi*) and green sea turtles (*Chelonia mydas*).

- Rodenticide would be applied by hand or aerial application and/or bait stations, using a hopper [bait applicator] for aerial application with a 120 degree deflector, using hand broadcast in shoreline areas and/or with bait placed directly in burrows or other areas deemed to be high quality rat habitat, establishing a coastal no-fly buffer for bait application, and flying the helicopter from the shoreline inland to minimize risk of bait dropped in the ocean.
- Diphacinone would be applied at 12.5 lb/acre per application and bait stations would be filled with bait continuously for approximately two years, allowing rats free access. Any application of brodifacoum bait would be applied at up to 13.5 lb/acre or less as required.
- Conducting eradication operations during the dry summer season between April and October when rat population densities and the potential for storm events are lowest to avoid bait being washed into the ocean (only when no rain is forecast for 48 hours).

- Time bait broadcast in the summer to avoid shorebird season and juvenile albatross and transient birds of prey.
- Buffer zones within which no bait will be distributed will be maintained around shoreline areas.
- Bait will not be applied in high wind conditions.
- Any crews conducting hand broadcast of rodenticide pellets on the island will maintain a 100-foot buffer from [Hawaiian monk] seals.
- The helicopter will be required to alter course to avoid flying directly over hauled-out seals and no bait will be spread on or around seals.
- Pellets will be evaluated to ensure that no active seeds of nonnative plants are embedded in the bait pellets.
- Monitor plant communities before, during, and after rabbit and rat eradication efforts to determine if alien "weeds" are increasing and implement a weed management program if necessary.

Following completion of the 2005 Final EA for ecological restoration of Lehua Island, European rabbits were eradicated through intensive hunting efforts in 2005 and 2006. With the rabbits gone, the next restoration project task is the eradication of the rats.

1.2.1 Modifications to the Selected Alternative

Since the FONSI was signed in 2005, new information has become available and important modifications to the rat eradication operation on Lehua Island associated with the selected Alternative 2 have been determined to be more effective for rat eradication, while also minimizing and/or avoiding adverse impacts to both birds and humans. Therefore, the USFWS and DLNR, as joint lead agencies, have determined that the original Environmental Assessment for the Lehua Island Ecosystem Restoration Project should be supplemented to evaluate the impacts associated with these modifications (40 CFR 1502.9(c)). The purpose of this supplement is to describe the rat eradication operation for Lehua Island in detail as modified and evaluate the effectiveness and impacts associated with the entire operation, including the modifications.

The changes are:

- Changing the season of starting rat eradication from mid-summer to mid-winter (December through February) in order to:
    - increase efficacy of the operation by exposing 100% of the individual rats to rodenticide because rat breeding is far lower and may cease in winter and the presence of dependent rat pups in burrows insulated from exposure to rodenticides is lowest,
    - substantially decrease exposure of migratory nontarget bird species to rodenticide since fewer birds are present in winter,
    - avoid exposure of fishermen, limpet-pickers, and tourists, who rarely if ever use the area during winter,

  - reduce bird strike hazard concerns for the helicopter pilot by operating when fewer seabirds are present, and
  - avoid all federally listed threatened and endangered seabird species, which are not present on Lehua during the winter.

- The following changes to operational activities and mitigation described in the 2005 EA will be made for two reasons. First, these changes will improve the effectiveness of bait application in critical shoreline areas, thus, providing for 100% exposure of all individual rats to rodenticide bait. Second, they are not necessary to protect marine organisms due to the extremely low risk and toxicity of bait to marine organisms, as shown by the literature summary and analysis in this supplement (Section 3.3.2) and marine sampling results from the February 2008 Mokapu Island rat eradication near Moloka‘i.
  - A deflector on the bait applicator will not be used. Such deflectors, as currently designed, make it difficult for pilots to distribute bait pellets uniformly and frequently cause the bait applicator to malfunction;
  - The helicopter pilot and project manager will be given the discretion to distribute bait in the most effective pattern and will not be required to fly only from the coastline inland toward the ridgeline; and
  - The project manager and the pilot will not be excluded from applying bait adjacent to coastlines, thus ensuring a uniform and complete distribution of pellets in shoreline areas used by rats.
- If any broadcast of rodenticide pellets occurs after black-footed and/or Laysan albatross chicks hatch, then all pellets within 6 feet of the nest will be manually collected so that chicks cannot play with or ingest pellets. All albatross nesting is localized near and at the top of the northwestern portion of the inner crescent, facilitating such removal.
- The definition of “high winds” is clarified to be 35 mph (as stated on the pesticide label), beyond which aerial application of pesticides cannot be conducted.
- Helicopters will be prohibited from flying over humpback whales and vessels will be prohibited from approaching within 100 yards of humpback whales.

1.2.3 Scope of this Supplement

This supplement also provides additional details for the rodenticide operation and conducts more detailed impact analyses than was provided in the original 2005 EA. It also clarifies some scientific interpretations regarding the timing of the operation in the original 2005 EA. Updated evaluation of significance of impacts of the rat eradication operation per Hawai‘i HRS 343 is also included. This supplement serves as the final document for the rat eradication operation on Lehua Island and supersedes the 2005 EA in this matter.

This supplement does not:

- Affect the component of selected Alternative 2 regarding the rabbit eradication project, since this project was successfully completed in 2006.
- Modify the program for plant and animal restoration as identified in the original 2005 EA.

- Modify the programs for quarantine of and response to releases of nonnative plant and animal species.
- Duplicate unnecessary information regarding the affected environment and other information, as this information is detailed in Chapter 2 of the 2005 EA.
- Re-evaluate the no action alternative (not conducting a rat eradication project on Lehua Island) or Alternative 3 (use only brodifacoum as the rat eradication rodenticide on Lehua Island) as these alternatives were evaluated and rejected by the USFWS in the FONSI for the 2005 EA dated September 30, 2005.
- Describe the alternatives not considered in detail, as these are described in the 2005 Final Lehua EA.
- Consider or evaluate the use of any other rodenticides, chronic or acute, such as chlorophacinone, zinc phosphide or cholecalciferol for use on Lehua Island.

Therefore, the USFWS, in cooperation with DLNR, will use this supplemental EA and other appropriate documents to determine only if the modified rodent eradication might have significant impacts requiring analysis in an Environmental Impact Statement (EIS). No other decisions are necessary for this operation.

The USFWS and the Hawai‘i Department of Land and Natural Resources (DLNR) are joint lead agencies on this EA per NEPA, and DLNR is the approving agency per HRS 343. This supplemental EA is prepared consistent with the National Environmental Policy Act (NEPA), its Council on Environmental Quality (CEQ) implementing regulations at 40 CFR 1500-1508, and HRS 343 and its implementing regulations at HAR 11-200, Department of Interior NEPA manuals 516 DM 1, 2, and 8 (USFWS) and other pertinent Federal and State of Hawai‘i laws and regulations.

The action discussed in this supplement was developed cooperatively by USFWS and DOFAW staff in collaboration with members of the Offshore Island Restoration Committee (OIRC). Operational requirements, monitoring plan, and project planning were also reviewed by the New Zealand Island Eradication Advisory Group as part of the analysis for this supplement, integrating methodologies that have been successful in New Zealand and other locations.

This EA will be in effect through the eradication efforts and into the future if rats ever re-invade Lehua. However, this document would need to be further supplemented if the eradication project is further modified, new information becomes available that indicates that the effects would be different than those anticipated and documented in the original 2005 EA as modified by this supplement, or new eradication technologies become available.

A Finding of No Significant Impact (FONSI) per NEPA is appropriate based on the analysis in Chapter 3 of this supplement. No significant impacts have been determined per HRS 343.

Details of the general impacts of rats (*Rattus* spp.) on island ecosystems are found in both Chapter 1 of the 2005 final EA for Lehua Island and a more detailed analysis is found in Chapter 1 of the Final Environmental Assessment for Eradication of Polynesian Rats (*Rattus exulans*) from Mokapu Island, Hawai‘i (FONSI signed January 10, 2008). Both final EAs are available from the Point of Contact on the cover of this supplement. This information merely supports and does not change the analyses in this supplement, which supersedes the original 2005 EA regarding the rat eradication project on Lehua Island.

1.3 Public Comments on 2005 EA

For the original 2005 EA, USFWS and DLNR DOFAW contacted all the organizations and individuals identified in Chapter 5 of the original Lehua Island EA. The USFWS and DOFAW made extensive efforts in 2005 to inform and seek input from the general public and government regulatory agencies, regarding the need to restore Lehua Island. In addition, members of a non-profit conservation organization, Island Conservation, were consulted and helped prepare the 2005 EA. A member of the New Zealand Department of Conservation conducted a site visit to Lehua Island and provided input into the development of plans for the eradication of rabbits and rats from the island.

The following comments were obtained regarding the proposed rat eradication operation during the 2005 scoping period:

- Public: two letters in strong support and one not in support (objecting to the rabbit eradication project only)
- Hawai‘i environmental recreational businesses: two letters in strong support
- Pacific Seabird Group: strong support.

Based on the input gathered during the 2005 scoping process, a Draft EA was prepared and issued for public comment on June 8, 2005. The Draft EA was posted on the Service’s Pacific Islands Office website per agency policy for NEPA and a notice requesting comment was published in the State of Hawai‘i’s Office of Environmental Quality Control Bulletin per HRS 343. Letters were also sent notifying interested parties of the availability of the Draft EA and requesting comments. A list of all the parties who were notified is included in Chapter 5 of the Final EA. The 30-day comment period closed on July 8, 2005. Four letters were received: one from The Nature Conservancy (comments in support of the project), and three from State of Hawai‘i agencies: the Historic Preservation Division (concurring with the finding of no adverse impact with mitigation and requesting the final cultural resources report), the Department of Health (no comment), and the Office of Environmental Quality Control (requesting an evaluation of an HRS 343 finding of no significant impact and requesting documentation of contact with Native Hawaiian cultural experts). These letters and the response letters to them are included in Appendix F of the 2005 final EA.

1.4 Section 7 Consultations on the Selected Alternative in the 2005 EA and the 2008 Supplemental EA

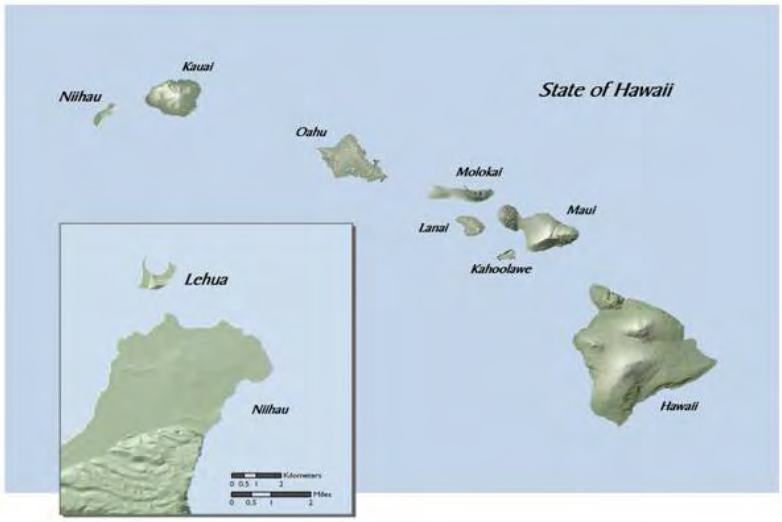
Intra-Service Section 7 Endangered Species Act Consultation for the Newell’s shearwater and Hawaiian petrel (both listed), and the band-rumped storm-petrel (a candidate for listing) was finalized in April 2005 and included in Appendix E of the 2005 final EA. The USFWS determined that the proposed action would benefit the ecosystem and the three species of seabirds, resulting in a determination of “may affect but is not likely to adversely affect” the shearwater and petrel, and a determination of “no effect” for the storm-petrel. The following actions were required to reduce adverse effects: *“To minimize disturbance, hunting and trapping of rabbits will occur in the winter, when no listed seabirds are present and the smallest numbers of other seabirds are nesting. Newell’s shearwaters, Hawaiian petrels, and band-rumped storm-petrels commute to and from their nesting sites at night. Aerial broadcast by helicopter and hand-placement of rodenticide bait would be done during the day, so no direct disturbance to*

listed seabirds is expected." With the proposed change to a winter operation, when listed seabirds are not present, no impact to these species is anticipated and no mitigation needed.

An informal Section 7 consultation with the National Marine Fisheries Service (NMFS) (letter dated July 5, 2005, Appendix E of the 2005 EA) resulted in concurrence by NMFS that the proposed eradication projects on Lehua Island were not likely to adversely affect federally listed Hawaiian monk seals or sea turtles. The mitigation measures identified in the letter are included in italicized letters in Section 1.2.1 of this supplement. The letter also concurred with the USFWS statement that *"bait pellets will not present a poisoning hazard to foraging seals or sea turtles."* NMFS further stated: *"It should also be noted that as a result of this project there could be indirect beneficial effects to both monk seals and sea turtles arising from increased native plant cover which will stabilize soils, reduce sediment runoff into the ocean and improve marine water quality. This may result in the establishment of improved nearshore foraging habitat for both monk seals and sea turtles. Given the mitigation put in place under the draft EA we conclude that any effects of the proposed action on monk seals or sea turtles would be discountable. NOAA Fisheries Service therefore concurs with your determination that the project may affect but is not likely to adversely affect ESA listed species under our jurisdiction."*

A second informal Section 7 consultation was initiated with NMFS in 2008 because of the change in project timing to the winter season. In addition to including the monk seals and sea turtles discussed in the 2005 consultation for a summer operation, the 2008 consultation also included an assessment of impacts to endangered humpback whales (*Megaptera novaeangliae*), which are present in Hawaii only in the winter. The USFWS determined that the project was not likely to adversely impact any of these species. In a letter dated September 3, 2008 (included as Appendix D to this document), NMFS concurred with this determination, stating that "…*we concur that the proposed action, as currently revised, is not likely to adversely affect ESA-listed marine species*." Mitigation measures are listed in Section 2.3.1 below.

Fig. 1. Location of Lehua Island off the coast of Niʻihau and Kauaʻi



Graphic: USFWS

Fig. 2. Lehua Island aerial photograph #1

Photo: Steve Ebbert

Fig. 3. Lehua Island aerial photograph #2

Photo: Google Earth

1.5 Consistency with USFWS and DOFAW Invasive Species Policies

In this supplemental EA, the term "invasive" will be used to mean any nonnative species introduced into an area that causes ecological harm. The key characteristics of an invasive species involve the following factors:

- the human-induced introduction of a species occurring outside of its historically known natural range
- potential dispersal and establishment of the species within the new suitable habitat, and
- resulting damage to the native ecology, the economy, or human health.

Not only are invasive species highly adaptable, but typically they encounter favorable conditions in their new environment, and their rapid establishment can be facilitated by the availability of more or better resources, fewer or less efficient native competitors and predators, and/or a more advantageous habitat (Courchamp et al. 2002).

Restoration of native biological diversity by removing invasive species and preventing further introductions is a major priority of the USFWS, consistent with its mission and USFWS policy for managing refuges for biological diversity, integrity, and environmental health (601 FW 3, 2001).

The USFWS policy as stated in 601 FW 3 (2001) is to, first, maintain existing levels of biological integrity, diversity and environmental health at the landscape scale; and secondly, to restore lost or severely degraded elements of integrity, diversity, and environmental health at the landscape scale and other appropriate landscape scales where it is feasible and supports achievement of refuge purposes and mission. The policy recognizes that applications of chemicals may be necessary to maintain biological integrity. The policy also focuses on preventing the introduction of invasive species, detecting and controlling populations of invasive species, and providing for restoration of native species and habitat conditions in invaded ecosystems.

DOFAW's policy, as described in Hawai'i's Comprehensive Wildlife Conservation Plan (Mitchell et al. 2005) identifies seven objectives that are necessary for the long-term conservation of Hawai'i's native wildlife, of which the first two are related to protection of native species and habitats and management of invasive species:

1) Maintain, protect, manage, and restore native species and habitats in sufficient quantity and quality to allow native species to thrive;
2) Combat invasive species through a three-tiered approach combining prevention and interdiction, early detection and rapid response, and ongoing control or eradication.

Under the first objective, a high priority was to remove introduced mammals, including rats, from important habitats to establish ungulate and predator-free areas on each island, including landscape-level predator management.

Under the second objective, high priority actions include continuing coordination of invasive species prevention, management and control programs for county, state, Federal and private sector entities through existing entities and mechanisms, as well as to continue research on effective management methods and tools for introduced vertebrates and other taxa, including rats.

1.6 Previous Hawai‘i Rodent Eradications and Consistency with Executive Orders

Using New Zealand’s successes in controlling and eradicating invasive rodents as a model, Hawai‘i has been at the forefront of efforts in the United States to adapt agricultural and commensal rodent control and eradication techniques to native ecosystem conservation areas. Developing rodenticide application techniques and obtaining registrations for them in Hawai‘i has been pursued with the goal of conservation of plants and animals, while allowing natural and active restoration or recovery of species impacted by introduced rodents. This has been carried out by substantially reducing rodent populations in valuable native ecosystems on the main Hawaiian Islands and by eradicating them from uninhabited offshore islands and remote atolls. Beginning in 1990, the USDA-APHIS-Wildlife Services eradicated rats from four remote Pacific atolls where rats were having devastating impacts on seabird colonies (Hess et al. *in press*):

1) Conducted with the USFWS and the Samoan Department of Wildlife and Marine Resources, eradicated Polynesian rats on uninhabited Rose Atoll (17 acres), American Samoa, using brodifacoum (0.005% active ingredient) in bait stations. Although the first attempt controlled but failed to eradicate rats, a subsequent application with bromethalin (0.01% active ingredient), an acute neurotoxin, completed the eradication.
2) Wildlife Services (WS) and the Hawai‘i Department of Land and Natural Resources (DLNR) eradicated Polynesian rats in 1993 from 348-acre Green Island, Kure Atoll (Northwestern Hawaiian Islands) using techniques similar to those used on Rose Atoll.
3) WS and U.S. Navy eradicated black rats from Eastern Island (362 acres) and Spit Island (3 acre) at Midway Atoll, using the same techniques used at Rose Atoll for Eastern Island and trapping on Spit Island. They also eradicated rats on 1,300-acre Sand Island at Midway Atoll using bait stations and live traps. Sand Island is the largest and the only inhabited island in the United States from which rats have been removed.

The last attempted eradication on a Pacific Atoll (black rats from Palmyra Atoll, in the equatorial Line Islands in 2001) was by far the most complex, involving approximately 742 acres and 52 islets, most of which were densely vegetated. This operation failed due to insufficient funding, inadequately trained personnel, and interference with bait stations by several species of land crabs.

In 2002, the Offshore Island Restoration Committee (OIRC) was formed to restore selected small offshore islands around the Main Hawaiian Islands. To date, eradication of black rats (*Rattus rattus*) on Mokoli‘i near O’ahu using diphacinone in bait stations has been completed (D. Smith, *pers. comm.*). In February 2008, the first aerial rodenticide application to eradicate rats from an island in Hawai`i using diphacinone was conducted on Mokapu Island off Moloka‘i. This was the firs aerial eradication in the world to use diphacinone.

These past, existing and proposed projects are fully consistent with and contribute to complying with Executive Order 13112 of February 3, 1999, *Invasive Species,* which requires Federal agencies whose actions may affect the status of invasive species to, subject to the availability of appropriated funds and within administrative budgetary limits, use relevant programs and authorities to:

- Prevent the introduction of invasive species;
- Detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner;

- Monitor invasive species populations accurately and reliably;
- Provide for restoration of native species and habitat conditions in ecosystems that have been invaded;
- Conduct research on invasive species and develop technologies to prevent introduction of and provide for environmentally sound control of invasive species; and
- Promote public education on invasive species and the means to address them.

Under Executive Order 13186 of January 11, 2001, *Responsibilities of Federal Agencies to Protect Migratory Birds*, the USFWS is given authority to recognize and promote the great ecological and economic value of migratory birds to the United States and other countries by promoting the conservation of migratory bird populations. The Executive Order states that each Federal agency shall, to the extent permitted by law and subject to the availability of appropriated funds and within Administration budgetary limits, and in harmony with agency missions:

- Support the conservation intent of the migratory bird conventions by integrating bird conservation principles, measures, and practices into agency activities and by avoiding or minimizing, to the extent practicable, adverse impacts on migratory bird resources when conducting agency actions;
- Restore and enhance the habitat of migratory birds, as practicable;
- Prevent or abate the pollution or detrimental alteration of the environment for the benefit of migratory birds, as practicable;
- Design migratory bird habitat and population conservation principles, measures, and practices, into agency plans and planning processes (natural resources, land management, and environmental quality planning);
- Ensure that environmental analyses of Federal actions required by NEPA or other established environmental review processes evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern;
- Identify where unintentional take of migratory birds reasonably attributable to agency actions is having, or is likely to have, a measurable negative effect on migratory bird populations, focusing on species of concern, priority habitats and key risk factors.

This supplemental environmental assessment contributes to continuing pursuit of these goals, consistent with Executive Orders 13112 and 13186 and Federal and state policy, by planning and implementing an aerial broadcast application of diphacinone on a small offshore island with an established invasive rodent population to restore the natural habitat of native seabirds and plants.

1.7 Compliance with Laws/Executive Orders Applicable to Rodent Eradication

1.7.1 Coastal Zone Management Act in Hawai‘i

The Coastal Zone Management Act (CZMA) is a Federal law that delegates authority to states with approved management plans, including Hawai‘i, to restore and protect coastal waters and resources. The Federal regulations at 15 CFR 930 and State statutes, regulations and guidance interact to provide the framework for State management of the coastal resources.

Federal regulations at 15 CFR 930.30-930.46 require “all Federal agency activities, including development projects affecting any coastal use or resource will be undertaken in a manner consistent to the maximum extent practicable with the enforceable policies of approved management plans.” “To the maximum extent practicable" is defined as "fully consistent with the enforceable policies of [State] management plans unless full consistency is prohibited by existing law applicable to the Federal agency” (15 CFR 930.32).

“Enforceable Policies” are state policies which are legally binding through state constitutional provisions, laws, regulations, land use plans, ordinances, judicial or administrative decisions, by which a State exerts control over private and public land and water uses and natural resources in a coastal zone and which are incorporated in an approved management plan. They contain standards of sufficient specificity to guide public and private uses, and the state must base any objections to proposed actions within the coastal zone on the enforceable policies (15 CFR 930.11(h)).

The Hawai‘i Office of State Planning has the authority to review Federal actions or actions on Federal lands for compliance with the State’s implementing law (HRS 205A). The State of Hawai‘i law for implementing the federal Coastal Zone Management Act is HRS 205A: Coastal Zone Management.

The following State enforceable policies have been identified as potentially applicable and consistency with these laws is documented in Section 3.4 of this supplement:

- HRS 149A: Hawai‘i Pesticides Law
- HRS 195D and HAR 13-124: Conservation of Aquatic Life, Wildlife, and Land Plants (endangered species)
- HRS Chapter 6E: Historic Preservation
- HRS 342D and HAR 11-54: Water Pollution and Water Quality Standards

In a letter dated July 23, 2008 (included in Appendix E), the State Office of Planning determined that the project described in this document is consistent with the enforceable policies of the Coastal Zone Management Act.

1.7.2 State of Hawai‘i Code for Pesticide Control

In addition to the Federal Insecticides, Fungicides, and Rodenticides Act (FIFRA), under which formulations of both diphacinone and brodifacoum are registered for conservation use, the State of Hawai‘i also requires management and registration of pesticides. These requirements (in HRS Chapter 149A, HAR 4-66, 2006), are administered by the Hawai‘i Department of Agriculture. The law requires licensing and labeling for pesticides, certification for applicators, and licensing for sales.

Both diphacinone and brodifacoum are considered "restricted use" pesticides. Therefore, pesticide applicators supervising the proposed program must have a Category 2 certification for persons using or supervising the use of pesticides in forests, forest nurseries, and forest seed producing areas. The helicopter pilot doing the bait application must have a Category 4 certification for persons applying pesticides by aircraft.

No person shall apply a restricted use pesticide by aircraft except by special permit under the following conditions and limitations:

- A written application including information on that applicant and applicator, purpose of aerial treatment, pesticide formulation, dosage, method of aerial treatment and proposed number of treatments to be made, and proposed sites and conditions.
- The request for special permit may be refused in writing, with rationale, if it is determined that the proposed aerial treatment may cause unreasonable adverse effects to humans or the environment (meaning any unreasonable risk to humans or the environment, taking into account the economic, social, and environmental costs and benefits of use of the pesticide (4-66-2)) or will create a hazard.
- A special permit specifies the time period and may specify and limit the number of treatments, or continuous treatments when conditions are not expected to change or vary during subsequent treatments conducted in the same designated area or areas.
- The Hawai‘i Department of Agriculture shall be notified 24 hours in advance of the treatment.
- The special permit does not relieve the permittee from the penalty provisions or the law or any liability for any damage or contamination of crops or plants, animals, man and the environment resulting from the aerial treatment.

The necessary State permit will be obtained prior to aerial application of rodenticide on Lehua Island, and all rodenticide applications will be under the direct supervision of a certified applicator.

1.7.3 The Endangered Species Act

The Endangered Species Act (ESA) provides the means to conserve ecosystems upon which threatened and endangered species depend as well as the conservation of endangered and threatened species, and provides for taking steps as may be appropriate for meeting U.S. obligations in treaties and conventions such as migratory bird treaties with Mexico, Japan, Canada and Russia. It prohibits the “take” of listed threatened and endangered animal species without meeting certain procedural requirements. “Take” includes harassment which is defined as an “intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering”(50 CFR 17.3).

Hawai‘i State law HRS 195D-4 and associated regulations at HAR 13-124 govern the State regulation of endangered and threatened species. It provides for all Federally listed species to also be listed by the State, although the State retains the right to uplist species listed as threatened by the Endangered Species Act to endangered status. It also provides a list of endangered species at HAR 13-124.

No adverse impacts to and potential beneficial impacts on listed species were identified during the informal Section 7 consultations with the USFWS and NMFS for the operations described in the 2005 EA. USFWS initiated a second informal Section 7 consultation with NMFS in August 2008, specifically for the revised actions described in this document. Because humpback whales are potentially present around Lehua in the winter, they were included in the 2008 consultation along with the two marine species previously included in the 2005 consultation (monk seals and green sea turtles). In a letter dated September 3, 2008 (included as Appendix D), NMFS concurred with the USFWS finding that “the proposed project, as currently revised, is not likely

to adversely affect ESA-listed marine species." Mitigation measures for avoiding disturbance to monk seals, sea turtles, and whales (see Section 2.3.1 below) will be followed. The change from a winter, rather than a summer, operation eliminated any potential for adverse impacts on ESA-listed seabirds (which are absent in the winter) so there was no need to re-initiate the internal USFWS Section 7 consultation.

Marine mammals, which protected under the Marine Mammal Protection Act, would not be adversely impacted.

1.7.4 The Migratory Bird Treaty Act and Executive Order Guidance for Protection of Migratory Birds

The Migratory Bird Treaty Act (MBTA), originally passed in 1918, implements the United States' commitment to four bilateral treaties with Mexico, Japan, Russia and Canada for the protection of migratory bird resources. The Canadian treaty was amended in 1995 to allow traditional subsistence hunting of migratory birds. Each of the treaties protects selected species of birds and provides for closed and open seasons for hunting identified migratory game birds. Although the MBTA applies to the Federal government, based on the D.C. Circuit Court of Appeals decision (*The Humane Society of the United States v. Glickman*, Case No. 99-5309, decided 18 July 2000), other case law has found that the MBTA does not apply to actions, Federal or non-Federal, in which incidental (indirect) take of migratory birds occurs incidental to some other activity conducted for some other purpose. Subsequent to the *Humane Society* decision, the U.S Fish and Wildlife Service issued a Director's Order (now superseded and reinforced by USFWS Manual 724 FW 2, *Migratory Bird Permits*) that clearly applies the MBTA to the Federal government. Federal agencies must obtain permits for the same activities for which permits are required for other entities, including permits for bird banding, scientific collecting permits, and depredation.

The USFWS regulations do not provide for permits for any other type of activity, including the application of pesticides. However, the USFWS decided to prepare an environmental impact statement (EIS) for an initial incidental take permit and a subsequent environmental assessment (EA) for renewal of that permit under MBTA per a California District Court action (civil action number 01-2288) for aerial application of brodifacoum on Anacapa Island, California (National Park Service 2000), even though the Court did not require application of NEPA to such a permit. Therefore, the precedent is set for the application of MBTA permits for aerial application of rodenticides for the purpose of rodent eradication for ecological objectives on land under Federal jurisdiction. However, the USFWS has no formal policy in place regarding the requirement for a permit for pest eradication projects. Therefore, although this document will provide sufficient NEPA analysis for a permit application for adoption (40 CFR 1506.3) by the USFWS should one be needed, the USFWS authority per the MBTA will not require that the Federal government nor anyone else request a permit for any rodent control or eradication projects conducted on Lehua Island.

The USFWS published a list of species not regulated under the MBTA in 2005 (*Federal Register* 70(49): 12710-12716). Although many avian species found in Hawai‘i are native to North America but not to the Hawaiian archipelago, the MBTA does not exempt a species covered by one or more of the four conventions that is nonnative to Hawai‘i but native within the contiguous United States or its territories (same *Federal Register* notice). Of the species found on Lehua, the nutmeg mannikin (*Lonchura punctulata*), the house sparrow (*Passer domesticus*), the rock

dove (*Columba livia*), and the zebra dove (*Geopelia striata*) are not protected under the MBTA. The northern cardinal (*Cardinalis cardinalis*), house finch (*Carpodacus punctulata*), barn owl, and cattle egret are nonnative to Hawai‘i but still protected under the MBTA. However, the cardinal and house sparrow are not present on Lehua Island in the winter months. The nonnative barn owl is known to be adversely impacting native birds on Lehua (VanderWerf 2007) and the cattle egret may also be feeding on chicks and eggs and potentially competing for nest sites.

On January 10, 2001, President Clinton issued Executive Order 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds,* requiring that Federal agencies not only support the conservation intent of the migratory bird conventions, but also identify where unintentional take that is reasonably attributable to agency actions is likely to have measurable negative effects on migratory bird populations.

The analyses for birds protected under the MBTA and requiring analysis under E.O. 13186 potentially present on Lehua Island in the winter are included in this document.

1.7.5 State of Hawai‘i State Wildlife Sanctuaries

Lehua Island is a legally designated State Seabird Sanctuary. Per 13 HAR Chapter 125, the State of Hawai‘i, under the authority of the DLNR, can establish wildlife sanctuaries for the purpose of conserving, managing and protecting indigenous wildlife in sanctuaries. It is prohibited to remove, disturb, injure, kill or possess any form of plant or wildlife or to introduce any form of plant or animal life without a permit. Permits may be issued to enter or land upon identified sanctuaries only for scientific, educational, or conservation purposes and shall specify any terms and conditions deemed necessary for the conservation, management, and protection of indigenous wildlife and wildlife habitats. Therefore, a permit for carrying out conservation operations in a sanctuary will need to be issued by DLNR prior to conducting the rat eradication project on Lehua Island.

The island is also zoned as a Conservation District per HRS 183C and associated regulations at HAR 13-5. Because eradication of alien species is a standard management activity on Conservation lands and no construction or other alterations are proposed, there is no need for a Conservation District Use Permit.

1.7.6 National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) requires that every Federal agency take into account how each of its undertakings could affect historic properties, and provide the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment on the proposed project. Any property that is listed on or eligible for listing on the National Register of Historic Places, including archaeological resources, is considered historic. The protections of Section 106 extend to properties that possess significance but have not yet been listed or formally determined eligible for listing, as well as properties that have not yet been discovered but possess significance.

The Federal action agency is responsible for initiating and completing the Section 106 review, coordinating with the State Historic Preservation Officer (SHPO). The process includes:

- Identifying and evaluating the significance of historic and archaeological properties;

- Assessing the effects based on criteria in 36 CFR 800 ("No Effect", "No Adverse Effect", "Adverse Effect");
- Consulting with the SHPO or ACHP if the agency determines that adverse effects would occur.

HRS Chapter 6E, Historic Preservation, implements the NHPA in Hawai‘i, under the jurisdiction of the DLNR, State Historic Preservation Division. The state law requires that before any agency or officer of the State or its political subdivisions commences any project which may affect historic property, aviation artifacts or a burial site, the agency or officer shall advise the department and allow the department an opportunity for review of the effect of the proposed project, consistent with Section 6E-43 [prehistoric and historic burial sites], especially those on the Hawai‘i register of historic places. The proposed project shall not be commenced, or in the event that it has already begun, be continued until the department shall have given its written concurrence (Section 6E-8). Section 6E-43.6 also regulates the inadvertent discovery of burial sites.

The State Historic Preservation Officer concurred with the USFWS determination that the project will have "No Adverse Effect" on significant historic sites on Lehua Island (letter dated October 17, 2005), provided that the following mitigation measures are implemented: 1) Submission of a completed archaeological inventory survey report; 2) Recovery of data from a hearth site by a qualified archaeologist; and 3) placement of site tags on historic properties prior to restoration. Mitigation measures 2) and 3) are completed and measure 1) is in progress and will be completed prior to rat eradication.

1.7.7 Magnusen-Stevens Act and Essential Fish Habitat

The Magnusen-Stevens Act provides for protecting certain fish stocks that have declined to the point where their survival is threatened and other stocks that have been so substantially reduced in number that they could become threatened from fisheries and direct and indirect marine, estuarine, and other aquatic habitat losses. Essential Fish Habitat (EFH) identified in Fishery Management Plans required by law includes those waters and substrates necessary to identified stocks of fish for spawning, breeding, feeding, and/or growth to maturity, considering the species' full life cycle. An "adverse effect" on EFH means any impact that reduces the quality and/or quantity of EFH, including direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH, and may include site-specific or habitat-wide impacts, including cumulative impacts. The Federal action agency retains the discretion to make their own determinations as to what actions may fall within NMFS' definition of "adverse effect."

The analysis of potential impacts to EFH is discussed later, with a determination of no adverse effect.

1.7.8 Federal Clean Water Act and State HRS 342D and HAR 11-55

The U.S. Environmental Protection Agency (EPA) has issued a final rulemaking pursuant to the Clean Water Act regarding whether a National Pollution Discharge Elimination System (NPDES) permit is required for application of pesticides that are applied over or near water (71 FR 227:68483-68492, November 27, 2006). The final rule, at 40 CFR 122.3, states that the

"application of pesticides consistent with all relevant requirements under FIFRA (*i.e.*, those relevant to protecting water quality), is excluded from the requirements to obtain a National Pollutant Discharge Elimination System permit in the following two circumstances:

"(1) The application of pesticides directly to waters of the United States in order to control pests…

"(2) The application of pesticides to control pests that are present over the waters of the United States, including near such waters, where a portion of the pesticides will unavoidably be deposited to waters of the United States in order to target the pests effectively; for example, when pesticides are aerially applied to a forest canopy or when pesticides are applied over or near water for control of adult mosquitoes or other pests."

Based on the final rule, this proposed action does not require a NPDES permit because the second of these criteria applies to the proposed bait application at Lehua, which will be in full compliance with FIFRA. The Hawai‘i Department of Health's regulations regarding NPDES permits, found in HAR 11-55-04(h), are in full agreement with the language in 40 CFR 122.3.

The State of Hawai‘i also has a law and associated regulations for managing and protecting freshwater and marine water quality, located at HRS 342-D and HAR 11-54. Analysis regarding the low potential for water quality degradation under HRS 342-D is included in Section 3.6.2 of this document.

1.7.9 Subsistence and Other Human Uses

ESA and MBTA allow for subsistence take of species protected pursuant to their authority. Analysis of potential impacts to subsistence users in the Hawaiian Islands is incorporated into Chapter 3.

Executive Order 12898 *Federal Actions to Address Environmental Justice in Minority and Low Income Populations* (1994) requires every Federal agency to collect, maintain, and analyze information assessing and comparing environmental and human health risks borne by populations identified by race, national origin or income. To the extent practical and appropriate, the Federal agency shall use this information to determine whether its actions and programs have disproportionately high and adverse human health or environmental effects on minority populations and low-income populations.

No studies were found regarding ongoing cultural practices on Lehua Island. No comments regarding cultural uses were received in response to the request for comments on the 2005 Draft EA for the Lehua Island Ecosystem Restoration Project. However, responses gathered during interviews by DOFAW for the 2005 Lehua Island EA indicated that residents from both Kaua`i and Ni‘ihau visit the waters around Lehua to fish. Interviewees said that the residents of Ni‘ihau visit the island when the water is good; residents of Kaua‘i apparently visit Lehua less frequently, most likely due to the distance from Kaua‘i. Respondents reported that people visit the island in order to fish and to collect opihi (marine limpets) and limu (seaweed).

The waters around Lehua are also a destination for SCUBA trips departing from Kaua‘i. Lehua's remoteness makes this trip a full-day undertaking, so use is light compared to most dive sites in Hawai‘i. Sportfishing, bird watching, snorkeling, and eco-tourism also occur in the waters around Lehua. All these activities most commonly occur in the calm summer season when the waters between Kaua‘i and Lehua are not as rough.

Because most human use on and around Lehua occurs in the summer and the proposed modification changes the operational season to winter, when the surrounding seawaters are rough, no adverse impacts are expected to human use. Based on field and laboratory tests and experiences with past broadcasts, toxicants are not expected to accumulate in fish or marine invertebrates. Therefore, no closures of Lehua for fishing and gathering for consumptive purposes are planned if diphacinone is used. The public will be notified prior to diphacinone application and the results of laboratory tests for diphacinone residues in Lehua seawater and marine species will be made public as soon as they become available. However, a temporary closure would be considered if brodifacoum is used, in addition to public notification, which could go into the summer fishing season. Therefore, no impact associated with diphacinone use would occur regarding either subsistence use of resources or disproportionate impacts to minorities or low income communities and no further analysis is conducted in this supplement. However, the possible closure mitigation for brodifacoum is discussed later, even though the chance of using this rodenticide is low and would only be considered if diphacinone fails to eradicate rats from Lehua.

1.7.10 Consistency with the Hawai‘i State Comprehensive Wildlife Conservation Plan

The Hawai‘i Comprehensive Wildlife Conservation Plan (Mitchell et al. 2005) was prepared by the Hawai‘i Department of Land and Natural Resources (DLNR) as a requirement for participating in the State Wildlife Grant program administered by the USFWS. It presents strategies for long-term conservation of Hawai‘i’s native terrestrial and aquatic species and their habitats. The Plan built upon Hawai‘i’s strong history of conservation and involved working with resource managers, biologists, and concerned individuals statewide.

The mission of Hawai‘i’s Comprehensive Conservation Strategy is to guide conservation efforts across the state to ensure protection of Hawai‘i's wide range of native wildlife and the diverse habitats that support them.

The Plan identifies and analyzes threats to Hawai‘i’s Species of Greatest Conservation Need (SGCN), including all native terrestrial animals, all endemic aquatic animals, additional indigenous aquatic animals identified as in need of conservation attention, a range of native plants identified as in need of conservation attention, and all identified endemic algae. All the species evaluated in this supplement except the cattle egret, glaucous-winged gull (*Larus glaucescens*), peregrine falcon (*Falco peregrinus*), northern cardinal, house finch, nutmeg mannikin, and house sparrow are identified as SGCN in this Plan.

Consistency of the proposed action with the Plan is integrated into this supplemental EA wherever it is appropriate. Therefore, this rat eradication project on Lehua Island as modified is fully consistent with and contributes to implementing the Hawai‘i Comprehensive Wildlife Conservation Plan.

1.7.11 Consistency with the County of Kaua‘i General Plan Objectives and Policies

The County of Kaua‘i General Plan goals for environmental quality seek to achieve an ecological balance between a high quality of life and an environment in which the natural resources of the island are viable and sustainable, maintain and, if feasible, improve the existing environmental quality of the island and to control pollution. The stated policies applicable to the proposed action, with associated policies, include:

Chapter 3. Caring for Land, Water, and Culture.

> Policy 3.1.1.1(d). Projects undertaken with State or County lands or funds shall be designed to conserve heritage resources.
>
> Policy 3.3.2.1. Preserve important archaeological and historic sites.

The County of Kaua‘i Planning Department, in a letter dated August 4, 2008 (included in Appendix E), determined that the project is consistent with the policies and objectives of the County of Kaua‘i General Plan.

1.7.12 Native Hawaiian Rights

Native Hawaiians have special rights under Federal law, the State Constitution, and State statutes, as interpreted by Federal and State courts. Under the State Constitution, the State and Counties are empowered to promote the health, safety, and welfare of all inhabitants without discrimination as to ethnic origin. The State and Counties recognize the rights of native Hawaiians and the laws concerning land and waters that have been established through the State Constitution, State and Federal Laws, and State and Federal court decisions:

- Native Hawaiian water rights provided under State Water Code, HRS Chapter 174C.
- Kuleana lands, water rights, and access rights provided under the Kuleana Act of 1850, as recognized in current statutes, rules and court decisions.
- Konohiki and hoa’aina fishing rights provided under the 1839 Law of Kamehameha, as modified by subsequent legislative acts and court decisions.
- Traditional and customary rights of native Hawaiians, such as for access and gathering, provided under the State Constitution and Hawai‘i revised statutes, as interpreted by the courts (for example, the *PASH* case).
- Burial rights provided under the Hawai‘i Historic Preservation Act and the Federal Native American Graves Repatriation Act.
- Preservation of historic properties and archaeological resources provided under the Federal Archaeological Resources Protection Act of 1979, the National Historic Preservation Act of 1966, and the Hawai‘i Historic Preservation Act.

The proposed project will have no impact on any native Hawaiian rights to land, access, burial rights, or rights to resources. The impact of the program to marine fish, invertebrates, and associated consumption of marine fish are evaluated in later sections.

1.8 Response to Public Comments on the 2008 Draft Supplemental EA

Eight written comments were received in response to notification letters sent by the USFWS (see contact list in Appendix G) and to the public notification published in the State of Hawaii OEQC *Environmental Notice* on July 8, 2008. These letters are included in Appendix E. Seven of the letters were positive and and/or did not raise any issues requiring a response. The written response to questions raised in the eighth letter is included in Appendix F.

A letter from the State of Hawai`i Office of Planning stated that the proposed project is consistent with the enforceable policies of the Coastal Zone Management Act. No response letter was sent since this letter did not raise any questions or concerns.

A letter from the County of Kaua`i Planning Department stated that the proposed project is consistent with the objectives and policies of the Kaua`i County General Plan. No response letter was sent since this letter did not raise any questions or concerns.

A letter from the Conservation Council of Hawai`i expressed support for the project and urged the agencies involved to move forward with project implementation. No response letter was sent since this letter did not raise any questions or concerns.

An email from Dr. Nick Holmes, Kaua`i Endangered Seabird Recovery Project Coordinator, expressed strong support for the project and stated that it has "…immense value for Hawaiian seabirds." No response letter was sent since this letter did not raise any questions or concerns.

A letter from Ms. Margaret Lohfeld, member of the Ocean Conservancy, supported the project. No response letter was sent since this letter did not raise any questions or concerns.

A letter from Mr. Mark Rauzon expressed strong support for the project. No response letter was sent since this letter did not raise any questions or concerns.

A letter from Mr. Melvin Gabel expressed strong support for the project. No response letter was sent since this letter did not raise any questions or concerns.

A letter from the Hawai`i Department of Agriculture did not oppose the project but raised technical questions and concerns about toxicology data and rat eradication techniques, which are summarized (in italics) and answered below. The letter sent in response to these comments is included as Appendix F.

Lack of information in the Supplemental Draft EA for marine mammals other than seals

- The Service recently completed an informal consultation with the National Marine Fisheries Service (NMFS), under section 7 of the Endangered Species Act, on the potential effects of the Lehua project on threatened and endangered marine species, including humpback whales. NMFS' response letter (see Appendix D) concurs with the Service's determination that the project is unlikely to adversely affect any ESA-listed marine species, including whales.

- A new section was added to Chapter 3 of the Final Supplemental EA to provide additional risk analysis for humpback whales.

General lack of data on rodenticide toxicity to marine mammals

- According to the NMFS recovery plan (NMFS 1991) for humpback whales, they do not feed in Hawaii so there is no viable pathway by which humpback whales can ingest rodenticide. Therefore, precise estimations of toxicity of rodenticides to humpback whales are not required to determine risk.

- No exposure pathway exists because: a) humpback whales do not feed when they are in Hawaii; b) diphacinone is almost completely insoluble in water; and c) there is no evidence of marine contamination resulting from any previous aerial rodenticide broadcast, including the one done at Mokapu Island near Moloka`i. Seawater, fish and invertebrates collected at Mokapu all tested negative for diphacinone residues.

Concerns about uneven bait distribution at Keahuou Ranch experimental bait drop

- Many improvements have been made since the misapplication of bait at Keauhou Ranch in 2003. These include safeguards that will ensure that bait is evenly and correctly applied at Lehua. Now regarded as standard operating procedures, safeguards such as the use of differential GPS and GIS to track bait application were not used at Keauhou. Also, the bait bucket used for Keauhou was old, had been stored under poor conditions, and had not been properly maintained or repaired. Consequently, it malfunctioned during the application.

- The final report on the Keauhou operation concluded that: "Numerous deviations from the study protocol and from the terms of the EPA permit, such as pigs' tampering with bait stations, bait spillage, and an uneven broadcast application rate likely allowed pigs to efficiently forage on concentrated sources of diphacinone bait."

- New buckets with current technology that ensures even bait distribution were purchased in 2007 and will be used on Lehua. The bucket is calibrated prior to each use to confirm that bait is being distributed at the desired application rate and a differential GPS is used to accurately record the location of application swaths. The pilot uses the real-time display of this information to ensure that there are no gaps between application swaths or overlap application swaths by too much. Pellet counts will be done on the ground to confirm that the desired and correct application rate is being achieved.

Lack of discussion of unacceptable aerial broadcast operating conditions

- All relevant operating conditions were discussed in the Draft Supplemental EA. In addition to not flying when winds exceed 35 mph, no broadcast will occur when heavy rains are forecasted. Also, the pilot has the final authority for determining safe flying conditions and will not fly if he is uncomfortable with the any of the conditions.

- An experienced pilot with specialized training in the aerial application of rodenticides, and a State-issued pesticide application certification, was used for Mokapu Island and the same pilot will be used for Lehua.

Concerns about achieving uniform bait distribution on slopes

- Experience from bait applications onto steep islands throughout the world has demonstrated that sufficiently uniform bait coverage can be achieved and result in complete rat eradication. The pilot for Lehua has been instructed on treatment methodology for slopes by the project manager and an experienced broadcast application pilot from New Zealand who has conducted successful bait applications in steep areas.

- Sufficiently uniform bait distribution on slopes will be ensured by calibrating the bucket with placebo bait prior to the application, using specialized application equipment, and using a differential GPS to guide the pilot on systematic flight lines and GIS to document and check where bait was applied. This will be confirmed with on-the-ground bait application assessments during the entire treatment period.

- Pellets moving downhill during each individual application swath will be a relatively uniform factor throughout all swaths and is accounted for, resulting in overall uniformity of bait across the island. Although a small amount of fine scale variation resulting from differences in physical topography will occur, the average bait density on steep slopes will remain relatively uniform and within label application rates. Pellet movements down-slope will be monitored at selected locations following each broadcast.

- Aerial broadcast was the only application method considered because many areas of Lehua are too dangerous or physically impossible to reach on foot.

Suggestion to use spray adjuvants to make bait sticky so it will stick to slopes

- The use of a spray adjuvant is not practical because sticky bait pellets would clog the bucket. Any pellets that make it out of the bucket will stick together and result in clumps, making uniform bait distribution impossible.

- None of the other 58 islands that have been treated with aerial broadcast used sticky bait pellets and no adverse impacts to the nearshore marine environment or pelagic marine life has been documented.

Concerns about the death of a humpback whale calf on Maui after the Mokapu Island rat eradication

- NOAA investigated the February 2008 stranding and death of the whale calf on Maui and found no reason to suspect a causal connection with the use of diphacinone on Mokapu Island, Moloka`i earlier that month. Their conclusion was based on: a) the lack of a pathway for toxin ingestion (since humpbacks don't feed while in Hawai`i) or dermal absorption (since diphacinone is virtually insoluble in water); b) the unremarkable results of the gross necropsy; and c) the negative lab results from the tests for diphacinone performed on the calf's liver (see following bullet item).

- Liver samples were collected from the humpback whale and analyzed for diphacinone residues by laboratories at the U.S. Department of Agriculture's National Wildlife Research Center and the U.S. Geological Survey-Biological Resources Division's Columbia Environmental Research Center. The laboratories' detection limits for diphacinone were 77 parts per billion (ppb) and 15 ppb, respectively. Neither laboratory detected diphacinone residues in the samples. Diphacinone concentrates in the liver and would be expected to be present if the calf had been exposed to diphacinone.

Concerns about susceptibility of pregnant marine mammals to diphacinone

- There is no risk to pregnant marine mammals because there is no exposure pathway, for the reasons discussed above.

- Although there is no toxicity data for marine mammals, a laboratory study that fed pregnant rats for multiple consecutive days with diphacinone found that a dose of 0.01 mg/kg/day caused vaginal bleeding (Daniel 1993). Extrapolating the results for rats to whales, a 45 metric ton adult female humpback whale would have to find and ingest 8.16 kilograms (4,080 two-gram pellets) every day over multiple days to cause excess maternal bleeding during birth. It is extremely unlikely that a whale would be able to find or even be attracted to this many bait pellets over multiple days, especially since whales don't feed in Hawai`i.

Question about human fatalities associated with anticoagulants in 2006

- All of the 18 human fatalities associated with anticoagulants documented in the 2006 report cited in the comment letter resulted from anticoagulant pharmaceuticals (*e.g.*, acetaminophen), not rodenticides. Diphacinone and brodifacoum were not contained in any of these pharmaceuticals. None of the deaths were caused by anticoagulant rodenticides.

Question about the number of fatalities when diphacinone was used as a human medication

- According to the records of the Pharmacia Corporation, there were no human fatalities associated with diphacinone (formerly marketed as Dipaxin) during its 23 years of use as a human medication in the United States.

Verbal comments received during the July 24, 2008, public meeting held at the Waimea Neighborhood Center on Kaua`i, were all supportive of the project. Several questions were asked seeking clarification or more detail on various aspects of the project. These questions (in italics) and the answers are summarized below.

Will crabs be collected and tested for rodenticide residues after the bait is applied?

- Yes, intertidal crabs (and other marine organisms) will be sampled. Test results will be made public.

Will the rodenticide harm the birds?

- No impacts are expected since diphacinone is relatively non-toxic to birds, they would have to eat huge amounts to be affected, and seabirds feed only in the ocean and are not attracted to food items (*e.g.*, bait pellets) on land. As an additional precaution, bait pellets around albatross chicks will be collected, since the chicks sometimes play with and swallow items they find around their nests.

How long does it take for the bait pellets to break down?

- The pellets will probably break down within about 2-3 days in rough ocean conditions. The active rodenticide ingredient within the pellets, however, is almost insoluble in water and is not expected to be available in solution to any marine organisms. The half-life of diphacinone in soil, which breaks down into carbon dioxide, is approximately 35 days (depending on soil type, sunlight, and temperature).

If a barge is used as a staging platform for the helicopter applying bait, how long will it stay at Lehua?

- Various options are being considered for staging logistics, but if a barge is used it would stay at Lehua for less than a day during each bait application (there could be from 2-4 bait applications) and then return to Honolulu at the end of the day. The barge would not stay overnight at Lehua.

How long will bait application take?

- Each helicopter bait application would take less than a day, but bait could be applied a total of 2-4 times.

After the eradication, could rats re-colonize Lehua by swimming from Ni`ihau?

- It's unlikely that they would swim across the channel. The greatest risk is from rats on visiting boats.

Are there plans to eradicate invasive weeds?

- Yes, highly invasive incipient weed populations (like *Verbesina*) will be eradicated but some other weeds are too widely established to eradicate.

What about impacts of helicopters on humpback whales?

- This issue was addressed in the 2008 Section 7 consultation with NMFS. Helicopters will not be allowed to fly over whales. NMFS has concurred that the operation, as described in the Supplemental EA and including use of helicopters, is not likely to adversely affect humpback whales or other ESA-listed marine species.

2.0 DESCRIPTION OF THE MODIFIED PROJECT AND MITIGATION

2.1 Selection of Winter Timing for Application of Rodenticides

Since the operational objective is to eradicate Polynesian rats from Lehua Island, a key consideration when evaluating potential timing is the biology of the target rat population. It is especially important to identify periods when rat reproduction is low or nonexistent so that dependent juveniles are not in burrows where they will not be exposed to the rodenticide (Orueta and Ramos 2001). Consideration of the abundance of rats and their seasonal food availability is also important.

Subsequent to the consideration of rat biology, the presence of nontarget species that could be vulnerable to rodenticide exposure and toxicity, either directly by eating bait or indirectly by eating prey that have rodenticide residues within their tissues must be evaluated. Selecting the season when most nontarget species are not present is the most effective mitigation method (Orueta and Ramos 2001). In Hawai‘i, and especially on arid Lehua where the weather varies little, with storms occurring occasionally in the winter, weather is a tertiary consideration.

The proposed timing in the 2005 EA was based on the common sense but erroneous assumption that rat reproduction would peak during the wet winter months when water, sprouting plants, insects, and other food items would be most available. However, rodent population monitoring on Lehua in 2007 and 2008 demonstrated that rat populations and breeding activity are actually highest in dry summer months and lowest in winter (Dunlevy 2008).

Lehua rat abundance and reproductive status were monitored in July and September 2007 and March 2008 in preparation for the eradication operation (Dunlevy 2008). Standardized traplines were put in place to sample microhabitat types from coast to summit in order to make inferences regarding Polynesian rat distribution. In July and September, captures occurred from the coast to the summit in all habitat types, and large numbers of rats, which are typically nocturnal, were seen active during the day. In March, only one capture of an adult pregnant female occurred, on the coast, and only two rats were seen active during the day. The corrected trap index, a comparative index of rat abundance based on the number of rats trapped per the number of trap nights, was 30% in July, 17% in September, and 1% in March. The best predictor of trap success was the presence of nearby vegetation. Rats are distributed throughout the island, reinforcing that the entire land area must be treated, with special attention paid to vegetated areas.

Dunlevy (2008) concluded that rat numbers on Lehua dropped significantly from the summer through the fall and apparently reached a low sometime during the winter months. In the summer months, almost 50% of the population was composed of juvenile rats (indicating a high level of breeding at that time), dropping to about 30% in the fall. No juveniles were caught in March, although the only rat trapped was a pregnant female, indicating that breeding was occurring at that time. As population and reproduction levels on Lehua are apparently lowest during the winter, the winter provides the highest probability for successful eradication of the rats. Tamarin and Malecha (1972) postulated that the most probable environmental factor controlling breeding is the length of daylight.

Based on the site-specific findings on Lehua Island (Dunlevy 2008), the probability of eradication success is greatly increased by conducting the operation in December through

February (with follow-up if needed in March), when reproduction and the probability of juvenile rats in burrows is clearly low or non-existent.

The timing of the operation in winter avoids disturbing the largest numbers of birds (especially the wedge-tailed shearwaters), all the listed bird species, and thus the majority of the vulnerable eggs and chicks (see Table 1 below). This also resolves many concerns with the exposure of nontarget species to the rodenticide. Applying the rodenticide when most nontarget species are absent is the primary and most assured method of reducing the exposure of these species to the toxicant or disturbance (Orueta and Ramos 2001). Low numbers of birds flocking in the air also reduces safety concerns associated with helicopters striking birds. Based on surveys conducted on Lehua from 2002 through 2005, the greatest abundance of native bird species is present from March through August and many of the overwintering birds are non-nesting visitors (VanderWerf et al. 2007).

Table 1. Bird species present/absent on Lehua during winter (December-February) and winter breeding status (B = winter breeder, NB = winter non-breeder)

Species	***Present***	***Absent***
Black-footed albatross (B in low numbers)	X	
Laysan albatross (B in low numbers)	X	
Hawaiian black noddy (NB)	X	
Great frigatebirds (NB)	X	
Brown booby (B in low numbers)	X	
Red-footed booby (NB)	X	
Red-tailed tropicbird (B in low numbers)	X	
Sooty tern (NB, rare visitor)	X	
White-tailed tropicbird		X
Gray-backed tern		X
Wedge-tailed shearwater (most numerous Lehua species; 23,000 pairs breeding in summer)		X
Newell's shearwater (threatened species)		X
Christmas shearwater		X
Bulwer's petrel		X
Hawaiian petrel (endangered species)		X
Band-rumped storm petrel (candidate species)		X
Pacific golden plover (NB, migrant)	X	
Ruddy turnstones (NB, migrant)	X	
Glaucous winged gull (NB rare visitor)	X	

Peregrine falcon (NB rare visitor)	X	
Barn owl (NB, alien)	X	
Cattle egret (NB, alien)	X	
Great blue heron (rare visitor)		X
Black-crowned night heron (rare visitor)		X
Rock dove (alien)		X
Zebra dove (alien)		X
Nutmeg mannikin (alien)		X
House sparrow (alien)		X

However, certain species are primarily present only in the winter (migratory Pacific golden-plover, ruddy turnstone and the two species of breeding albatross) and will warrant extra caution when planning and conducting operations. Albatross chicks in particular may peck at or swallow objects near their nests. However, albatross chicks in January and February do not yet move from the nests so the proposed mitigation (removing the pellets near nests with chicks, all of which are localized near the top of the western portion of the inner crescent), would reduce any concerns.

In general, storms occur most frequently from October through March, with occasional heavy rains and sometimes strong winds. Average wind speeds are highest during the summer trade-wind period. From September through April, when trade winds are not as prevalent, wind speeds in excess of 12 mph occur about 40% of the time. Frequent light variable winds are balanced by occasional very strong winds. Most storms occur during the winter but are usually short-duration events (http://www5.ncdc.naoo.gov/climatenormals/clim60/states/clim_HI_01.pdf).

For the Lehua operation, the primary weather-related logistical constraints are wind and rain. Rodenticide application will not be conducted in winds higher than 35 mph. For each application day, a forecast of five days and nights without significant rainfall (>13 mm) is preferred (Dunlevy 2007). Currently, the closest long-term weather station with similar conditions is located on the leeward side of Kaua‘i in Kekaha, with weather data collected from 1949 through 2000. The average precipitation during the spring, summer, and fall (April through November) varies from 0.31 inches to 2.78 inches. The average precipitation for December is 4.13 inches, for January is 4.05 inches, for February is 2.22 inches and for March is 2.06 inches (Western Regional Climate Center). The National Weather Service in Honolulu will be used to supply forecasts for the Lehua area, and a rain gauge and anemometer will be set up on site and recorded daily before and after bait application (Dunlevy 2007).

Therefore, the ideal time to conduct the rodent eradication project on Lehua Island would be at the time of year that ensures the highest probability of successfully distributing rodenticide and eradicating rats while having the lowest potential impact on nontarget species. Between December and March, most species of native seabirds that may provide food for rats and are also nontarget species are absent from Lehua or only present in low numbers. Only the red-footed and brown boobies are present in any numbers, and only albatrosses have chicks, although small,

and all the nests are located within 60 to 300 feet below the summit on the western portion of the inner crescent.

Therefore, the optimum timing of the operation is based primarily on the lack of rat reproduction and the absence of the majority of seabirds. This occurs during the winter months from December through February. Operations may continue into March, if necessary.

2.1.1 Rodenticide Selection and Use

Selection of the most appropriate rodenticide for the specific conditions of a project is one of the primary decisions for any rodent eradication project. Rodenticides must be used in the lowest quantity and toxicity which ensures that every rodent is exposed to a lethal dose while minimizing adverse environmental effects, especially impacts to nontarget species. Prudent use is also critical to ensure that regulators will allow effective rodenticides to continue to be made available for future use (Marsh 1985, Cromarty et al. 2002).

Marsh (1985) advised selecting the rodenticide for which the target rodent has a high susceptibility and nontarget wildlife species have a low susceptibility, thereby maximizing effectiveness and minimizing adverse effects, especially to nontarget species. Maximizing effectiveness of the selected rodenticide involves combining the critical factors of the concentration of the active ingredient in the bait formulation, the method of application, the bait application rate, and the seasonal timing of bait application (when rodent populations, reproduction, and alternative foods are lowest) to ensure that all target rodents are exposed to a lethal dose. Both the selection of the appropriate rodenticide and the technical considerations must also consider the complexity of the physical terrain and the size of the island to be treated.

The technical considerations of efficacy are more straightforward than those involved in minimizing adverse effects on nontarget species and other public trust environmental resources. Minimizing overall adverse effects is possible in a variety of ways; most mitigation methods for reducing hazards to nontarget species involve (Kalmbach 1943, Marsh 1985):

- Applying bait when nontarget species are not present, present in seasonally low numbers, or not breeding or raising young;
- reducing bait toxicity to nontarget species;
- reducing the acceptance of bait (exposure) by nontarget species;
- minimizing or avoiding exposure of nontarget species (e.g., via protective stations);
- minimizing rodenticide residues in the tissues of target and nontarget species.

In summary, the selection of the appropriate rodenticide in an effective bait formulation for a specific project must ensure a high potential for efficacy in eliminating invasive rodents when conducted according to the description of the proposed action during the optimum seasonal time frame, while having the lowest potential for adverse impacts to nontarget species.

The New Zealand Department of Conservation (NZ DoC) implemented a policy in October 2000 that placed restrictions on the use of brodifacoum for conservation purposes on the New Zealand mainland because of documented levels of direct and indirect poisoning of nontarget species. NZ DoC conducted a study using diphacinone 0.005% formulations of pellets and blocks in mainland control situations that demonstrated the efficacy of diphacinone in the field (Gillies et al. 2006). Studies in Hawai‘i have also documented the efficacy and lower nontarget impacts of

diphacinone in field and laboratory studies (Swift 1998, Dunlevy et al. 2000, Dunlevy and Campbell 2002, Nelson et al. 2002, Spurr et al. 2003a and 2003b, Eisemann and Swift 2006).

For the rodent eradication project on Lehua, the rodenticide with the lower risk to nontarget species, diphacinone, has been selected for use. Brodifacoum would be used only if the application of diphacinone fails and the failure can be determined to have been caused by the rodenticide diphacinone itself and not improper or inadequate application methods, timing, bait life, bait competition with nontarget species, or other operational issues.

2.1.2 Operational and Ecological Monitoring

Introduction

Monitoring the efficacy of rodent eradication and successful ecosystem restoration, as well as environmental fate and the potential for adverse effects on nontarget species and populations is critical to rodent eradication projects (Atkinson 1994, Courchamp et al. 2002, Smit 2003). Smit (2003) focuses on the importance of monitoring not only to determine if goals are achieved, but also to add to existing knowledge on how to better manage ecosystems, including learning from experience and adjusting actions when necessary to better meet objectives. He states that it is critical to define indicators that characterize the state of the resource, define the intensity of monitoring, and use thresholds to determine whether to increase or decrease the intensity of monitoring or stop it altogether, based on the results of monitoring. Courchamp et al. (2002) also emphasize the importance of learning from "unwitting mistakes made in the past, since all results contribute to an understanding of island ecology and can be used in future conservation actions on other islands."

Bait Monitoring

Rodenticide uptake by target rodents must be evaluated to ensure that sufficient bait is applied to ensure consumption of a lethal dose by 100% of the rats (Sterner and Ramey 2002). Monitoring of bait take during broadcast application requires refined monitoring techniques (Sterner and Ramey 2002). Careful testing and calibration of equipment and methods prior to broadcast and detailed records of the amounts of rodenticide applied and the areas (using Differential GPS systems) over which it is distributed are the first steps in the monitoring of bait application, while providing for the computation of nominal bait application rate. Monitoring the appropriate density of bait is also necessary. In addition, broadcast applications should monitor bait degradation, which should also be outlined in detail within the specific project operation plan. In general, this entails closely monitoring weather conditions in representative habitats and areas of possibly variable exposure and observing how rapidly the bait deteriorates. The level of toxicant in the bait should also be monitored, both before application and once on the ground, to ensure that all rats are exposed to the appropriate dosage of active ingredient for meeting eradication objectives (Spurr and Powlesland 2000).

On-the-ground application monitoring methods are outlined in detail in the specific project operation plan (Dunlevy 2007). It is planned that rodenticide application will be assessed by measuring and recording the total amount of bait applied and evaluating the actual bait distributed on the ground in the treatment area using ground surveys. The number of pellets found within census plots will be recorded immediately after bait application, while recording

substrate and slope. To assess bait disappearance, marked pellets will be examined daily for up to 14 days until they disappear or biodegrade.

Eradication Efficacy Monitoring

Radio telemetry will be used to monitor the fate of 20 rats fitted with radio collars before the operation begins. Signals will be monitored for three days before bait application to confirm activity and until all collared animals are confirmed dead post treatment. Recovered rats will be necropsied to determine exposure to rodenticide and cause of death, and carcasses will be individually labeled, bagged and frozen for residue analysis.

Rat presence will be assessed annually in the summer for two years post-operation (Dunlevy 2007). Rat presence post-operation will be assessed using rodent traps, using the protocols established during the 2007 and 2008 Lehua rat surveys. An appropriate number of transects with snap-traps will be laid out and baited daily for several days after pre-baiting to avoid rats' natural fear of new objects. Monitoring for success in meeting the eradication objective will be conducted in July 2009 and 2010 using night-vision goggles, chew blocks, snap-traps, and tracking tunnels, as appropriate.

A brodifacoum formulation could be used only if operational failure occurs and can be determined to have been caused by the rodenticide diphacinone itself and not improper or inadequate application methods, timing, bait life, bait competition with nontarget species, or other operational issues. If this were to occur, the brodifacoum product would be used the following winter, at least one year after the diphacinone treatment, during the same time period. The treatment regime would be similar, entailing two broadcasts following the approved label. The primary difference between the application of diphacinone and brodifacoum would be the application rate dictated by the label.

Ecological Monitoring

Monitoring for primary and secondary adverse impacts on nontarget species is one of the foremost concerns for rodent eradication projects. Sometimes the primary factor in determining whether to conduct an eradication project is the evaluation of the ecological cost of killing individuals of nontarget species, and potentially adversely impacting populations, as compared to the benefits associated with meeting ecosystem restoration objectives. Primary hazards (through direct ingestion of bait) and secondary hazards (through eating prey with rodenticide residues in their tissues) to individuals of nontarget birds may potentially occur. The evaluation and determination of killing a proportion of a nontarget population and whether it would cause adverse impacts at a population level must be considered in terms of species' biology and population dynamics. Based on the analyses in these sections, no adverse impacts to any bird species are anticipated.

Baseline vegetation and bird surveys have been conducted on Lehua Island (Wood et al. 2004, VanderWerf et al. 2007) and will be continued following the eradication operation to monitor restoration success. Key indicators of successful restoration will be improvements in the status of threatened plant species and native vegetation abundance and composition, as well as recolonization by nesting seabirds. The spread of introduced plants from reduced herbivory by rabbits and rats will also be monitored. A comprehensive list of introduced plants on Lehua, documenting qualitative and quantitative weed information (Wood et al. 2004) provides the comparative baseline.

Populations of desired nontarget species, including nesting seabirds and protected plants, will be actively monitored for a sufficient period to produce reliable estimates before and after operations. At a minimum during the operation, personnel will collect all carcasses found incidentally for necropsy and laboratory analysis of rodenticide residues in tissues. Any rat carcasses found in the open will also be recorded and collected for residue analysis. Avian predators or scavengers seen on Lehua will also be recorded. The cattle egret, which is known to be an opportunistic predator on eggs and chicks, and the barn owl, recently recorded on Lehua, are both introduced species to Hawai‘i.

Multiple seawater and intertidal invertebrate and fish tissue samples will be collected after the broadcast and sent to at least two laboratories to test for the presence of rodenticide residues. The exact timing of sample collection will be determined by safety considerations, but the goal will be to collect post-application samples 24 hours after the first application and 7 days after the first and last application.

2.1.3 Rodenticide Label Requirements for Invasive Rats

All applications of rodenticides must follow label requirements as approved by the US Environmental Protection Agency (EPA) pursuant to FIFRA.

EPA-Approved Diphacinone Label

The FIFRA Section 3 label (see label in Appendix B) for conservation purposes (EPA reg. no. 56228-35, Diphacinone--50, 0.005% or 50 ppm active ingredient), has the following use requirements:

- Broadcast applications are prohibited on vessels or in areas of human habitation. Broadcast bait pellets by helicopter or manually at a rate of 11.1 to 13.8 kg/ha (10 to 12.5 lbs/ac) of bait per treatment. Depending upon local weather conditions, make a second broadcast application (typically 5 to 7 days after the first application), at a rate no higher than 13.8 kg/ha (12.5 lbs/ac). In situations where weather or logistics only allow one bait application, a single application may be made at a rate no higher than 22.5 kg/ha (20 lbs/ac). Aerial (helicopter) applications may not be made in winds higher than 35 mph (30 knots). The pilot in command has final authority for determining safe flying conditions. However, aerial applications will be terminated when the following conditions are present: Windspeed in excess of 25 knots with an evaluation of the terrain and impact of the wind conditions and not to exceed a steady wind velocity of 30 knots. If rodent activity persists after application, set up and maintain tamper-resistant bait stations or apply bait directly to rodent burrows in areas where rodents remain active. If terrain does not permit the use of bait stations or burrow treatment, continue with broadcast baiting, limiting such treatment to areas where active signs of rodents are seen. Maintain treatments for as long as rodent activity is evident in the area and rodents appear to be accepting bait.
- For all methods of baiting, monitor the baited area periodically and collect and dispose of any dead animals found.

Broadcast applications of Diphacinone--50 at the maximum label rate of 22.5 kg/ha (20 lb/ac) result in approximately one 2 gram pellet distributed about every square meter.

EPA-Approved Brodifacoum Label

The nationwide label (see Label in Appendix B) approved by EPA for conservation purposes (EPA reg. no. 56228-37, Brodifacoum-25D, 0.0025% or 25 ppm active ingredient) has the following use requirements:

- Broadcast applications are prohibited on vessels or in areas of human habitation. Broadcast bait using aircraft, ground-based mechanical equipment, or by gloved hand at a rate no greater than 18 kg bait/ha (16 lbs/acre) per application. Make a second broadcast application, typically 5 to 7 days after the first application, depending on local weather conditions, at a rate no higher than 8 lbs. of bait per acre (9 kg bait/ha). In situations where weather or logistics only allow one bait application, a single application may be made at a rate no higher than 16 lbs. bait per acre (18 kg/ha). Aerial (helicopter) applications may not be made in winds higher than 30 knots (35 mph). The pilot in command has final authority for determining safe flying conditions. However, aerial applications will be terminated when the following conditions are present: Windspeed in excess of 25 knots with an evaluation of the terrain and impact of the wind conditions and not to exceed a steady wind velocity of 30 knots. Set the application rate according to the extent of the infestation and apparent population density. For eradication operations, treat entire land masses.
- Assess baited areas for signs of residual rodent activity (typically 7 to 10 days post-treatment). If rodent activity persists, set up and maintain tamper-resistant bait stations or apply bait directly to rodent burrows in areas where rodents remain active. If terrain does not permit use of bait stations or burrow baiting, continue with broadcast baiting, limiting such treatments to areas where active signs of rodents are seen. Maintain treatments for as long as rodent activity is evident in the area and rodents appear to be accepting bait.
- Monitor the baited area periodically and, using gloves, collect and dispose of any dead animals and spilled bait properly.

The maximum broadcast application rate of Brodifacoum-25D allowed by the label is 18 kg/ha (16 lb/ac), resulting in a density of just under one 2 gram pellet per square meter.

2.1.4 Necessary Permits for Eradication Projects on Lehua Island

For conducting any actions on Lehua, which is designated as a State Wildlife Sanctuary, DOFAW must issue a permit (HAR 13-125-6).

For aerial application of rodenticide on Lehua, a permit from the Hawai‘i Department of Agriculture per HRS 149A and HAR 4-66 must be acquired prior to beginning the operation.

If diphacinone fails to achieve eradication and the decision is made to use brodifacoum, it could only be applied if the State Department of Agriculture’s Pesticides Branch also licenses the FIFRA Section 3 label for brodifacoum use within Hawai‘i under HRS Chapter 149A.

2.2 Aerial Application of Rodenticides

2.2.1 Overall Application Operational Plan

Rats will be eradicated using a rodenticide formulation containing the active ingredient diphacinone at 50 ppm. The bait is dyed green by the manufacturer to reduce acceptance by

birds. The rodenticide will be uniformly broadcast across the emergent land area of the island at an approved application rate exposing all rats to a lethal dosage. Rodenticide bait will be applied once all necessary personnel and equipment are in place and a suitable weather forecast is received.

Application on Lehua will be completed by aerial broadcast across 100% of the land area of the island. All rodenticide application would be carried out under the direct supervision of licensed pesticide applicators. Aerial broadcast will be carried out utilizing an agricultural spreader suspended from a helicopter. Bait will be applied at a nominal rate of 10 to 12.5 lbs/acre in at least two, but up to four, separate broadcast applications to be carried out approximately five to seven days apart. To ensure as uniform an application rate as possible, onboard Differential Global Positioning System (DGPS) in the helicopter and computerized GIS mapping would document the application area. This allows real time and after-the-fact monitoring and assessment of the rodenticide application, as well as printouts showing the actual path covered by the helicopter during bait application. Immediately prior to the application, all equipment will be tested and calibrated in a location allowing for repairs or adjustments and ensuring accurate application results.

Bait loading and helicopter re-fueling will be done either on land at Lehua or west Kauai, or on a vessel temporarily staged at Lehua during the bait application.

The first application is planned to occur after January 1, 2008 and before the end of March 2009. If broadcast is delayed beyond this period, it will be attempted again the following winter. Each aerial broadcast application operation will start as early in the day as possible to provide as much time as possible to finish the entire application, check GPS printouts and re-apply to any gaps and conclude bait application monitoring before dark.

Weather forecasts will again be consulted before deciding on the appropriate day for the second application of bait, five to seven days after the first application, using the same application rate and methods outlined above. The five-to-seven day interim before the second application may be extended if sufficient bait is still on the ground (greater than 5 lb/ac bait remaining). Flight lines for the second application may be treated in reverse and/or perpendicular to the first application. Up to four such applications, if necessary, will comprise the full treatment regimen. Treatment should be completed by March if possible, or by the end of March at the latest.

If rats persist post-operation and it is shown that the active ingredient diphacinone is solely responsible for the failure (as opposed to application methodology, weather or bait condition, for example), bait containing 25 ppm brodifacoum could be used the following winter per the approved label. With the exception of label differences, the treatment would be the same as that described in this section for diphacinone per the brodifacoum label. However, this is not expected to be needed.

2.2.2 Bait Handling, Storage and Staff Safety Measures

- All possible measures to transport and store the rodenticide in a manner that maintains its integrity and quality will be followed. Optimum storage conditions are a cool, dry and dark environment.
- The rodenticide will be inspected regularly, and the relative humidity within the storage area monitored. Any bait with evidence of decay will be immediately removed and

disposed of according to the label, and the remaining bait dried. Anti-moisture techniques will be used for stored bait as needed, including use of moisture absorbents, ventilation during dry conditions, elevating and maintaining drainage around the storage area.

- Staff will follow all approved label handling and disposal instructions, such as:
    - Storing bait in original containers tightly sealed in a dry secure place inaccessible to unauthorized people, children and pets, away from fertilizer and products with strong odors, which may contaminate the bait and reduce acceptability.
    - Wearing long-sleeved shirts, long pants, gloves and shoes plus socks at all times when handling bait;
    - Wearing required personal protective equipment (PPE) such as eyewear and dust masks when loading bait for aerial application;
    - Washing hands and all exposed skin before eating and after work;
    - Not reusing empty bait containers for any reason, and disposing of empty bait containers according to the label;
- Any spilled bait on land will be collected for disposal according to the label.
- In the event of a helicopter ditching or other event that causes a bait spill into the ocean in a shallow coastal area, appropriate State and Federal agencies, including the U.S. Coast guard, will be notified. Bait pellets will be removed from the water and disposed of if it is feasible and safe to do so. Because each bucket load holds no more than 750 pounds of bait, this would be the largest amount of bait potentially spilled into the water.

2.2.3 Reporting, Project Debriefing and Adaptive Management

Upon completion of each broadcast, a debriefing will be conducted with all operational personnel, including the pilot, for the purpose of evaluating the application and making any necessary modifications. Upon completion of the project, at a minimum, an internal report will be completed. In addition, a project debriefing will be conducted and lessons learned from this project will be applied to subsequent rodent control and eradication projects using aerial broadcast in Hawai‘i.

2.3 Resource-Specific Mitigation Measures

Many mitigation measures for project-level actions are already incorporated directly into the description of the eradication operation, including the use of a rodenticide with reduced toxicity to nontarget organisms (diphacinone), conducting the operation in the winter when most nontarget bird species are not present and rodent biology is favorable, safe bait handling procedures, not flying in high winds or when heavy rains are predicted, public notification prior to application, and pre- and post-project monitoring. The following mitigation actions are in addition to those already incorporated into the modified eradication operation and are based on analyses documented in Chapter 3 and included in the 2008 Section 7 consultation with NMFS. These mitigation measures will be implemented as part of the operation and are included in the operational plan.

2.3.1 Species on Lehua Protected under the Endangered Species Act

Per the results of the informal Section 7 consultation conducted with the USFWS for the rat eradication project on Lehua Island, the only listed or candidate species that could be present during a summer application would be the threatened Newell's shearwater, the endangered Hawaiian petrel, and the candidate band-rumped storm-petrel. None of these birds or any other listed birds will be present in the winter (VanderWerf et al. 2007) so no mitigation will be needed. Per the results of the informal Section 7 consultations conducted with NMFS in 2005 and 2008, the following mitigation measures (in addition to those previously mentioned) will be implemented to protect ESA-listed marine species:

- The helicopter will be required to avoid flying over or spreading bait onto any monk seals hauled out on Lehua.
- Ground crews will attempt to maintain a 100 foot buffer from monk seals on land
- The helicopter will be required to avoid flying over humpback whales.
- Vessels associated with the project will be prohibited from approaching within 100 yards of humpback whales.

Both NMFS and the USFWS recognized that the eradication operation will benefit listed species by improving water quality, increasing vegetation cover and eliminating depredation by rats.

2.3.2 Archaeological Sites Protected under the National Historic Preservation Act

The State Historic Preservation Officer has concurred with the USFWS determination of "No Adverse Effect" on significant historic sites on Lehua Island from the project (letter dated 10/17/05), conditioned upon on completion of the following mitigation measures: 1) Submission of an approved and completed archaeological inventory survey report; 2) Recovery of data from a hearth site by a qualified archaeologist; and 3) placement of site tags on historic properties prior to restoration. All these measures will be completed prior to rat eradication.

2.3.3 Coastal Zone Management Act and Enforceable and Administrative Policies

The Hawai'i State Office of Planning has determined that all proposed rodenticide projects must go through the consistency process. The analyses are included in this supplement and are incorporated into the CZM review package. The CZMA review and the public involvement process were conducted concurrently with the review for this supplement and the State Office of Planning determined that this project is consistent with the enforceable policies of the CZMA.

2.3.4 Protection for Albatross Chicks from Ingesting Bait

If bait is applied after chicks have hatched, all bait pellets within 6 feet of nests with chicks will be manually removed as soon as possible after bait application. Pellets further than 6 feet away cannot be reached by the chicks sitting in the nest, since they would not yet be mobile.

2.3.5 Human Health

Public notices will be posted and published in local newspapers informing people before the bait is applied. Weather permitting, seawater, marine sediment, marine invertebrate, and fish tissue samples will be collected 24 hours after the first application and 7 days after the first and last

applications to test for rodenticide residues. Test results will be published in Kaua‘i newspapers. Use of inland areas of Lehua is by DOFAW permit only. The area is used by recreational divers and limpet and algae gatherers during the summer. However, as the project will be conducted in the winter (January through February, with the potential for some follow-up into March), no potential for impacts would occur. Access permits for other than authorized personnel will not be issued during pre-operational monitoring, distribution of bait, post-operational monitoring and, for diphacinone, one month after the last bait application. If the use of brodifacoum becomes necessary, a temporary harvest closure after bait application could occur if required by the State Department of Health.

2.3.6 Water Quality

In the event of a helicopter ditching or other event that causes a bait spill into the ocean in a shallow coastal area, the U.S. Coast Guard and the State Department of Health would be notified and bait pellets would be removed from the water and disposed of if it is feasible and safe to do so. A water ditching could result in a maximum 750-pound bait spill, since the bait bucket holds no more than 750 pounds. See Section 3.2.1 for analysis of the impacts of the loss of bait into the water.

3.0 ENVIRONMENTAL CONSEQUENCES

3.1 Introduction

This chapter includes the technical background and affected environment information for each issue considered in detail, and documents the impact analysis for each issue. This chapter also includes consistency analyses with the Hawai‘i Enforceable and Administrative Policies under the Coastal Zone Management (CZMA), analysis of impacts to birds protected by the Migratory Bird Treaty Act and required by E.O. 13186, potential impacts to species listed under the Endangered Species Act, and potential impacts to Essential Fish Habitat under the Magnusen-Stevens Act and state equivalent laws. Since the analyses required for the impacts under the identified laws are functionally equivalent to those required for NEPA, these analyses are incorporated into this chapter and are identified as such to facilitate understanding the impacts and resultant determinations and to avoid unnecessary paperwork, consistent with NEPA (40 CFR 1501.7, 1502.25, 1506.4).

To assist the understanding of the analyses of impacts caused by rodenticides on each issue, Appendix A of this document summarizes the scientific literature regarding the rodenticides diphacinone and brodifacoum and compares their characteristics and their relative toxicity to invertebrates, fish, birds and mammals. It also summarizes the methodologies used in this EA for evaluating the impacts of proposed actions on the resources of Lehua. This information was not included in the 2005 EA and is intended here to help the reader better understand the logic of the impact analyses and how the differing characteristics of the rodenticides apply to those impacts. For additional background, the approved pesticide labels for diphacinone and brodifacoum are included in Appendix B.

Table 2 has also been added below as a reference. It outlines the acute oral doses and dietary toxicity for birds and primary and secondary hazards for birds and mammals as well as known tissue residues for brodifacoum and diphacinone (from Erickson and Urban 2004 and Fisher et al 2003). In order to understand Table 2 and subsequent risk analyses, it is necessary to understand the following three terms:

- Acute oral toxicity or LD_{50} – A single dose that is lethal to 50% of the test subjects in the population or study group under consideration, expressed as milligram(s) of active ingredient per kilogram of test subject body weight;
- Dietary toxicity or LC_{50} – The concentration of rodenticide in the diet (multiple feedings) that is lethal to 50% of test subjects in the population or study group under consideration, expressed as parts per million of the daily diet.
- Lowest observed effects level or LOEL – The lowest dosage at which measurable effects, such as increased blood-clotting times, are documented. This is not a mortality threshold and no negative impacts are necessarily derived at this hazard level. Diphacinone has LOELs calculated for birds and mammals; brodifacoum does not because of its substantially higher toxicity.

Table 2. Nontarget Hazards to Birds and Mammals from Brodifacoum and Diphacinone (50 mg active ingredient[a.i.]/kg bait)[1]

		Brodifacoum	Diphacinone
Acute Oral Toxicity (LD_{50}) to Birds	Mallard	0.26 mg a.i./kg	3,158 mg a.i./kg
	Northern bobwhite	Not reported	>400, <2,000 mg a.i./kg
Acute Dietary Toxicity (LC_{50}) to Birds	Mallard	2.0 ppm	906 ppm
	Northern bobwhite	0.8 ppm	>5,000 ppm
Bird: Primary Hazard	Lowest reported LD_{50} for birds (amount of a.i. per kg body weight to kill 50% of population)	0.26 mg a.i./kg	>400 mg a.i./kg
	25-g bird: grams of bait LD_{50} / % of daily food intake	0.13 g / 2.1%	200 g / >100%
	100-g bird: grams of bait LD_{50} / % of daily food intake	0.52 g / 5.4%	800 g / >100%
	1000-g bird: grams of bait LD_{50} / % of daily food intake	5.2 g / 9.6%	8000 g / >100%
Bird: Secondary Hazard	Liver retention time (half life)	217 days	90 days
	# reported incidents where rodenticide was detected in wild birds	143 incidents	6 incidents
Mammal: Primary Hazard	Average LD_{50} for rats (amount of a.i. per kg body weight to kill 50% of population)	0.4 mg a.i./kg	2.3 mg a.i./kg
	25-g rodent: grams of bait LD_{50} / % of daily food intake	0.2 g / 5.2%	1.2 g / 32%
	100-g rodent: grams of bait LD_{50} / % of daily food intake	0.8 g / 9.6%	4.6 g / 55.4%
	1000-g mammal: grams of bait LD_{50} / % of daily food intake	8.0 g / 11.6%	46.0 g / 67%
Mammal: Secondary Hazard	Liver retention time (half life)	113.5 days	3 days
	# reported incidents where rodenticide was detected in non-target wild mammals	101 incidents	14 incidents
Avg. Number of LD_{50} Doses Consumed by Rats by Time of Death	Choice test	40	Not reported
	No choice test	80	
Anticoagulant Residue Levels in Primary Consumers exposed to 50 mg a.i./kg bait	Residue ranges measured in whole carcasses of rodents and other mammalian target species (in ppm)	2.07 - 25.97 ppm	0.48 - 3.4 ppm

[1] All data and information from Erickson and Urban (2004) except liver retention time, from Fisher et al. 2003).

3.2 Potential Impacts to Soil, Water, Invertebrates and Fish

3.2.1 Environmental Fate of Brodifacoum and Diphacinone in Soil and Water

Both diphacinone and brodifacoum have extremely low solubility in water and bind tightly to organic matter in soil, where the rodenticide is degraded by soil micro-organisms and exposure

to oxygen and sunlight. The half-life in soil is 30 to 60 days for diphacinone, and 84 to 175 days for brodifacoum, depending on the soil type and aerobic vs. anaerobic soil conditions. The rate of microbial degradation is dependent on climatic factors such as temperature, light, and the presence of microbes enabling degradation. Therefore, degradation time will increase in colder climates and decrease in warm sunny places like Hawai`i (Eason and Wickstrom 2001, Eisemann and Swift 2006). Due to the non-polarity of brodifacoum and diphacinone molecules and the ionic strength of seawater, seawater solubility of both these compounds is extremely low. The solubility of brodifacoum is likely in the low parts per billion range (Primus et al. 2005), with diphacinone assumed to be substantially less soluble.

The low risk of rodenticide showing up in seawater was also demonstrated by sampling conducted after the aerial application of diphacinone bait pellets to Mokapu Island in February 2008. Samples of surface seawater (as well as intertidal limpets and nearshore fish) were collected to address public concerns about contaminating marine life and to verify assumptions that the project would have no negative impacts to marine waters and organisms (see complete Mokapu sampling and laboratory report in Appendix C). These assumptions were based on data from extensive laboratory and field trials submitted to Hawai‘i Department of Agriculture’s Pesticides Branch and EPA during the rodenticide registration process. In addition, operational safeguards built into the aerial broadcast process minimized risk of bait pellets getting into the adjacent seawater. These safeguards included applying bait only during sufficiently low wind speeds or when no significant rainfall was predicted, and using a calibrated bait delivery system to avoid overapplication of bait and an on-board differential GPS system to correctly target bait application.

Mokapu Island samples were sent for testing to the U.S. Department of Agriculture National Wildlife Research Center in Fort Collins, Colorado and to the U.S. Geological Survey Columbia Environmental Research Center in Columbia, Missouri.

Results from the laboratories were obtained in April and May 2008. No diphacinone residues were detected in any of the Mokapu seawater, limpet or fish samples (see Appendix C for results and description of laboratory quality assurance/quality control procedures). This indicated that project mitigation measures, low water solubility of diphacinone, rough winter seas, dilution, or some combination of these factors resulted in little or no rodenticide being released into or retained in the water column.

The threat of an accidental spill of rodenticide pellets is a remote possibility. In the event of serious flight difficulties requiring an emergency landing, the helicopter pilot would likely need to jettison the spreader bucket before landing, potentially resulting in up to 750 pounds of bait pellets going into the water. Should such an unlikely scenario occur, the project emergency plan would be enacted, notifying all relevant persons and initiating the appropriate response and clean-up, if possible. However, since the pellets contain only .005% of active ingredient of diphacinone (or .0025% active ingredient in the case of brodifacoum), the actual amount of active chemical ingredient entering the water from a 750-pound bait pellet spill would be less than an ounce for either rodenticide. Due to the very low water solubility of both rodenticides, very little of this small amount of active ingredient would dissolve into the water column and the risk to marine organisms would be minimal.

Water quality data collected after a massive brodifacoum spill into nearshore waters supports this statement. In 2001, a truck went off the road into the ocean on the east coast of New Zealand’s

South Island, prior to an eradication project. Twenty tons of 0.002% (20 ppm) brodifacoum bait was spilled into the ocean at a single point. Furthermore, because the seas were calm, the congealed bait material remained on the ocean floor for about a week, until it was diluted and dissipated by wave action. Despite expectations that significant concentrations of brodifacoum would be dissolved into the water column, brodifacoum levels in water samples were no longer detectable 36 hours after the spill had occurred (Primus et al. 2005).

In summary, the potential for contamination of surface water, groundwater or seawater is extremely low for both diphacinone and brodifacoum. Lehua does not have any known permanent surface water or groundwater. Possible mechanisms for rodenticide to reach the ocean include pellets bouncing off or rolling down steep slopes, being blown off course by high winds, or being washed into the ocean by heavy rains before they are eaten by rats. The last two possibilities will be minimized by not applying bait pellets in high winds (greater than 35 mph) or when heavy rains are forecast. Contamination of ocean water is unlikely due to the same combinations of factors that resulted in the inability of labs to detect rodenticide residues in water samples taken after the Mokapu Island aerial application and the New Zealand bait spill.

3.2.2 Effects of Diphacinone and Brodifacoum on Marine Invertebrate and Fish Species, including Essential Fish Habitat

Marine organisms can potentially be exposed to rodenticides in one of three ways: they can eat bait pellets, they can eat prey items that have accumulated rodenticide in their tissues, or they can absorb rodenticides that have dissolved in seawater through their skin.

Previous sections discussed project mitigation measures to help keep bait out of the water, which will minimize risks of marine invertebrates and fish being exposed to rodenticides through any of these pathways. The very low water solubility of both diphacinone and brodifacoum, discussed above, further decreases the likelihood of exposure of marine organisms to dissolved rodenticides.

This section presents evidence that direct ingestion of bait and consumption of contaminated prey are also very unlikely. Evidence includes results from Lehua field observations indicating that nearshore fish are unlikely to be attracted to bait pellets, in addition to sampling results from a rat eradication recently conducted at Mokapu Island, which found no detectable rodenticide residues in marine tissues after two diphacinone applications. Further evidence comes from the unexpectedly low rodenticide levels in marine organisms following a massive 20 ton spill of brodifacoum pellets into shallow, nearshore waters in New Zealand.

The 20 ton spill of brodifacoum in New Zealand documented by Primus et al. (2005) is a "worst case" scenario that will be used here for a highly conservative analysis of rodenticide impacts. The use of this data in toxicity models yields very conservative results because:

- Brodifacoum is more toxic, persistent and bioacummulative than diphacinone; and
- The likelihood of that volume of any rodenticide being spilled into the environment at a point source is extremely remote. The only circumstance under which such a spill could happen in the Hawaiian Islands would be if a vessel carrying large quantities of bait to an island to be treated would sink in shallow nearshore waters, which is highly unlikely, even in the winter.

This analysis will conclude that the risks to marine species at Lehua are very low, based on the lack of likely exposure pathways; the fact that the Mokapu Island bait application did not result in detectable rodenticide residues in marine samples; and the surprisingly low levels of localized contamination resulting from the worst-case scenario of the New Zealand brodifacoum spill. No significant impacts are anticipated to Lehua's marine invertebrates and fish from the use of either diphacinone or brodifacoum.

Additionally, no physical changes would occur to any Essential Fish Habitat (EFH) at Lehua and the proposed project is not anticipated to adversely affect Essential Fish Habitat in any way. As a result, no EFH assessment per the Magnusen-Stevens Act is required.

Marine Invertebrates

Since diphacinone and brodifacoum are highly insoluble in water, invertebrates could not be exposed to significant amounts of dissolved rodenticides. Therefore, as with the fish, any problems or concerns with invertebrates would have to be caused by their eating bait pellets or eating contaminated prey.

Because many marine invertebrates scavenge or graze on items on the bottom or in intertidal areas, it is possible that they would pick up bait pellets or pellet fragments prior to the pellets breaking down in the water. Complete breakdown of a pellet in the water would likely take only a few days, especially if the water is rough. Therefore, dietary exposure to pellets would have to occur during the few days when the pellet was still intact. The question then becomes whether or not this potential exposure pathway is significant.

Evidence against the existence of a significant dietary exposure pathway for invertebrates, at least in the context of the proposed Lehua project, comes from field sampling of marine invertebrates conducted following an actual rodenticide application in Hawai`i, and another round of sampling done after an accidental New Zealand spill of large amounts of brodifacoum into the ocean.

The sampling program conducted at Mokapu Island, following aerial application of diphacinone bait, did not detect diphacinone residues in any of the water or tissue samples collected. Seawater, limpet and fish samples were collected at Mokapu Island on February 17, 2008, 11 days after the first rodenticide application and 5 days after the second and final application. Two Moloka'i fishermen and a USFWS employee collected samples by hand (water and limpets) and with hook-and-line (fish) after accessing the island by boat. Forty intertidal limpets (*Cellana exarata*) were collected from three locations around Mokapu. Limpets were shelled and the whole bodies, including gut contents, were analyzed for diphacinone residues. Six fish (3 different species) were also collected. Appendix C contains the laboratory reports documenting that no diphacinone was found in the limpets or in the fish muscle tissues. Since gut contents were included in the limpet samples, it can be assumed that because they did not have any bait pellet fragments in their digestive tracts they either did not encounter or did not like bait pellets.

In 2001, a semi-trailer truck went off the road into the ocean on the east coast of the South Island of New Zealand prior to an eradication project. Twenty tons of 0.002% (20 ppm) brodifacoum bait was spilled into the nearshore environment at a single point (Primus et al. 2005). Samples of marine invertebrates and fish were taken immediately after the spill, then monthly for four months, then at three and six month intervals for the following 21 months. Bait spilled into the

water began to soften and disintegrate quickly, but the plume of green water from the bait dye lasted approximately 24 hours. Approximately one week post-spill, the congealed grain bait material on the ocean floor was diluted and dissipated by wave action. Most exposure of marine invertebrates occurred within approximately 300 feet of the spill site; minor exposure was detected from 300 to 900 feet from the spill site, and none was detected beyond 900 feet.

The following results were found during sampling (Primus et al. 2005):

- Mean brodifacoum concentrations in mussels peaked at 0.41 ppm one day after the spill and were just above detection limits after 29 days. Five mussel samples collected 353 days after the spill still averaged 0.002 ppm.
- Abalone gut and muscle tissue residues were highest on day 29 with 0.07 ppm for gut tissue and 0.03 ppm for muscle tissue. At day 191, residues averaged 0.003 ppm for gut and 0.0015 ppm for muscle. At day 353, abalone gut and muscle tissues were 0.0017 ppm and 0.0014 ppm, respectively.
- Limpet tissue maintained detectable brodifacoum residues for about 80 days.

The New Zealand spill was a worst-case scenario but still only resulted in low levels (less than 1.0 ppm) of tissue contamination, mostly within 300 feet of the spill site. However, the persistence of brodifacoum in the tissues was thought to be due to a combination of the high volume of brodifacoum introduced into the shallow marine environmental at one location, a prolonged half-life of the brodifacoum in the invertebrates, and re-exposure to the high volume of bait due to tidal action. Because brodifacoum would only be considered for use on Lehua if diphacinone fails and the likelihood of a major bait spill into the ocean is minute, the risk of any such persistent accumulation of brodifacoum in invertebrate tissues at Lehua is small.

Corals would not likely be exposed to rodenticide since coral cover around Lehua is very sparse, due largely to extreme winter surf conditions. However, there is a large and exceptional bed of *Sinularia abrupta* (a soft coral) located off the northwest horn of Lehua. Although the effects of rodenticides on corals have not been tested in the laboratory, the rat eradication should not pose a risk to this coral bed for the following reasons: 1) the pellets and most pellet fragments are too big for the filter-feeding coral polyps to eat; 2) the solubility of rodenticides in water and thus the risk of corals absorbing dissolved toxins are very low and the concentrations of rodenticide in pellets (25-50 ppm) are low to begin with; 3) there is no known physiological mechanism by which vertebrate anticoagulants can affect invertebrates; and 4) because the *Sinularia* bed is located off of the narrow, tapering northwest tip of Lehua, relatively little bait would be applied to this area and even less could potentially fall into the water.

For all these reasons, no adverse impacts to marine invertebrates are predicted as a result of using diphacinone or brodifacoum bait pellets on Lehua.

Marine Fish

Since diphacinone and brodifacoum are highly insoluble in water, fish could not be exposed to significant amounts of dissolved rodenticides. Therefore, as with the invertebrates, any problems or concerns with fish would have to be caused by their eating bait pellets or contaminated prey.

In order to address the question of whether fish would eat bait pellets, the USFWS conducted field trials on Lehua Island in 2004, using placebo bait pellets similar in size, shape and material to pellets that might actually be used (C. Swenson, USFWS, unpublished data). Results showed

that although certain species routinely inspected bait pellets in the water, none of the 21 nearshore fish species observed ate the placebo bait (Table 3). Although other fish species are present at Lehua that were not observed during these tests, results included a representative sample of species and provided good evidence that fish don't consider bait pellets to be palatable. In any event, bait pellets are not available to fish or other organisms for long since they quickly soften and break up in water, particularly when the ocean is rough (Empson and Miskelley 1999).

If fish aren't exposed to dissolved rodenticides and don't eat bait pellets, the only remaining question is whether they could take up rodenticide by eating contaminated prey items. Strong supporting evidence that prey species would not likely be contaminated comes from field sampling of fish and invertebrates conducted following an actual rodenticide application in Hawai`i, and another round of sampling done after an accidental New Zealand spill of large amounts of brodifacoum into the water.

The sampling program conducted at Mokapu Island, following aerial application of diphacinone bait, did not detect diphacinone residues in any of the water or tissue samples collected. Seawater, limpet and fish samples were collected at Mokapu Island on February 17, 2008, 11 days after the first rodenticide application and 5 days after the second and final application. Two Moloka'i fishermen and a USFWS biologist collected samples by hand (water and limpets) and with hook-and-line (fish) after accessing the island by boat. The fish collected included four blue-lined snappers (*Lutjanus kasmira*), one hogfish (*Bodianus bilunulatus*), and one bridled triggerfish (*Sufflamen fraenatus*). All of these fish are shoreline-associated predators that feed primarily on invertebrates and/or small fish. Appendix C contains the laboratory reports documenting that no diphacinone was found in fish muscle or limpet tissues.

Additional supporting evidence for the lack of significant pathways for rodenticide accumulation in fish tissues comes from results of sampling conducted following a massive, 20 ton spill of brodifacoum pellets into shallow, protected coastal waters in New Zealand. Expectations were that significant contamination of fish would result. However, the only fish with detectable residues was a butterfish sampled 9 days after the spill. This fish had only 0.040 parts per million (ppm) brodifacoum in the liver and 0.02 ppm in the gut, and no detectable residues in muscle tissues. No brodifacoum residues were detected in four other fish samples collected between day 14 and 16 after the spill (Primus et al. 2005). As discussed above, brodifacoum was found in invertebrate tissues in concentrations below 1.0 ppm, primarily within 300 feet of the spill site. The New Zealand example was a worst-case scenario but still only resulted in low levels of localized tissue contamination.

For all these reasons, no adverse impacts to marine fish are predicted as a result of using diphacinone or brodifacoum bait pellets on Lehua.

Table 3. Attraction of nearshore marine fishes to placebo Ramik Green rat bait pellets (2-3 gram size) at Lehua Island, Hawai`i, September 18-19, 2004 (USFWS unpublished data)

Common English Name	Scientific Name	Total Number of Fish	Number of bait interactions observed (some individuals interacted multiple times)			Number of bait interactions per species
			Inspected Bait	Touched Bait	Consumed bait	
Orangespine Unicornfish	*Naso literatus*	13	10	8	0	18
Convict Tang	*Acanthurus triostegus*	8	0	0	0	0
Whitebar Surgeonfish	*Acanthurus leucopareius*	85	19	0	0	19
Orangeband Surgeonfish	*Acanthurus olivaceous*	7	3	5	0	8
Achilles Tang	*Acanthurus achilles*	2	0	0	0	0
Ringtail Surgeonfish	*Acanthurus blochii*	1	0	0	0	0
Eyestripe Surgeonfish	*Acanthurus dussumieri*	1	0	0	0	0
Lagoon Triggerfish	*Rhinecanthus aculeatus*	1	1	0	0	1
Black Durgon	*Melichthys niger*	6	21	13	0	34
Pinktail Durgon	*Melichthys vidua*	5	13	9	0	22
Moorish Idol	*Zanclus cornutus*	1	0	0	0	0
Ornate Butterflyfish	*Chaetodon ornatissimus*	1	0	0	0	0
Longnose Butterflyfish	*Forcipiger longirostris*	1	0	0	0	0
Cornetfish	*Fistularia commersonnii*	1	0	0	0	0
Gray Reef Shark (juv.)	*Carcharhinus amblyrynchos*	1	1	0	0	1
Blackspot Sergeant	*Abudefduf sordidus*	1	3	0	0	3

Manybar Goatfish	*Parupeneus multifasciatus*	2	0	0	0	0
Blue Goatfish	*Parupeneus cyclostomus*	3	0	0	0	0
Yellowstripe Goatfish	*Mulloidichthys flavolineatus*	1	0	0	0	0
Hawaiian Hogfish	*Bodianus bilunulatus*	1	1	1	0	2
Parrotfish spp.	Family *Scaridae*	2	0	0	0	0

3.3 Potential Impacts to Humans

Human harvest near Lehua focuses on marine fish and limpets. The analysis in Section 3.2 shows that there is minimal risk that the project will contaminate marine organisms. Field data collected from Lehua supports the assumption that Hawai‘i nearshore fish do not eat the type of bait pellets planned for use and, therefore, would not have rodenticide residues in their tissues (Table 3). Exposure levels of marine invertebrates to rodenticide, if any, would be at such low levels and for such a short time that no tissue accumulation is anticipated and, therefore, no effects to human consumers are anticipated. As discussed earlier, no diphacinone residues were detected in the seawater, limpets, or fish sampled following the 2008 Mokapu Island rat eradication (see Appendix C). Following the large New Zealand bait spill, only low levels of brodifacoum were detected in organisms close to the spill site.

In addition, access to the waters surrounding Lehua is often risky or impossible for recreational or harvesting purposes during the rough winter months when the bait application would occur. Therefore, collection of limpets and fish is highly unlikely during the period of operations. Project mitigation methods to prevent or minimize bait pellets falling into the water include not applying bait in high winds and not applying before heavy rains that could wash pellets into the water. For all these reasons, the risks of either direct or indirect human exposure to rodenticides in marine organisms are minimal to non-existent. Nonetheless, the public will be notified prior to any bait application. Sampling of water, fish and invertebrate tissues is planned after application, if ocean conditions permit safe sample collection. Results from marine sample testing will be published in Kaua‘i newspapers as soon as they become available.

Harvest or consumption of terrestrial resources, such as plants or seabirds living on the island is illegal and is not known to occur.

Project personnel would follow all required safety and product handling procedures and would not, therefore, be exposed to harmful amounts of rodenticides.

3.4 Potential Impacts to Birds

Most birds found on Lehua are seabirds, which are present in significant numbers only in the summer and fall and are absent or greatly reduced in numbers in the winter. However, some species are year-round residents. Nonnative passerine birds are also found on Lehua but have only been observed in the summer. Nonnative barn owls are apparently a recent year-round

resident. All species on Lehua except the nonnative house sparrow and the nutmeg mannikin are protected under the Migratory Bird Treaty Act.

In general, birds can only be exposed to rodenticides in two ways: either they can eat the bait pellets (direct ingestion) or they can eat prey organisms that have been contaminated by eating rodenticide (indirect ingestion). The types of birds at highest risk of rodenticide poisoning are birds of prey or scavengers that may feed on live or dead rodents that have already eaten rodenticide pellets. However, because almost all the birds on Lehua during the winter operation are seabirds, there is little risk of either direct or indirect rodenticide ingestion by birds. Seabirds do not generally eat things they find on land, such as bait pellets or rodents. Seabirds only eat fish and other marine organisms they catch in the ocean, often far from shore (see Table 4).

Nonetheless, the following sections present data on the effects on birds of direct and indirect bait ingestion. The common theme is that diphacinone, regardless of how ingested, is less toxic than brodifacoum. In most cases, it would be physically impossible for birds to eat enough diphacinone pellets or tainted prey to cause death. As stated earlier, diphacinone is the preferred compound for use on Lehua. Brodifacoum would only be used as a last resort if a failure to eradicate Lehua's rats could be directly traced to a problem with using diphacinone. Even though it is more toxic than diphacinone, it is unlikely to cause problems since birds are not likely to eat bait pellets or contaminated prey.

3.4.1 Impacts to Native Seabirds Present on Lehua in the Winter

Biology and Status

The numbers of seabirds on Lehua are reduced in the winter compared to the rest of the year, largely because the most numerous species, the wedge-tailed shearwaters, are absent in winter. Breeding is also greatly reduced in the winter and the number of active nests at this time is relatively small. Species observed nesting during the December-February project period (also see Table 1) include both albatross species, brown boobies, and red-tailed tropicbirds. Other year-round Lehua residents like black noddies and red-footed boobies may be breeding in small numbers also but have not been observed to do so. All Lehua seabirds feed on marine organisms offshore and do not gather any food on land.

The following seabird species have been recorded on or near Lehua during the winter (VanderWerf et al 2007):

- black-footed albatross
- Laysan albatross
- red-tailed tropicbird (possible year-round resident)
- brown booby
- red-footed booby (year-round resident)
- great frigatebird
- glaucous-winged gull (rare visitor)
- sooty tern (rare visitor)

- brown noddy (rare visitor)
- Hawaiian black noddy (year-round resident)

Potential Impacts to Seabirds from Direct Ingestion of Rodenticide (Primary Nontarget Hazard)

Because the adults of all the Lehua seabird species feed by foraging for fish and other marine organisms offshore (Table 4), it is highly unlikely that any of the seabirds would be attracted to or incidentally pick up bait pellets of either diphacinone or brodifacoum during a winter operation. Few pellets would actually fall into the nearshore waters and any pellets falling into the water would disintegrate rapidly. However, as older albatross chicks in the nest are known to be curious and pick up small articles near the nest, it is possible that a chick could ingest a pellet.

If an adult seabird picked up bait pellets, which is highly unlikely, a black noddy, the smallest of the seabirds, would have to consume 860 grams (2 pounds) of 50 ppm diphacinone bait (based upon the lower reported acute oral LD_{50} of >400 mg/kg body weight for bobwhites) to obtain an LD_{50}-equivalent dosage. It would be physically impossible for such a small bird to consume that much bait in one or even several days. An adult red-footed booby, the most numerous seabird species on Lehua in the winter, would have to consume 8,000 grams (approximately 17.6 pounds) of diphacinone bait, which is physically impossible.

The great frigatebird would have to eat 10,800 g (almost 24 pounds) of 50 ppm diphacinone bait to consume a lethal dose (Table 5). However, the projected LOEL (extrapolated from the lowest reported LOEL for diphacinone in birds, 0.11 mg/kg/day, Savarie et al 1977) of diphacinone for the great frigatebird, is 0.15 mg/kg/day or about three grams of bait per day. As long as bait is present in a treated area, a non-lethal level of exposure like this would be physically possible, although it is highly improbable that any of the seabirds would forage on bait pellets along the coastline rather than fish in the open ocean.

Based on the acute oral LD_{50} figure reported for mallards (0.26 mg/kg body weight), a 108 g (3.8 oz.) black noddy, the smallest species of seabird likely to be present during the operational window, would only have to consume 1.1 gram of 25 ppm brodifacoum bait, or half of one 2-g pellet, to obtain an LD_{50}–equivalent dosage. The average adult great frigatebird weighs approximately 1,350 g (3 lbs) and would need to ingest 14 g, or about seven small-size (2 g) pellets of a brodifacoum product to obtain the LD_{50}–equivalent dosage of 0.35 mg (Table 5). LOEL values are not available for brodifacoum because of its high toxicity. Again, it is highly improbable that any of the seabirds would forage on bait pellets along the coastline rather than fish in the open ocean.

However, it is possible that Laysan or black-footed albatross chicks, known to be curious about objects near their nest, might pick up and inadvertently ingest bait pellets that they can reach from their nests. Albatross chicks grow rapidly after hatching, but newly hatched chick, such as those likely to be present during the project period, weigh about 200 g or 7 ounces (Whittow 1993a and 1993b). A 200 g chick would have to ingest 1,600 g (over 3.5 pounds) of diphacinone bait pellets to obtain the LD_{50}–equivalent dosage of 80 mg; an impossible amount to eat.

This same size chick would need to ingest about 2.1 g, or roughly one (2 g) pellet of a brodifacoum product to obtain the LD_{50}–equivalent dosage of 0.05 mg (Table 5). As stated in Section 3.2.1, LOEL values are not available for brodifacoum because of its high toxicity.

Larger albatross chicks would have to ingest proportionately larger volumes of either bait to cause an effect. However, because of the potential for direct ingestion, all pellets within 6 feet of any active albatross nest will be manually removed soon after bait application.

In conclusion, the potential for any adverse impacts to seabirds from consuming either diphacinone or brodifacoum pellets is low because seabirds feed on marine organisms, not bait pellets, and they feed in the open ocean far from where bait will be applied. The possible exception to this is albatross chicks accidentally feeding on bait pellets near their nest. Therefore, mitigation measures include quickly removing bait pellets near any active albatross nests.

Potential Impacts to Seabirds from Indirect Ingestion of Rodenticide (Secondary Nontarget Hazard)

Another potential route of exposure to rodenticides for seabirds is consumption of prey items that have themselves ingested rodenticide. However, all species of seabirds on Lehua consume fish or squid offshore. As a result, it is highly improbable that adult seabirds would feed on or bring fish with rodenticide residues back to their chicks, because the fish in the open ocean would not be exposed to rodenticides and, even if they were, are not expected to feed on bait pellets and thus bioaccumulate residues, as discussed earlier. Therefore, this scenario will not be evaluated in detail. Nonetheless, the number of grams of marine animal tissues necessary for secondary poisoning to seabirds is included in Table 5. Using the numbers in this table, even under the extreme circumstances of an accident involving a large-scale brodifacoum bait spill and assuming that the seabirds eat nearshore invertebrates (an unknown behavior for the seabird species on Lehua) rather than fish and squid in the open ocean, the risk of mortality for any species of seabird on Lehua is essentially zero for either a diphacinone or brodifacoum formulation.

Table 4. Biological Characteristics of Seabirds Present on Lehua Island in the Winter

Species[1]	Mass (g)[1]	Energy Dynamics	Winter Distribution	Diet	Biological Information	Seasonal Presence in Lehua Area	Citations[2]
Black-footed albatross ka‘upu	Adult: 2800 Chick: 200 (hatch weight)	Data not available	Outside of Japan, 95% breed on Laysan Island and Midway Atoll; breeding recently confirmed on Lehua (VanderWerf 2007), pelagic rest of year	In Hawai’i, squid, deep-water crustaceans, fish and flyingfish eggs	Age at first breeding >5 years; 1 egg; nest in scooped out hollows; both parents incubate, brood, feed chick	Eggs laid in November and chicks fledge in June and July	Mitchell et al. 2005; VanderWerf et al. 2007
Laysan albatross Mōlī	Adult: 2400 Chick: 200 (hatch weight)	Data not available	Breed throughout NWHI and on Kaua‘i, O‘ahu, and Lehua Islands in winter, pelagic rest of year	In Hawai’i, squid, deep-water crustaceans, fish and flyingfish eggs	Age at first breeding 8 or 9 years; 1 egg; nest scrape to ring-like structure comprised of sand, vegetation, and debris on steep rocky areas on Lehua; both parents incubate, brood, feed chick	Eggs laid between November and December; chicks fledge in July; 1 egg	Mitchell et al. 2005; VanderWerf et al. 2007
Brown booby ‘ā	1340	141 g/day	Little known about movements outside of breeding season	Forages on fish by diving into the water	Age at first breeding 4 to 5 years; 2 eggs/season; nests on ground; both parents incubate, brood, and feed chicks	Breeding from March through May, with fledging by September	Mitchell et al. 2005; VanderWerf et al. 2007
Red-footed booby ‘ā	1000	Data not available	Breed throughout NWHI, Kaua‘i, Kaneohe Bay O‘ahu, Moku Manu and Lehua	In Hawai’i, flyingfish and squid, mackerel scads, saury, and anchovies	Age at first breeding 3 -4 years; nest in shrubs and trees; 1 egg; both parents incubate, brood and feed chick	Egg-laying possibly February, most young fledged by September’ some birds present year-round	Mitchell et al. 2005; VanderWerf et al. 2007
Great frigatebird ‘iwa	1350	147 g/day	Outside breeding season, breeding adults remain relatively close to breeding area; young and nonbreeders disperse	Steals food from other seabirds and forages for fish by dipping into the water	First breeding at 8 to 10 years; 1 egg/season; platform nests in low bushes; both parents incubate, brood, and feed; females often only breed every 2 to 4 years	Does not breed in the main Hawaiian Islands but can be present and possibly roosting throughout the year; nesting not confirmed on Lehua	Mitchell et al. 2005; VanderWerf et al. 2007

Species[1]	Mass (g)[1]	Energy Dyna-mics	Winter Distribution	Diet	Biological Information	Seasonal Presence in Lehua Area	Citations[2]
Red-tailed tropicbird koa‘e ‘ula	660	87 g/day	Outside the breeding season, adults are solitary and pelagic	Forages on fish by diving into the water	Age at first breeding between 2 and 4 years; 1 egg/season; nests on ground; both parents incubate, brood, and feed	Breeding can occur throughout the year, but most nests active between February and June	Mitchell et al. 2005; VanderWerf et al. 2007
Glaucous-winged gull	1,180 (male) 950 (female)	Data not available	Farther from shore during winter; beaches and nearshore habitat, intertidal zone other seasons	Seizes small fish from near the water surface and forages for marine invertebrates	One of first species to first recolonize islands after removal of introduced mammalian predators; 2-3 eggs; highly territorial	Rare winter visitor to Lehua	Verbeek 1993; VanderWerf et al. 2007
Sooty Tern ’ewa’ewa	200	Data not available	Remain aloft outside of breeding season; pelagic	Squid, goatfish, flyingfish, mackerel scad	First breeding at 4 to 10 years; nests on shallow scrapes; 1 egg; high site fidelity; both parents incubate, brood, and feed chicks.	Reported recently as a rare visitor to Lehua; only breeds in large colonies between February and September	Mitchell et al. 2005; VanderWerf et al. 2007
Brown Noddy noio kōhā	180	Data not available	Remain near breeding grounds (within 62 miles) year-round	Fish and squid	First breeding at 3 to 7 years; 1 egg; nest on ground, cliffs, trees; both parents incubate, brood, and feed chicks.	Previously extirpated on Lehua; Only breeds in large dense colonies in spring and summer	Mitchell et al. 2005; VanderWerf et al. 2007
Black Noddy Noio	108	29 g/day	Remain near breeding grounds (within 50 miles) year-round	Juvenile goatfish, lizardfish, herring, flyingfish, and gobies	First breeding at 2 to 3 years; Nests on ledges in back of sea caves; egg laying occurs year-round, although no nests found on Lehua in February; high site fidelity; 1 egg; both parents incubate, brood, and feed chicks.	Present year-round and presumable breeding in the sea caves	Mitchell et al. 2005; VanderWerf et al. 2007

[1] Mass values from Birds of North America, www.bna.ed

Table 5. Acute Toxicity of Diphacinone and Brodifacoum to Seabirds Wintering in the Lehua Area.[1,2]

Note: 1 pound = 454 grams	Amount of rodenticide that would have to be directly eaten to kill 50% of the population				Amount of contaminated prey that would have to be eaten to kill 50% of the population			
	Diphacinone		Brodifacoum		Diphacinone		Brodifacoum	
	mg of active ingredient	Grams of bait pellets (50 ppm)	mg of active ingredient	Grams of bait pellets (25 ppm)	Grams of Mussels	Grams of Fish Liver	Grams of Mussels	Grams of Fish Liver
Black-footed or Laysan albatross chick	80	1,600	0.05	2.08	195,122	2,000,000	127	1,300
Brown booby	536	10,720	0.35	13.90	1,307,317	13,400,000	850	8,710
Red-footed booby	400	8,000	0.26	10.40	975,610	10,000,000	634	6,500
Black noddy	43	860	0.03	1.10	105,366	1,080,000	69	702
White-tailed tropicbird	182	3,640	0.12	4.73	443,902	4,550,000	289	2,958
Red-tailed tropicbird	264	5,280	0.17	6.90	643,902	6,600,000	419	4,290
Great frigatebird	540	10,800	0.35	14.00	1,317,073	13,500,000	856	8,775
Glaucous-winged gull	380	7,600	0.25	9.90	926,829	9,500,000	602	6,175
Sooty tern	80	1,600	0.05	2.10	195,122	2,000,000	127	1,300
Brown noddy	72	1,440	0.05	1.90	175,610	1,800,000	114	1,170

1 Based on the lower of the two acute oral LD_{50} values for bobwhites or mallards (>400 mg/kg body weight for diphacinone, 0.26 mg/kg body weight for brodifacoum).

2 Based on the maximum tissue residue recorder in mussels and fish liver

3.4.2 Potential Impacts to Migratory Shorebirds Present on Lehua in the Winter

Biology and Status

Two species of shorebirds are present on Lehua during the winter: the Pacific golden-plover and the ruddy turnstone. Neither species nests in Hawai‘i. Both species are present in small numbers on Lehua during the winter. Six golden-plovers and 9 ruddy turnstones were observed during a recent winter expedition to Lehua (VanderWerf et al. 2007). The ruddy turnstone feeds on marine invertebrates in the intertidal zone. The golden-plover feeds on terrestrial insects and intertidal invertebrates (Table 6). Other shorebird species, such as wandering tattlers and sanderlings, are common in Hawai‘i in the winter but have not been observed on Lehua.

Potential Impacts from Direct Ingestion of Rodenticide (Primary Nontarget Hazard)

Ruddy turnstone and Pacific golden-plover, which both forage in intertidal areas (see Table 6), are likely to be present during the winter operational window on Lehua and could potentially be exposed to rodenticide. Although pellets could be available in the intertidal area, it is highly unlikely that these species would actually forage on bait pellets given their normal feeding behavior, the low density of pellets, and the small number of shorebirds on Lehua.

Even if a bird were to pick up diphacinone bait pellets, the ruddy turnstone would have to consume approximately 640 g (almost 1.5 pounds) and the Pacific golden-plover would have to consume approximately 1,200 g (almost 2.7 pounds) of diphacinone bait to deliver an LD_{50}–equivalent dosage (based upon the lower reported acute oral LD_{50} of >400 mg/kg body weight for bobwhites). It would be physically impossible for either species to consume that much bait in one or several days. However, the projected LOEL (extrapolated from the lowest reported LOEL for diphacinone in birds, 0.11 mg/kg/day, Savarie et al. 1977) of diphacinone for a ruddy turnstone is 0.01 mg/day or about 0.2 gram of bait per day and for a Pacific golden-plover it is 0.02 mg/day or about 0.3 gram of bait per day (Table 6). As long as bait is present in a treated area, such a level of non-lethal exposure would be possible. However, the bird would most likely not consume it based on feeding habits.

Based on the acute oral LD_{50} figure reported for mallards (0.26 mg/kg body weight, Table 6), a ruddy turnstone would only have to consume 0.8 g of a 25 ppm brodifacoum bait, or about 50% of one average-sized pellet, to obtain an LD_{50}–equivalent dosage; while a Pacific golden-plover would only have to consume 1.6 g of a 25 ppm brodifacoum bait, or about one average sized pellet, to obtain an LD_{50}–equivalent dosage (Table 6). The lethal effects of brodifacoum have been confirmed in northern New Zealand dotterels (*Charadrius obscurus acquilonius*), and observed in an additional two shorebird species on a mainland mammal eradication project (pied stilts, *Himantopus himantopus;* and spur-winged plovers, *Vanellus miles nova novaehollandiae*) (Dowding et al. 1999, Dowding et al. 2006). Again, no LOEL has been determined for brodifacoum because of its substantially higher toxicity; all doses administered have had measurable effects.

In conclusion, the potential is very low for any direct adverse impacts to shorebirds from directly consuming either diphacinone or brodifacoum pellets, since neither species is likely to feed directly on pellets, pellets will be distributed at very low densities, and few shorebirds use Lehua. Even if they did feed on diphacinone pellets, it would be physically impossible for either species to consume a lethal dose.

Table 6. Biological Characteristics of Shorebirds Present on Lehua Island in the Winter

Species[1]	Mass[1] (g)	Energy Dyna-mics	Winter Distribution	Diet	Biological Information	Seasonal Presence in Lehua Area	Citations[2]
Pacific golden-plover Kōlea	150	No informa-tion	Common on all main Hawaiian Islands (August-April) along shorelines and grassy areas	Terrestrial insects and intertidal marine invertebrates	High site fidelity to wintering grounds and territories within those areas in Hawai‘i; no nesting	Winter only	Mitchell et al. 2005; VanderWerf et al. 2007
Ruddy turnstone ‘akekeke	80	No informa-tion	Common on all main Hawaiian Islands (August-April). Found on rocky shorelines with abundant seaweed and on mudflats	Primarily marine invertebrates, including worms, small fish, bivalves and crustaceans	Age of first breeding is 2 years; 3-4 eggs/clutch; nests on ground in tundra; both parents incubate and feed young; 1 clutch per year	Winter only	Mitchell et al. 2005; VanderWerf et al. 2007

[1] Mass values from Birds of North America, www.bna.edu

Potential Impacts from Indirect Ingestion of Rodenticide (Secondary Nontarget Hazard)

A ruddy turnstone would have to consume over 78,049 g (172 pounds) of mussels with diphacinone in their tissues to obtain the equivalent LD_{50} dose, which is physically impossible. For brodifacoum, a turnstone would have to eat 50.7 g (1.8 ounces) of contaminated mussels, which is unlikely. The LOEL for secondary hazard for diphacinone would be 21 g of contaminated mussels and 220 g of fish liver. Only if contaminated tissue were available over several days would there be any risk of obtaining an LOEL for the turnstone through secondary exposure to diphacinone. This is unlikely because of the small amount of bait to which marine invertebrates might be exposed in the intertidal zone. The ruddy turnstone would not be adversely impacted with diphacinone because of the impossibly large amount of contaminated invertebrates that would need to be consumed, nor with brodifacoum, because it is unlikely there would be enough invertebrates exposed to the degree necessary to accumulate significant levels of toxins.

The Pacific golden-plover would have to consume over 146,341 g (323 pounds) of mussels with diphacinone in their tissues to obtain the equivalent LD_{50} dose, which is physically impossible. For brodifacoum, the level is 95.1 g (3.4 ounces) of contaminated mussels, which is unlikely. The LOEL for secondary hazard would be 40 g of mussels contaminated with diphacinone and 413 g of fish liver. Only if contaminated tissue were available over several days would there be any risk of obtaining an LOEL for the Pacific golden-plover through secondary exposure to diphacinone (Table 6).

In conclusion, the potential is very low for any indirect adverse impacts to shorebirds from consuming prey items contaminated with either diphacinone or brodifacoum, primarily because intertidal organisms are not expected to accumulate rodenticides in their tissues. Even if shorebirds did feed on contaminated prey, it would be physically impossible for them to consume a lethal dose of diphacinone. It is physically possible but unlikely in this context for shorebirds to consume a lethal dose of brodifacoum in prey tissue, given the low probability that invertebrates will be exposed to enough rodenticides to accumulate it in their tissues.

Table 7. Acute Toxicity of Diphacinone and Brodifacoum to Shorebirds Wintering in the Lehua Area.[1,2]

Note: 1 pound = 454 grams	Amount of rodenticide that would have to be directly eaten to kill 50% of the population				Amount of contaminated prey that would have to be eaten to kill 50% of the population			
	Diphacinone		Brodifacoum		Diphacinone		Brodifacoum	
	mg of active ingredient	Grams of Bait (50 ppm)	mg of active ingredient	Grams of Bait (25 ppm)	Grams of Mussels	Grams of Fish Liver	Grams of Mussels	Grams of Fish Liver
Pacific golden-plover	60	1,200	0.04	1.6	146,341	1,500,000	95.1	975
Ruddy turnstone	32	640	0.02	0.8	78,049	800,000	50.7	520

1. Based on the lower of the two acute oral LD_{50} values for bobwhites or mallards (>400 mg/kg body weight for diphacinone, 0.26 mg/kg body weight for brodifacoum)
2. Based on the maximum tissue residue recorded in mussels and fish liver

3.4.3 Potential Impacts to Barn Owls, Cattle Egrets and Peregrine Falcons

Biology and Status

The barn owl, not native to Hawai‘i but native to North America, has been recently recorded on Lehua and could potentially visit the island in the winter. No breeding has been documented on Lehua. A sediment deposit beneath a roost on the southern shore of Lehua contained thousands of bones from Polynesian rats, feral rabbits, Bulwer’s petrels, brown noddies, zebra doves and several other bird species. One owl pellet contained the entire skull of a wedge-tailed shearwater, demonstrating that the owls prey on relatively large species (VanderWerf et al. 2007). Because barn owls eat rodents, it is possible that they could secondarily ingest rodenticide in poisoned rats.

The peregrine falcon is an extremely rare winter visitor from either Asia or North America, where it has been delisted under the Endangered Species Act. Single birds have been observed infrequently during winter months flying near Lehua but not landing (VanderWerf et al. 2007). Peregrine falcons feed primarily on small birds on the wing, so they would not be expected to scavenge bait pellets or feed on live or dead rodents. Because there is no likely pathway for poisoning for falcons, they will not be considered further.

Cattle egrets are not native, and some commute to Lehua from nearby Ni‘ihau and Kaua‘i. Adults are present in February but don’t nest until later spring and summer on Lehua. They may be predators on seabird eggs and chicks (VanderWerf et al. 2007) and appear to prefer live prey, although they are not known to eat live rats. They also would not be expected to scavenge bait pellets or eat dead rodents. Because there is no likely pathway for poisoning for egrets, they will not be considered further.

Potential Impacts from Direct Ingestion of Rodenticide (Primary Nontarget Hazard)

Barn owls only capture live prey and therefore would not ingest grain-based pellets (Table 8). Therefore, there is no potential for the barn owl to ingest rodenticide directly in the form of bait pellets.

Potential Impacts from Indirect Ingestion of Rodenticide (Secondary Nontarget Hazard)

Because barn owls hunt live prey, they would not eat dead rats but could eat live ones carrying rodenticide residues in their tissues prior to dying. The most conservative (worst case) analyses of these situations will be examined here, using data from the literature. To assess secondary nontarget hazards for the barn owl, the analysis will use whole body values with the maximum residue levels documented in rodents (Erickson and Urban 2004). The LD_{50} for an average sized 315 g (0.7 lbs) owl is estimated to be 0.1 mg of brodifacoum and 126 mg of diphacinone. To ingest these amounts of rodenticides secondarily via rodents contaminated to the highest level documented, an owl would need to consume 3.15 g (0.1 ounce) of a brodifacoum-loaded rat or 37 kg (81.6 pounds) of a diphacinone-loaded rat. An owl could obtain an LOEL dosage of diphacinone by eating 10 g of contaminated rodents. Even under these extreme situations, the risk of mortality due to using a diphacinone formulation is essentially zero.

Table 8. Biological Characteristics of Barn Owls Present in Winter on Lehua Island

Species	Mass[1] (g)	Energy Dynamics	Winter Habitat	Diet	Biological Information	Seasonal Presence in Lehua area	Citations[1]
Barn owl	378 (female) 315 (male)	41 g to maintain weight for 24 hours (1-2 adult voles/day)	Open or semi-open country	Live rats and small birds, including seabirds, on Lehua	3-8, sometimes 12 or more eggs/clutch, 1-2 broods per year	Year-round resident, probably flies in from Ni`ihau and Kaua`i	Kaufmann 1996

[1] Mass values from Birds of North America, www.bna.edu

Table 9. Acute Toxicity of Diphacinone and Brodifacoum to Barn Owls Present in Winter on Lehua Island

***Note*: 1 pound = 454 grams**	**Amount of rodenticide that would have to be directly eaten to kill 50% of the population**				**Amount of contaminated prey that would have to be eaten to kill 50% of the population**	
	Diphacinone (50 ppm)		**Brodifacoum (25 ppm)**		**Diphacinone**	**Brodifacoum**
	mg of active ingredient	**Grams of Bait**	**mg of active ingredient**	**Grams of Bait**	**Grams of Rodents[1]**	**Grams of Rodents[1]**
Barn owl (315 g body mass)	126	2,520	0.08	3.30	37,059	3.15

[1] Based on maximum whole body residues recorded in rodents: 3.4 ppm diphacinone, 25.97 ppm brodifacoum.

Using a brodifacoum product, however, could create a substantial risk to a small number of barn owls on Lehua. However, brodifacoum would only be used if diphacinone fails and it can be shown that eradication failed due to the use of diphacinone rodenticide, not other factors. Because this scenario is unlikely, there is little risk from the proposed project to nonnative barn owls. However, in the event that a barn owl died as a result of ingesting brodifacoum, it would not affect the population significantly since barn owls are regular visitors from the adjacent islands such as Kaua‘i and Ni‘ihau (VanderWerf et al 2007), where the large owl populations would not be affected and could rapidly provide additional birds.

3.5 Potential Impacts to Hawaiian Monk Seals

Biology and Status

Hawaiian monk seals (*Monachus schauninslandi*) are a Federally-listed endangered species endemic to the Hawaiian Archipelago. The population is declining and only about 1,200 animals remain. The most serious threats to the population are food limitation, entanglement in fishing gear, and shark predation. The majority of seals are found in the northwestern Hawaiian Islands but small resident populations are present in the main Hawaiian Islands, including around Ni`ihau (NMFS 2007). They are potentially present around Lehua throughout the year and are often seen hauled out on Lehua’s rocky ledges. However, anecdotal information from boat captains familiar with Lehua indicates that seals are not present on Lehua during the winter months when the rat eradication is scheduled to occur.

Potential impacts to monk seals were discussed in the 2005 EA and in the 2005 and 2008 informal section 7 consultations with NMFS. Monk seal use of Lehua is not expected to increase in winter (and may in fact decrease), so switching to a winter operational season will not change anything with regard to the 2005 impact analysis. None of the other proposed modifications will increase risk to monk seals. NMFS confirmed this in September 2008 when they concurred with the Service’s determination that the project is not likely to adversely affect monk seals. In short, there is no probable pathway of injury since monk seals are not likely to eat bait pellets and there is only a very slight risk that marine organisms eaten by monk seals could become contaminated. In order to minimize disturbance, helicopters will not fly directly over or apply rodenticides onto monk seals hauled out on Lehua. Project personnel on island will also maintain a 100’ distance from hauled out seals. For all these reasons, no impacts are anticipated.

Potential Impact from Direct Ingestion of Rodenticide (Direct Nontarget Hazard)

Hawaiian monk seals forage at sea in offshore areas and sometimes at depths of up to 500 meters in precious coral beds (NMFS 2007). They sometimes spend days at sea before returning to the islands where they sleep and digest their food. Spiny lobster, eels, flatfish, scorpenids, larval fishes and octopus are the most commonly consumed prey. Due to these foraging areas and food habits, and the very small risk that rodenticide will contaminate marine organisms near Lehua (see above sections), it is highly unlikely that direct ingestion of rodenticide pellets would occur during operations. Dermal absorption

of dissolved rodenticide is not a risk due to the virtual insolubility of brodifacoum and diphacinone in water.

Even in the unlikely event that a monk seal ate bait pellets, a 227 kg (500 lb) Hawaiian monk seal would have to ingest 91 mg of pure brodifacoum to receive an LD50–equivalent dosage (based on the Norway rat LD50 value of 0.4 mg/kg body weight). To obtain this amount, the seal would have to ingest 3.6 kg (7.9 lbs) of 25 ppm brodifacoum bait pellets. It is extremely improbable that Hawaiian monk seals would feed in the nearshore area of Lehua or be attracted to bait pellets as a food item. For a diphacinone product, the likelihood that a seal would consume enough bait to approach an LD50 dosage is ever lower than with brodifacoum. Based on the Norway rat LD50 value of 2.3 mg/kg body weight, an average seal would have to ingest 522 mg of pure diphacinone to receive an LD50-equivalent dosage. To attain this dosage, a seal would have to consume 10.4 kg (22.9 lbs) of 50 ppm diphacinone bait pellets.

Potential Impact from Indirect Ingestion of Rodenticide (Secondary Nontarget Hazard)

The possibility of Hawaiian monk seals being exposed to rodenticides by consuming marine prey items that have ingested rodenticides (secondary hazards) is very remote, based on the analyses in Section 3.22 above. The most conservative (worst case) analysis of this unlikely scenario will be constructed using data from the massive, 20 ton brodifacoum spill in New Zealand, resulting from a truck crash on the coast. This scenario assumes an adult female Hawaiian monk seal of average weight (227 kg or 500 lbs) that feeds exclusively in an area massively contaminated to the extent documented at a bait spill site in New Zealand, and feeds exclusively on the most contaminated organisms collected during the monitoring of that incident (mussels). One day after the New Zealand truck spilled 20 tons of brodifacoum directly into nearshore marine waters, mussels contained brodifacoum residues of 0.41 ppm.

Based on the Norway rat LD50 value of 0.4 mg/kg body weight, a 227-kg (500-lb) Hawaiian monk seal would have to ingest 91 mg of pure brodifacoum to receive an LD50–equivalent dosage. To obtain this amount, the seal would have to ingest 221 kg (487 lbs) of mussels contaminated at the 0.41 ppm level found in mussels collected one day after the New Zealand spill. That amount of intake would almost equal the seal's body weight and would be much more than the animal's possible daily food intake. For a diphacinone product, the likelihood that a seal would consume enough contaminated mussels to approach an LD50 dosage is even lower than with brodifacoum. Based on the Norway rat LD50 value of 2.3 mg/kg body weight, an average female seal would have to ingest 522 mg of diphacinone to receive an LD50-equivalent dosage. To attain this dosage, a seal would have to consume 1,273 kg (2,806 lbs) of mussels contaminated with diphacinone at 0.41 ppm. That amount of consumption is almost six times the animal's body weight. Ingestion of these amounts of either rodenticide would be impossible.

At nine days post-spill in New Zealand, butterfish had residue concentrations of 0.04 ppm in the liver and 0.02 ppm in the gut, and below the method limit of detection (<0.02 ppm) in the muscle tissue. However, conservatively assuming that a monk seal ate only fish whose entire bodies were as contaminated as the livers sampled at the spill site, it would still have to eat 2,270 kg (5,004 lbs) of contaminated tissue (ten times its total

body weight) to receive an LD50 dose. In the case of diphacinone, a seal would have to eat 13,053 kg (28,777 lbs) of contaminated tissue, an impossible amount of food intake.

Therefore, even using the most conservative assumptions, no effects to Hawaiian monk seals would be expected to occur from indirect ingestion of rodenticide in contaminated prey.

3.6 Potential Impacts to Humpback Whales

Biology and Status

Humpback whales (*Megaptera novaeangliae*) are a Federally-listed endangered species found throughout the world's oceans. World populations appear to be increasing as a result of whaling bans and other legal protection. The northern Pacific population that migrates seasonally to Hawaiian waters in the winter spends the rest of the year in Alaska or other west coast locations. Adults and calves are present in Hawai`i from approximately November to May, often in shallow coastal waters and including areas around Ni`ihau and Lehua. Whales calve and breed in Hawai`i but are not known to feed here (NMFS 1991).

Potential impacts to endangered humpback whales were addressed in the 2008 informal section 7 consultation with NMFS. NMFS concurred with the Service's determination that the project is not likely to adversely affect marine ESA-listed species at Lehua, including humpback whales. There is no realistic pathway by which humpback whales can be exposed to rodenticide at Lehua because: a) humpback whales do not feed when they are in Hawaii; b) diphacinone and brodifacoum are almost completely insoluble in water; and c) there is no evidence of marine contamination resulting from any previous aerial rodenticide broadcast, including the one done at Mokapu Island. Seawater, fish and invertebrates collected at Mokapu all tested negative for diphacinone residues. In order to minimize mechanical disturbance, mitigation measures will include prohibitions on helicopters flying over humpback whales and vessels from approaching within 100 yards of them. For all these reasons, no adverse impacts are anticipated.

Potential Impact from Direct Ingestion of Rodenticide (Direct Nontarget Hazard)

The humpback whales that migrate to Hawai`i forage exclusively at sea in Alaska's offshore areas during the summer (NMFS 1991). Krill and small schooling fish, such as herring (*Clupea harengus*), salmon, capelin (*Mallotus villosus*) and sand lance (*Ammodytes americanus*) as well as mackerel (*Scomber scombrus*), pollock (*Pollachius virens*) and haddock (*Melanogrammus aeglefinus*) are the most commonly consumed prey. Due to these foraging areas and food habits, it is virtually impossible that direct ingestion of rodenticide bait pellets would occur during operations at Lehua. Dermal absorption of dissolved rodenticide is not a risk due to the virtual insolubility of brodifacoum and diphacinone in water.

Based on the Norway rat LD50 value of 0.4 mg/kg body weight, a 45,000 kg (99,208 lb) humpback whale would have to ingest 18,000 mg of pure brodifacoum to receive an LD50–equivalent dosage. To obtain this amount, the whale would have to ingest 720 kg (1,587 lbs) of 25 ppm brodifacoum bait pellets. For a diphacinone product, the likelihood

that a whale would consume enough bait to approach an LD50 dosage is even lower than with brodifacoum. Based on the Norway rat LD50 value of 2.3 mg/kg body weight, an average whale would have to ingest 103,500 mg of pure diphacinone to receive an LD50-equivalent dosage. To attain this dosage, a whale would have to consume 2,070 kg (4,564 lbs) of 50 ppm diphacinone bait pellets; more bait than will be applied to Lehua during any single application.

Although there is no toxicity data for marine mammals, a laboratory study that fed pregnant rats for multiple consecutive days with diphacinone found that a dose of 0.01 mg/kg/day caused vaginal bleeding (Daniel 1993). Extrapolating the results for rats to whales, a 45 metric ton (45,000 kg) adult female humpback whale would have to find and ingest 8.16 kilograms (4,080 two-gram pellets) every day over multiple days to cause excess maternal bleeding during birth. It is extremely unlikely that a whale would be able to find (or be attracted to) this many bait pellets over multiple days, especially since they don't feed in Hawai`i.

Potential Impact from Indirect Ingestion of Rodenticide (Secondary Nontarget Hazard)

The possibility of humpback whales being exposed to rodenticides by consuming marine prey items that have ingested rodenticides (secondary hazards) is very remote, based on the analyses in Section 3.22 above. The most conservative (worst case) analysis of this unlikely scenario will be constructed using data from the massive, 20 ton brodifacoum spill in New Zealand, resulting from a truck crash on the coast. This scenario assumes an adult female humpback whale (45,000 kg or 99,208 lbs) that feeds exclusively in an area massively contaminated to the extent documented at the spill site in New Zealand, and feeding exclusively on the most contaminated organisms collected during the monitoring of that incident (mussels). One day after the New Zealand truck spilled 20 tons of brodifacoum directly into nearshore marine waters, mussels contained brodifacoum residues of 0.41 ppm.

Based on the Norway rat LD50 value of 0.4 mg/kg body weight, a 45,000 kg (99,208 lb) humpback whale would have to ingest 18,000 mg of pure brodifacoum to receive an LD50–equivalent dosage. To obtain this amount, the whale would have to ingest 43,902 kg (96,787 lbs) of prey contaminated at the 0.41 ppm level found in mussels collected one day after the New Zealand spill. For diphacinone, the likelihood that a whale would consume enough contaminated mussels to approach an LD50 dosage is even lower than with brodifacoum. Based on the Norway rat LD50 value of 2.3 mg/kg body weight, an average whale would have to ingest 103,500 mg of pure diphacinone to receive an LD50-equivalent dosage. To attain this dosage, a whale would have to consume 252,439 kg (556,532 lbs) of mussels contaminated with diphacinone at 0.41 ppm; almost six times the animal's body weight**.** Ingestion of these amounts of either rodenticide would be impossible even if whales ate while in Hawaiian waters.

At nine days post-spill in New Zealand, butterfish had residue concentrations of 0.04 ppm in the liver and 0.02 ppm in the gut, and below the method limit of detection (<0.02 ppm) in the muscle tissue. Conservatively assuming that the humpback whale ate only fish whose whole bodies were as contaminated as the livers sampled at the spill site, it would have to eat 450,000 kg (992,080 lbs), or ten times the whale's total body weight,

of brodifacoum-contaminated tissue to receive an LD50 dose. For diphacinone, it would have to eat 2,587,500 kg (5,704,461 lbs) of contaminated tissue. Even given these extremely conservative assumptions, such food intake levels would be impossible. As a side note, the New Zealand bait spill occurred in a marine sanctuary when marine mammal species were present, and no adverse impacts to these mammals were observed.

Therefore, even using the most conservative assumptions, no effect to humpback whales would be expected to occur from indirect ingestion of rodenticide in contaminated prey.

3.7 Potential Impacts to Green Sea Turtles

Biology and Status

Green sea turtles (*Chelonia mydas*), a Federally-listed threatened species, are found in tropical and sub-tropical oceans. The Hawai`i population appears to be increasing. Approximately 90% of the Hawai`i population nests at French Frigate Shoals (NMFS and USFWS 1998). Small numbers of turtles nest in the main Hawaiian Islands but not at Lehua, where the absence of any sandy shores makes nesting impossible. Green sea turtles are sometimes seen in waters around Lehua but, according to a NMFS sea turtle biologist, “Lehua has not demonstrated itself as a site commonly used by any of the [turtle] species. Turtles are uncommon to rare there, and then only in the sea, not on land basking, and certainly not nesting (George Balazs, pers. comm.)." Adult green sea turtles are obligate herbivores and feed on a variety of seaweeds and seagrasses (NMFS and USFWS 1998).

Possible impacts to turtles were addressed in the 2005 and 2008 informal section 7 consultations with NMFS. Because Lehua does not appear to be good feeding habitat, nesting is impossible, and turtles have never been documented to haul out, the chance of any negative interaction is minimal. Chances of direct and indirect ingestion are minimal, as detailed below. For all these reasons, NMFS concurred with the USFWS in both the 2005 and 2008 section 7 consultations that the proposed project is not likely to adversely affect green sea turtles or any other ESA-listed marine species.

Potential Impact from Direct Ingestion of Rodenticide (Direct Nontarget Hazard)

Although there is no data for marine reptiles, some terrestrial reptiles are potentially susceptible to brodifacoum and diphacinone. Telfair's skinks (*Leiolopisma telfairii*) were found dead after eating 20 ppm brodifacoum bait used for eradication in New Zealand, and post-mortem analyses revealed brodifacoum concentrations of 0.6 mg/kg in samples. There has been no documented mortality of herpetofauna associated with the use of diphacinone.

Green sea turtles forage in nearshore seagrass meadows within bays, lagoons and shoals. Adult green sea turtles feed exclusively on various species of seagrass and seaweed. They have been observed grazing on various species of macroalgae; specifically *Caulerpa*, *Turbinaria*, *Spyridia*, *Codium*, and *Ulva* are the most commonly consumed species. Due to these foraging areas and food habits, it is very unlikely that direct ingestion of rodenticide bait pellets would occur during Lehua operations. Therefore, direct consumption of rodenticide bait will not be considered in detail. Dermal

absorption of dissolved rodenticide is not a risk due to the virtual insolubility of brodifacoum and diphacinone in water.

Potential Impact from Indirect Ingestion of Rodenticide (Secondary Nontarget Hazard)

There is no possibility of green sea turtles being exposed to rodenticides by consuming prey items that have ingested rodenticides (secondary hazards). As noted above green sea turtles feed exclusively on various species of seagrass and seaweed. Plants have not been documented to take up and store anticoagulants.

Therefore, no effect on green sea turtles would be expected to occur from indirect ingestion of rodenticide in their food.

3.8 Consistency with Hawai‘i State Enforceable Policies per CZMA, Federal Endangered Species Act, National Historic Preservation Act, and Clean Water Act

3.8.1 Consistency with Applicable State Coastal Management Policies

The following objectives and policies of HRS 205A-2 (Coastal Zone Management) would apply to the proposed project (J. Nakagawa, Hawai‘i Coastal Zone Management Program, Hawai‘i Office of State Planning, pers. comm.), with evaluation of consistency:

- (b)(4)(A) Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.
    - **Consistency rationale:** The native ecosystems on Lehua have been disrupted by invasive rats. This project intends to eradicate the rats to allow the plant and seabird components of the ecosystems to recover naturally when possible and to provide the foundation for actively removing invasive weeds for supporting the restoration of native plant communities. These actions are consistent with the purposes of HAR 13-125 regarding State Wildlife Sanctuaries. No adverse impact will occur to any marine vertebrate or invertebrate communities and species, nor to marine plant communities.
- (c)(4)(C) Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance.
    - **Consistency rationale:** Rats are an ongoing threat to native plants and animals on Lehua and eradication will benefit native species. Lehua has remnant populations of native plant species that will be preserved with the rat eradication project. Existing seabird species will have the potential to recover to larger populations if rats are removed, and species that are not found on Lehua but found on adjacent islands may be able to recolonize available habitat. Again, no adverse impact will occur to any marine vertebrate or invertebrate communities and species, or to marine plant communities.
- (c)(4)(E) Promote water quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance

water quality through the development and implementation of point and nonpoint source water pollution control measures.

- **Consistency rationale:** Water quality will not be adversely impacted because:
  - No surface water is found on Lehua;
  - Extremely small amounts of rodenticide would enter the marine environment when applied as described in Chapter 2;
  - The rodenticide pellets that do enter the marine environment break up rapidly in the intertidal dynamics;
  - Studies made of a huge point source spill of brodifacoum in New Zealand indicate that marine invertebrates are not adversely affected; the minute amounts of diphacinone entering the marine environment would have no adverse impacts to water quality.
  - No diphacinone residues were detected in any seawater samples collected at Mokapu Island after the February 2008 aerial rodenticide broadcast.

3.8.2 Consistency with State Enforceable Policies

The following four State laws and associated regulations, as well as their Federal counterparts, are described in detail in Chapter 1. Consistency with these state enforceable policies are evaluated for each law and found consistent.

HRS 149A: Hawai‘i Pesticides Law and FIFRA

Consistency rationale: Both diphacinone and brodifacoum are “restricted use” pesticides. The USDA will obtain the necessary permits from the State Department of Agriculture for aerial application of the rodenticide and all rodenticide application will be under the direct supervision of a certified applicator. Per both FIFRA and HRS 149A, all applications will be according to the label, and no pesticide will be used that does not have an approved label.

HRS 195D and HAR 13-124: Conservation of Aquatic Life, Wildlife, and Land Plants (Endangered Species) and Federal Endangered Species Act

Consistency rationale: No threatened or endangered bird species are known to be present on Lehua in the winter but Hawaiian monk seal, green sea turtles, and humpback whales could be present. No listed plants or insects are present.

Intra-Service Section 7 Endangered Species Act Consultation for the Newell’s shearwater and Hawaiian petrel (listed), and the band-rumped storm-petrel (candidate) was finalized in April 2005 and included in the 2005 final EA for the Lehua Island project. The USFWS determined that the proposed action would have positive effects on the ecosystem and the three species of seabirds, resulting in a determination of “may affect but is not likely to adversely affect” the shearwater and petrel, and a determination of “no effect” on the storm-petrel. With the change to a winter operation, when listed seabirds

are not present, no impact is anticipated. All operations would be conducted during the day.

An informal Section 7 consultation with the National Marine Fisheries Service (letter dated July 5, 2005, Appendix E of the 2005 EA) also determined that the proposed eradication project on Lehua Island was not likely to adversely affect federally listed Hawaiian monk seals or sea turtles. The letter also documented that the USFWS found that "bait pellets will not present a poisoning hazard to foraging seals or sea turtles." NMFS concurred with this finding and further stated: "It should also be noted that as a result of this project there could be indirect beneficial effects to both monk seals and sea turtles arising from increased native plant cover which will stabilize soils, reduce sediment runoff into the ocean and improve marine water quality. This may result in the establishment of improved nearshore foraging habitat for both monk seals and sea turtles. Given the mitigation put in place under the draft EA we conclude that any effects of the proposed action on monk seals or sea turtles would be discountable. NOAA Fisheries Service therefore concurs with your determination that the project may affect but is not likely to adversely affect ESA listed species under our jurisdiction."

A second informal Section 7 consultation was initiated with NMFS in 2008 because of the change in project timing to the winter season. In addition to including the monk seals and sea turtles discussed in the 2005 consultation for a summer operation, the 2008 consultation also included an assessment of impacts to endangered humpback whales (*Megaptera novaeangliae*), which are present in Hawaii only in the winter. The USFWS determined that the project was not likely to adversely impact any of these species. In a letter dated September 3, 2008 (included as Appendix D to this document), NMFS concurred with this determination, stating that "…*we concur that the proposed action, as currently revised, is not likely to adversely affect ESA-listed marine species*." Mitigation measures are listed in Section 2.3.1.

Therefore, the informal Section 7 consultations conducted with the USFWS and NMFS fulfills compliance with both state and federal law and regulations.

HRS Chapter 6E: Historic Preservation and Federal National Historic Preservation Act

Consistency rationale: Lehua has several historical sites, one of which has been data-recovered and all the others marked with tags. Since bait will be applied from the air, bait application will not adversely affect these sites. Placing pre-operational rat and bait monitoring gear, as well as conducting post-operational monitoring, will require limited foot traffic. All personnel will be trained to avoid disturbing these sites, which have all been marked by a qualified archaeologist. No digging or other excavations will be conducted during operations or monitoring. No cultural practices are currently known to occur on Lehua Island itself. Subsistence gathering in waters around Lehua rarely if ever occurs in the winter months and therefore is not expected to be impacted. Rodenticide residues are not expected to accumulate in subsistence species. Therefore, no impact would occur to cultural structures and practices. The State Historic Preservation Officer has concurred with the USFWS determination of "No Adverse Effect" on significant historic sites on Lehua Island from the project (letter dated 10/17/05), as long as the following mitigation measures are completed: 1) Submission of a completed archaeological inventory survey report; 2) Recovery of data from a hearth site by a

qualified archaeologist; and 3) placement of site tags on historic properties prior to restoration. All mitigation measures will be completed prior to initiating rodent eradication.

HRS 342D and HAR 11-54 Water Pollution and Water Quality Standards; HAR 11-55 and Federal Clean Water Act

Consistency rationale: Per HAR 11-54-4(b)(3), no rodenticide, including diphacinone and brodifacoum, is identified as a toxic pollutant. No disturbance of soil and no construction activities are included in the proposed action.

The minute amount of rodenticide pellets that might enter nearshore marine waters would disintegrate quickly and be dispersed. Therefore, the pellets and the active ingredient would not:

- form either a bottom sludge nor floating materials;
- change any water characteristics;
- be toxic to any marine life;
- encourage any nonnative marine life.

Consistency rationale: HAR 11-54-6 (b) defines the waters around Ni`ihau and Lehua as Class AA open coastal waters and sets numerical water quality parameters that must not be exceeded in such areas, including criteria for total nitrogen, ammonia nitrogen, nitrate+nitrite nitrogen, total phosphorus, light extinction coefficient, chlorophyll and turbidity. However, use of diphacinone or brodifacoum rodenticides could not result in exceedances of these parameters because:

- Rodenticides contain little or none of these chemical compounds; and
- The minute amount of rodenticide pellets that might enter nearshore marine waters would disintegrate quickly and be dispersed and therefore would not cause turbidity or light extinction.

Consistency rationale: No NPDES permit is required under either the Federal Clean Water Act per 40 CFR 122.3 or per State of Hawai‘i HAR 11-55-04(h), as explained previously.

Consistency rationale: Environmental sampling following a similar Hawai`i project did not detect any diphacinone residues in the environment. Seawater, limpets and fish were sampled around Mokapu Island, Moloka`i following two aerial applications of diphacinone to eradicate rats in February 2008. Two independent laboratories tested the samples, with detection limits set in the low parts per billion range, and neither detected any trace of diphacinone. This indicates that even if diphacinone pellets did enter the water, they did not leave detectable residues in water or marine tissues.

3.9 Cumulative Impact Analysis

Under the National Environmental Policy Act (NEPA), cumulative effects are defined as:

> “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. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." (40 CFR 1508).

Under Endangered Species Act (ESA) regulations cumulative effects are defined as:

> "Those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal Action subject to consultation." (50 CFR 402.2)

The U.S. Fish and Wildlife Service further defines "State or private activities" as including tribal, local, or private actions that are reasonably certain to occur in the action area considered. Future Federal actions that are unrelated to the proposed action are not considered because they require separate evaluation under Section 7 consultation. The past and present impacts of non-Federal actions are part of the environmental baseline. The lighthouse managed by the Coast Guard does not adversely impact any resources on Lehua and no additional actions were identified in the 2005 EA.

Overall, because the proposed rat eradication project is under the jurisdiction of DOFAW (the island is a State Wildlife Sanctuary), no further cumulative impacts would occur to the species evaluated below under either NEPA or the ESA beyond those already having occurred or continuing to occur under the baseline (i.e, under the no action alternative as described and analyzed in the 2005 EA). No other non-Federal action could occur on the island without full approval of DOFAW. No planned actions or even proposed actions other than this ecological restoration project are foreseen at this time. Therefore, foreseeable actions will have no contributory adverse impacts to any resources evaluated in this supplement.

Even with four applications of diphacinone in the winter of 2008 to 2009, no long-term cumulative impacts are expected for any species or resource, as evaluated in this chapter. Again, although the hazards to nontarget birds are substantially higher with brodifacoum than diphacinone, the analyses in this chapter indicate that no long term adverse cumulative effects are foreseen with brodifacoum, even if potentially impacted alien bird populations are reduced. It is expected that population recovery would take longer with brodifacoum than with diphacinone, but that it would occur, especially with ingress from alien bird populations on Kaua‘i and Ni‘ihau. If quarantine fails in the future and rats re-invade the island, then the proposed action may be repeated. This is not expected to occur and, even if it does, it would not occur for at least two years. Therefore, any impacted populations would be expected to have recovered and no cumulative impacts would occur to those populations.

3.10 State Evaluation of Significance of Impacts per HRS 343

The State of Hawai‘i Environmental Council gives 13 criteria (in italics below) for defining significant project impacts (Hawai‘i Administrative Rules, Section 11-200-12). As discussed below, this project does not trigger any of the criteria for significance and thus, under State law, does not require preparation of an environmental impact statement (EIS). Federal criteria at 40 CFR 1508.27(b) for significance and the State criteria for significance listed below are similar but not identical.

The proposed actions do not involve an irrevocable commitment to loss or destruction of any natural or cultural resource. The actions will contribute to the restoration of a healthy native ecosystem on Lehua by eradicating nonnative rats (Chapter 1). These actions are also consistent with the Hawai‘i Comprehensive Wildlife Conservation Plan (Mitchell et al. 2005).

The proposed actions will not curtail the range of beneficial uses of the environment. The activities proposed are intended to contribute to ecological restoration of the island and improve habitat for the native plants and nesting seabirds that inhabit or historically inhabited the island, prior to its degradation by invasive rats. Restoration of Lehua will thus improve the range of beneficial uses of the environment, including for endangered seabirds, Hawaiian monk seals and sea turtles (Chapter 1).

The proposed actions will not conflict with the State's long-term environmental policies. The proposed actions will not conflict with the environmental policies set forth in HRS Chapter 343 and the State written policies and enforceable policies and other statutes and regulations, since the proposed actions will not damage sensitive natural resources. Instead, they will improve the environment of Lehua (Chapter 1).

The proposed actions will not substantially adversely affect the economic and social welfare of the community. The proposed activities utilize the most effective strategies to eradicate invasive rats as well as mitigating potential adverse impacts, thus contributing to the restoration of the ecosystem of Lehua. With ecosystem restoration, seabird populations will most likely increase and additional species will most likely return to Lehua, increasing its value as a State Seabird Sanctuary. Therefore, the proposed project will result in an improved environment, thus supporting eco-tourism and enhancing economic and social welfare (Chapter 1).

The proposed actions will not substantially adversely affect the public health of the community. The rodenticides have been found to have no adverse impacts on water quality or on marine life that might be consumed by people (Chapter 3).

The proposed actions will not involve substantial secondary impacts, such as population changes or effects on public facilities. Lehua is a small island designated as a State Seabird Sanctuary and is uninhabited and undeveloped. The project does not propose construction of public facilities or involve establishing a human population. Thus, the proposed actions will not affect any public recreational facilities and will not induce population growth or decline in the area.

The proposed actions will not involve a substantial degradation of environmental quality. Modifying the project to be conducted in the winter and using diphacinone as the primary rodenticide will minimize impacts to the environment during the implementation of the proposed actions. ESA-listed species potentially present in the winter include the endangered Hawaiian monk seal and humpback whale, and threatened green sea turtles. NMFS has concurred that the project is not likely to adversely affect these species. Restoration will increase the environmental quality of the ecosystems of Lehua for its flora and fauna (Chapter 3).

The proposed actions will not affect a rare, threatened or endangered species or its habitat. The operation as modified will benefit native plant and animal species protected

under the Federal and state endangered species laws. The limited and temporary human activities associated with the modified operation will have a negligible impact on listed species because either they will not be present during the winter (*e.g.*, listed seabirds) or project actions combined with mitigation identified during the informal Section 7 consultations with NMFS will result in no adverse impacts (Chapters 1 and 2).

The proposed actions will not have cumulative impacts or involve a commitment for larger actions. The analyses show that the modified operation and mitigation measures integrated into the proposed actions, such as the use of diphacinone and conducting operations during the winter when presence of nontarget and listed species is minimal, will result in no cumulative impacts. No other known or potential actions would contribute to or cause any cumulative impacts (Chapter 3).

The proposed actions will not substantially affect air or water quality or ambient noise levels. The proposed actions are fully consistent with both Federal and State water quality laws and regulations. Helicopters will cause noise for a period of up to four non-consecutive days during aerial application of rodenticides on Lehua, but the effect will be highly temporary and no people not associated with the operation will be present on the island (Chapter 2).

The proposed project is not located in an environmentally sensitive area (e.g. flood plain, tsunami zone and coastal zone). Although the site is located in a State Seabird Sanctuary, the proposed actions are in accordance with HAR 13-125, as well as Federal and State Coastal Zone Management policies and enforceable policies. All actions will protect sensitive resources, including the coastal zone while meeting ecological management objectives. Project actions are in accord with environmental management goals of USFWS and DOFAW (Chapter 1).

The proposed actions will not substantially affect scenic vistas and view planes identified or State plans or studies. The project does not involve construction of any permanent structures or alteration of landscapes. Thus, it will not affect any sites or vistas.

The proposed project will not require substantial energy consumption. The affected area is not on a local power grid. The only energy uses will be using motorized vehicles for accessing points of departure to the island and for broadcasting bait via helicopter for up to 4 days total over several months. All work will be conducted during daylight hours.

4.0 LIST OF PREPARERS

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Ms. Lee has over 30 years experience developing and implementing planning strategies for and managing complex and often politically-charged Environmental Impact Statements and Environmental Assessments using highly skilled agency technical staff. Ms. Lee specializes in facilitating cross-functional and inter-organizational coordination, resulting in well-supported decisions and long-term positive inter- and intra-agency relationships. Using a simple yet detailed and effective systematic interdisciplinary process, her proven "Facilitated Planning Approach," she facilitates teams through articulation of clear statements of need, quantified objectives, scope of decisions to be made, issue statements in cause-and-effect format, reasonable alternatives and mitigation measures, and focused analyses of environmental consequences. She also prepares the document concurrently with the progress of the analysis, using a self-correcting review process. Her training and workshops are nationally recognized for their quality and direct application to the workplace. Her facilitation and conflict-resolution skills have been used to great and long-lasting advantage by many agencies. With two degrees in wildlife management and biology, she has extensive experience in preparing programmatic NEPA documents for wildlife damage management, including invasive rats, for USDA-APHIS-Wildlife Services and the USFWS. With Mr. Dunlevy, she has prepared a final draft programmatic EA for the Aleutian Islands Unit of the Alaska Maritime National Wildlife Refuge, and prepared the EA for the rat eradication on Mokapu Island, Hawai‘i.

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Mr. Dunlevy has over 15 years experience as a wildlife biologist and has worked for both Wildlife Services and the Fish and Wildlife Service as well as for universities. Much of this has been studying rodent biology, including their roles as vectors of zoonoses, population dynamics, control/ eradication methods as well as nontarget hazard analysis and toxicology. Mr. Dunlevy has actively participated in the FIFRA registration process for rodenticides and has conducted GLP studies for several labels sought and obtained in both Alaska and Hawai‘i. He has also co-written programmatic as well as site specific invasive rodent NEPA documents. In addition, he has planned and instituted invasive rodent programs and projects on the operational level in both Alaska and Hawai‘i, including the rat eradication operation on Mokapu Island.

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APPENDIX A

INTRODUCTION TO RODENTICIDES AND RODENTICIDE HAZARD ANALYSIS, WITH SPECIAL REFERENCE TO BIRDS

Both diphacinone and brodifacoum are chronic rodenticides, meaning that the onset of symptoms only begins sometime after the lethal dosage has been ingested. If a rat does not experience symptoms until long after ingesting a lethal dose of the rodenticide, it can not associate the symptoms with the new food item, causing the rat to continue eating the bait until or even long after a lethal dose has been ingested.

Diphacinone and brodifacoum are anticoagulants which act by disrupting the normal blood-clotting mechanisms of vertebrates by competing with vitamin K, a chemical necessary for clotting of blood, for receptor sites in the liver. Death in animals receiving a lethal dose of an anticoagulant rodenticide typically occurs from shock due to excessive blood loss through internal and sometimes external hemorrhaging eventually causing severe anemia. Prior to dying, between the time of ingestion and actual death (latent period), poisoned animals may exhibit increasing weakness and behavioral changes such as acting sluggish, changes in activity time, and reduced predator avoidance ability. This behavior can make target rodents more susceptible to predation (Cox and Smith 1990, Newton et al. 1990, Innes and Barker 1999).

Anticoagulant rodenticides are divided into two chemical groups, the indandiones, such as diphacinone; and the coumarins, which includes brodifacoum. More informally, anticoagulant rodenticides are also described either as “first generation” or “second generation” rodenticides, simply referring to the time period during which they were developed. Diphacinone is a first generation and brodifacoum a second generation rodenticide. Second generation compounds were specifically designed to overcome resistance to warfarin (an early “first generation” compound) and are therefore generally more toxic than the first generation rodenticides. The coumarins in general, but especially brodifacoum, are characterized by an increased potential for accumulation and persistence in body tissues. This is due primarily to their greater affinity to bind to receptors in the liver and the long latent period during which rodents continue to feed on the toxicant (Eason and Wickstrom 2001, Fisher et al. 2003).

Comparison of Brodifacoum and Diphacinone Characteristics

Brodifacoum is more toxic than diphacinone and is retained much longer in the body tissues of exposed animals, especially the liver, than diphacinone. Animals may ingest a lethal dose of brodifacoum more quickly than with diphacinone; however, death is still typically delayed from 4 days to about 2 weeks for both rodenticides. During this extended latent period between ingestion of the lethal dose and death, the animals continue to feed on the brodifacoum bait and build up ever higher levels of toxic residues in their tissues. In contrast, diphacinone, because it is less toxic and more rapidly metabolized and excreted, accumulates in body tissues less readily and in lower concentrations (Erickson and Urban 2004).

Products containing diphacinone were first registered for rodent control in 1960 at active ingredient concentrations of 0.005% to 0.01 % (50 to 100 ppm). Diphacinone (0.005% active ingredient) is currently registered for use for conservation purposes in the United States. Brodifacoum was first registered for rodent control in and around buildings in 1979 and is now registered for conservation purposes in the United States.

In general, the median oral lethal dosage of diphacinone for rats is about 3.0 mg/kg, while for brodifacoum it is roughly 0.3 mg/kg. Brodifacoum is about ten times more toxic on a weight/weight basis to rats than diphacinone. However, as previously mentioned, there is a similar latent period between the time of ingestion and death between the two toxicants. Many factors influence this delay, but in general the latent period is about seven days and ranges from three to 14 days for both of these rodenticides (Eason and Wickstrom 2001, Erickson and Urban 2004).

A rodenticide that is rapidly metabolized and/or excreted from the primary consumer (the animal directly ingesting the rodenticide) poses fewer hazards to secondary consumers than one that is readily retained in tissues and therefore accumulates in the bodies of animals over time. Sublethal exposure to anticoagulants can produce significant blood clotting abnormalities and internal and external hemorrhaging. Such chronic hemorrhaging might be especially detrimental if combined with other factors such as adverse weather, food shortages, pregnancy or predation stressors, and could predispose an animal to death from other sources, such as bruising, food stress, and reduced potential for recovery from wounds and accidents.

Most rodents will continue eating for several days or more after ingesting a lethal dose of an anticoagulant rodenticide. In a laboratory study with wild caught brown rats the average number of LD_{50} doses of brodifacoum (50 ppm bait) ingested was 80 if feeding only on bait, and as many as 40 LD_{50} doses were ingested prior to dying if offered a choice of bait or nontoxic food (after ICI Americas, Inc. 1978b, cited in Erickson and Urban 2004). Another similar laboratory study found that rats (*Rattus norvegicus* Wistar) in an *ad libitum* 2-choice study ate almost 25 LD_{50} doses of a brodifacoum (20 ppm) bait formulation resulting in liver residues of 10.7 mg/g (Fisher et al. 2004). For comparison, Brodifacoum-25D is 0.0025% (25 ppm) a.i. or 2.5 mg/g of bait. Therefore, the livers of these rats contained more than four times the active ingredient concentration of the actual brodifacoum bait formulation.

Using the same procedures, the same study found that rats ate over twelve LD_{50} doses of a diphacinone bait formulation resulting in liver residues of 4.7 mg/g. For comparison, Diphacinone--50 is 0.005% a.i. or 5 mg/g (Fisher et al. 2004). Therefore, the livers of these rats actually contained slightly less than the active ingredient concentration of the actual bait formulation.

Generally, repeated exposures to small doses of anticoagulants over several days pose a greater hazard than larger single doses. Anticoagulants bind to receptors in the liver and other tissues, including the kidneys, pancreas, lungs, brain, fat and muscles and are eliminated from the liver last. The length of time a rodenticide is retained in tissues or how quickly it is eliminated (half-life) greatly influences accumulation of rodenticides in tissues and, therefore, nontarget hazards.

Elimination of anticoagulant rodenticides from tissues is biphasic, with a proportion of the toxicant excreted within a shorter time and the remainder bound in the tissues and excreted over a much longer period of time (Parmer et al. 1987, cited in Fisher et al. 2003). The first phase of brodifacoum excretion from tissues takes about 60 days, with the second phase lasting almost 300 days. In contrast, 70% of a single dose of diphacinone may be excreted in about 8 days. In a laboratory test, 0.1 mg/kg of brodifacoum was administered to rats, resulting in mean liver residue concentrations of 1.27 mg/kg at one week, 0.59 mg/kg at 18 weeks and 0.49mg/kg at 24 weeks. The study estimated the liver elimination half-life of brodifacoum to be 113.5 days. In the same test, 0.8 mg/kg of diphacinone was administered to rats, resulting in mean liver residue concentrations of 0.08 mg/kg at one week and below the detectable limit at six weeks. Further trials of diphacinone resulted in the estimated liver elimination half-life 3 days (Fisher et al. 2003). In addition, the range of whole carcass residues reported by the EPA in primary consumers was 2.07 to 25.97 ppm for brodifacoum and 0.48 to 3.4 ppm for diphacinone.

Therefore, brodifacoum presents a substantially higher potential for causing secondary exposure to predators and scavengers than diphacinone.

Efficacy Studies of Brodifacoum and Diphacinone

The following information is compiled from Erickson and Urban (2004) and the New Zealand Pesticide Toxicology Manual (New Zealand Department of Conservation 2001).

Brodifacoum has been used for most rat eradication projects worldwide because its far greater toxicity is perceived to impart a greater probability of success. However, it is important to remember that toxicity and efficacy are not synonymous terms. Efficacy is a complex interaction of many factors, including bait acceptance, application rate, application method, toxicity, and timing of application when rodent populations, reproduction and alternate foods are lowest to ensure eradication. The eradication of rodents on islands has been successfully implemented using the generally less toxic anticoagulant rodenticides warfarin, pindone, diphacinone and bromadiolone (Witmer et al. 2001, Donlan et al. 2003, Dunlevy and Scharf 2008) and some eradication efforts have failed during operations using brodifacoum (Tyrell et al. 2000, Clout and Russell 2006, Howald et al. 2004).

Recently, however, an increasing number of experts in island rodent eradication and control have recommended using less toxic rodenticides such as diphacinone, and decreasing the use of more persistent and toxic rodenticides such as brodifacoum on future projects because of the greater risk to nontarget species associated with brodifacoum, including both primary hazards (when nontarget species feed directly on the bait) and secondary hazards (when nontarget species feed on rodenticide-exposed animals with rodenticide residues in their tissues) (Tobin 1994, Eason et al. 1999, Fisher et al. 2003). New Zealand has a policy of reducing brodifacoum use on mainland sites, but still only uses brodifacoum in offshore island eradications (Hoare and Hare 2006). Fisher et al. (2004), recommend conducting additional field studies using diphacinone to further determine efficacy and validate estimates of lower risk for secondary poisoning of nontarget species.

A number of laboratory and field studies in the United States have evaluated the effectiveness of various application methods and the efficacy of diphacinone for control of rat populations, especially in Hawai‘i:

- Laboratory trials using Sprague-Dawley strain laboratory rats found that 100% of 20 laboratory-bred brown rats died after consuming an average of 42 grams of bait (0.21 g of the a.i. diphacinone), 7 g per day per animal over an average of six days (Svircev 1992).
- Laboratory trials found that 100% of 20 Hawaiian wild-caught Polynesian rats died over two to ten days after consuming an average of 19.7 grams of bait (0.099 g of diphacinone) per animal and 95% of 20 wild-caught black rats died over four to 17 days after consuming an average of 21.2 grams of bait (0.106 g of diphacinone) per animal. These trials indicated that a minimum average exposure time of 7 days with 37.5 g of bait is needed for effective control of black rats, and 6 days and 30 g are needed for effective control of Polynesian rats (Swift 1998).
- A broadcast application rate study using a nontoxic formulation of Ramik® Green and a biomarker determined the optimal application rate, 22.5 kg/ha or 20 lb/ac, which exposed 100% of Polynesian rats and 94.4% of black rats over a 14-day period (Dunlevy et al. 2000), even though immigration could not be eliminated. Bait disappearance was most rapid at the 22.5 kg/ha application rate with 50% of the bait disappearing by day 6 and 80% disappearing by day 12.
- An exposure study using remote cameras found that 98.98% of vertebrates photographed at placebo rodenticide pellets were the target species, rats and mice (Dunlevy and Campbell 2002).
- A hand broadcast trial, using Ramik® Green bait containing 0.005% (50 ppm) diphacinone, resulted in 100% mortality of radio-collared Polynesian and black rats in two 4-ha study areas in Hawai‘i (Lindsey and Forbes 2000). Follow-up broadcasts in the same study areas were also highly effective in controlling subsequent rat immigration.
- A trial of Ramik® Green aerially broadcast into a 45.5 ha forested area in Hawai‘i also achieved 100% mortality of 21 radio-collared rats within one week of application. Three weeks after bait application, based on trapping and chew blocks, rat abundance was still reduced by 99% relative to reference areas (Spurr et al. 2003a and 2003b) despite the immigration issues of this main island study site.
- In the Bay of Islands, Adak, Alaska, a three-year study evaluated Ramik® Green and various application methods on several small islands and concluded that rats had been eradicated (Dunlevy and Scharf 2008).

These successful laboratory trials and field studies strongly suggest that well planned rat eradication projects utilizing diphacinone have a very high probability of eradicating rats on islands if used appropriately.

Rodenticide Hazard Analysis

The US Environmental Protection Agency (EPA) evaluates the hazards associated with the use of rodenticides. Standard evaluation tests of hazard include a toxicity assessment of rodenticides from a single ingestion (acute toxicity) as well as with repeat ingestion over time (chronic toxicity), mortality of nontarget species, retention time of rodenticide residues in primary consumers (animals that eat the bait directly) and indirect exposure of predators and scavengers that eat exposed primary consumers. Because of these concerns, EPA requires standardized studies for determining the toxicity of compounds and their impacts on fish, birds and mammals prior to registration of a particular rodenticide formulation under FIFRA. EPA has two recent documents outlining study methodologies, overall results of studies, and resultant hazards of various rodenticides, including brodifacoum and diphacinone (Reregistration Eligibility Decision (US Environmental Protection Agency 1998) and Potential Risks of Nine Rodenticides to Birds and Nontarget Mammals: A Comparative Approach (Erickson and Urban 2004)). The following summary of study approaches and terms is primarily from Erickson and Urban (2004), which summarizes the findings of studies regarding diphacinone and brodifacoum, as well as other rodenticides.

The EPA limits their definition of nontarget hazard to a product of toxicity and exposure. The level of exposure is determined by the amount of active ingredient (a.i.) ingested.

Hazard can be characterized and assessed by many measures, including:

- Acute oral toxicity or LD_{50}– A single dose that is lethal to 50% of the test subjects in the population or study group under consideration, expressed as milligram(s) of active ingredient per kilogram of test subject body weight;
- Dietary toxicity or LC_{50}– The concentration of rodenticide in the diet (multiple feedings) that is lethal to 50% of test subjects in the population or study group under consideration, expressed as parts per million of the daily diet.
- Lowest observed effects level or LOEL– The lowest dosage at which measurable effects, such as increased blood-clotting times, are documented. This is not a mortality threshold and no negative impacts are necessarily derived at this hazard level. Diphacinone has LOELs calculated; brodifacoum does not because of its substantially higher toxicity.
- The dietary risk quotient (RQ) was developed by the EPA to compare hazards among different rodenticides. The ratio of the concentration of any rodenticide (ppm of active ingredient) to the dietary toxicity (LC_{50}) of the rodenticide provides a relative index of hazard. This allows for the comparison of the hazards among various rodenticides. The Level of Concern (LOC) is an RQ threshold used by the EPA to determine if unacceptable risk exists for a particular species. The index allows for comparisons among risks for different species. Risk is presumed for non-endangered species if the RQ is ≥ 0.5 and for an endangered species if the RQ >0.1.
- Half life - The length of time that rodenticide residues persist in tissues or the environment is calculated in terms of the time until only half of the original concentration of residue still persists.

- Total daily food intake for a particular species compared to the animals weight can be used to gauge the possibility that an animal is physically capable of eating the amount of rodenticide (at any particular concentration of the active ingredient) required to deliver an LD_{50} dosage.

To describe the range of potential hazards to nontarget species from rodenticide applications, this analysis discusses the acute oral toxicity of both diphacinone and brodifacoum for the species of concern. We can determine the amounts of bait and/or rodenticide residue in tissues of prey that an individual of a nontarget species would be required to eat to obtain the LD_{50}. Using this information we can assess the potential for this level of exposure based on knowledge of the biology of the nontarget species, such as behavior and daily food intake. Another very useful way of evaluating the potential hazards associated with rodenticide use is to describe the lowest dosage which results in any measurable effect and assess the potential for this level of exposure. Using laboratory and field data accepted by the EPA, quantitative characterizations of rodenticide nontarget hazards can be made and assessed in conjunction with the known biology of the species of concern.

Standardized laboratory studies are used to determine the acute oral and dietary toxicity of vertebrate pesticides for some standard test subjects, such as Norway rats, and sometimes for other species. These studies produce a range of values, sometimes with considerable variation. The details and assessments by the US EPA of these studies are discussed in the Reregistration Eligibility Decision (US EPA 1998) and Erickson and Urban (2004).

The determinations of the EPA in these documents are utilized in the analyses presented here. For untested mammals, a theoretical LD_{50} can be calculated, based on the weight of the animal, using the laboratory documented LD_{50}, accepted by the US EPA, for a Norway rat for any particular compound. For a Norway rat, the LD_{50} of diphacinone is 2.3 mg/kg; for brodifacoum it is 0.4 mg/kg, indicating the substantially greater relative toxicity for brodifacoum. A 100 kg mammal would, therefore, require 230 mg of diphacinone, or 40 mg of brodifacoum to ingest the projected LD_{50} dosages.

EPA calculates hazards for nontarget bird species the same way, using a known laboratory-derived LD_{50} from representative birds: the northern bobwhite quail (*Colinus virginianus*) and mallard duck (*Anas platyrhynchos*). Some studies have also documented, in the laboratory, LD_{50} and LC_{50} values for some other species besides the standard species consistently used by EPA in toxicity studies.

Methodology Used in This Document to Analyze Rodenticide Impacts to Birds & Mammals

The analyses of the direct and indirect impacts of diphacinone and brodifacoum on nontarget birds are based on the known laboratory LD_{50} and LC_{50} information documented by the US Environmental Protection Agency (US EPA 1998, Erickson and Urban 2004).

Broadcast applications of diphacinone bait at the maximum rate of 22.5 kg/ha (20 lb/ac); result in approximately one 2-gram pellet distributed about every square meter. The

maximum proposed broadcast rate of brodifacoum bait is 18 kg/ha (16 pounds bait/acre), resulting in a density of just under one 2-gram pellet per square meter (see Section 2.1.3 for label requirements).

The analyses of the primary hazards of brodifacoum and diphacinone use a computed LD_{50}-equivalent dose. This is based on laboratory studies in species such as the rat, a surrogate for other mammals, and bobwhite or mallard for other avian species. The average weight of an adult female animal of concern and the established LD_{50} of the surrogate species studied are used to calculate the amount of each rodenticide that would need to be ingested to reach the LD_{50}-equivalent dosage. This is compared to the area over which that amount would be distributed during an aerial application and the likelihood of an animal eating every bait pellet within that area. If it is highly unlikely that the animal would directly eat bait pellets based on its dietary habits, the calculated results are evaluated in that context.

The analyses of the secondary impacts of brodifacoum and diphacinone assume that the adult female animal of average weight feeds exclusively in an area massively contaminated to the extent documented at the spill site in New Zealand and exclusively on the most contaminated samples collected during the monitoring of the incident: mussels and fish liver. One day after the accident, mussels contained brodifacoum residues of 0.41 ppm and a butterfish sampled nine days after the spill had brodifacoum liver residues of 0.04 ppm. This is then used to calculate the amounts of these prey items secondary nontarget species would need to eat in order to ingest the computed LD_{50} for the species of concern. This is then compared to either the animal's average daily food intake or body weight to determine if eating such a quantity is probable or even possible.

The evaluation and comparison of LD_{50} values and risk quotients provides a good description of the upper end of the hazard spectrum associated with rodenticide use. However, because anticoagulants are far more toxic when administered over multiple days with smaller exposures, to fully characterize the range of possible hazard the lower end of the hazard potential needs to be assessed. To do this we will examine the Lowest Observed Effect Level (LOEL) for all nontarget species that we know are at the highest risk of exposure. Assessing the LOEL will illustrate the minimum amount of exposure necessary to produce a measurable effect, such as increased blood-clotting time. This is not a mortality threshold and no negative impacts are necessarily derived at this hazard level.

In a laboratory study using golden eagles fed diphacinone-laced sheep muscle (2.7 ppm) Savarie et al. (1979) established the LOEL for golden eagles at 0.11 mg/kg/day in a 7-day exposure study. The EPA reports the LOEL of diphacinone for rats in a 14-day subchronic lab study as 0.085 mg/kg/day (EPA 1998).

The LOELs of brodifacoum are not as well documented as those of diphacinone. No LOEL of brodifacoum for birds has been established because effects have been observed for all doses administered in all tests. The EPA reports the LOEL of brodifacoum for rabbits in a developmental lab study as 0.005 mg/kg/day (EPA 1998). The lower limit of potential hazard can be assessed by using these available figures to extrapolate the LOELs for each of the species of concern.

Effects on Birds from Ingestion of Rodenticides by Eating Bait (Direct Effect)

Standard EPA studies of the acute oral toxicity of diphacinone have been conducted for two avian species. A study using brodifacoum was done on one species. For diphacinone, the LD_{50} for the mallard duck is 3,158 mg/kg and for the northern bobwhite 400 mg/kg $<LD_{50}<$ 2000 mg/kg. For brodifacoum, the LD_{50} for the mallard is 0.26 mg/kg (no documentation for the bobwhite) (Erickson and Urban 2004). The dietary (chronic) toxicity studies of diphacinone for mallard (*Anas* platyrhynchos) and bobwhite quail (*Colinus virginianus*) documented LC_{50} values of 906 ppm for the mallard and >5,000 ppm for the bobwhite quail. For brodifacoum, the LC_{50} reported for the mallard is 2.0 ppm and for the northern bobwhite it is 0.8 ppm, many orders of magnitude lower than the LC_{50} for diphacinone (Erickson and Urban 2004).

Primary and secondary hazard calculations of diphacinone acute oral toxicity for nongame birds weighing $\leq$0.22 pounds ($\leq$3.5 ounces) were made for the equivalent of Hawaiian passerine birds. In order to consume sufficient diphacinone bait to reach a dose equivalent to the LD_{50} for the northern bobwhite, a passerine bird would have to eat 0.53 pounds of bait or 5,027 pounds of invertebrates in one day. Neither of these amounts is even physically possible. While to obtain the LC_{50} for diphacinone, the bird would have to consume 0.36 g of bait or 3.59 g of invertebrates per day over several days. However, hazard calculations for sublethal exposure show that a 30 g bird would only need to eat 0.07 g (a 100th of a bait pellet, or 0.2% of its body weight) or 0.65 g of invertebrates per day for multiple days to ingest a dose that resulted in measurable blood clotting effects in golden eagles. Therefore, small passerine birds could be vulnerable to sublethal or possibly lethal effects through both primary and secondary exposure if they forage on diphacinone bait or contaminated invertebrates over time (Eisemann and Swift 2006).

Birds that are most at risk from feeding directly on rodenticides are those that are naturally inquisitive, which are terrestrial ground-feeders, and that have a diet that includes grains and seeds. The risk of secondary poisoning is greatest for predatory and scavenging birds, especially those that feed directly on the target rodent species, such as owls. Brodifacoum has a far greater potential for primary and secondary poisoning of nontarget bird species than diphacinone because of its much higher toxicity, longer retention time in tissues, and higher rate of bioaccumulation (Erickson and Urban 2004, Eason and Wickstrom 2001, Fisher et al. 2003, Fisher et al. 2004). Combined with an extremely long half-life of residues in tissues, the general characteristic of anticoagulants for delayed symptoms and mortality after exposure results in target animals ingesting many lethal doses before death (Erickson and Urban 2004).

Erickson and Urban (2004) provide this useful discussion of potential effects of brodifacoum and diphacinone on avian nontarget species found during field operations:

> Eason and Spurr (1995) reviewed the impacts of brodifacoum baiting on nontarget birds during baiting programs in New Zealand, where bait is applied in bait stations (50 ppm cereal-based wax blocks) or aerially broadcast (20 ppm pellets). They report mortality of a wide range of bird species, including 33 indigenous species or subspecies and 8 introduced species or subspecies, and presume most resulted from primary exposure. Populations of indigenous rails (weka, *Gallirallus australus*; pukeko,

Porphyrio porphyrio) monitored during rodenticide baiting operations were severely reduced: "For example, the entire population of western weka on Tawhitinui island were exterminated by consumption of Talon® 50WB intended for ship rats, which they obtained by reaching into bait stations, eating bait dropped by rats, and eating dead or dying rats (Taylor 1984)."

On another island, 80% to 90% of the Stewart Island weka population was killed by brodifacoum bait applied for brown rats. Aerial application of 0.002% brodifacoum bait on two other islands reduced a weka population by about 98% and a pukeko population by >90%. Numbers of quail, blackbirds, sparrows and myna were markedly reduced on another island. Some other species suffered no apparent adverse effects. Dowding et al. (1999) and Veitch (2002) found numerous dead birds after an aerial baiting operation to eradicate rats and mice and reduce rabbit numbers on Motuihe Island, New Zealand. Brodifacoum bait (20ppm) was applied twice, with 9 days between applications. Nontarget species were monitored, including pukeka (3 groups of 98 birds), a flock of 52 paradise shelducks (*Tadorna variegata*), 8 New Zealand dotterels (*Charadrius obscurus*), and 14 variable oystercatchers (*Haematopus unicolor*). There was no evidence that dotterels or oystercatchers were adversely affected, but mortality of pukeko and shelducks was 49% and 60%, respectively. Birds of 10 species were found dead. The liver from each of 29 dead birds of 10 species was analyzed. All livers contained brodifacoum residue, with mean levels per species ranging from 0.56 to 1.43 ppm. Chaffinch (*Fringilla coelebs*), North Island robin (*Petroica australis longipes*), North Island weka, and North Island saddleback (*Philesturnus carunculatus rufusater*) also were found dead after a brodifacoum baiting on Mokoia Island, New Zealand (Stephenson et al.1999).

Hegdal (1985) conducted a field study in Washington to examine the risk to game birds from the broadcast application of 0.005% diphacinone bait applied for vole control in orchards. Most orchards were treated twice, with 20 to 30 days between treatments; at an average rate of 12.9 kg/ha (11.5 lb/acre). Telemetry was used to monitor the fate of 52 ring-necked pheasants, 18 California quail, and 30 chukar potentially exposed to the bait. About half of the quail and all chukar were pen-raised and had been released into the orchards. Dead game birds and other animals found were necropsied and any available tissue collected for residue analysis. Eight of 30 pheasants, 9 of 15 quail and one of ten chukar collected by the researchers or shot by hunters contained diphacinone residue in the liver but no mortalities were attributed to diphacinone. Bait made up as much as 90% of crop contents of some birds. No residue was detected in four passerines collected 31 to 73 days after treatment. The author concluded that risk to game birds in orchards appeared to be low but emphasized that substantial quantities of bait were eaten and longer-term behavioral and physiological effects, such as susceptibility to predation, need to be

considered along with direct mortality in order to evaluate potential hazards from exposure.

Several laboratory studies document data assessing the hazards of rodenticides ingested by birds. Chickens (*Gallus gallus*) were fed a rodenticide containing 50 ppm brodifacoum by Lund (1981). This study was a choice test and included offering of the toxic bait as well as untreated chicken food for up to 15 days. The four chickens offered brodifacoum bait died within 6 to 12 days. A similar study with chickens by Christopher et al. (1984) offered brodifacoum bait every other day for one to four feedings and documented 50% mortality. Ten northern bobwhites and 10 ring-necked pheasants were exposed to a 50 ppm brodifacoum rodenticide for 14 days in an *ad libitum* feeding choice including the toxic pellets and untreated food by Ross et al. (1979a) and Ross et al. (1979(b)). Six each of the bobwhites and pheasants died. In addition, several pheasants died when exposed to 50 ppm brodifacoum pellets in a broadcast pen trial conducted by ICI Americas, Inc (1981). Diphacinone was not tested in any of these studies.

During field studies using diphacinone, searches for nontarget carcasses after baiting found one dove and two roadrunners (*Geococcyx californicus*); however there was no evidence that these birds were exposed to the rodenticide (Baroch 1994 and 1996). No avian nontarget mortality was observed during rodent eradication operations using a diphacinone rodenticide conducted on Buck Island in the Virgin Islands (Witmer et al. 2001) or Canna Island in Scotland (Elizabeth Bell, pers. comm., February 2006). Throughout two years of studies using a diphacinone rodenticide in the Aleutian Islands only one bird carcass was documented, though two ravens shot during this work also contained diphacinone residues and winter wrens, song sparrows and ptarmigan were also documented to eat the bait (Dunlevy and Scharf 2008). Two studies evaluated diphacinone residues in game birds captured from sites in Hawai‘i that had been treated by hand or aerial broadcasting 0.005% diphacinone bait. The first study utilized hand broadcast techniques on a 10-acre treatment area (Spurr et al. 2003a). Five Kalij pheasants (*Lophura leucomelana*) were collected within the treatment area between 2 and 6 weeks after treatment. Of the five, only one contained detectable diphacinone residues. The liver of this bird contained 0.09 ppm diphacinone. The second study was an aerial broadcast trial of Ramik Green (Spurr et al. 2003b). Two Kalij pheasants were collected within the 112 acre treatment area one month after treatment. Diphacinone residues of 0.12 and 0.18 ppm were found in the livers of these birds. Though extensive carcass searches were conducted during both studies no avian mortality due to diphacinone was found.

Effects on Birds from Rodenticide Ingestion by Eating Prey (Indirect Effect)

Incident reports submitted to EPA indicate that nontarget birds and mammals are being secondarily exposed to rodenticides, especially brodifacoum, in the field. Brodifacoum is widely used for control of rodents in protective stations around buildings and human habitation; while diphacinone products are also available for this use pattern they are used less for this purpose. Diphacinone products are also registered for some field uses, such as in the agriculture industry. In 264 reported incidents, 20 animals had diphacinone residues and 244 animals had brodifacoum residues. The birds most commonly exposed to brodifacoum include great horned owls and red-tailed hawks, but multiple incidents

are reported for bald and golden eagles, crows, barn owls, screech owls, hawks, falcons, kestrels and vultures.

Erickson and Urban (2004) found eleven laboratory studies which have investigated brodifacoum secondary hazards in eight nontarget avian species. These studies recorded that out of a total of 149 individuals that were exposed to brodifacoum-poisoned prey, 63 birds (42% of the total) died, including: eleven of twenty barn owls, six of six red-tailed hawks (*Buteo jamaicensis*) and red-shouldered hawks (*Buteo lineatus*), thirteen of 65 American kestrels (*Falco sparverius*), one of four Eurasian harriers (*Circus pygargus*), and 32 of 50 laughing gulls (*Larus atricilla*). However, no deaths occurred in four golden eagles tested (*Aquila chrysactos*), although three showed external symptoms of anticoagulant toxicosis such as bleeding. Some studies did not report whether evidence of toxicosis was observed in surviving birds. Of studies that examined survivors, about one-third exhibited symptoms of toxicosis. Stone et al. (1999) also found brodifacoum residues in wildlife carcasses submitted for testing in New York State.

Three laboratory studies report the secondary toxicity of diphacinone to birds. Test species were barn owls, great horned owls (*Bubo virginianus*), saw-whet owls (*Aegolius acadicus*), golden eagles (*Aquila chrysaetos*), and American crows (*Corvus brachyrhynchos*). A total of 34 individuals were exposed to diphacinone-poisoned prey during these studies and three (9%) birds died, including two of three great horned owls and the only saw-whet owl tested. Symptoms of anticoagulant poisoning were noted in 13 (42%) of the survivors, indicating that raptors can recover from sublethal doses. The highest dosage administered to an eagle was 0.23 mg/kg/day for 10 consecutive days and the LOEL was determined to be 0.11 mg/kg/day. If it is assumed that the great horned owls ate equal quantities of treated mice each day, they would have consumed a maximum dose of 0.78 mg/kg/day for 5 days. Using the same methods, it can be calculated that the saw-whet owl consumed a dose of 11.1 mg/kg/day (Erickson and Urban 2004).

Hazard calculations for the short-eared owl (*Asio flammeus*, pueo) from eating contaminated rats were calculated for the secondary effects of diphacinone as there is an extremely low probability that an owl would feed directly on bait pellets. A 0.77 pound bird would have to consume at least 90.5 pounds of rodents containing 3.4 ppm diphacinone (the highest whole-carcass residue found in a rat) in one day to ingest a dose equivalent to the LD_{50} for the northern bobwhite. Hazard calculations for sublethal exposure show that an owl would only need to eat 11 g of rodent tissue containing 3.4 ppm diphacinone per day for multiple days to ingest a LOEL dose. This amount is less than one rodent per day (Eisemann and Swift 2006). The assessments in Eisemann and Swift (2006) are based on very conservative assumptions and are assumed to overestimate the actual hazard of aerial broadcast of diphacinone.

Conclusion on Rodenticide Toxicity to Birds

The EPA (1998) states that brodifacoum is “very highly toxic” to both bobwhite quail and mallard duck for both acute and dietary exposure. Diphacinone is “moderately toxic” in acute tests of bobwhite quail, “practically nontoxic” to quail in dietary tests, and “moderately toxic” to mallard in dietary tests. Brodifacoum toxicity in birds is two

orders of magnitude more toxic than required for the category "very highly toxic." The EPA declares a potential primary hazard to nontarget birds when their dietary risk quotient equals or exceeds 0.5 for non-endangered species and 0.1 for endangered species. Brodifacoum exceeds this level of concern for non-endangered species by 126-fold using the northern bobwhite LC_{50} and 50-fold using the mallard LC_{50}. For endangered species, the level of concern is exceeded by 630 times and 250 times, respectively. Diphacinone does not exceed these levels of concern for either endangered or non-endangered species using the mallard LC_{50}. Using the northern bobwhite $LC_{50,}$ diphacinone is considered "practically nontoxic" to birds by the EPA. The LOEL of brodifacoum for birds has not been determined; where efforts to establish this have been made, all dosages administered produced measurable effects; therefore a dosage where no observed effects (NOEL) have been measured has not been documented. A dosage of no observed effects is necessary to establish the lowest observable effects level.

Although individuals of avian nontarget species can die during eradication operations, especially associated with the use of brodifacoum, if the nontarget population is not extirpated and is healthy and viable it usually recovers. However, if the population is an endangered species or a small isolated island population, it may be driven too low to recover or experience negative population-level genetic effects. In most cases the long-term ecosystem benefits probably outweigh the initial nontarget mortality caused by rodenticides during eradication operations (Taylor and Thomas 1993, Eason and Spurr 1995, Dowding et al. 1999). Stephenson et al. (1999) found that passerine populations can recover naturally from a 30% decrease in populations within one to two breeding seasons following a rodenticide operation because passerine species typically have several clutches per year and successfully fledge several young per clutch. Populations of owls, because they live longer and typically fledge less than one chick per year, may recover more slowly, taking two to three seasons (also Murphy et al. 1998). The relative resilience of a species to recover after large population declines depends on the species' capacity to compensate for density independent perturbations in abundance, such as the broad-scale application of rodenticides. Species with a high intrinsic rate of increase and strong-density dependent links between their demographics and factors that regulate their abundance will typically be more resilient than species without these population dynamics. Species for which there is clear evidence of a high intrinsic capacity for increase and strong density-dependence in their dynamics should be able to sustain higher levels of reduction from poisoning without any undue threat to their long-term viability (Choquenot and Ruscoe 1999).

Erickson and Urban (2004) conclude that potential primary risks are higher for second generation rodenticides, including brodifacoum, than for first generation rodenticides, including diphacinone. A small bird finding and eating just a small pellet or two of brodifacoum is likely to ingest a lethal dose, and a few small pellets could provide a lethal dose to larger birds. In contrast, it seems highly unlikely that any small bird could eat 100 to 1000 pellets of diphacinone in a single feeding which would be needed to provide an LD_{50} dose from a first-generation anticoagulant. Eason et al. (1999) and Eason and Wickstrom (2001) state: "the recorded mortality of birds after some control operations, coupled with the detection of brodifacoum residues in a range of wildlife including native birds and feral game animals raises serious concerns about the long-term effects of the targeted field use of brodifacoum…where wildlife might encounter

poisoned carcasses." New Zealand is recommending reducing the field use of brodifacoum because of the high risk of poisoning nontarget species, especially secondary poisoning (Eason and Wickstrom 2001, Eason and Murphy 2001, Hoare and Hare 2006).

APPENDIX B

APPROVED PESTICIDE LABELS FOR DIPHACINONE AND BRODIFACOUM

RESTRICTED USE PESTICIDE
DUE TO HAZARDS TO NON-TARGET SPECIES

For retail sale to and use only by Certified Applicators or persons under their direct supervision and only for those uses covered by the Certified Applicators certification

For use by or in cooperation with government conservation agencies.

Department of Agriculture
STATE OF HAWAII

LICENSED

PERIOD 2008-2010 LIC. NO. 8600.1

Diphacinone-50:
Pelleted Rodenticide Bait for Conservation Purposes

Fish Flavored, Weather-resistant Rodenticide for Control or Eradication of Invasive Rodents on Islands or Vessels for Conservation Purposes

ACTIVE INGREDIENT:
Diphacinone (2-Diphenylacetyl-1,3-Indandione).....0.005%
INERT INGREDIENTS:.....99.995%
TOTAL.....100.000%

KEEP OUT OF REACH OF CHILDREN

CAUTION

PRECAUTIONARY STATEMENTS

HAZARD TO HUMANS AND DOMESTIC ANIMALS

Caution: Keep away from humans, domestic animals and pets. If swallowed, this material may reduce the clotting ability of the blood and cause bleeding. Wear protective gloves when applying or loading bait. With a detergent and hot water, wash all implements used for applying bait. Do not use these implements for mixing, holding or transferring food or feed.

FIRST AID Have label with you when obtaining treatment advice.	
If swallowed	• Call a poison control center, doctor, or 1-800-222-1222 immediately for treatment advice. • Have person sip a glass of water if able to swallow. • Do not induce vomiting unless told to do so by the poison control center or doctor.
If on skin or clothing	• Take off contaminated clothing. • Rinse skin immediately with plenty of water for 15-20 minutes. • Call a poison control center, doctor, or 1-800-222-1222 immediately for treatment advice.
• **Note to Physician**: If ingested, administer Vitamin K_1, intramuscularly or orally as indicated in bishydroxycoumarin overdose. Repeat as necessary based on monitoring of prothrombin times.	

For a medical emergency involving this product, call 1-800-222-1222.

ENVIRONMENTAL HAZARDS

This product is toxic to mammals and birds. Predatory and scavenging mammals and birds might be poisoned if they feed upon animals that have eaten bait.

STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal.

STORAGE: Store only in original closed container in a cool, dry place inaccessible to children and pets. Store separately from fertilizer and away from products with strong odors which may contaminate the bait and reduce acceptability. Spillage should be carefully swept up and collected for disposal.

PESTICIDE DISPOSAL: Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

PLASTIC CONTAINER DISPOSAL: Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

READ THIS LABEL: Read this entire label and follow all use directions and use precautions.

IMPORTANT: Do not expose children or pets to this product. Take all appropriate steps to limit exposure to and impacts on nontarget species, especially those for which special conservation efforts are planned or ongoing. To help to prevent accidents:

1) Store product not in use in a location out of reach of children and pets.
2) Apply bait only as specified on this label and in strict accordance with the "**USE RESTRICTIONS:**" and "**APPLICATION DIRECTIONS:**". For applications involving bait stations, the bait stations must be tamper-resistant. The bait stations must deny access to bait compartments by children, pets, and other non-target species larger in body size than the type(s) of rats or mice being targeted by the bait program. Lock and secure bait stations, as necessary, to exclude such nontarget species. In locations where captive or feral livestock occur, either remove and exclude such animals from the application site prior to treatment or make sure that the bait stations used are capable of denying them access to bait compartments, and
3) Dispose of product container, and unused, spoiled and unconsumed bait as specified on this label.

USE RESTRICTIONS: This product may be used only to control or eradicate Norway rats (*Rattus norvegicus)*, roof rats (*Rattus rattus),* Polynesian rats (*Rattus exulans),* house mice (*Mus musculus*) or other types of invasive rodents for conservation purposes on islands, grounded vessels or vessels in peril of grounding. This product may be applied only using bait stations, burrow baiting, canopy baiting or aerial and ground broadcast application techniques.

This product is to be used for the protection of State or Federally-listed Threatened or Endangered Species or other species determined to require special protection.

Do not apply this product to food or feed.

Treated areas must be posted with warning signs appropriate to the current rodent control project.

APPLICATION DIRECTIONS:

Bait Stations: Tamper-resistant bait stations must be used when applying this product on grounded vessels or vessels in peril of grounding or when used in areas of human habitation. See Item 2) under "**IMPORTANT:**" regarding the performance characteristics needed for tamper-resistant bait stations. To bait rats: Apply 4 to 16 ounces (113 to 454 grams) of bait per placement. Space placements at intervals of 5 to 50 meters. Placements should be made in a grid over the area for which rodent control is desired. To bait mice: Apply 0.25 to 0.5 ounces (7 to 14 grams) of bait per placement. Space placements at intervals of 2 to 4 meters. Placements should be made in a grid over the area for which rodent control is desired. Larger placements (up to 2 ounces) may be needed at points of very high mouse activity. For both rat and mouse baiting: Maintain an uninterrupted supply of fresh bait for at least 15 days or until signs of rodent activity cease. Where a continuous source of infestation is present, permanent bait stations may be established and bait replenished as needed.

Burrow-baiting: Place bait in burrows only if this can be done in a way that minimizes potential for ejection of bait and exposure of bait to seed-eating birds and other non-target species. To bait rats: place 3 to 4 ounces (85 to 113 g) of bait inside each burrow entrance. Baits used in burrows may be applied in piles or in cloth or reasealable plastic bags. The bags should be knotted or otherwise sealed to avoid spillage and holes should be made in plastic bags to allow the bait odor to escape. To bait mice: place approximately 0.25 ounces (7 grams) of bait in each active burrow. For both rat and mouse baiting: place one such bag or placement in each active burrow opening and push bag into burrow far enough so that its presence can barely be seen. Do not plug burrows. Flag treated burrows and inspect them frequently, daily if possible. Maintain an uninterrupted supply of bait for at least 15 days or until rodent activity ceases. Remove bait from burrows if there is evidence that bags are ejected.

Canopy Baiting (bait placement in the canopy of trees and shrubs): In areas where sufficient food and cover are available to harbor populations of rodents in canopies of trees and shrubs, canopy baiting should be included in the baiting strategy. Approximately 4 to 7 ounces (113 g to 200 g) of bait should be placed in a cloth or resealable plastic bag. The bags should be knotted or otherwise sealed to avoid spillage and holes should be made in plastic bags to allow the bait odor to escape. Using long poles (or other devices) or by hand, bait filled bags should be placed in the canopy of trees or shrubs. Baits should be placed in the canopy at intervals of 50 meters or less, depending upon the level of rodent infestation in these habitats. In

some vegetation types, bait stations may need to be used to ensure bait will stay in the canopy.

Aerial and Ground Broadcast: Broadcast applications are prohibited on vessels or in areas of human habitation. Broadcast bait pellets by helicopter or manually at a rate of 10 to 12.5 lbs. of bait per acre (11.1 to 13.8 kg/ha) per treatment. Make a second broadcast application typically 5 to 7 days after the first application, depending upon local weather conditions, at a rate no higher than 12.5 lbs. (13.8 g/ha) of bait per acre. In situations where weather or logistics only allow one bait application, a single application may be made at a rate no higher than 20.0 lbs. bait per acre (22.5 kg/ha).

Aerial (helicopter) applications may not be made in winds higher than 35 mph (30 knots). Pilot in command has final authority for determining safe flying conditions. However, aerial applications will be terminated when the following conditions are met:

- Windspeed in excess of 25 knots with an evaluation of the terrain and impact of the wind conditions and not to exceed a steady wind velocity of 30 knots.

If rat activity persists after broadcast application, set up and maintain tamper-resistant bait stations or apply bait directly to rodent burrows in areas where rodents remain active. If terrain does not permit use of bait station or burrow baiting, continue with broadcast baiting, limiting such treatments to areas where active signs of rats are seen. Maintain treatments for as long as rodent activity is evident in the area and rodents appear to be accepting bait.

For all methods of baiting, monitor the baited area periodically and, using gloves, collect and dispose of any dead animals and spilled bait properly. Dead animals and spilled bait may be buried on site if the depth of burial makes excavation by nontarget animals extremely unlikely.

UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
4700 River Road, Unit 149
Riverdale, MD 20737-1237
EPA Reg. No 56228-35
EPA Est. No. 61282-WI-1

Net Contents: 20 lbs. (9.07 Kg)

Label Revised: 12/07/2007

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

Keep away from humans, domestic animals and pets. If swallowed, this material may reduce the clotting ability of the blood and cause bleeding. Wear protective gloves when applying or loading bait. With detergent and hot water, wash all implements used for applying bait. Do not use these implements for mixing, holding, or transferring food or feed.

ENVIRONMENTAL HAZARDS

This pesticide is toxic to birds, mammals and aquatic organisms. Predatory and scavenging mammals and birds might be poisoned if they feed upon animals that have eaten bait.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Applicators and other handlers must wear:

-long sleeved shirt and long pants
-gloves
-shoes plus socks

For aerial application, in addition to the above PPE, loaders must wear protective eyewear or a face shield and a dust/mist filtering respirator (MSHA/NIOSH TC-21C).

USE RESTRICTIONS

It is a violation of Federal law to use this product in a manner inconsistent with its labeling. A copy of this label must be in the possession of the user at the time that the product is applied.

READ THIS LABEL: Read this entire label and follow all use directions and precautions**.**

IMPORTANT: Do not expose children, pets or other non-target animals to rodenticides. To help prevent accidents:

1) Keep children out of areas where this product is used or deny them access to bait by use of tamper resistant bait stations.
2) Store this product in locations out of reach of children, pets, and other nontarget animals.
3) Apply bait only according to the directions authorized.
4) Dispose of product container and unused, spoiled, or unconsumed bait as specified in the "**STORAGE AND DISPOSAL**" section.

(SEE RIGHT PANEL FOR ADDITIONAL USE RESTRICTIONS)

RESTRICTED USE PESTICIDE

DUE TO HAZARDS TO NON-TARGET SPECIES

For retail sale to and use only by Certified Applicators or persons under their direct supervision and only for those uses covered by the Certified Applicators certification.

For use by or in cooperation with government conservation agencies.

BRODIFACOUM-25D CONSERVATION

PELLETED RODENTICIDE BAIT FOR CONSERVATION PURPOSES

For control or eradication of invasive rodents in dry climates on islands or vessels for conservation purposes

ACTIVE INGREDIENT
Brodifacoum (CAS No. 56073-10-0) 0.0025%
INERT INGREDIENTS 99.9975%
TOTAL 100.0000%

KEEP OUT OF REACH OF CHILDREN

CAUTION

First Aid

If swallowed	-Call a physician or poison control center immediately for treatment advice. -Have person sip a glass of water if able to swallow. -Do not induce vomiting unless told to do so by a poison control center or doctor. -Do not give anything by mouth to an unconscious person.
If on skin or clothing	-Take off contaminated clothing. -Rinse skin immediately with plenty of water for 15-20 minutes. -Call a poison control center or doctor for treatment advice.
If inhaled	-Move person to fresh air. -If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. -Call a poison control center or doctor for further treatment advice.
If in eyes	-Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. -Call a poison control center or doctor for treatment advice.

Have the product container or label with you when calling a poison control center or doctor, or when going for treatment.

For a medical emergency involving this product, call (877) 854-2494

NOTE TO PHYSICIAN: If swallowed, this material may reduce the clotting ability of blood and cause bleeding. If ingested, administer Vitamin K_1, intramuscularly or orally, as indicated in bishydroxycoumarin overdose. Repeat as necessary based on monitoring of prothrombin times.

USE RESTRICTIONS, (CONT)

This product may be used to control or eradicate Norway rats (*Rattus norvegicus*), roof rats (*Rattus rattus*), Polynesian rats (*Rattus exulans*), house mice (*Mus musculus*) or other types of invasive rodents on islands for conservation purposes, or on grounded vessels or vessels in peril of grounding.

This product may be applied using bait stations, burrow baiting, canopy baiting or by aerial and ground broadcast application techniques.

This product is to be used for the protection of State or Federally-listed Threatened or Endangered Species or other species determined to require special protection.

Do not apply this product to food or feed.

Treated areas must be posted with warning signs appropriate to the current rodent control project.

This product is for use in dry climates.

DIRECTIONS FOR USE

BAIT STATIONS: Tamper-resistant bait stations must be used when applying this product to grounded vessels or vessels in peril of grounding, or when used in areas of human habitation. Bait must be applied in locations out of reach of children, non-target wildlife, or domestic animals, or in tamper-resistant bait stations.

TO BAIT RATS: Apply 4 to 16 ounces (113 to 454 grams) of bait per placement. Space placements at intervals of 16 to 160 ft (about 5 to 50 meters). Placements should be made in a grid over the area for which rodent control is desired.

TO BAIT MICE: Apply 0.25 to 0.5 ounces (7 to 14 grams) of bait per placement. Space placements at intervals of 6 to 12 ft (about 2 to 4 meters). Larger placements, up to 2 ounces (57 grams) may be needed at points of very high mouse activity. Placements should be made in a grid over the area for which rodent control is desired.

FOR BOTH RAT AND MOUSE BAITING: Maintain an uninterrupted supply of fresh bait for at least 15 days or until signs of rodent activity cease. Where a continuous source of infestation is present, permanent bait stations may be established and bait replenished as needed.

EPA Approved 03/18/08
EPA Reg. No. 56228-37

DIRECTIONS FOR USE (CONT.)

BURROW-BAITING: Place bait in burrows only if this can be done in a way that minimizes potential for ejection of bait and exposure of bait non-target species.
TO BAIT RATS: Place 3 to 4 ounces (85 to 113 g) of bait inside each burrow entrance. Baits used in burrows may be applied in piles or in cloth or resealable plastic bags. The bags should be knotted or otherwise sealed to avoid spillage and holes should be made in plastic bags to allow the bait odor to escape.
TO BAIT MICE: Place approximately 0.25 ounces (7 grams) of bait in a cloth or resealable bag in each active burrow.
FOR BOTH RAT AND MOUSE BAITING: Place one such bag or placement in each active burrow opening and push bag into burrow far enough so that its presence can barely be seen. Do not plug burrows. Flag treated burrows and inspect them frequently, daily if possible. Maintain an uninterrupted supply of bait for at least 15 days or until rodent activity ceases. Remove bait from burrows if there is evidence that bags are ejected.

CANOPY BAITING (bait placement in the canopy of trees and shrubs): In areas where sufficient food and cover are available to harbor populations of rodents in canopies of trees and shrubs, canopy baiting should be included in the baiting strategy. Approximately 4 to 7 ounces (113 to 200 grams) of bait should be placed in a cloth or resealable plastic bag. The bags should be knotted or otherwise sealed to avoid spillage and holes should be made in plastic bags to allow the bait odor to escape. Using long poles (or other devices) or by hand, bait filled bags should be placed in the canopy of trees or shrubs. Baits should be placed in the canopy at intervals of 160 ft (about 50 meters) or less, depending upon the level of rodent infestation in these habitats. In some vegetation types, bait stations may need to be used to ensure bait will stay in the canopy.

DIRECTIONS FOR USE (CONT.)

BROADCAST APPLICATION: Broadcast applications are prohibited on vessels or in areas of human habitation. Broadcast bait using aircraft, ground-based mechanical equipment, or by gloved hand at a rate no greater than 16 lbs of bait per acre (18 kg bait/hectare) per application. Make a second broadcast application, typically 5 to 7 days after the first application, depending on local weather conditions, at a rate no higher than 8 lbs. of bait per acre (9 kg bait/hectare). In situations where weather or logistics only allow one bait application, a single application may be made at a rate no higher than 16 lbs. bait per acre (18 kg/ha).

Aerial (helicopter) applications may not be made in winds higher than 35 mph (30 knots). Pilot in command has final authority for determining safe flying conditions. However, aerial applications will be terminated when the following conditions are present:

> Windspeed in excess of 25 knots with an evaluation of the terrain and impact of the wind conditions and not to exceed a steady wind velocity of 30 knots.

Set the application rate according to the extent of the infestation and apparent population density. For eradication operations, treat entire land masses.

Assess baited areas for signs of residual rodent activity (typically 7 to 10 days post-treatment). If rodent activity persists, set up and maintain tamper-resistant bait stations or apply bait directly to rodent burrows in areas where rodents remain active. If terrain does not permit use of bait stations or burrow baiting, continue with broadcast baiting, limiting such treatments to areas where active signs of rodents are seen. Maintain treatments for as long as rodent activity is evident in the area and rodents appear to be accepting bait.

For all methods of baiting, monitor the baited area periodically and, using gloves, collect and dispose of any dead animals and spilled bait properly.

STORAGE AND DISPOSAL

Do not contaminate water, food, or feed by storage or disposal.

STORAGE: Store only in original closed container in a cool, dry place inaccessible to unauthorized people, children and pets. Store separately from fertilizer and away from products with strong odors, which may contaminate the bait and reduce acceptability. Spillage should be carefully swept up and collected for disposal.

PESTICIDE DISPOSAL: Wastes resulting from the use of this product may be disposed of at an approved waste disposal facility.

CONTAINER DISPOSAL: Completely empty container. Then dispose of empty container in sanitary landfill or by incineration, or, if allowed by State and local authorities, by burning. If burned, stay out of smoke.

NOTICE: Buyer assumes all risks of use, storage, or handling of the material not in strict accordance with directions given herewith. The efficacy of the product may be reduced under high moisture conditions.

UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
Riverdale, MD 20737-1237
EPA Est. No. 56228-ID-1
EPA Reg. No. 56228-37
Net Weight

APPENDIX C

RESULTS OF LABORATORY ANALYSIS OF MARINE SAMPLES COLLECTED AFTER THE 2008 AERIAL DIPHACINONE APPLICATION TO MOKAPU ISLAND, MOLOKA`I

Prepared in cooperation with the U.S. Fish and Wildlife Service, Region 1

Determination of Diphacinone in Sea Water, Vertebrates, Invertebrates, and Bait Pellet Formulations Following Aerial Broadcast on Mokapu Island, Molokai, Hawai'i

Open-File Report 2008–1285

U.S. Department of the Interior
U.S. Geological Survey

Cover. Aerial photograph of Mokapu Island, Molokai, Hawai'i (Photo by C. Swenson, U.S. Fish and Wildlife Service).

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U.S. Department of the Interior
U.S. Geological Survey

U.S. Department of the Interior
DIRK KEMPTHORNE, Secretary

U.S. Geological Survey
Mark D. Myers, Director

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Suggested citation:
Gale, R.W., Tanner, M., and Orazio, C.E., 2008, Determination of diphacinone in sea water, vertebrates, invertebrates, and bait pellet formulations following aerial broadcast on Mokapu Island, Molokai, Hawai'i: U.S. Geological Survey Open-File Report 2008–1285, 16 p.

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Conversion Factors

Multiply	By	To obtain
	Length	
meter (m)	0.3048	feet (ft)
kilometer (km)	0.621388	mile (mi)
nanometer (nm)	=	10^{-9} meter
	Volume	
microliter (µL)	0.00003382	ounce, fluid (fl. oz)
milliliter (mL)	0.03382	ounce, fluid (fl. oz)
liter (L)	33.82	ounce, fluid (fl. oz)
	Mass	
gram (g)	0.03527	ounce, avoirdupois (oz)
microgram (µg)	=	1×10^{-6} grams
nanogram (ng)	=	1×10^{-9} grams
	Concentration	
molar (M)	=	moles per liter
millimolar (mM)	=	millimoles per liter (10^{-3} M)
micromolar (µM)	=	micromoles per liter (10^{-6} M)
microgram per gram (µg/g)	=	parts per million (ppm: 10^6)
nanogram per gram (ng/g)	=	part per billion (ppb; 10^9)
microgram per milliliter (µg/mL)	=	parts per million (ppm: 10^6)
microgram per liter (µg/L)	=	parts per billion (ppb: 10^9)
nanogram per milliliter (ng/mL)	=	part per billion (ppb; 10^9)
	Application rate	
pounds per acre (lb/acre)	1.125	kilograms per hectare (kg/ha)
	Electrical resistance	
mega-ohms (mΩ)	=	10^6 ohms

Temperature in degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) as follows:

$$°F = (1.8 \times °C) + 32$$

Concentrations of chemical constituents in solid materials (tissues) are given in nanogram per gram (ng/g, or parts per billion, ppb). Concentrations of chemical constituents in calibration standard solutions and in liquid samples (sea water) are given in nanograms per milliliter (ng/mL, or parts per billion, ppb).

Determination of Diphacinone in Sea Water, Vertebrates, Invertebrates, and Bait Pellet Formulations Following Aerial Broadcast on Mokapu Island, Molokai, Hawai'i

By Robert W. Gale, Michael Tanner, and Carl E. Orazio

Abstract

This report presents the results of a study to determine diphacinone concentrations in samples of sea water and in fillet samples of fish and in limpets from the ocean adjacent to Mokapu Island and from reference samples from Molokai, Hawai'i; concentrations of the active ingredient (diphacinone) were also determined in samples of the Ramik® Green bait pellets used for the broadcast study. After preparation, diphacinone concentrations were determined with high-performance liquid chromatography with photodiode array detection. No detectable concentrations of diphacinone were found in the fish, limpets, or sea-water samples from Mokapu Island or from the reference sites. The limit of detection for diphacinone in sea water was 18 nanograms per milliliter (parts per billion); the limit of detection in fish fillets was 10 nanograms per gram (parts per billion); and the limit of detection in limpets was 17 nanograms per gram. The average concentration of diphacinone in the Ramik® Green bait pellets was 45 micrograms per gram (parts per million), which represents 90 percent of the nominal concentration stated for the product by the manufacturer.

Introduction

Oceanic islands contain a disproportionate share of the world's unique terrestrial species and are especially vulnerable to the impacts of invasions by nonnative species, including rats. More than 80 percent of all oceanic islands worldwide have been infested by some species of invasive rodent. The ecosystems on oceanic islands are extremely susceptible to disturbances caused by infestations of invasive species because of their limited habitat coverage and the close integration of niche species. Most species extinction events that have occurred or are occurring in these isolated ecosystems are caused by invasive species. Many island rodent eradication projects have been successfully conducted worldwide using anticoagulant rodenticides.

Mokapu is an approximately 10-acre island located approximately 1 kilometer (km) off the north coast of Molokai just east of the Kalaupapa Peninsula (figs. 1 and 2). The island is a Hawai'i State Seabird Sanctuary managed by the Hawai'i Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW); the island supports native populations of white-tailed tropicbirds (*Phaethon lepturus*), red-tailed tropicbirds (*P. rubricauda*), black noddies (*Anous minutus*), and wedge-tailed shearwaters (*Puffinus pacificus*). Like the nearby islands of Okala and Huelo, Mokapu supports some of the most diverse native coastal plant communities in Hawai'i. For example, Mokapu contains 29 native plant species; several of these species are rare and vulnerable to extinction. The island is dominated by native shrubs, but retains small groves of native lama trees (*Diospyros spp.*), some native palm trees (*Pritchardii hillebrandii*), which dominate nearby Huelo, and 11 of the last 14 individuals of the shrub *Pittosporum halophilum* that is endemic to Molokai. *Peucedanum sandwicense*, a large perennial herbaceous plant, is listed as threatened under the Endangered Species Act of 1973, and *Lepidium bidentatum var. o-waihiense*, a succulent herbaceous plant, also is a species of concern on the island. In 2003, the U.S. Fish and Wildlife Service (USFWS) designated Mokapu Island as critical habitat for *P. sandwicense* and *Tetramolopium rockii* (perennial shrubs) and *Brighamia rockii*, a succulent perennial plant present on nearby adjacent islands.

It is extremely likely that the presence of rats has terminated or slowed the recruitment of the threatened *Peucedanum sandwicense* as well as *Pritchardia, Pittosporum*, and *Diospyros* along with other native plant taxa on Mokapu. Rats are known to eat *Pritchardia* seeds, and their presence on Mokapu is believed to be contributing to the decline of this rare, endemic species. In 2006, only 12 mature *Pritchardia* palms and one seedling were present on Mokapu.

Likewise, only 11 individuals of *Pittosporum*, 20 individuals of *Peucedanum*, and two small groves of *Diospyros* remain on Mokapu. In addition, observations from other Pacific islands document that rats depredate eggs, and sometimes prey upon the young and adults of three of the seabird species known to nest on Mokapu: red-tailed and white-tailed

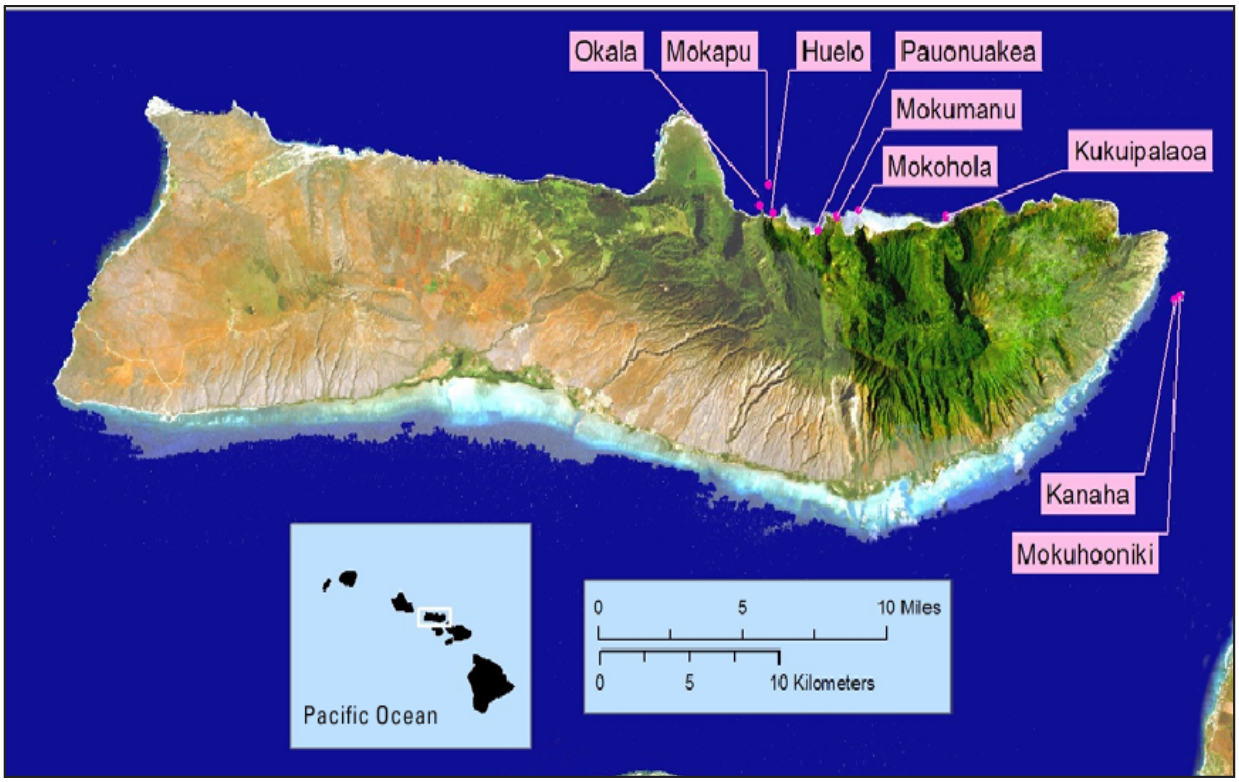

Figure 1. Screen shot of Mokapu, Island, Molokai, Hawai'i (courtesy of GoogleEarth©).

Figure 2. Aerial photograph of Mokapu Island, Molokai, Hawai'i. (Photo by C. Swenson, U.S. Fish and Wildlife Service).

tropicbirds and wedge-tailed shearwaters; therefore, rodent control is a critical management objective for maintaining and/or restoring the ecological integrity of Mokapu Island.

Diphacinone is a chronic anticoagulant rodenticide that acts by disrupting the normal blood clotting mechanisms of vertebrates; competing at receptor sites in the liver with vitamin K, a necessary chemical for blood clotting. Diphacinone has been shown to be an effective toxicant for rats in Hawai'i and elsewhere. It is efficacious, yet has relatively low risk of impacts to nontarget species through consumption of bait pellets (direct impacts) and/or through consumption of prey that have consumed the bait pellets (secondary impacts).

The USFWS, the DOFAW, and the U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services (USDA–APHIS–WS) proposed to eradicate Polynesian rats from Mokapu Island using the anticoagulant rodenticide diphacinone (0.005 percent active ingredient) applied by aerial broadcast. Operations were conducted only during the winter months (December through March) when alternate rat foods and rat populations are lowest and migratory native nontarget species were not present, or were present only in low numbers.

Toxic bait pellets containing the active ingredient diphacinone at 50 parts per million (ppm) were used to exterminate rats. The bait is dyed green by the manufacturer to reduce dietary exposure to birds. The rodenticide was broadcast uniformly across the emergent land area of the island at the approved application rate in an attempt to expose all rats to a lethal dose. Applications were completed by aerial broadcast across 100 percent of the land area of the island at a nominal rate of 10 pounds per acre (lb/acre) in two separate broadcast applications on February 6 and February 12, 2008. Coastlines and steep areas were treated with twice the rodenticide for each application.

Monitoring for primary and secondary adverse impacts of diphacinone on nontarget species was one of the foremost concerns for this rodent eradication project. Populations of desired nontarget species, including nesting seabirds and protected plants, were monitored actively for a sufficient period (approximately 2 years) to produce reliable population estimates of adverse impacts before and after rodenticide treatments. The preceding text was condensed from Swenson and Duvall, 2007.

This report presents the development of analytical chemistry methods for determining diphacinone concentrations in sea water, fish tissues, and limpets, and the quantification of diphacinone concentrations in these samples after application of the rodenticide to Mokapu Island. Sea water, fish, and limpets from Kalaupapa National Historical Park and from commercial sources were used as negative control (reference) samples. The results are intended to provide the program managers and other resource managers in the study area with reference data regarding the fate and effects of diphacinone on Mokapu Island. Additionally, the procedures developed for the various matrices could serve as prototypes for the development of similar methods on other matrices where diphacinone contamination may be an issue in the future.

Purpose and Scope

The objectives of this study were to assess the levels of diphacinone present in sea water and biota as a consequence of aerial broadcast of Ramik Green® rodenticide to exterminate Polynesian rats from Mokapu Island. These results will serve as a demonstration of the actual risk of exposure of non-target organisms to the use of diphacinone in the proposed rodent eradication strategy. The study consisted of several analytical sample sets, each addressing the post-broadcast diphacinone exposure levels in the immediate environment.

Methods

Mokapu Sample History

Personnel from the USFWS, DOFAW, and/or USDA–APHIS–WS collected grab samples of reference sea water on January 23, 2008, at Kalaupapa National Historical Park (Ka Laea Point) for diphacinone analysis. Aerial broadcasts of Ramik® Green rodenticide bait were conducted on February 6 and February 12, 2008. On February 17, after aerial broadcasts were completed, sea-water samples were collected from several points surrounding Mokapu Island for diphacinone analysis.

Following aerial broadcast of Ramik® Green, surface water grab samples were collected within 30 feet (ft) of the eastern and western sides of Mokapu Island. Six 250 milliliter (mL) samples were collected at each of the six stations. Three stations were located off the eastern shore and three off the western shore. Parts of each sample were shipped cold [4 °Celsius (°C)] to the U.S. Geological Survey (USGS) and the other participating laboratories using chain of custody protocols. Two samples from each site were provided to the USGS for analysis. An additional experiment was incorporated to validate the effect of holding time for the analysis of diphacinone in sea-water samples (stored at 4 °C for 53 days).

Diphacinone was determined in invertebrates (limpets) and vertebrates (fish) from reference sites and from Mokapu Island following aerial broadcast of Ramik® Green to quantify reference and post-broadcast diphacinone levels. Personnel from the USFWS, DOFAW, and/or USDA–APHIS–WS collected one species of mollusk (Opihi, the Hawai'ian Limpet) from a reference location (Kalaupapa) and from Mokapu sites after aerial broadcast on February 17, 2008. Six individual fish samples (duplicate samples of three separate species, i.e. Ta`ape, A`awa, and Hagi) were collected from within 50 ft of the western shore of Mokapu on February 17, 2008, following aerial broadcast. Reference samples of Ta`ape were purchased from a commercial Oahu market. Fish and limpet samples were packaged in aluminum foil packets sealed in zip-lock bags and stored frozen. Whole limpet carcasses and fillet

portions of each fish were shipped frozen to the participating laboratories under chain of custody on March 17, 2008 (table 1).

The diphacinone content of Ramik® Green rodenticide bait samples stored at the Maui DOFAW base yard and subsequently used in the rat eradication efforts on Mokapu Island, Hawai'i, was verified. Personnel from the USFWS, DOFAW and/or USDA–APHIS–WS collected 10 random Ramik® Green rodenticide bait samples from the Maui DOFAW base yard on February 12, 2008. Parts [~30 2-gram (g) pellets] of each sample were shipped frozen to the participating laboratories under chain of custody, and were received by March 17, 2008 (table 1).

Upon receipt at the USGS, the sea-water samples were logged in to the sample data-base system, assigned a unique identification number, and stored refrigerated at 4 °C until analysis. The tissue and bait samples were logged and stored in the dark at -20 ºC until analysis.

Sample Preparation

Sample preparation methods for diphacinone are matrix-dependent and were developed for each target matrix: sea water, fillet, whole limpet, and bait. The general method consisted of extraction of diphacinone from the matrix of interest, and subsequent concentration and purification of the extract by solid-phase extraction (SPE) or low performance size-exclusion chromatography (LP-SEC). The general schemes developed are presented in figure 3.

Analytical separation of diphacinone was performed by high performance liquid chromatography (HPLC) followed by ultraviolet-visible photodiode array absorbance (PDA) detection and quantification after the methods of Yang and others (2001). Coumarin was used as the instrumental internal standard.

Materials

Solid-phase extraction cartridges [Oasis-HLB (hydrophilic/lipophilic balance) 6 mL x 500 milligrams (mg)] were purchased from Waters Corp., Milford, Massachusetts. Octadecyl SPE cartridges [Isolute C18(EC) 6 mL x 1 g] were purchased from International Sorbent Technology, Mid Glamorgan, United Kingdom. The size exclusion material (SX-3 biobeads 200–400 mesh) was purchased from Bio-Rad Co. Richmond, California. Acetone, acetonitrile, dichloromethane, methanol (OPTIMA grade), acetic acid (HPLC-grade), anhydrous sodium sulfate, ascorbic acid (reagent grade), and 2 N *o*-phosphoric acid were purchased from Fisher Scientific, Fair Lawn, New Jersey. Whatman 0.45 micrometer (µm) polytetrafluoroethylene (PTFE) syringe filters were purchased from Whatman, Inc., Sanford, Maine. Tetrabutylammonium hydroxide (TBAH) was purchased from Sigma-Aldrich, St. Louis, Missouri. Tetrabutylammonium phosphate (TBAP) was purchased from ACROS Organics, Somerville, New Jersey. Diphacinone and coumarin standard solutions (in methanol) were purchased from AccuStandard, New Haven, Connecticut. Milli-Q water [18 mega-ohms (mΩ), Millipore Synergy UV, Millipore Corp., Bedford, Massachusetts] was used throughout the analytical process.

Aqueous tetrabutylammonium hydroxide ion pair (TBAH-IP) solutions used for HPLC and for SPE were prepared at 0.1 molar (M) and 0.03 M in water and pH adjusted to 6.0 with *o*-phosphoric acid. Solid TBAP (not pH adjusted) was used to prepare the methanolic 5 millimolar (mM) tetrabutylammonium phosphate solution used for the bait reflux-extractions.

Sample Preparation for Diphacinone in Sea-Water Samples

Diphacinone has a water solubility of 30 ppm and is subject to hydrolysis at pH 5 or less; however, it is stable to hydrolysis from pH 7 to 9 (U.S. Environmental Protection Agency, 1998). The sea-water samples collected for this study were stored refrigerated at 4 °C and in the dark for 53 days before analysis. The samples were collected on February 17, 2008, shipped to USGS on March 17, 2008, and extracted on April 10, 2008, following method development and validation. The storage stability of diphacinone in sea water for a similar period was investigated to ensure that the holding time for diphacinone was not exceeded. A 200 mL aliquot of Kalaupapa reference sea water (pH 8.1) was fortified with about 5 micrograms (µg) of diphacinone and was returned to refrigerated storage to simulate the holding times for the samples. Another 200 mL volume of Kalaupapa reference sea water (pH 8.1) was fortified with about 5 µg diphacinone at the time of analysis to determine recovery efficiency. The storage stability sample was analyzed on May 19, 2008 (53 days post fortification), using the methods described for sea-water samples.

A solid phase extraction method was developed for the isolation of diphacinone from sea water. Although the isolation of diphacinone from coconut crab (*Birgus latro*) tissues is well understood (Tanner and Orazio, written commun., 2008), no work has been reported to assess the recovery of diphacinone from sea water. Generally, the water samples were extracted by an appropriate SPE cartridge to adsorb diphacinone that was then recovered by elution of the SPE and quantified by HPLC with PDA detection. Potential matrix effects from salts on recovery of diphacinone from the SPE sorbent or the retention of diphacinone were investigated and determined to be negligible.

The pH of the Mokapu Island water samples was determined using a Mettler-Toledo Seven Easy pH meter (Schwerzenbach, Inc., Switzerland). The pH meter was calibrated with 4.00 and 7.00 buffer solutions (Fisher Scientific, Fair Lawn, New Jersey) before pH determinations. Fortified samples were prepared using 200 mL of Kalaupapa reference sea water or 100 mL of aqueous Oceanic Natural Sea Salt solution and adding 2.5 µg diphacinone. The final concentrations of the fortified reference sea-water samples and the Oceanic Natural

Table 1. Sample collection information.

[USGS, U.S. Geological Survey; ID, identification; mL, milliliters; Al, aluminum; g, grams]

Collection date	USGS ID	Site	Sample description	Sample type	Sample container	Amount	Notes
1/23/2008	42033	Kalaupapa National Historical Park (at Ka Laea Point), Molokai	Sea water	Water	250-mL wide-mouth jars	3x250 mL	Reference site; white lids letter “R”
1/23/2008	42034	Kalaupapa National Historical Park (at Ka Laea Point), Molokai	Limpet, Opihi (*Cellata exarata*)	Whole organism (incl. shell)	Al-foil/Ziploc	3 individuals—about 10 g each	Reference site
3/17/2008	42035	Oahu Commercial Fish Market	Blue-lined Snapper, Ta`ape (*Lutjanus kasmira*)	Skin-on fillet	Al-foil/Ziploc	4 individuals—about 50 g each	Reference site
2/17/2008	42036	Mokapu Station 1	Sea water	Water	250-mL wide-mouth jars	2x250 mL	Site 1 of 6
2/17/2008	42037	Mokapu Station 2	Sea water	Water	250–mL wide-mouth jars	2x250 mL	Site 2 of 6
2/17/2008	42038	Mokapu Station 3	Sea water	Water	250–mL wide-mouth jars	2x250 mL	Site 3 of 6
2/17/2008	42039	Mokapu Station 4	Sea water	Water	250–mL wide-mouth jars	2x250 mL	Site 4 of 6
2/17/2008	42040	Mokapu Station 5	Sea water	Water	250–mL wide-mouth jars	2x250 mL	Site 5 of 6
2/17/2008	42041	Mokapu Station 6	Sea water	Water	250–mL wide-mouth jars	2x250 mL	Site 6 of 6
2/17/2008	42042	Mokapu Station 1	Limpet, Opihi (*Cellata exarata*)	Whole organism (without shell)	Al-foil/Ziploc	~4 individuals—about 10 g total	Site 1 of 3
2/17/2008	42043	Mokapu Station 2	Limpet, Opihi (*Cellata exarata*)	Whole organism (without shell)	Al-foil/Ziploc	~4 individuals—about 10 g total	Site 2 of 3
2/17/2008	42044	Mokapu Station 3	Limpet, Opihi (*Cellata exarata*)	Whole organism (without shell)	Al-foil/Ziploc	~4 individuals—about 10 g total	Site 3 of 3
2/17/2008	42045	Mokapu Station 1-A	Blue-lined Snapper, Ta`ape (*Lutjanus kasmira*)	Skinless fillet	Al-foil/Ziploc	1 individual—about 50 g	Site 1 Fish-1
2/17/2008	42046	Mokapu Station 1-B	Blue-lined Snapper, Ta`ape (*Lutjanus kasmira*)	Skinless fillet	Al-foil/Ziploc	1 individual—about 50 g	Site 1 Fish-2
2/17/2008	42047	Mokapu Station 1-C	Blue-lined Snapper, Ta`ape (*Lutjanus kasmira*)	Skinless fillet	Al-foil/Ziploc	1 individual—about 50 g	Site 1 Fish-3
2/17/2008	42048	Mokapu Station 1-D	Blue-lined Snapper, Ta`ape (*Lutjanus kasmira*)	Skinless fillet	Al-foil/Ziploc	1 individual—about 50 g	Site 1 Fish-4
2/17/2008	42049	Mokapu Station -E	Hogfish, A`awa (*Bodianus bilunulatus*)	Skinless fillet	Al-foil/Ziploc	1 individual—about 50 g	Site 1 Fish-5
2/17/2008	42050	Mokapu Station 1-F	Bridled triggerfish, Hagi (*Sufflamen fraenatus*)	Skinless fillet	Al-foil/Ziploc	1 individual—about 50 g	Site 1 Fish-6
2/17/2008	42051	Maui-1	Ramik® Green (diphacinone bait pellets)	Individual box of pellets #1	Ziploc	~25–30 pellets 30 g	Box 1:2
2/17/2008	42052	Maui-2	Ramik® Green (diphacinone bait pellets)	Individual box of pellets #2	Ziploc	~25–30 pellets 30 g	Box 2:2
2/17/2008	42053	Maui-3	Ramik® Green (diphacinone bait pellets)	Individual box of pellets #3	Ziploc	~25–30 pellets 30 g	Box 3:2
2/17/2008	42054	Maui-4	Ramik® Green (diphacinone bait pellets)	Individual box of pellets #$	Ziploc	~25–30 pellets 30 g	Box 4:2
2/17/2008	42055	Maui-5	Ramik® Green (diphacinone bait pellets)	Individual box of pellets #5	Ziploc	~25–30 pellets 30 g	Box 5:2
2/17/2008	42056	Maui-6	Ramik® Green (diphacinone bait pellets)	Individual box of pellets #6	Ziploc	~25–30 pellets 30 g	Box 6:2
2/17/2008	42057	Maui-7	Ramik® Green (diphacinone bait pellets)	Individual box of pellets #7	Ziploc	~25–30 pellets 30 g	Box 7:2
2/17/2008	42058	Maui-8	Ramik® Green (diphacinone bait pellets)	Individual box of pellets #8	Ziploc	~25–30 pellets 30 g	Box 8:2
2/17/2008	42059	Maui-9	Ramik® Green (diphacinone bait pellets)	Individual box of pellets #9	Ziploc	~25–30 pellets 30 g	Box 9:2
2/17/2008	42060	Maui-10	Ramik® Green (diphacinone bait pellets)	Individual box of pellets #10	Ziploc	~25–30 pellets 30 g	Box 10:2

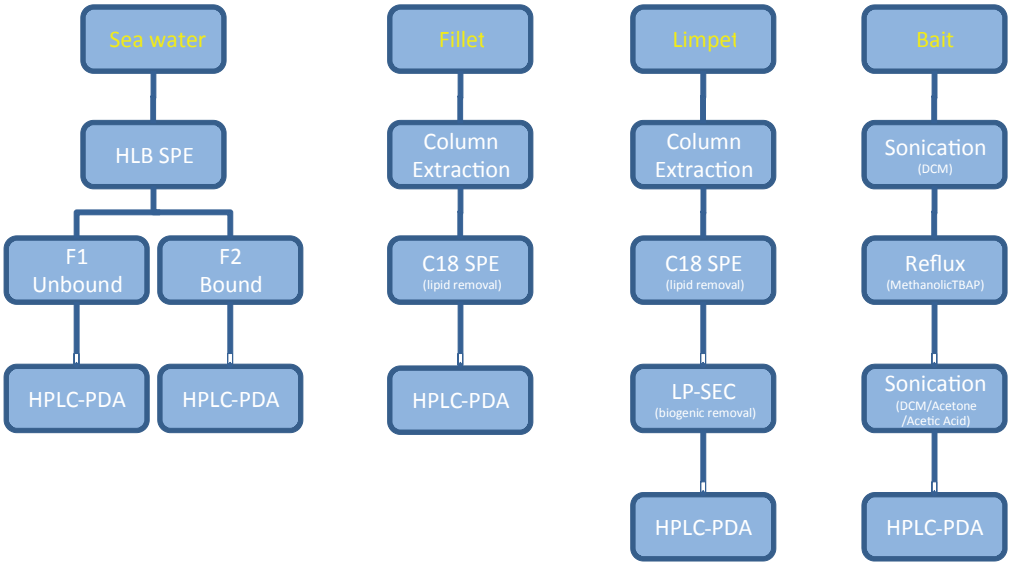

Figure 3. Preparatory methods for diphacinone in the various matrices.

Sea Salt water samples were 12.5 nanograms per milliliter (ng/mL) and 25 ng/mL, respectively.

Oasis-HLB SPE cartridges were cleaned and preconditioned with 10 mL acetonitrile followed by 10 mL methanol at a flow rate of about 1 mL/minute and then dried under vacuum for about 3 minutes. Immediately before extraction, the SPE cartridge was conditioned with 10 mL aqueous TBAH-IP reagent followed by 20 mL of Milli-Q water, at about 1 mL/minute (cartridge remained wet). A 200 mL water sample (100 mL for replicates, laboratory blanks, and laboratory-fortified samples) was applied to the cartridge at about 3 mL/minute. The sample container was rinsed quantitatively with about 20 mL Milli-Q water, which then was applied to the cartridge. Next, the cartridge was washed with 3 mL Milli-Q water and dried under vacuum for about 3 minutes.

Diphacinone was recovered from the cartridge with 13 mL acetonitrile; the eluant was collected in a 15-mL amber culture tube (fraction 1). Any more strongly bound diphacinone was recovered from the cartridge with 5 mL 70:30 (methanol:aqueous TBAH-IP reagent; volume:volume); this eluant was collected in a separate 15-mL amber culture tube (fraction 2).

The first diphacinone eluants (fraction 1) were evaporated to dryness using nitrogen with a water bath temperature of < 50 ºC (N-EVAP, Organomation, Inc., Berlin, Massachusetts). The residues were dissolved in 700 microliters (µL) methanol, 300 µL of the aqueous TBAH-IP reagent was added to match the liquid chromatography mobile phase, and 1 µg coumarin (instrumental internal standard) was added. The residual diphacinone eluants (fraction 2) were fortified with 5 µg coumarin and analyzed directly.

Sample Preparation and Quantification of Diphacinone in Tissues

Hunter and Sharp (1988) described the addition of ascorbic acid to the extraction solvent, as well as to the matrix before dehydration for extractions from vertebrate liver samples. This increased the recovery of indandione-group anticoagulant rodenticides in all of the liver samples tested. Before analysis of Mokapu field samples, it was established that ascorbic acid treatment was not required to achieve adequate recoveries of any diphacinone from the fish and limpet matrices. Further method development efforts established that a C18 SPE cleanup was necessary for fish fillet samples, whereas both C18 SPE and LP-SEC cleanup steps were necessary to remove residual lipid materials from the limpet matrix.

Fish: Ta`ape, A`awa, and Hagi Fillets

Fortified fish fillet samples were prepared in about 5 g of reference Ta`ape matrix or sodium sulfate (procedural spikes) by adding 2.5 µg diphacinone to the dehydrated reference material. The final concentration of the fortified matrix samples was 500 nanograms per gram (ng/g) wet-weight.

Homogenized Ta`ape (*Lutjanus kasmira*), A`awa (*Bodianus bilunulatus*), or Hagi (*Sufflamen fraenatus*) fillet tissue samples (5 g fish skinless fillet) were dehydrated with 25 g anhydrous sodium sulfate. The mixture was allowed to dehydrate at least 2 hours, and then was blended with stainless steel blades and a commercial blender until a free flowing powder was obtained.

The dehydrated sample was loaded into an extraction column with a total of about 20 mL of acetonitrile rinses of the sample container and then saturated with acetonitrile. The acetonitrile saturated dehydrated matrix was allowed to interact approximately 1 hour before extraction. Additional acetonitrile

(150 mL) was added to the column, and the sample extracted at a flow rate of approximately 2 mL/minute until flow ceased; additional acetonitrile (100 mL) was added to the column, the extraction continued, and the eluant collected with the original extract. The extracts were rotary evaporated under vacuum (< 50 °C) to approximately 3 mL, and quantitatively transferred to 15-mL culture tubes with three sequential 2-mL rinses with acetonitrile. The sample extracts were evaporated by nitrogen stream to 2 mL and mixed thoroughly.

Some co-extracted interferences (mainly lipid material) were removed by C18 SPE. The cartridges were conditioned with 10 mL methanol followed by 10 mL 0.03 M TBAH-IP, dried under vacuum for about 1 minute, and finally by rinsing with 10 mL acetonitrile (the cartridge remained wet). The 2 mL sample extracts were applied to the cartridge at about 2 mL/minute (with three 1-mL acetonitrile rinses). Diphacinone was recovered from the cartridge with 7-mL acetonitrile (total acetonitrile 10 mL: three 1-mL rinses plus 7 mL for elution). The eluant was collected in a 15-mL amber culture tube.

The diphacinone eluants were evaporated to dryness with nitrogen. The residues were dissolved in 700 µL methanol, 300 µL of the aqueous TBAH-IP reagent was added to match the liquid chromatography mobile phase, and 1 µg coumarin (instrumental internal standard) was added.

Limpet: Whole Opihi

Fortified samples were prepared with about 3 g of reference limpet matrix or sodium sulfate (procedural spikes) by adding 2.5 µg diphacinone to the dehydrated reference material. The final concentration of the fortified matrix samples was 830 ng/g.

Whole Opihi (*Cellata exarata*) limpet sample homogenates (about 3 g) were dehydrated with 30 g anhydrous sodium sulfate. The mixture was allowed to dehydrate at least 2 hours, and then was blended with stainless steel blades and a commercial blender until a free flowing powder was obtained.

The dehydrated sample was loaded into an extraction column with a total of about 20 mL of acetonitrile rinses of the sample container and then saturated with acetonitrile. The acetonitrile saturated dehydrated matrix was allowed to interact approximately 1 hour before extraction. Additional acetonitrile (150 mL) was added to the column and the sample extracted at a flow rate of approximately 2 mL/minute until flow ceased; additional acetonitrile (100 mL) was added to the column, the extraction continued, and the eluant collected with the original extract. The extracts were rotary evaporated under vacuum (< 50 °C) to approximately 3 mL, and quantitatively transferred to 15-mL culture tubes with three sequential 2-mL rinses with acetonitrile. The sample extracts were evaporated by nitrogen stream to 2 mL and mixed thoroughly.

Some co-extracted interferences (mainly lipid material) were removed by C18 SPE. The cartridges were conditioned with 10 mL methanol followed by 10 mL 0.03 M TBAH-IP, dried under vacuum for about 1 minute, and finally by rinsing with 10 mL acetonitrile (the cartridge remained wet). The 2 mL sample extracts were applied to the cartridge at about 2 mL/minute (with three 1-mL acetonitrile rinses). Diphacinone was recovered from the cartridge with 7 mL acetonitrile (total acetonitrile 10 mL: three 1-mL rinses plus 7 mL for elution). The eluant was collected in a 15-mL amber culture tube.

The diphacinone eluants were evaporated to dryness with nitrogen. The residues were dissolved in 3 mL dichloromethane. Additional lipids and other biogenic material were removed by low-performance size-exclusion chromatography (SX-3 biobeads, dichloromethane mobile phase at a flow of 3.5 mL/minute). The diphacinone fractions (LP-SEC collect window from 40 to 60 minutes) were rotary evaporated under vacuum (< 50 °C) to approximately 3 mL, and quantitatively transferred to 15-mL culture tubes with three sequential 2-mL rinses with dichloromethane. The dichloromethane sample extracts were evaporated to dryness with nitrogen. The residues were dissolved in 700 µL methanol, 300 µL of the aqueous TBAH-IP reagent was added to match the liquid chromatography mobile phase, and 1 µg coumarin (instrumental internal standard) was added.

Sample Preparation for Diphacinone in Ramik® Green Bait

Primus and others (1998) described the extraction of diphacinone from steam rolled oat baits using 5 mM methanolic tetrabutylammonium phosphate ion pairing solution. Mesmer and Flurer (2000) described the extraction of diphacinone by sonication of commercial indanedione rodenticides with methanol containing 2 percent formic acid. The extraction recovery of diphacinone from the Ramik® Green formulation was established in this study before analysis of field samples. The removal of co-extracted inert ingredients (green dye, waxes, etc.) using suitable SPE and other techniques also was investigated.

No reference material without active ingredient was available; therefore, no method quality-control samples were analyzed with the sample set. Instead, steps were taken to optimize extraction efficiency based on the nominal active ingredient concentration of diphacinone reported by the manufacturer in Ramik® Green bait (50 ppm).

Three composites of the bait samples were prepared containing two baits from each sample-lot submitted as follows: Lots 1, 2, and 3; Lots 4, 5, and 6; Lots 7, 8, 9, and 10. Two bait pellets were removed from each of the zip-lock bags, individual weights recorded, and the pellets were transferred to a ceramic mortar. The individual pellets were chopped into smaller pieces using a stainless steel knife, and the composite samples were ground to a fine powder using a ceramic pestle.

Approximately 2 g portions of each composite were weighed into 250-mL boiling flasks, approximately 15 mL dichloromethane added, and the composites sonicated for 1 hour. Next, the dichloromethane extracted samples were extracted by reflux with 5 mM methanolic tetrabutylammonium phosphate (TBAP; 55 mL) for 8 hours. The extracts were

filtered through Whatman 41 ashless filter paper with repeated rinses of the boiling flask with extraction solvent.

A second extraction was performed by soncating the post-refluxed composite bait samples with 15 mL dichloromethane:acetone:acetic acid (1:1:2%; volume:volume:volume) for 2 hours to recover any residual diphacinone. This second extract was filtered with repeated rinses with the extraction solvent. Final volumes were adjusted to 100 mL (for the reflux extract) or 25 mL (for the sonicated extract) using the appropriate extraction solvent and the solutions were thoroughly mixed. Sub-samples of each of the first extracts (2 mL) and each of the second extracts (10 mL) were transferred to 15-mL amber culture tubes.

The first and second extracts of the composite bait samples were evaporated individually to dryness with nitrogen. The residues were dissolved in 700 µL methanol, 300 µL of the aqueous TBAH-IP reagent was added to match the liquid chromatography mobile phase, and 1 µg coumarin (instrumental internal standard) was added.

Instrumental Analysis and Data Reduction

Final Sample Preparation

As per previous discussion, all extracts were evaporated to approximately 3 mL by rotary evaporation and transferred to 15-mL screw capped amber culture tubes with three sequential 2-mL acetonitrile rinses. The concentrated extracts were evaporated to dryness by nitrogen evaporation and reconstituted in 700 µL of methanol. Once the residues were dissolved, 300 µL of 0.03 M tetrabutylammonium hydroxide ion pair reagent (TBAP-IP) in water was added and mixed thoroughly. The samples were filtered through 0.45 µm PTFE syringe filters directly in to 1-mL amber autosampler vials.

HPLC-PDA Analysis

Quantification of diphacinone was performed with a Surveyor® HPLC system (Thermo-Fisher, Inc., San Jose, California), consisting of an autosampler, gradient pump, PDA detector, and XCalibur® chromatography data collection and processing software. A Luna® C18(2) 100 Å, 150 x 2 millimeter (mm) x 3 µm analytical column with a Security-Guard® C18 guard column cartridge (Phenomenex. Torrance, California) was used for the separation of diphacinone. The ion-pair reagent for the mobile phase was 0.03 M TBAH-IP in water adjusted to a pH of 6.0 using 2 N *o*-phosphoric acid. The mobile phase, methanol/0.03 M TBAH-IP (70:30 volume:volume), was delivered isocratically at 0.8 mL/minute. The sample was applied onto the column via 20 µL full-loop injections. Diphacinone was detected by wavelength scanning from 230 to 400 nanometers (nm) with quantification at the primary wavelength (286 nm) and confirmation at the two secondary wavelengths (314 and 326 nm). The primary wavelength for the instrumental internal standard, coumarin was 276 nm with a secondary wavelength of 312 nm. A diphacinone standard chromatogram is shown in figure 4; a photodiode array detector spectrum is shown in figure 5. Calibration of the instrument was achieved through a range of standards from just above the limit of quantification of about 10 ng/mL to 5,000 ng/mL diphacinone [and coumarin].

Quality Assurance and Quality Control

All research was conducted in accordance with the USGS Quality Assurance Plan, a system of checks managed by a Quality-Assurance system that assures that defined standards of quality are being met (at stated levels of confidence). The objective of the quality assurance plan for this study was to assure that the analytical and/or biochemical analyses provided accurate and precise measurements of the samples collected in this study. The general scheme included replication of various stages (table 2), comparison and calibration against known standards, proper maintenance and calibration of equipment, accurate sample tracking and custody, proper documentation at all steps of sample processing, and other considerations of Good Laboratory Practice.

The accuracy and precision of analytical methods for this study was assessed by the following checks of sample preparation and instrumental analysis: replicated sample or reference matrices, procedural blanks, fortified procedural samples, negative control (reference) matrix blanks, and fortified negative control matrix samples. The fortified matrix samples were amended with native analyte(s) during sample preparation. The numbers of quality control samples of each type are presented in table 3.

Sea Water Holding Time

Because of questions related to the storage of sea-water samples (dark, refrigerated at 4 °C), a stability check experiment was conducted to determine the feasibility of the approximately 50 day holding time from sample collection (February 17, 2008), shipping to the USGS (March 17, 2008), and subsequent analysis (April 10, 2008).

Negative Control Bait Matrix

The lack of a reference bait material without active ingredient limited the quality control samples to be analyzed with the bait sample set. Steps were taken to maximize extraction efficiency, based on the manufacturer's nominal active ingredient concentration of 50 ppm diphacinone in Ramik® Green bait.

Criteria for Quantification of HPLC-PDA Data

Method limits of detection (LOD) and limits of quantification (LOQ) were estimated from low-level standards and

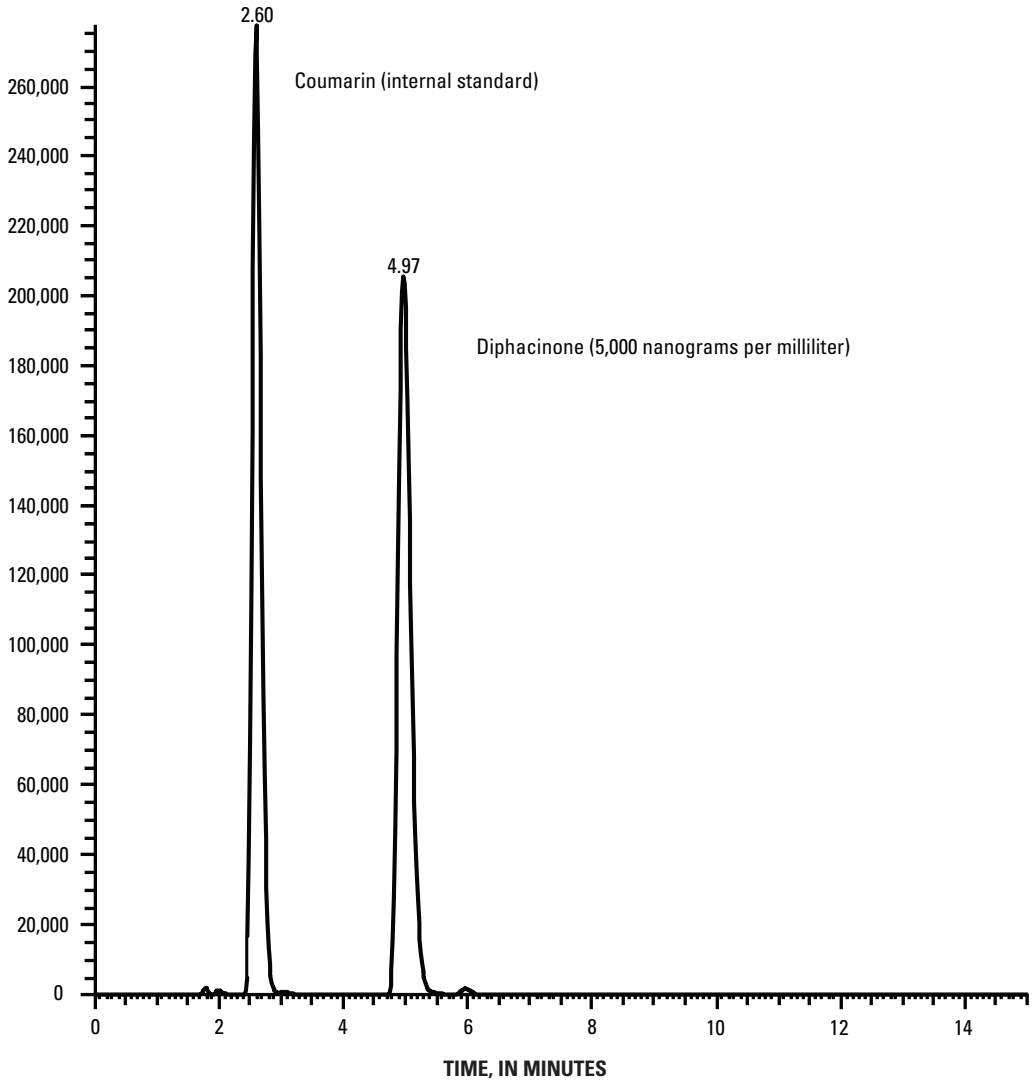

Figure 4. High performance liquid chromatography-photodiode array (HPLC-PDA) chromatogram of diphacinone (wavelength range 230 to 400 nanometers).

determined by the signal-to-noise ratio of the peak. Keith and others (1983; 1991) established the LOD as 3 times the background signal, and the LOQ as 10 times background signal. For the positive identification and quantification of each analyte, the following criteria were established:

1. The analyte peak area must be greater than 10 times background signal (LOQ) for quantification, or 3 times background signal (LOD) to be considered detected, but <LOQ. If a peak is not present, or is less than three times background signal, it will be considered "Not Detected".
2. The analyte elution must occur at retention times that are equivalent to those for the corresponding calibration standards (within ± 3 seconds or < 1 percent difference, as established by the method validation).
3. The spectrum of an unknown analyte must be comparable to the spectrum of a corresponding calibration standard (within purity factors established by the method validation and the expertise of the analyst).

Acceptance or Rejection Criteria for Results

Background responses from procedural and matrix blanks were quantified and used to estimate method limits of detection and quantification. Acceptable recoveries of spiked samples were determined by diphacinone methods development studies as 50 to150 percent.

Results

Final analytical results were adjusted using the response of the instrumental internal standard and then adjusted for any

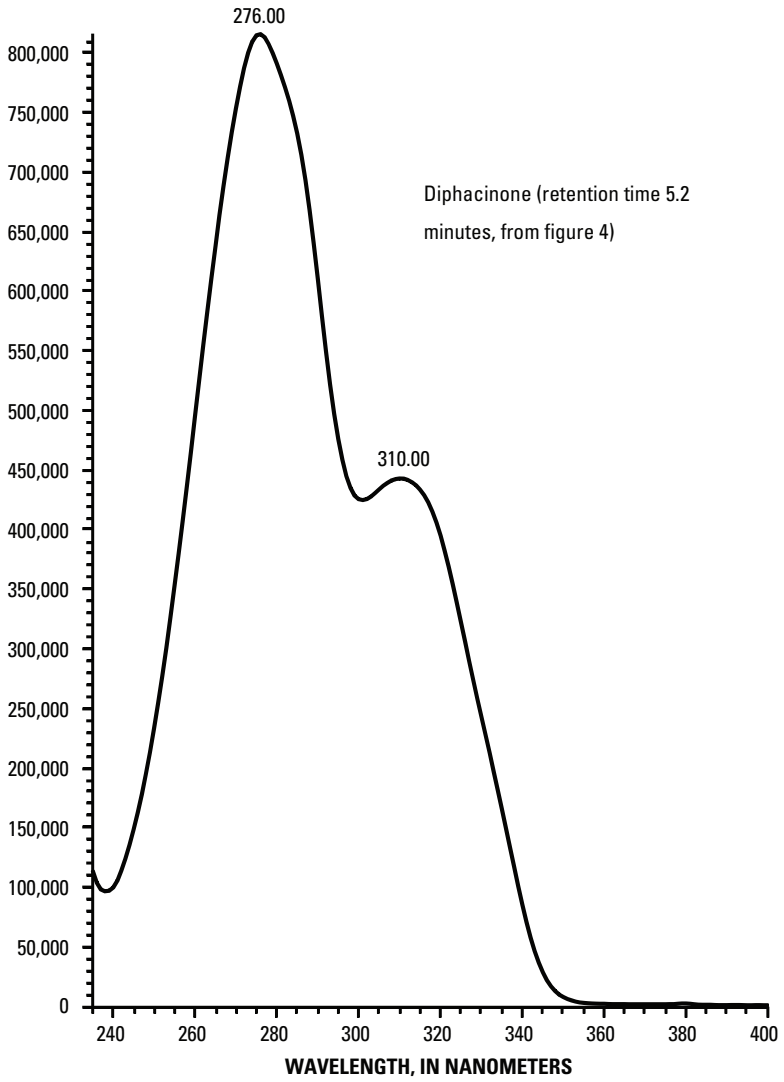

Figure 5. Photodiode array (PDA) spectrum of diphacinone.

background levels of analytes by subtraction of mass-weighted procedural blank amounts. Similarly, matrix spike recoveries were estimated after any necessary corrections.

The sample preparation methods increased in their complexity as the complexity of the sample matrices increased, generally in the order: sea water < fillet < limpet. Preparation of bait composite samples required strong and specific reaction conditions to completely release diphacinone bound in the bait matrix and the wax-like coating materials. The efficiency and selectivity of the preparatory methods that were developed for this study was reflected in the achievement of consistently low detection limits without background interferences for all matrices.

Sea Waters

The concentrations of diphacinone in Mokapu Island seawater samples were below the LOD determined for this matrix and method (table 4). The LOD was 18 ng/mL (or parts per billion), and the LOQ was 61 ng/mL according to the methods of Keith et al. (1983; 1991). Fraction 1 contained greater than 98 percent of the diphacinone in fortified sea-water samples. The instrumental internal standard (coumarin) response ranged from 96 to 108 percent of standards. Instrumental blanks, procedural blanks, and negative control samples for the seawater analyses did not have any detectable concentrations of diphacinone.

Fish Fillets

The concentrations of diphacinone in Mokapu Island Ta`ape, A'awa, and Hagi skinless fillet samples were below the LOD [table 5; 10 nanograms per gram (ng/g), or ppb]. The instrumental internal standard (coumarin) responses ranged from 96 to 104 percent. Instrumental blanks, procedural blanks, and negative control (reference) samples for the fish

Table 2. Quality-control sample types for analysis of environmental samples.

Sample type	Quality-control function
Procedural blank	Determines analyte laboratory background levels or background interferences with analyte signal.
Negative control material (Matrix blank)	Determines background interferences with analyte signal related to a representative and controllable sample matrix.
Fortified negative control material (Matrix spike)	Determines analyte recovery and assesses potential signal enhancement or suppression from a representative and controllable sample matrix.
Replicate sample—within set	Determines repeatability analyte signal associated with a specific environmental matrix.
Replicate sample—between sets	Determines the reproducibility of analyte signal associated with a specific environmental matrix.
Positive control material	Determines analyte recovery and assesses potential signal enhancement or suppression from a representative and controllable sample matrix on an ongoing basis within or between laboratories.

Table 3. Quality-control sample types and levels selected for study.

[--, not applicable]

Sample type	Quality-control level (number of samples)			
	Sea water	Fish fillet	Whole limpet	Ramik® Green Bait
Mock fortification solutions	1	1	1	1
Procedural blanks	1	1	1	1
Fortified procedural blanks	--	1	1	1
Negative control (reference) matrices	1	1	1	--
Fortified negative control (reference) matrices	1	1	1	--
Replicate samples within set	3	3	3	3
Total	7	8	8	6

Table 4. Diphacinone concentrations in sea water.

[USGS, U.S. Geological Survey; ID, identification; ng/mL, nanograms per milliliter (parts per billion, ppb); <, less than; ND, not detected; --, not applicable]

USGS ID	Field label	pH	Diphacinone (ng/mL)	Recovery (percent)
42033	Kalaupapa National Historical Park Ka Laea Point, Molokai	8.10	< 18 (ND)	--
42036	Mokapu Station 1	8.20	< 18 (ND)	--
42037	Mokapu Station 2	8.17	< 18 (ND)	--
42038	Mokapu Station 3	8.10	< 18 (ND)	--
42039	Mokapu Station 4	8.21	< 18 (ND)	--
42040	Mokapu Station 5	8.16	< 18 (ND)	--
42041-1	Mokapu Station 6—replicate 1	8.17	< 18 (ND)	--
42041-2	Mokapu Station 6—replicate 2	8.17	< 18 (ND)	--
42041-3	Mokapu Station 6—replicate 3	8.17	< 18 (ND)	--
	HPLC blank	--	< 18 (ND)	--
	SPE blank	--	< 18 (ND)	--
	Procedural blank	--	< 18 (ND)	--
42033	Negative control (reference) sea water blank Kalaupapa National Historical Park	7.96	< 18 (ND)	--
	Fortified procedural Ocean Sea Salt solution	7.96	--	88
42033-fortified	Fortified negative control (reference) sea water Kalaupapa National Historical Park	8.11	--	86

Table 5. Diphacinone concentrations in fish fillets.

[USGS, U.S. Geological Survey; ID, identification; ng/g, nanograms per gram (parts per billion, ppb); values reported on a wet-tissue weight basis; <, less than; ND, not detected; --, not applicable]

USGS ID	Field label	Sample type	Diphacinone (ng/g)	Recovery (percent)
42035	Oahu Commercial Fish Market	Blue-lined Snapper, Ta`ape (*Lutjanus kasmira*)	< 10 (ND)	--
42045	Mokapu Station 1-A	Blue-lined Snapper, Ta`ape (*Lutjanus kasmira*)	< 10 (ND)	--
42046-1	Mokapu Station 1-B—replicate 1	Blue-lined Snapper, Ta`ape (*Lutjanus kasmira*)	< 10 (ND)	--
42046-2	Mokapu Station 1-B—replicate 2	Blue-lined Snapper, Ta`ape (*Lutjanus kasmira*)	< 10 (ND)	--
42046-3	Mokapu Station 1-B—replicate 3	Blue-lined Snapper, Ta`ape (*Lutjanus kasmira*)	< 10 (ND)	--
42047	Mokapu Station 1-C	Blue-lined Snapper, Ta`ape (*Lutjanus kasmira*)	< 10 (ND)	--
42048	Mokapu Station 1-D	Blue-lined Snapper, Ta`ape (*Lutjanus kasmira*)	< 10 (ND)	--
42049	Mokapu Station E	Hogfish, A`awa (*Bodianus bilunulatus*)	< 10 (ND)	--
42050	Mokapu Station 1-F	Bridled Triggerfish, Hagi (*Sufflamen fraenatus*)	< 10 (ND)	--
	Procedural blank		< 10 (ND)	--
42035	Negative control Ta`ape (reference)	Blue-lined Snapper, Ta`ape (*Lutjanus kasmira*)	< 10 (ND)	--
	Fortified procedural sample		--	102
42035-fortified	Fortified negative control Ta`ape (reference)	Blue-lined Snapper, Ta`ape (*Lutjanus kasmira*)	--	100

fillet analyses did not have any detectable concentrations of diphacinone.

The performance throughout the method was monitored by fortified procedural samples and fortified reference Ta`ape matrix samples. No diphacinone residues were detected in the procedural blanks or reference Ta`ape samples. Method recoveries ranged from 100 to 102 percent.

Limpets

The concentrations of diphacinone in Mokapu Island limpet (whole body Opihi) samples were below the LOD (table 6; 17 ng/g). The instrumental internal standard (coumarin) responses ranged from 99 to 101 percent. Instrumental blanks, procedural blanks, and negative control (reference) samples for the whole Opihi limpet analyses did not have any detectable concentrations of diphacinone.

The performance throughout the method was monitored by fortified procedural samples and fortified field Opihi limpet matrix. No diphacinone residues were detected in the procedural or reference Opihi blanks. Method recovery was 102 percent for the fortified procedural samples and the fortified Opihi sample.

Ramik® Green Diphacinone Bait Pellets

The concentrations of diphacinone in the three composited lots of Ramik® Green baits used for the Mokapu Island rat eradication study were determined to contain from 44 to 46 µg/g (parts per million) diphacinone as determined by this methodology (table 7). The LOD and LOQ were not established because negative control bait (without diphacinone) was unavailable. The nominal concentration for the baits as reported by the manufacturer was 50 µg/g (parts per million); thus, the concentrations of diphacinone in composited lots of baits ranged from 88 to 92 percent of the nominal concentration. The amount of diphacinone recovered by reflux extraction averaged 99.4 percent of the total extractable diphacinone determined by combined reflux and sonication extraction steps. The instrumental internal standard (coumarin) responses ranged from 97 to 99 percent.

Conclusions

The analytical part of this study demonstrated that there were no matrices that contained diphacinone at or above the

Table 6. Diphacinone concentrations in whole Opihi limpets.

[USGS, U.S. Geological Survey; ID, identification; ng/g, nanograms per gram (parts per billion, ppb); values reported on a wet-tissue weight basis; <, less than; ND, not detected; --, not applicable]

USGS ID	Field label	Sample description	Diphacinone (ng/g)	Recovery (percent)
42034	Kalaupapa National Historical Park Ka Laea Point, Molokai	Limpet, Opihi (*Cellata exarata*)	< 17 (ND)	--
42042	Mokapu Station 1	Limpet, Opihi (*Cellata exarata*)	< 17 (ND)	--
42043	Mokapu Station 2	Limpet, Opihi (*Cellata exarata*)	< 17 (ND)	--
42044-1	Mokapu Station 3—replicate 1	Limpet, Opihi (*Cellata exarata*)	< 17 (ND)	--
42044-2	Mokapu Station 3—replicate 2	Limpet, Opihi (*Cellata exarata*)	< 17 (ND)	--
42044-3	Mokapu Station 3—replicate 3	Limpet, Opihi (*Cellata exarata*)	< 17 (ND)	--
	Fortified C18 SPE procedural sample			99
	Fortified LP-SEC procedural sample			100
	Procedural blank		< 17 (ND)	--
	Fortified procedural sample		--	102
42034-fortified	Fortified field Opihi (reference)	Limpet, Opihi (*Cellata exarata*)	--	102

Table 7. Diphacinone concentrations in Ramik® Green bait lot composites.

[USGS, U.S. Geological Survey; ID, identification; µg/g, micrograms per gram (parts per million, ppm); values reported on an as-received weight basis]

USGS composite ID	Field label	Sample type	Diphacinone (µg/g)
42051/42052/42053	Maui-1/-2/-3	Ramik® Green (diphacinone bait pellets)	44
42054/42055/42056	Maui-4/-5/-6	Ramik® Green (diphacinone bait pellets)	45
42057/42058/42059/42060	Maui-7/-8/-9/-10	Ramik® Green (diphacinone bait pellets)	46

method limit of detection, which ranged from about 10 to 18 parts per billion (nanograms per milliliter for sea-water samples, or nanograms per gram for tissue samples). The methods developed were satisfactory, with negligible background interferences being encountered and efficient recoveries of diphacinone, which ranged from about 86 to 102 percent in fortified matrix samples.

Concentrations of diphacinone, the active ingredient, in Ramik® Green bait samples, averaged 45 micrograms per gram (parts per million), which was 90 percent of the nominal concentration. Refluxing for 8 hours with methanolic solutions of the tetrabutylammonium phosphate (TBAP) ion-pairing reagent was required for efficient recovery of diphacinone from the bait samples.

For quality control, confirmation of peak identity and purity was made by comparing the retention times and peak spectra to diphacinone standards. All samples with diphacinone concentrations less than the limit of detection did not have peaks that matched the retention times or spectra of diphacinone standards. Additionally, the area ratios of the primary and secondary quantitation wavelengths did not correspond to known diphacinone standards, with the exception of diphacinone fortified quality-control samples

The isolation, concentration, and high performance liquid chromatography-photodiode array (HPLC-PDA) method performed well throughout the analyses of all sample matrices (sea water, fish fillet, whole limpet, and Ramik® Green bait samples). No instances of interfering compounds co-eluting with diphacinone (or with coumarin) were noted. The co-elution of compounds that interfere with analyte response (quantitation) or analyte spectra (identification) typically results in reporting an analyte as not quantifiable at an increased limit of quantification.

Acknowledgements

The authors thank Peter Dunlevy (USDA–APHIS–WS) and Cathrine Swift (USFWS) for their contributions in this effort. They have made the primary selection of the study area, and continued to work on logistics, sampling, site assessment, and other aspects of this study.

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To: Chris Swenson
Pacific Islands Coastal Program
US Fish and Wildlife Service

Peter Dunlevy
Pacific Islands Fish and Wildlife Office
USDA – APHIS – Wildlife Services

Katie Swift
Ecological Services Office
US Fish and Wildlife Service

Subject: Determination of Diphacinone in Fish Tissue

Method: 159A - Modified

Analysis Date: 3/31/08

AC Notebook Reference: AC 137 pp. 171-173

QC Notebook Reference: QC 26 p. 67

Analyst: Chad Wermager, Tom Primus

Sample Description: Fish samples arrived 03/20/08 and were logged into our sample tracking system. Samples arrived in Ziploc bags according to sample number with fish fillet individually wrapped in aluminum foil. Each tissue sample was homogenized in a SPEX liquid nitrogen freezer mill. Each homogenized sample was placed in a labeled bag, vacuum sealed and frozen (-30 °C) until analyzed.

Additional Comments: The MLOD was determined to be 0.013 ppm Diphacinone and 0.003 ppm Chlorophacinone. Modifications to method 159A included the following. After evaporating the extraction solution, each sample residue was reconstituted with 2 mL chloroform and 3 mL hexanes. During filtering before cleanup, each sample tube was rinsed with 1 mL of both chloroform and hexanes. The solid phase extraction (SPE) cleanup procedure was completed with Phenomenex Strata X-AW 33 µm polymeric weak anion (200 mg) SPE columns conditioned with 0.5 mL methanol, 1.0 mL chloroform and 1.5 mL hexanes. After loading each SPE column with the sample extract, each column was washed with a solution used to rinse the sample tube consisting of 0.25 mL methanol, 0.5 mL chloroform and 0.75 mL hexanes. The analyte was eluted off each SPE column with 12 mL of 15 mM TBA in methanol and collected in a 10 mL screw top tube.

The mobile phase was replaced with 60% 5 mM TBA in Methanol : 40% Aqueous IPCA Solution with pH ~8.5. High performance liquid chromatograph used UV detection @ 325 nm for the analytical wavelength with 360 nm as the reference.

Analyst	Date	QC Specialist	Date	Reviewer	Date
	4/19/08		4/19/08		4/19/08

Results:

Table 1. Diphacinone concentration in analyzed fish samples.

Sample Description	Lab ID	Diphacinone Conc. (ppm)
Oahu Fish Market Reference Fish	S080320-14	<MLOD
Mokapu 2/17 Fish 1	S080320-15	<MLOD
Mokapu 2/17 Fish 2	S080320-16	<MLOD
Mokapu 2/17 Fish 3	S080320-17	<MLOD
Mokapu 2/17 Fish 4	S080320-18	<MLOD
Mokapu 2/17 Fish 5	S080320-19	<MLOD
Mokapu 2/17 Fish 6	S080320-20	<MLOD

Table 2. Quality Control Recovery for Diphacinone (Surrogate Corrected).

ID	Fortification Level (ppm)	% Recovery (surrogate corrected)
QF 1	Blank	------
QF 2	Blank	------
QF 3	0.100	97.5
QF 4	0.0947	100
QF 5	0.237	103
QF 6	0.244	100
Mean		100 ± 2.3

Oahu Fish Market Reference Fish used for all QC samples (S080320-14)

Cc: Tom Primus
Doreen Griffin
John Johnston

Wildlife Services NWRC National Wildlife Research Center Analytical Services Report	United States Department of Agriculture Animal Plant Health Inspection Service Wildlife Services National Wildlife Research Center Invasive Species and Technology Development Research Program Analytical Chemistry Project	Invoice #: 08-025/3 Date: 04/21/2008 Page: 1 of 2

To: Chris Swenson
Pacific Islands Coastal Program
US Fish and Wildlife Service

Peter Dunlevy
Pacific Islands Fish and Wildlife Office
USDA – APHIS – Wildlife Services

Katie Swift
Ecological Services Office
US Fish and Wildlife Service

Subject: Determination of Diphacinone in Limpets

Method: 159A - Modified

Analysis Date: 4/14/08

AC Notebook Reference: AC 137 pp. 171, 175

QC Notebook Reference: QC 26 p. 71

Analyst: Chad Wermager, Tom Primus

Sample Description: Limpet samples arrived 03/20/08 and were logged into our sample tracking system. Samples arrived in Ziploc bags according to sample number with limpet soft tissue wrapped in aluminum foil. Samples had no shell. Reference limpets (S080320-21) required soft tissue to be removed from shell before homogenization. Each tissue sample was homogenized in a SPEX liquid nitrogen freezer mill. Each homogenized sample was placed in a labeled bag, vacuum sealed and frozen (-30 °C) until analyzed.

Additional Comments: The MLOD was determined to be 0.059 ppm Diphacinone. Modifications to method 159A included the following. Methanol was used as the extraction solution. After evaporating the extraction solution, each sample residue was reconstituted with 2 mL chloroform and 3 mL hexanes. During filtering before cleanup, each sample tube was rinsed with 1 mL of both chloroform and hexanes. The solid phase extraction (SPE) cleanup procedure was completed with Phenomenex Strata X-AW 33 µm polymeric weak anion (500 mg) SPE columns conditioned with 1.5 mL chloroform and 1.75 mL hexanes. After loading each SPE column with the sample extract, each column was washed with a solution used to rinse the sample tube consisting of 1.5 mL chloroform and 1.75 mL hexanes. The analyte was eluted off each SPE column with 12 mL of 15 mM TBA in methanol and collected in a 10 mL screw top tube.

The mobile phase was replaced with 60% 5 mM TBA in Methanol : 40% Aqueous IPCA Solution with pH ~8.5. High performance liquid chromatograph used UV detection @ 325 nm for the analytical wavelength with 360 nm as the reference.

Analyst	Date	QC Specialist	Date	Reviewer	Date
	4/14/08		4/19/08		4/19/08

Results:

Table 1. Diphacinone concentration in analyzed limpet samples.

Sample Description	Lab ID	Diphacinone Conc. (ppm)
Kalaupapa Reference Limpets	S080320-21	<MLOD
Mokapu 2/17 Limpet 1	S080320-22	<MLOD
Mokapu 2/17 Limpet 2	S080320-23	<MLOD
Mokapu 2/17 Limpet 3	S080320-24	<MLOD

Table 2. Quality Control Recovery for Diphacinone.

ID	Fortification Level (ppm)	% Recovery
QL 1	Blank	------
QL 2	Blank	------
QL 3	0.195	113
QL 4	0.201	101
QL 5	0.965	90.3
QL 6	0.975	101
Mean		101 ± 9.3

Kalaupapa Reference Limpets used for all QC samples (S080320-21)

Cc: Tom Primus
Doreen Griffin
John Johnston

Wildlife Services NWRC National Wildlife Research Center Analytical Services Report	United States Department of Agriculture Animal Plant Health Inspection Service Wildlife Services National Wildlife Research Center Invasive Species and Technology Development Research Program Analytical Chemistry Project	Invoice #: 08-025/1 Date: 04/03/08 Page: 1 of 2

To: Chris Swenson
Pacific Islands Coastal Program
US Fish and Wildlife Service

Peter Dunlevy
Pacific Islands Fish and Wildlife Office
USDA – APHIS – Wildlife Services

Katie Swift
Ecological Services Office
US Fish and Wildlife Service

Subject: Determination of Diphacinone in Seawater

Method: 158A - Modified

Analysis Date: 03/27/08

AC Notebook Reference: AC 137 pp. 169-170

QC Notebook Reference: QC 26 pp. 66

Analyst: Chad Wermager, Tom Primus

Sample Description: Water samples arrived 03/20/2008 and were logged into our sample tracking system. Water samples were in 250 mL screw top jars. Water samples were stored in a refrigerator at 4 °C until analyzed. All samples were analyzed with a modified version of method 158A. The method uses 150 mL of sample. As specified 75 mL of each set of two replicates from each sample location (total of six) were composited into a 150 mL sample. The remaining water from each of 12 samples (two from each location) was composited after the final results were tabulated. This composited sample will be used for a storage stability study.

Additional Comments: The MLOD was 0.029 ppb Diphacinone and 0.058 ppb Chlorophacinone. Method 158A modifications included omitting step 3 (addition of salt to the sample to increase ionic strength of the sample) and replacing the mobile phase with 60% 5 mM TBA in Methanol : 40% Aqueous IPCA Solution with pH ~8.5. High performance liquid chromatograph used UV detection @ 325 nm for the analytical wavelength with 360 nm as the reference.

Analyst	Date	QC Specialist	Date	Reviewer	Date
	4/19/08		4/19/08		4/19/08

Results:

Table 1. Diphacinone concentration in analyzed water samples.

Sample Description	Lab ID	Diphacinone Conc. (ppb)
Kalaupapa Reference Sea Water	S080320-01	<MLOD
Mokapu Sea Water 2/17 1A	S080320-02	<MLOD
Mokapu Sea Water 2/17 1B	S080320-03	
Mokapu Sea Water 2/17 2A	S080320-04	<MLOD
Mokapu Sea Water 2/17 2B	S080320-05	
Mokapu Sea Water 2/17 3A	S080320-06	<MLOD
Mokapu Sea Water 2/17 3B	S080320-07	
Mokapu Sea Water 2/17 4A	S080320-08	<MLOD
Mokapu Sea Water 2/17 4B	S080320-09	
Mokapu Sea Water 2/17 5A	S080320-10	<MLOD
Mokapu Sea Water 2/17 5B	S080320-11	
Mokapu Sea Water 2/17 6A	S080320-12	<MLOD
Mokapu Sea Water 2/17 6B	S080320-13	

75 mL of each sample designated as A and B were composited together for each 150 mL sample.

Table 2. Quality Control Recovery for Diphacinone (Surrogate Corrected).

ID	Fortification Level (ppb)	% Recovery (surrogate corrected)
QW 1	Blank	------
QW 2	Blank	------
QW 3	0.502	115
QW 4	0.500	114
QW 5	2.00	111
QW 6	2.00	103
Mean		111 ± 5.4

Kalaupapa Reference Sea Water used for all QC samples (S080320-01

Cc:
Tom Primus
Doreen Griffin

APPENDIX D

2008 ENDANGERED SPECIES ACT SECTION 7 CONSULTATION WITH NATIONAL MARINE FISHERIES SERVICE

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Pacific Islands Regional Office
1601 Kapiolani Blvd., Suite 1110
Honolulu, Hawaii 96814-4700
(808) 944-2200 • Fax (808) 973-2941

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SEP 05 2008
U.S. FISH & WILDLIFE SVC
PACIFIC ISLANDS FWD
HONOLULU, HI 96850

SEP - 3 2008

Patrick Leonard
Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Blvd., Room 3-122, Box 50088
Honolulu, HI 96850

Dear Mr. Leonard:

This letter responds to your letter dated August 22, 2008, requesting reinitiation of consultation under Section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. §1531 *et seq.*), on the effects of your proposed Lehua Island Ecosystem Restoration Project on ESA-listed marine species. The proposed action consists of eradication of invasive rabbits and rats by aerial rodenticide application. In our letter dated July 5, 2005, we concurred that this proposed action is not likely to adversely affect any ESA-listed marine species. The proposed action has not changed, except the seasonality of rodenticide application, prompting your reinitiation of consultation. However, the proposed action has not been altered in a manner that would change the effects to ESA-listed marine species that were considered in our July 5, 2005 concurrence letter. Thus, the rationale provided in our original letter for concurring that this action is not likely to adversely affect ESA-listed marine species remains unchanged. Therefore, we concur that the proposed action, as currently revised, is not likely to adversely affect ESA-listed marine species.

If you have further questions please contact Lance Smith of my staff at (808) 944-2258. Thank you for working with NMFS to protect our nation's living marine resources.

Sincerely,

William L. Robinson
Regional Administrator

Cc: Chris Yates – ARA PR, PIRO
Gerry Davis – ARA HC, PIRO

NMFS File No. (PCTS): I/PIR/2008/05404
PIRO Reference No.: I-PI-08-701-LVA

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawaii 96850

In Reply Refer To:
12200-2008-FA-152

AUG 22 2008

Chris Yates, Assistant Regional Administrator
Protected Resources Division
National Marine Fisheries Service
Pacific Islands Regional Office
1601 Kapiolani Blvd., Suite 1110
Honolulu, Hawaii 96814

Subject: Request for Informal Consultation under Section 7 of the Endangered Species Act for Proposed Ecosystem Restoration of Lehua Island, Hawaii

Dear Mr. Yates:

The U.S. Fish and Wildlife Service (Service) is requesting informal consultation under section 7 of the Endangered Species Act of 1973, as amended (ESA), regarding the Service's proposal to fund and carry out ecosystem restoration on Lehua Island. The proposed action is being conducted by the Service in partnership with the Hawaii Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW). In addition, the U.S. Coast Guard, which administers Lehua and maintains a navigational facility on the island, is a cooperating agency for the National Environmental Policy Act process associated with this action. The Service will also contract the U.S. Department of Agriculture to oversee technical aspects of the aerial rodenticide application on Lehua.

The Service is requesting your concurrence with our determination that the proposed action may affect, but is not likely to adversely affect, the following ESA-listed marine species known to be present in the project area: the endangered Hawaiian Monk Seal (*Monachus schauinslandi*), the threatened Green Sea Turtle (*Chelonia mydas*), and the endangered Humpback Whale (*Megaptera novaeangliae*). The project area does not include any designated critical habitat for these species and is also outside the boundaries of the Hawaiian Islands Humpback Whale National Marine Sanctuary.

Background

The Service completed an informal ESA section 7 consultation with your office in 2005 on this project for Hawaiian Monks Seals and Green Sea Turtles. In a letter dated July 5, 2005 (Attachment #1), your office concurred with our determination that the project may affect, but was not likely to adversely affect, these two species. The rabbit eradication portion of this

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project was completed but the rat eradication and subsequent native species restoration actions are still pending. The Service and DOFAW also completed a joint State-Federal Environmental Assessment (EA) for Lehua Island restoration in 2005, and issued respective findings of no significant impact.

The Service is re-initiating consultation with your office because the proposed seasonal timing of the rat eradication has been changed from summer to winter. New data has shown that the best time to conduct rat eradication on Lehua is during the winter, not during the summer as proposed in 2005. Research has shown that rats on Lehua are more susceptible to eradication during the winter when their populations are low and they are not breeding. Because of this proposed project change, we are re-initiating informal consultation and are including Humpback Whales, a species that would not have been present during a summer operation. Service staff provided a briefing on the Lehua project to members of your office on June 19, 2008.

We are also in the process of finalizing a joint State-Federal Draft Supplemental EA to address the proposed project changes (Attachment #2). The Draft Supplemental EA was sent out for public review on July 8, 2008, and the Service notified your office by letter that this document was available for review. The Final Supplemental EA will incorporate by reference relevant information in the 2005 Final EA, and will supplement the 2005 analysis of impacts to marine species. Several mitigation measures to avoid or minimize impacts to Monk Seals, Green Sea Turtles and Humpback Whales are identified in this letter and will be included in the Final Supplemental EA.

Description of the Action and the Action Area

Lehua Island is a Federally owned island administered by the U.S. Coast Guard. It is approximately 310 acres in size and is located in Kauai County approximately ¾ mile north of Niihau. Lehua is the site of one of the largest seabird colonies in the main Hawaiian Islands. However, Lehua's ecosystem continues to be damaged by alien rats (*Rattus exulans*) that were first documented on Lehua in the 1930s. The Service proposes to restore Lehua Island by eradicating rats, thereby allowing recovery of the many species of seabirds, coastal plants and insects routinely preyed upon by rats. We anticipate that removing rats will also increase plant cover, thus stabilizing soils, reducing sediment runoff into the ocean, and improving the quality of nearshore water and benthic habitats. This will have a beneficial effect on many marine species, including turtles, seals, and possibly whales. Many native terrestrial species are expected to recolonize Lehua after rats are removed, including several ESA-listed threatened and endangered plants and seabirds. Native species that are unable to effectively re-colonize the island will be re-introduced and monitored as part of the restoration program.

We propose to eradicate rats by aerial broadcast of 2-3 gram pellets containing 50ppm of the anticoagulant diphacinone. The pellets are 99.995% inert materials, primarily pressed grain. Pellets would be applied at a density of 10 to 12.5 pounds per acre. The average bait density resulting from each bait application would be approximately one bait pellet every 15 square feet. Diphacinone is an effective yet far less toxic rodenticide than that most often used for rat eradication. However, if eradication is not achieved and diphacinone is shown to be the cause of failure, then brodifacoum, a more powerful toxicant, would be considered for use the following

winter. We anticipate applying diphacinone bait on two different occasions, approximately 5-7 days apart, although there could be up to four applications if rodents are detected after the first two applications. Aerial broadcast would be accomplished by a helicopter carrying a hopper containing bait pellets, which would be distributed at low densities over the island. Each bait application will take less than a day, so the helicopter will conduct baiting operations on two (but possibly up to four) non-consecutive days. Bait bucket re-loading will be done either on Lehua or on a vessel near the island. A second helicopter may be present at the same time during the bait application for short periods in order to transport project personnel to and from the island.

One or two vessels may be present near the island for a total of a few days to support bait application, follow-up monitoring on the island, and marine sampling. Subsequent restoration actions on the island would require crews to access the island by boat, generally every one to two months. In addition, project personnel working on long-term restoration projects may be dropped off and picked up from Lehua by helicopter if the seas are rough. If this occurs, the helicopter will load, unload and then fly directly from the island back to Kauai. Field crews will sometimes stay on Lehua for multiple days but will not camp near the shoreline areas where seals haul out.

Aerial rodenticide application has successfully been used on 58 islands throughout the world to eradicate rats, including Mokapu Island off the north shore of Molokai. It is the most effective method for achieving complete removal of rats from Lehua with the least amount of environmental impact, as discussed in the Draft Supplemental EA. The pesticide label registration process for this type of pesticide use, the label requirements for users, and the licensing of pesticide applicators are all highly regulated and all operations will be in full compliance with Federal and State laws. The tentative schedule, dependent on weather conditions, is to eradicate rats in early 2009, between January and March. Re-introduction of native species and follow-up monitoring could continue for several years after that.

Baseline Human Use Conditions

Ongoing human uses at Lehua, not associated with the proposed action, include fishing from boats, gathering opihi on the Lehua shoreline, and commercial diving, snorkeling, and tour boat activities. These activities occur primarily in the summer when the channel between Kauai and Niihau is calm, although boats will go over on calm winter days as well. Niihau residents also conduct subsistence fishing and gathering in the waters around Lehua whenever waters are calm. Human activities during favorable sea conditions can be characterized as occurring at low but consistent levels.

Effects of the Action

Potential effects on Hawaiian Monk Seals and Green Sea Turtles are discussed in the 2005 Final EA, the 2008 Supplemental Draft EA, and the 2005 informal section 7 consultation with your office. The proposed change in project timing will not increase potential interactions with or risks to either of these species and, therefore, does not alter the conclusions of the original analyses, which are hereby incorporated by reference. In fact, the new project schedule may further reduce the potential for seal interactions, based on anecdotal information from Kauai boat captains familiar with Lehua waters, indicating that monk seals rarely if ever haul out on Lehua during the winter months when the rat eradication would occur. Because rabbit eradication was

successfully completed in 2006, the 2005 analyses and mitigation measures associated with hunters and their dogs on Lehua no longer apply.

Humpback Whales were not included in the 2005 discussions since they are not present in Hawaii during the summer months when the rat eradication was originally proposed to occur. They are, however, present around Hawaii during the winter and have been documented in waters around Niihau and Lehua. The following analysis of the potential for impacts to Humpback Whales is new and will also be included in the 2008 Final Supplemental EA.

Species impacts identified in 1991 NMFS *Final Recovery Plan for the Humpback Whale* that are potentially relevant to this project include acoustic disturbance caused by boats and aircraft, collisions with boats, and habitat degradation from chemical pollution (*i.e.*, rodenticides).

Acoustic disturbance would be minimal due to the small number of vessels and helicopters involved in the project and the short amount of time they would be present, generally on non-consecutive days. Their impacts would be further reduced by mitigation measures prohibiting helicopters from flying over whales and boats from approaching within 100 yards of whales.

Risks of boats colliding with whales are likewise minimal due to the low number of boats present for short periods. Any boat captains employed for the project would be aware of the presence of whales in Hawaiian waters in general and specifically around Niihau. The mitigation measure prohibiting boats from approaching within 100 yards of Humpback Whales will further reduce risks to whales.

There is no risk of rodenticide poisoning to Humpback Whales resulting from this project because there is no pathway of exposure to toxins. Whales will not be affected by rodenticide use at Lehua because: a) Humpback Whales rarely if ever feed during the time they are in Hawaiian waters; b) diphacinone and brodifacoum are virtually insoluble in water, thus precluding any risk of dermal absorption posed by pellets that accidentally fell in the water; c) field feeding trials with placebo bait pellets conducted by the Service at Lehua in 2004 indicate that nearshore fishes are not interested in eating bait pellets; and d) no impacts to or exposure of marine life were documented as a result of aerial rodenticide broadcasts in numerous rat eradications from islands worldwide, including the recently completed rat eradication at Mokapu Island, located off the north shore of Molokai. Laboratory analyses of seawater, intertidal limpets and fishes collected after the Mokapu broadcast did not detect any traces of diphacinone in any of the samples (the lab results are included as an appendix to the attached Draft Supplemental EA). In addition, project mitigation measures will be in place to help avoid accidental spread of bait into the water, including not broadcasting bait when winds exceed 35 mph or heavy rains are forecast, and using a helicopter GPS system to track flight paths and avoid over-application of bait.

During the public comment period on the Draft Supplemental EA, we received a comment letter expressing concern about the fact that a Humpback Whale calf stranded and died on Maui on February 25, 2008, 13 days after the Mokapu Island rat eradication was completed off the north shore of Molokai. Because of the concerns raised about the timing of this incident, the Service arranged for testing of liver samples taken from the calf for diphacinone residues just after the stranding occurred and prior to receipt of this comment letter. Diphacinone concentrates in the

liver and would be expected to be present if the calf had been directly exposed to diphacinone either in utero or after birth via ingestion or dermal absorption, or if it had been indirectly exposed through its mother's milk.

The liver samples were analyzed for diphacinone residues by laboratories at the U.S. Department of Agriculture's National Wildlife Research Center and the U.S. Geological Survey-Biological Resources Division's Columbia Environmental Research Center. Neither laboratory detected any diphacinone residues. Laboratory detection limits for diphacinone were 77 parts per billion (ppb) and 15 ppb, respectively. In addition, verbal communications and emails from the NOAA Marine Mammal Stranding Coordinator in Hawaii stated that the gross necropsy of the calf showed nothing abnormal and that there is no evidence of a causal connection between the Mokapu diphacinone application and the calf's death. For these reasons, coupled with the lack of any feasible exposure pathway (as discussed above) to the whale calf or its mother through ingestion or dermal absorption of diphacinone, there is no reason to suspect that the incident was associated with the Mokapu Island rat eradication. Therefore, this incident does not provide any reason to alter the conclusion that rodenticide use at Lehua poses no risk to Humpback Whales.

Project Mitigation Measures for ESA-listed Marine Species

The following mitigation measures will be implemented to avoid project-related impacts or minimize them to insignificant or discountable levels:

- Ground crews conducting monitoring or other restoration activities on Lehua will maintain a 100 foot distance from Hawaiian Monk Seals hauled out on the shoreline.
- The helicopter will be required to avoid flying over or spreading bait onto any Hawaiian Monk Seals hauled out on Lehua.
- The helicopter will be required to avoid flying over Humpback Whales.
- No vessel associated with the project will approach within 100 yards of Humpback Whales.
- The helicopter will fly over land when distributing bait pellets.
- Diphacinone, an effective yet far less toxic rodenticide than that most often used for rat eradication, will be the first choice for use on Lehua.
- The helicopter pilot will guide and record bait application with an on-board differential global positioning system (GPS), assuring uniform and complete coverage of the island without over-application.
- To avoid bait being washed into the ocean by rain before it is consumed by rats, bait will only be applied when no significant rainfall is forecasted.
- To avoid uncontrolled bait spread and to comply with pesticide label requirements, bait will not be applied when winds exceed 35 mph (30 knots).
- Marine monitoring will be conducted following bait application and nearshore samples of water, fish, and invertebrates will be tested for rodenticide residues. Test results will immediately be made available to agencies and the public.

Conclusion

We have determined that the proposed ecosystem restoration actions at Lehua Island may affect, but are not likely to adversely affect, Hawaiian Monk Seals, Green Sea Turtles, and Humpback Whales. This project will benefit ESA-listed marine species by reducing sediment runoff into the ocean and improving the quality of nearshore waters and benthic habitats. If you have

questions or comments, please contact Coastal Program Coordinator Chris Swenson by telephone at (808) 792-9400 or by fax at (808) 792-9581.

Sincerely,

Patrick Leonard
for Field Supervisor

Attachments (2)

cc w/out attachments: Paul Conry, DOFAW
Thomas Kaiakapu, DOFAW
Jay Silberman, USCG
Mike Pitzler, USDA

APPENDIX E

COPIES OF PUBLIC COMMENT LETTERS RECEIVED

LINDA LINGLE
GOVERNOR
THEODORE E. LIU
DIRECTOR
MARK K. ANDERSON
DEPUTY DIRECTOR
ABBEY SETH MAYER
DIRECTOR
OFFICE OF PLANNING

DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

OFFICE OF PLANNING
235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

Telephone: (808) 587-2846
Fax: (808) 587-2824

Ref. No. P-12195

July 23, 2008

Mr. Chris Swenson
U.S. Fish and Wildlife Service
300 Ala Moana Boulevard, #3-122
Honolulu, Hawaii 96850

Dear Mr. Swenson:

Subject: Hawaii Coastal Zone Management (CZM) Program Federal Consistency Review for Rat Eradication on Lehua Island, North of Niihau

The proposal to use rodenticides to eradicate rats from Lehua Island (north of Niihau), which is a designated State Seabird Sanctuary, has been reviewed for consistency with the Hawaii CZM Program. It is our understanding that the aerial broadcast of rodenticide will occur over a maximum of four days in the winter of 2008-2009. We concur with your determination that the activity is consistent to the maximum extent practicable with the Hawaii CZM Program enforceable policies.

CZM consistency concurrence is not an endorsement of the project nor does it convey approval with any other regulations administered by any State or County agency. Thank you for your cooperation in complying with the Hawaii CZM Program. If you have any questions, please call John Nakagawa of our CZM Program at 587-2878.

Sincerely,

Abbey Seth Mayer
Director

c: Department of Land and Natural Resources,
Division of Forestry and Wildlife
Department of Planning, County of Kauai

BILL "KAIPO" ASING
MAYOR

GARY K. HEU
ADMINISTRATIVE ASSISTANT

IAN K. COSTA
DIRECTOR OF PLANNING

IMAIKALANI P. AIU
DEPUTY DIRECTOR OF PLANNING

COUNTY OF KAUA'I
PLANNING DEPARTMENT
4444 RICE STREET
KAPULE BUILDING, SUITE A473
LIHU'E, KAUA'I, HAWAI'I 96766-1326

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August 4, 2008

Chris Swenson
Fish and Wildlife Services
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, HI 96850

Subject: Response to Request for Public Comment on Draft Supplemental Environmental Assessment for the Lehua Island Ecosystem Restoration Project, Kaua'i County

Dear Mr. Swenson:

Thank you for the United States Department of Interior request for Fish and Wildlife Services review and comment, pursuant to the National Environmental Policy Act on the Draft Supplemental Environmental Assessment. The County of Kaua'i Planning Department has reviewed the above referenced Environmental Assessment for consistency with the County of Kaua'i General Plan Objectives and Policies and has determined that the EA for the Lehua Island Ecosystem Restoration Project falls within the stated policies and objectives. The project goals to restore an environmentally sensitive area and to reverse negative impacts caused by the invasive rodents are consistent with the General Plan.

IAN K. COSTA
Planning Director

AN EQUAL OPPORTUNITY EMPLOYER

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PACIFIC ISLANDS FWO

Conservation Council for Hawai'i

August 7, 2008

Patrick Leonard
Field Supervisor
Pacific Islands Fish and Wildlife Office
U.S. Fish and Wildlife Service
300 Ala Moana Blvd., Room 3-122
Honolulu, HI 96850

Via Facsimile Transmittal: 808 792-9581

Comments on Lehua Island Ecosystem Restoration Plan

Aloha. Conservation Council for Hawai'i supports efforts by the U.S. Fish and Wildlife Service and Hawai'i Department of Land and Natural Resources to restore habitat for native Hawaiian seabirds, plants, and other wildlife on Lehua Island, and the proposed use of diphacinone to eradicate introduced rats.

Based on the research and testing required to use diphacinone and information provided in the Draft Supplemental Environmental Assessment for the Lehua Island Ecosystem Restoration Project, we believe the proposed action will greatly benefit 16 seabird species and other Hawaiian wildlife, and will not harm non-target species. Monitoring the proposed action will provide additional safeguards. Given everything we know about the harm rats cause to native Hawaiian birds, tree snails, plants, and ecosystems, we believe the proposed action is necessary to save Lehua Island. No action is not an option if we are going to save what little remains of our unique flora and fauna. We urge you to move forward.

Thank you for the opportunity to comment.

Sincerely

Marjorie Ziegler

Working Today for the Nature of Tomorrow!

Telephone/Fax 808.593.0255 • email: info@conservehi.org • web: www@conservehi.org
P.O. Box 2923 • Honolulu, HI 96802 • Office: 250 Ward Ave., Suite 212 • Honolulu, HI 96814

Hawai'i Affiliate of the National Wildlife Federation

President: *Julie Leialoha* * Vice-President: *Nelson Ho* * Secretary/Treasurer: *Kim Ramos* * Directors: *Fred Kraus, Ph.D.* * *Douglas Lamerson, Maura O'Connor* * *George Robertson* * *Claire Shimabukuro* * *Helene Takemoto* .* Executive Director: *Marjorie Ziegler*

Nick Holmes
<ndholmes@hawaii.edu>
07/28/2008 09:08 AM

To Chris_Swenson@fws.gov
cc Thomas.J.Kaiakapu@hawaii.gov, Scott.Fretz@hawaii.gov
bcc
Subject Comments for Lehua EA

Hi Chris

Please consider these my comments for the Lehua EA. I'm not sure if they need to go via an official DOFAW comment list, so cc'd in Thomas and Scott as well.

The proposed Lehua rat eradication is of immense value for Hawaiian seabirds. Removal of rats will allow smaller species unable to breed with rat predation to return, with potential re-colonizers / colonizers including Grey-backed Tern, Sooty Tern, Brown Noddy, Blue Grey Noddy and Christmas Shearwater. Rat removal will also create habitat for including endangered species of Newell's shearwater and Band-rumped storm-petrel, and potentially Hawaiian petrel. Given the immense difficulty in protecting these endangered species on the main Hawaiian Islands, and the absence of other common predation threats to these species on Lehua (cats, pigs, dogs), Lehua represents an invaluable exercise in potentially creating / restoring a new colonies of these birds.

The monitoring procedures both during and after the rodenticide drop are sound and adequately meet the objectives of ensuring a safe and successful drop.

Best
Nick

.....

Nick Holmes, PhD
Coordinator
Kauai Endangered Seabird Recovery Project
PO Box 458
4622 Waimea Canyon Drive
Waimea HI 96796
P. 808 338 1361
C. 808 346 3782

Gina 7/15
Jeff N CR
copied for
Chris S.

Mrs. Margret Lohfeld
3425 Amesbury Rd
Los Angeles CA 90027-1424

RECEIVED
2008

July 10, 2008

TO: U.S. Fish and Wildlife service
reg. Lehua Island Ecosystem
Restoration Plan

First off: Thank you for sending me your NEWS RELEASE. From that information sheet I gather that the rat eradication will be performed properly, at the proper time, causing little or no environmental damage so that native species can flourish.

Since I am not a biologist I have to trust that you will use the most effective method and chemicals to get rid of the rats on Lehua Island.

Sincerely,

Mrs. Margret Lohfeld
Member The Ocean Conservancy

Chris Swenson
USFWS
300 Ala Moana Blvd.
Rm 3-122
Honolulu, HI 96850

JU 2008

July 10, 2008

Dear Sir:

I support the proposed Lehua Pacific Rat eradication efforts in order to conserve seabirds and their habitat. Rats are notorious for their depredations on individual bird chicks, eggs and plants that hold the ground in place. Island restoration is an on- going effort throughout the World, and in Hawaii, especially; the offshore islands need and deserve the attention proposed by this project. I urge you to consider the entire ecosystem effects of these introduced predators, their effect on seeds, seedlings, erosion, insects, an rare and endangered plants and of course seabirds.

The complete eradication of small mammals from Lehua will make his island a literal ark for endangered species found on other islands in the Northwest Hawaiian Islands.
For example, s recent sighting of a Blue Noddy off Niihau where they have not been seen breeding since around 1923 suggests they may be prospecting nesting sites. These smallest of terns are extremely susceptible to rodent depredation. The elimination of rats from Lehua will make this island a potential and only nesting site for them in the main Hawaiian Islands. Lehua will also become a plant refuge and a place where the Nihoa Finch might be placed in case of disaster there.

I believe that with final eradication of rodents, Lehua will become an important seabird colony on par with Moku Manu, a State seabird sanctuary off Oahu and the other Federal refuges in the Northwestern Hawaiian Islands.

Good Luck.

Sincerely,

Mark Rauzon
Marine Endeavors
4701 Edgewood Ave.
Oakland, CA 94602

July 9, 2008

JUL 2008

U.S. Fish and Wildlife Service
Pacific Islands office
300 Ala Moana Boulevard, Room 3-122
Honolulu, HI 96850

Dear Sir:

I fully support the proposed project that would eradicate non-native rats on Lehua Island, Kauai. Through the years, man has made many devastating changes to the natural environment. It's great that in this isolated instance corrections can be made that will help return the island to a more natural state for both plant and animal life.

Sincerely yours,

Melvin L. Gabel
3-3400 Kuhio Hwy C102
Lihue, HI 96766

LINDA LINGLE
Governor

SANDRA LEE KUNIMOTO
Chairperson, Board of Agriculture

DUANE K. OKAMOTO
Deputy to the Chairperson

State of Hawaii
DEPARTMENT OF AGRICULTURE
1428 South King Street
Honolulu, Hawaii 96814-2512

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U.S. FISH & WILDLIFE SVC
PACIFIC ISLANDS FWO

August 4, 2008

Mr. Chris Swenson
U.S. Fish and Wildlife Service
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawaii 96850

Dear Mr. Swenson:

Thank you for the opportunity to comment on the Draft Supplemental Environmental Assessment (DSEA) for the Lehua Island Ecosystem Restoration Plan. The Hawaii Department of Agriculture has the following comments on the assessment:

There are significant concerns regarding the aerial application of restricted-use pesticides in a situation where there are no enforceable slope requirements and when there is allowance of wind speeds up to 35 knots. There is also no toxicity data for marine mammals or comprehensive review of exposure pathways. While the National Marine Fisheries Service was consulted for the Hawaiian monk seal and sea turtles, all other marine mammals were not addressed in the information presented in the DSEA.

A summary of the Hawaii Department of Agriculture's concerns with the label proposed for use are attached to these comments.

There have been problems in Hawaii with uniform applications with the bait hopper carried under a helicopter. Uneven distribution occurred at the Keauhou Ranch in September 2003. One of the outcomes was a significant improvement of non-target toxicity information to mammals because a number of feral pigs were unexpectedly poisoned during that study.

There is no discussion about unacceptable operating conditions except with wind exceeding 35 miles per hour. Since only aerial applications will be conducted all alternative application methods have been removed from the DSEA. There appear to be slopes on Lehua which would result in uneven distribution of baits. How will uniform distribution (a stated objective of the study) be assured? Will less bait be deposited on steeper slopes? If so, what will the rate of application be for the different slopes on Lehua Island? Will the pilot determine this in flight?

No spray adjuvants such as stickers are discussed. Stickers would assist in uniform bait distribution. Normally stickers are used with aerosols or particle pesticide applications. There may be no commercially available stickers for pellets. Consideration should be given to develop a sticker for pellets that is palatable to rats and provides for more uniform distribution of the pellets when applied by air (especially where there are significant slopes that would favor uneven distribution of baits).

There were several water and tissues results of analyses presented for the February 6 and 12, 2008 Mokapu Island applications. Among the restrictions on the aerial permit issued by the

Department of Agriculture on February 5, 2008 was the statement, "Do not allow pellets/bait to enter water during application." See aerial permit attached. With this restriction, no residues would be expected in marine ecosystems. The small amount of diphacinone that would enter the water from the degradation of baits is unlikely to be detected in any marine ecosystem. The bait has 50 parts per million diphacinone. Residues of diphacinone may be detected in run-off from precipitation, but are unlikely to be detected once the run-off is diluted with sea water. There were also no results provided from the humpback whale calf that was reported to have beached on Puamana Beach, Maui on February 25, 2008 (an unfortunate coincidence or connection to the rodenticide applications). This concern was specifically identified to the National Marine Fisheries Services and the U.S. Fish and Wildlife Services. We were informed that tissue samples would be collected from the humpback whale calf. What were the results?

It should be noted that anticoagulants act to prevent blood clotting. Different species are more susceptible than others. However, some events may result in a species that is not particularly susceptible to be affected. Warfarin (Coumarin), one of the first anticoagulants, was identified when calves fed fermented alfalfa suffered uncontrolled bleeding following dehorning operations. A later use was to dose cattle in areas with vampire bats with anticoagulant to control (kill) bats feeding on cattle. Birthing can trigger a bleeding event. LD 50 values are important in assessing hazards to mammals or other animals not at risk or subject to bleeding events. However, an entirely different set of values should be applied for anticoagulants to susceptible individuals (pregnant female mammals that bleed during birth).

The American Association of Poison Control Centers reported 18 human fatalities associated with anticoagulants during 2006. What was the number of fatalities when Dipaxin was used?

Although there is extensive human exposure data with anticoagulants, there is very limited information on the toxicity of diphacinone to marine mammals. One way to mitigate this lack of information is to prohibit its application to water. This restriction will continue until better information on toxicity and exposure of anticoagulants to endemic Hawaiian marine mammals is available.

Thank you for the opportunity to comment.

Sincerely,

Robert A. Boesch

Robert A. Boesch
Pesticides Program Manager

Enclosures:

Letter to Debra Edwards, Office Director, Office of Pesticides Programs, dated July 11, 2008
Permit to Apply Restricted Use Pesticides by Aircraft, Permit No. MA-08-01 dated 2/5/08
Printout of abc KITV.com story entitled "Beached Whale Calf Found On Maui Shore", posted February 25, 2008
Map with Locations of Mokapu Island and Puamana Beach
2006 Annual Report of the American Association of Poison Control Center's National Poison Data System, A.C. Bronstein, et.al., page 832.

LINDA LINGLE
Governor

SANDRA LEE KUNIMOTO
Chairperson, Board of Agricultu

DUANE K. OKAMOTO
Deputy to the Chairperson

State of Hawaii
DEPARTMENT OF AGRICULTURE
1428 South King Street
Honolulu, Hawaii 96814-2512

July 11, 2008

Ms. Debra Edwards
Office Director
Office of Pesticides Program
USEPA Headquarters
Ariel Rios Building
1200 Pennsylvania Avenue, N. W.
Mail Code: 7501P
Washington, DC 20460

Dear Ms. Edwards:

The U.S. Fish and Wildlife Services and other wildlife protection agencies are using anticoagulant rodenticides to control rats that prey on birds and damage vegetation on off-shore islands. In some locations, aerial broadcast of rodenticide pellets is employed. Some of these islands have steep slopes and pellets are likely to fall into the ocean. Much of the ocean around Maui and portions of Oahu, Kauai, and Big Island is humpback whale sanctuary. Humpback whales migrate to Hawaii during the winter and give birth to calves. Hawaiian Monk Seals are another marine mammal that is endemic to the Hawaiian Islands. Both mammals are endangered species. Conditions placed on permits to prohibit the application or drift of pellets to the ocean has met considerable resistance from the wildlife conservation agencies

The following are what we understand to be the key issues:

1. The Office of Pesticides Programs has no testing guidelines designed to determine the risks of pesticides to marine mammals;
2. Because there are no pesticides currently registered for use in oceans, seas, or other deep ocean areas, any registration for these areas should receive registration from the U.S. Environmental Protection Agency;
3. State agencies may be authorized to implement the Clean Water Act, including the National Pollution Discharge Elimination System (NPDES). The NPDES programs are designed to regulate discharges to any waterway of the United States. Oceans, seas, straits, reefs, and other marine environments are waterways within the recognized territorial boundaries are waterways of the United States.
4. Authorized States may issue NPDES permits for marine environments.
5. Authorized states are likely to have knowledge of the impact of contaminants on receiving waters they regulate

6. The application of pesticides to control terrestrial pests is not addressed by EPA's rules and policies concerning FIFRA/Clean Water Act coordination.
7. The HDA does not have the expertise needed to determine impact of rodenticides on marine mammals and would require external review to assure that agencies knowledgeable in marine mammals and/or regulating discharges to the ocean are included in the review.
8. The HDA places a condition on aerial permits near coastal waters to prohibit application to water.

This is to request data or rationale submitted in support of removal of the prohibition "Do not apply this product directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark", especially data or rationale concerning effects on endangered marine mammals. This data is critical to determine whether or not we will continue to include the prohibition on application to water as a condition of aerial permits issued by the State for restricted-use pesticides.

Please contact me at 808-973-9404 should you have any questions concerning this request.

Sincerely,

Robert A. Boesch
Pesticides Program Manager

Enclosure: Amended label for Diphacinone-50: Conservation Pelleted Rodenticide Bait for Conservation Purposes

C: Clean Water Branch, Department of Health
Larry Lau, Deputy Director of Health
U.S. Fish and Wildlife Services
U. S. Environmental Protection Agency, Region IX
U.S. Environmental Protection Agency, Registration Division Insecticide-Rodenticide Branch (7504C)
U.S. Environmental Protection Agency, Environmental Fate and Effects Division (7507P)

LINDA LINGLE
Governor

SANDRA LEE KUNIMOTO
Chairperson, Board of Agriculture

DUANE K. OKAMOTO
Deputy to the Chairperson

State of Hawaii
DEPARTMENT OF AGRICULTURE
Pesticides Branch
1428 South King Street
Honolulu, Hawaii 96814-2512
Phone: (808) 973-9401 Fax: (808) 973-9418

PERMIT TO APPLY RESTRICTED USE PESTICIDES BY AIRCRAFT

Permit No. MA-08-01 **Certification No.** H72166/A15048

Date Issued 02/05/08 **Expiration Date** 03/05/08

To: (Name) Peter Dunlevy (A15048 cat. 2)

(Address) USDA- APHIS- Wildlife Services
3375 Koapaka St., H-420, Honolulu, HI 96819

Permission is hereby given to apply a restricted use pesticide by aircraft as specified in your application of 02/04/08 **(Date).**

This permit is conditioned upon compliance with the Administrative Rules on Pesticides of the Department of Agriculture applicable to aerial applications of restricted-use pesticides and upon the following additional conditions deemed necessary to avoid unreasonable adverse effects on the environment:

A responsible certified supervisor shall be present at the site during aircraft operations.

No aircraft spraying shall be conducted when wind velocity exceeds 10 MPH (25 MPH for aerial applications of diphacinone rodenticide bait).

Additional restrictions:

Note: application will be video-taped. Please notify Lester Chin, HDOA when you plan to apply at (808) 873-3557/(808) 283-9122. Pilot: David Okita (H72166 cat. 4). Do not allow pellets/bait to enter water during application.

- FOLLOW ALL PESTICIDE LABEL DIRECTIONS.
- You must adhere to all instructions, procedures and conditions of this permit.
- The applicant must notify the Pesticides Branch at 973-9401 of any changes on the Permit.
- Applicant must notify the Pesticides Branch, in writing, at least three (3) days prior to each application.

Lyle Wong

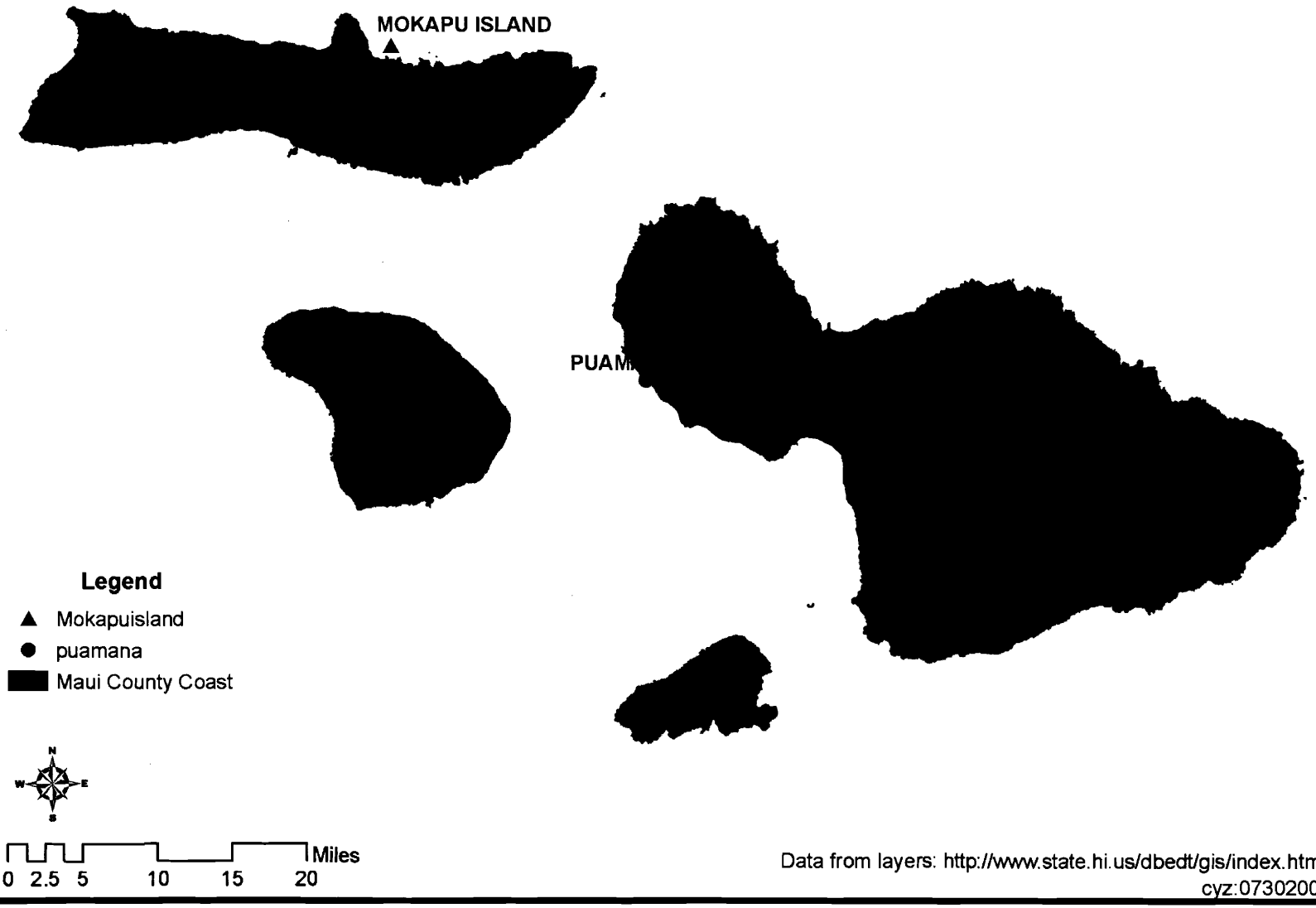
LYLE WONG
Plant Industry Administrator

Form P-24
(Rev. 01/08)

Island Fresh

For Bob Boesch

Mokapu Island: Aerial Application of Diphacinone, 02/12/08
Puamana Beach: Location of beached whale calf, 02/25/08



Data from layers: http://www.state.hi.us/dbedt/gis/index.html
cyz:07302008

Downloaded By: [University of Colorado Health Sciences Center] At: 17:31 28 December 20C

Clinical Toxicology (2007) **45**, 815–917
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ISSN: 1556-3650 print / 1556-9519 online
DOI: 10.1080/15563650701754763

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healthcare

AAPCC 2006 ANNUAL REPORT OF THE NPDS

2006 Annual Report of the American Association of Poison Control Centers' National Poison Data System (NPDS)

ALVIN C. BRONSTEIN, M.D., DANIEL A. SPYKER, PH.D., M.D.,
LOUIS R. CANTILENA, JR, M.D., PH.D., JODY GREEN, PH.D., BARRY H. RUMACK, M.D.,
and STUART E. HEARD, PHARM.D.

Address correspondence to Alvin C. Bronstein, MD, FACMT, American Association of Poison Control Centers, 3201 New Mexico Avenue NW Suite 330, Washington, DC 20016, USA. E-mail: annualreport@aapcc.org

Downloaded By: [University of Colorado Health Sciences Center] At: 17:31 28 December 20C

Table 17C. Substances most frequently involved in adult* (> 19 years) exposures (Top 25)

Substance	Number	%**
Analgesics	127,135	15.1
Sedative/hypnotics/antipsychotics	106,705	12.7
Cleaning substances (household)	74,926	8.9
Antidepressants	64,145	7.6
Bites and envenomations	53,715	6.4
Cardiovascular drugs	50,643	6.0
Alcohols	45,448	5.4
Pesticides	41,487	4.9
Food products/food poisoning	37,497	4.5
Cosmetics/personal care products	33,633	4.0
Chemicals	28,525	3.4
Anticonvulsants	27,108	3.2
Fumes/gases/vapors	26,691	3.2
Hydrocarbons	25,745	3.1
Antihistamines	24,341	2.9
Hormones and hormone antagonists	23,506	2.8
Antimicrobials	23,381	2.8
Stimulants and street drugs	22,949	2.7
Cold and cough preparations	20,576	2.5
Muscle relaxants	18,209	2.2
Topical preparations	17,193	2.0
Gastrointestinal preparations	13,036	1.6
Miscellaneous drugs	12,620	1.5
Foreign bodies/toys/miscellaneous	11,121	1.3

*Includes all adults with actual or estimated ages > 19 years old. Results also include "Unknown Adult" but do not include "Unknown Ages"
**Percentages are based on the total number of human exposures (2,403,539) rather than the total number of substances.

Table 18. Categories associated with largest number of fatalities (Top 25)

Substance	Number	% of all exposures in category
Sedative/hypnotics/antipsychotics	382	0.280
Opioids	307	1.030
Cardiovascular drugs	252	0.310
Acetaminophen in combination	214	0.300
Antidepressants	210	0.250
Stimulants and street drugs	203	0.450
Alcohols	139	0.210
Acetaminophen only	138	0.200
Muscle relaxants	98	0.410
Anticonvulsants	93	0.230
Cyclic antidepressants	75	0.720
Fumes/gases/vapors	69	0.170
Antihistamines	66	0.090
Aspirin alone	61	0.350
Other nonsteroidal anti-inflammatory drugs	55	0.060
Unknown drug	49	0.280
Chemicals	38	0.100
Oral hypoglycemics	35	0.300
Miscellaneous drugs	27	0.120
Diuretics	25	0.240
Automotive/aircraft/boat products	25	0.180
Antihistamine/decongestant, without phenylpropanolamine	22	0.040
Hormones and hormone antagonists	20	0.050
Anticoagulants	18	0.290

1. Undoubtedly responsible (and Proximate Cause of Death) – In the opinion of the Case Review Team the Clinical Case Evidence established beyond a reasonable doubt that the SUBSTANCES actually caused the death.
2. Probably responsible – In the opinion of the Case Review Team the Clinical Case Evidence suggests that the SUBSTANCES caused the death, but some reasonable doubt remained.
3. Contributory – In the opinion of the Case Review Team the Clinical Case Evidence establishes that the SUBSTANCES contributed to the death, but did not solely cause the death. That is, the SUBSTANCES alone would not have caused the death, but combined with other factors, were partially responsible for the death.
4. Probably not responsible – In the opinion of the Case Review Team the Clinical Case Evidence, established to a reasonable probability, but not conclusively, that the SUBSTANCES associated with the death did not cause the death
5. Clearly not responsible (and Not Contributory) – In the opinion of the Case Review Team the Clinical Case Evidence establishes beyond a reasonable doubt that the SUBSTANCES did not cause this death.
6. Unknown – In the opinion of the Case Review Team the Clinical Case Evidence was insufficient to impute or refute a causative relationship for the SUBSTANCES in this death.

Table 19. Comparisons of fatality data (1985–2006)

	Total fatalities		Suicides		Pediatric death	
Year	No.	% of cases	No.	% of deaths	No.	% of deaths
1985	328	0.037	174	(53.0)	20	(6.1)
1986	406	0.037	223	(54.9)	15	(3.7)
1987	398	0.034	227	(57.0)	22	(5.5)
1988	544	0.040	296	(54.4)	30	(5.5)
1989	590	0.037	323	(54.7)	24	(4.1)
1990	553	0.034	320	(57.9)	21	(3.8)
1991	764	0.042	408	(53.4)	44	(5.8)
1992	705	0.038	395	(56.0)	29	(4.1)
1993	626	0.036	338	(54.0)	27	(4.3)
1994	766	0.040	410	(53.5)	26	(3.4)
1995	724	0.036	405	(55.9)	20	(2.8)
1996	726	0.034	358	(49.3)	29	(4.0)
1997	786	0.036	418	(53.2)	25	(3.2)
1998	775	0.035	421	(54.3)	16	(2.1)
1999	873	0.040	472	(54.1)	24	(2.7)
2000	921	0.042	477	(51.8)	20	(2.2)
2001	1085	0.048	553	(51.0)	27	(2.5)
2002	1169	0.049	635	(54.3)	27	(2.3)
2003	1109	0.046	592	(53.4)	35	(3.2)
2004	1190	0.049	642	(53.9)	27	(2.3)
2005	1,261	0.052	623	(49.4)	24	(1.9)
2006	1,229	0.050	611	(49.7)	29	(2.4)

Table 20. Frequency of plant exposures (Top 25)

Botanical name	Number
Spathiphyllum species	2,133
Euphorbia pulcherrima	1,615
Ilex species	1,572
Philodendron spp	1,514
Phytolacca americana	1,358
Toxicodendron radicans	1,194
Schlumbergera bridgesii	705
Ilex opaca	608
Crassula argentea	604
Plants-cardiac glycosides	583
Malus species	582
Taraxacum officinale	581
Pepper mace	566
Epipremnum aureum	566
Plants-cyanogenic glycosides	555
Plants-pokeweed	543
Mold	538
Caladium spp	533
Nandina domestica	530
Narcissus pseudonarcissus	474
Spinacia oleracea	467
Cactus (Unknown type or name)	460
Rosa spp	450
Quercus spp	447
Hedera helix	446

Beached Whale Calf Found On Maui Shore

HONOLULU -- A humpback whale calf beached itself on Maui on Monday morning and later died, officials with the Pacific Whale Foundation said.

The 8- to 10-foot whale calf came onto shore at Puamana Beach. Officials with the foundation estimated the calf is a couple of weeks old.

There were no signs of cuts or shark bites, they said. Researchers said the calf looked emaciated and unhealthy.

Department of Land and Natural Resources teams went up and down the shoreline to prevent any sharks from going close to the beaches.

The carcass will be removed, and a necropsy will be performed by DLNR.

Beached whales are rare on Maui, according to a researcher with the foundation. Most ill whales are normally attacked by sharks before coming to shore, she said.

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YOU WORK HARD DURING THE DAY. YOUR SPRINKLER SHOULDN'T.

DON'T WATER YOUR LAWNS BETWEEN 9AM AND 5PM.

DON'T WASTE WATER

APPENDIX F

COPY OF RESPONSE TO PUBLIC COMMENT LETTER

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL ST., ROOM 325
HONOLULU, HAWAII 96813
TEL (808) 587-0166 FAX (808) 587-0160

October 8, 2008

Mr. Robert Boesch
Manager, Pesticide Branch
Department of Health
1428 S. King Street
Honolulu, HI 96814-2512

Dear Mr. Boesch:

Subject: Response to Comments on the Draft Environmental Assessment for a Proposed Ecosystem Restoration Project on Lehua Island, Kaua`i County

This letter is in response to your August 4, 2008, comment letter on the Draft Supplemental Environmental Assessment (EA) for the Lehua Island Ecosystem Restoration Project. An italicized summary of each of your comments and a reference to its location in your letter is included, followed by our response.

Lack of information for other marine mammals besides seals (Paragraph 2, sentence 3)

- The Service recently completed an informal consultation with the National Marine Fisheries Service (NMFS), under section 7 of the Federal Endangered Species Act (ESA), on the potential effects of the Lehua project on threatened and endangered marine species, including humpback whales. NMFS' response letter (included as Appendix D in the final Supplemental EA) concurs with the Service's determination that the project is unlikely to adversely affect any ESA-listed marine species, including humpback whales.

- A new section was added to Chapter 3 of the Final Supplemental EA to provide additional risk analysis for humpback whales.

Concern about a lack of data on rodenticide toxicity to marine mammals (Paragraph 2, sentence 1 and Paragraph 10, sentence 1)

- According to the NMFS recovery plan for humpback whales, they do not feed in Hawaii so there is no viable pathway by which humpback whales can ingest rodenticide pellets. Therefore, precise estimations of toxicity of the compound to that animal are not required to determine risk.

- No exposure pathway exists because: a) they are not known to feed when they are in Hawaii; b) diphacinone is almost completely insoluble in water; and c) there is no evidence of marine contamination resulting from any previous aerial rodenticide broadcast, including the one done at Mokapu Island. Seawater, fish and invertebrates collected at Mokapu all tested negative for diphacinone residues.

Concerns about uneven bait distribution at Keauhou Ranch and toxicity to non-target mammals (Paragraph 4, sentences 1- 2)

- Many improvements have been made since the misapplication of bait occurred at Keauhou Ranch in 2003. These include safeguards that will ensure that bait is evenly and correctly applied at Lehua. Now regarded as standard operating procedures, safeguards such as the use of differential GPS and GIS to track bait application were not used at Keauhou. Also, the bait bucket used for Keauhou was old, had been stored under poor conditions, and had not been properly maintained or repaired. Consequently, it malfunctioned during the application.

- The final report on the Keauhou operation concluded that: "Numerous deviations from the study protocol and from the terms of the EPA permit, such as pigs tampering with bait stations, bait spillage, and an uneven broadcast application rate likely allowed pigs to efficiently forage on concentrated sources of diphacinone bait."

- New buckets with current technology that ensures even bait distribution were purchased in 2007 and will be used on Lehua. The bucket is calibrated prior to each use to confirm that bait is being distributed at the desired application rate and a differential GPS is used to accurately record the location of application swaths. The pilot will use the real-time display of this information to ensure that there are no gaps between application swaths or overlap application swaths by too much. Pellet counts on the ground will confirm that the desired and correct application rate is being achieved.

- There are no non-target terrestrial mammals present on Lehua and no exposure pathway for marine mammals.

No discussion of unacceptable aerial broadcast operating conditions (Paragraph 5, sentence 1)

- All relevant operating conditions were discussed in the Draft Supplemental EA. In addition to not flying when winds exceed 35 mph, no broadcast will occur when heavy rains are forecasted. Also, the pilot has the final authority for determining safe flying conditions and will not fly if he is uncomfortable with the any of the conditions.

- An experienced pilot with specialized training in the aerial application of rodenticides, and a State-issued pesticide application certification, was used for Mokapu and the same pilot will be used for Lehua.

Concerns about uniform bait distribution on slopes (Paragraph 5, sentences 3-7)

- Experience from bait applications onto steep islands throughout the world has demonstrated that sufficiently uniform bait coverage can be achieved and result in complete rat eradication. The pilot for Lehua has been instructed on treatment methodology for slopes by the project manager and an experienced broadcast application pilot from New Zealand who has conducted successful bait applications in steep areas.

- Sufficiently uniform bait distribution on slopes will be ensured by calibrating the bucket with placebo bait prior to the application, using specialized application equipment, and using a differential GPS to guide the pilot on systematic flight lines and GIS to document and check where bait was applied. Per the suggestion of the Hawaii Department of Agriculture's Pesticides Branch, bait density on steep slopes will be measured following each broadcast.

- Pellets moving downhill during each individual application swath will be a relatively uniform factor throughout all swaths and is accounted for, resulting in overall uniformity of bait across the island. Although a small amount of fine scale variation resulting from differences in physical topography will occur, the average bait density on steep slopes will remain relatively uniform and within label application rates. In addition, pellet accumulation at the base of a selected steep slope will be measured to determine if a disproportionate amount of pellets roll downslope and accumulate at the base.

- Aerial broadcast was the only application method considered because many areas of Lehua are too dangerous or physically impossible to reach on foot.

Suggestion to use spray adjuvants (Paragraph 6, sentences 1- 5)

- The use of a spray adjuvant is not practical because sticky bait pellets would clog the bucket. Any pellets that make it out of the bucket will stick together in clumps, making uniform bait distribution impossible. Per the suggestion of the Hawaii Department of Agriculture's Pesticides Branch, planning for any future operations on steep-sloped offshore islands will include investigation into types of bait likely to lodge well on slopes.

- None of the other 58 islands that have been treated with aerial broadcast used sticky bait pellets and no adverse impacts to the nearshore marine environment or pelagic marine life has been documented.

Concerns about death of humpback whale calf and results of sampling (Paragraph 7, sentences 8-11)

- Liver samples were collected from the humpback whale calf that beached and died on Maui in February 2008. Samples were analyzed for diphacinone residues by laboratories at the U.S. Department of Agriculture's National Wildlife Research Center and the U.S. Geological Survey-Biological Resources Division's Columbia Environmental Research Center. The laboratories' detection limits for diphacinone were 77 parts per billion (ppb) and 15 ppb, respectively. Neither laboratory detected diphacinone residues in the samples. Diphacinone

concentrates in the liver and would be expected to be present if the calf had been exposed to diphacinone.

- The NOAA Marine Mammal Stranding Coordinator for Hawaii stated that "this death is likely a case of normal rate of infant mortality. The gross necropsy showed nothing abnormal..." NOAA found no causal link between the diphacinone bait used on Mokapu and the death of the whale on Maui. This conclusion was based on the gross necropsy, the negative lab results on tests for diphacinone in the calf's liver, and the lack of a feasible pathway for ingestion or dermal absorption of diphacinone.

Susceptibility of pregnant mammals to diphacinone (Paragraph 8, sentences 7-8)

- While a NOEL (no observable effects level) has not been established for maternal toxicity of diphacinone, the risk to pregnant marine mammals is minimal because there is no likely exposure pathway, for the reasons discussed above.

- Extrapolating EPA-approved toxicity test results for rats to whales, a 45-ton adult female Humpback Whale would have to find and ingest 8 kilograms (4,080 two-gram pellets) every day over multiple days to cause excess maternal bleeding during birth. It is extremely unlikely that a whale would be able to find (or be attracted to) this many bait pellets over multiple days.

Concerns about human fatalities associated with anticoagulants in 2006 (Paragraph 9, sentence 1)

- All of the 18 human fatalities associated with anticoagulants documented in the 2006 AAPCC report cited in the comment letter resulted from anticoagulant pharmaceuticals (*e.g.*, acetaminophen), not rodenticides. Diphacinone was not contained in any of these pharmaceuticals.

Question about the number of fatalities when Dipaxin was used medicinally (Paragraph 9, sentence 2)

- According to the records of the Pharmacia Corporation, there were no deaths associated with Dipaxin during 23 years of use as a human medication in the United States.

Thank you for your comments on the Draft EA for the Lehua Island Ecosystem Restoration Project. Please contact me at 587-0166 with any questions regarding this Response. I look forward to working closely with you and your staff as we implement this important restoration project.

Sincerely,

Paul J. Conry
Administrator

APPENDIX G

ORGANIZATIONS AND INDIVIDUALS CONTACTED

Organizations and Individuals Notified About the Opportunity to Comment on the Draft Supplemental EA

Organizations

Hawaii Department of Agriculture, Pesticides Branch
Animal Rights Hawaii
Office of Hawaiian Affairs
Earthjustice Legal Defense Fund
Hawaii Department of Health
- Clean Water Branch
- Environmental Planning Office

NOAA Fisheries Pacific Islands Regional Office
Kauai County Planning Department
Hawaii State Office of Planning, Coastal Zone Management Program
Carroll Cox, Envirowatch
Hawaii Department of Land and Natural Resources
- Division of Aquatic Resources, Director
- Division of Aquatic Resources, Kauai biologist
- State Parks Division, Administrator
- State Historic Preservation Division

Kauai Burial Council
University of Hawaii
- Environmental Center
- Chair, UH Manoa Zoology Department

Kauai Visitors Bureau
United States Navy, Command Pacific Division, Naval Facilities Engineering Command
United States Coast Guard, 14th District (Honolulu, HI)
- Commander
- Civil Engineering Unit

Hawaii Chapter of the Wildlife Society
Acting Mayor, County of Kauai
Kauai County Council, Council Services
State Senator Gary Hooser
State Representative Hermina Morita
State Representative Roland Sagum
State Representative James Tokioka
U.S. Congresswoman Mazie Hirono
U.S. Senator Daniel Inouye
U.S. Senator Daniel Akaka
Hawaii Audubon Society
National Tropical Botanical Garden
Hawaii Conservation Alliance
The Nature Conservancy of Hawaii
- Statewide Office, Honolulu
- Kauai Program Director

Environment Hawaii
Kauai Hunting Association

U.S. Environmental Protection Agency
- Office of Pesticide Programs, Washington, D.C.
- Region IX Headquarters, Sand Francisco, CA
- Pacific Islands Contact Office, Honolulu, HI

University of Hawaii Sea Grant Program
Kahea
Pacific Seabird Group
Waipa Community Foundation
Kai Makana
U.S. Department of Agriculture
- APHIS/Wildlife Services Honolulu Office
- USDA Kauai Office
- NRCS Lihue Service Center

Kauai Invasive Species Committee
Conservation Council of Hawaii
American Bird Conservancy
Kauai Public Land Trust
Kilauea Point Natural History Association
Garden Island Newspaper
Surfrider Foundation
Hanalei Watershed Hui
Kauai Westside Watershed Council
Na Pali Coast Ohana
Ke Kula Niihau O Kekaha
Kula Aupuni Niihau A Kahelela
Kauai Aquatic Life and Wildlife Advisory Committee
Hawaii State Library System
- Hawaii Documents Center, Honolulu
- Lihue Public Library
- Waimea Public Library

Holoholo Charters
Mauka Makai Fishing Tours
Kai Bear
Action Plus Adventures
Sea Lure Fishing Charters
Captain Don’s Sportfishing
Deep Sea Fishing Kauai
Hana Pa'a Sportfishing Charters
True Blue Charters
Na Pali Explorer
Open Sea Charter Fishing
Breakaway Fishing Charters
AAA Napali Riders Ocean Rafting
Captain Andy’s
Kauai Sea Tours
Kauai Seariders Adventures

Seasport Divers
Bubbles Below Scuba Charters
Dive Kauai Scuba Center
Snorkel Bob's Kauai Inc

Individuals
Bruce Robinson
Margeret Lohfeld
Mike Ord
Forest and Kim Starr
Cheryl Chung
Craig Harrison
David Kuhn
Kenneth Wood
Mark Rauzon
Melvin Gabel
Gregg Howald

APPENDIX F

Comments Received During Pre-Consultation

Pre-consultation for this project began with the formation of an outreach team. The outreach team gave presentations to community organizations and met with individuals connected to the Ka‘ena Point area (both the Mokulē‘ia and Wai‘anae sides), including the North Shore Neighborhood Board, the Wai‘anae Neighborhood Board, and the Mokulē‘ia Community Association. The outreach team also conducted user surveys at Ka‘ena Point on three weekends during the fall of 2007, to get input from actual users of Ka‘ena Point about why they visit Ka‘ena and what they think about the proposed fencing. Finally, the outreach team prepared a brochure and poster display for the Hawai‘i Conservation Conference, the Hawaii Seafood and Fishing Festival, and other similar events. A unique email account was established for the project, kaenapoint@yahoo.com, to create an easy-to-remember way for the public to communicate their thoughts about the project. Media, including an article in the October 2007 Hawaii Fishing News and a story on KHON2 News in November 2007, also publicized the planned project. In conjunction with the community outreach, the Department sent a scoping letter to over 90 government agencies, organizations, and individuals that were identified as potential stakeholders for the project. Follow-up meetings occurred with regulatory agencies to discuss permitting requirements. During the pre-consultation period, written comments were received from the following:

- NOAA
- U.S. Army Environmental staff
- U.S. Coast Guard
- Office of Hawaiian Affairs
- City and County of Honolulu Department of Planning and Permitting
- Councilmember Donovan Dela Cruz
- American Bird Conservancy
- Historic Hawaii Foundation
- Mokulē‘ia Community Association
- North Shore Neighborhood Board (10-23-07 meeting)
- Wai‘anae Neighborhood Board (12-4-07 meeting)
- Michele Bachman
- John Bennett
- David Bremer
- Randy Ching
- Rich Greenamyer
- Tom Lenchanko
- Keona Mark
- Reed Matsuura
- Cynthia Rezentes
- Steve Rohrmayr.

Jennifer Metz
<Jennifer.Metz@noaa.gov>
11/05/2007 08:57 AM

To Christen.W.Mitchell@hawaii.gov
cc
bcc
Subject comment for Kaena EA

History: This message has been replied to.

Aloha Christian,
I passed the EA to one of my colleagues, David Schofield, who is our Marine Mammal Strandings Coordinator. He does a lot of work with the Hawaiian monk seal. Please view his comment below regarding the monk seal in the draft EA. Thank you.

Aloha Jen,

I am happy with the mention of the Hawaiian monk seal in this document. It adequately notes the importance of the habitat to the monk seal and mentioning the 2006 pupping event is very appropriate.

It is a sound document but one suggestion might be to add that the monk seal would benefit from the predator fence not just to prevent disturbance but also to prevent disease transfer. The recently published Hawaiian Monk Seal Recovery Plan states as one of the threats the the survival of this species is disease transfer. Specifically diseases caused by morbilli virus (distemper), toxoplasmois, and leptospirosis are of high concern and can be shed by some of the named predators the project is working to eradicate.

Thanks for letting me review and I look forward to having the opportunity to further the partnership to raise awareness of monk seal issues at Kaena Pt.

Mahalo,
David

--
Jen Metz
Outreach and Education Specialist
Protected Resources Division
NOAA Fisheries, Pacific Islands Regional Office
1601 Kapiolani Blvd., Suite 1110
Honolulu, HI 96814-0047
Tel # (808) 944-2268

"Kawelo, Kapua H Ms CIV USA USARPAC" <kapua.kawelo@us.army.mil>

11/06/2007 04:46 PM

To <Christen.W.Mitchell@hawaii.gov>

cc "Ching, Susan N Ms CTR USA USARPAC" <susan.ching@us.army.mil>, "Mansker, Michelle L Mrs CIV USA USARPAC" <michelle.mansker@us.army.mil>

bcc

Subject Kaena Point Predator Fence Comments (UNCLASSIFIED)

Classification: **UNCLASSIFIED**
Caveats: NONE

Aloha Christen,
Got your flier about Kaena. We have been in the loop on some of this but felt we should formally convey our concern/support/interest in participating.

We are excited about this fence because it will be the first real test of this technology to protect a natural area in Hawaii. As you may know, Island Conservation is developing implementation plans for some predator fencing on DOD lands in Hawaii. Two sites of ours are included in possible pilot project sites. We are interested in what you learn and in learning from you.

Our major concern is the Chamaesyce celastroides var. kaena which will not be included in the fence. We have not observed rat damage to plants in the past at Kaena or at any other wild population sites where we work with this taxon. We are concerned that the fence may concentrate rats on the outside where the C. celastroides are and they may incur damage due to local rat number increases.

We are interested in any monitoring that is planned in conjunction with this project and since we work regularly at the C. celastroides would love to be involved in reviewing plans and in site visits for this aspect of the project.

Thank you for the opportunity to comment. Good luck with the project.

Mahalo Kapua

H. Kapua Kawelo
Biologist, Environmental Division
Directorate of Public Works, USAG-HI
Phone: (808) 656-7641
Fax: (808) 656-7471

Service is our Job! Excellence is our Goal!
Your comments are important to us. Logon to <http://ice.disa.mil/index.cfm?fa=card&service_provider_id=89247&site_id=48&service_category_id=1>

Classification: **UNCLASSIFIED**
Caveats: NONE

"Shepardson, Dale LCDR" <Dale.V.Shepardson@uscg.mil>
Sent by: Dale.V.Shepardson@uscg.mil

10/02/2007 06:49 AM

To <christen.w.mitchell@hawaii.gov>
cc
bcc
Subject FW: Ka'ena Point EA

Good Morning: We received your letter last week regarding "Pre-consultation on Environmental Assessment for Predator-Proof Fencing at Ka'ena Point Natural Area Reserve ..." The Coast Guard maintains a light on the Point that we will need to access in order to service the light. Will the location of the fence restrict access to the light and if so may we ask that the gate be large enough to allow access to the light? Thank you.

LCDR Dale Shepardson
Chief, D14 Waterways Management
(808) 541-2320

-----Original Message-----
From: Garrett, David BMC
Sent: Tuesday, October 02, 2007 6:28 AM
To: Shepardson, Dale LCDR
Subject: RE: Ka'ena Point

Sir,

This will not be a problem as long as we have access when ever we need it, and we can put one of our locks on it. We do a chain, lock to lock setup with other agencies on other light as well.

Thanks,

BMC Dave Garrett
Officer in Charge
Aids to Navigation Team
400 Sand Island Access Road
Honolulu, Hawaii 96819
(808) 842-2851
-----Original Message-----
From: Shepardson, Dale LCDR
Sent: Monday, October 01, 2007 4:21 PM
To: Garrett, David BMC
Subject: Ka'ena Point

Chief: The state wants to put up a fence at the Ka'ena Point Natural Area Reserve. The fence would run from the washout on the Wai'anae side to the boulder barricade. The fence would be 6.5 feet tall. Is that going to interfere with your ability to get out there?

LCDR Dale Shepardson
Chief, D14 Waterways Management
(808) 541-2320

PHONE (808) 594-1888

RECEIVED
'07 OCT -3 A10:46
FORESTRY & WILDLIFE
STATE OF HAWAII

FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

HRD07/3231

September 28, 2007

Christen Mitchell, Planner
Division of Forestry and Wildlife
State Department of Land and Natural Resources
1151 Punchbowl St. Rm. 325
Honolulu, HI 96813

RE: Pre-Consultation on Environmental Assessment for Predator-Proof Fencing at Ka'ena Point Natural Area Reserve and Ka'ena Point State Park, O'ahu, TMKs: 6-9-02: 4, 9, 13, 14; 8-1-01: 22.

Dear Christen Mitchell,

The Office of Hawaiian Affairs (OHA) is in receipt of your September 20, 2007, request for comments on the above proposed project, which calls for the erecting of a two-meter fence that will prevent predators from entering into the Natural Area Reserve. OHA offers the following comments.

OHA appreciates that the project will protect the populations of area seabirds and enhance the regeneration of native plants. OHA also appreciates that human access to the reserve will not be changed due to the fence. We do, however, request the applicant's assurances that should iwi kūpuna or Native Hawaiian cultural or traditional deposits be found during the construction of the fence, work will cease, and the appropriate agencies will be contacted pursuant to applicable law.

Thank you for the opportunity to comment. If you have further questions, please contact Sterling Wong (808) 594-0248 or e-mail him at sterlingw@oha.org.

Sincerely,

Clyde W. Nāmu'o
Administrator

PHONE (808) 594-1888

FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

HRD07/3231 B

November 2, 2007

Christen Mitchell, Planner
Division of Forestry and Wildlife
State Department of Land and Natural Resources
1151 Punchbowl St. Rm. 325
Honolulu, HI 96813

RE: Pre-Consultation on Environmental Assessment for Predator-Proof Fencing at Ka'ena Point Natural Area Reserve and Ka'ena Point State Park, O'ahu, TMKs: 6-9-02: 4, 9, 13, 14; 8-1-01: 22.

Dear Christen Mitchell,

On September 28, 2007, the Office of Hawaiian Affairs (OHA) sent a letter containing our comments on the above proposed project, which calls for the erecting of a two-meter fence that will prevent predators from entering into the Natural Area Reserve. After further consulting with our beneficiaries, we would like to submit additional comments on the project.

OHA requests that the path for the fence be positioned in such a way that excludes the Leina-a-ka-'uhane from the fenced-off area. Members of the Hawaiian community have concerns that including the leina in the fenced area would disturb the spiritual atmosphere surrounding the sacred site.

Thank you for the opportunity to comment. If you have further questions, please contact Sterling Wong (808) 594-0248 or e-mail him at sterlingw@oha.org.

Sincerely,

Clyde W. Nāmu'o
Administrator

C: William Ailā Jr.
86-630 Lualualei Homestead Road
Wai'anae, HI 96792

NOV 2 7 2007

PHONE (808) 594-1888

FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

HRD07/3231C

November 20, 2007

Chris Swenson
Craig Rowland
U.S. Department of the Interior
Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Blvd., Rm. 3-122
Box 50088
Honolulu, HI. 96850

RE: Initiating consultation for predator-proof fence at the Ka'ena Point Natural Area Reserve and Ka'ena Point State Park, O'ahu, TMKs: 6-9-02: 4, 9, 13, 14 and 8-1-01:22.

Dear Chris Swenson and Craig Rowland,

The Office of Hawaiian Affairs (OHA) is in receipt of the above-referenced request for comments on a project that calls for the installation of a two-meter high fence that will prevent predators from entering into the Natural Area Reserve. OHA appreciates the opportunity to provide input into the project and offers the following comments.

The fence alignment that OHA favors is "Option 2," which is positioned in such a way that excludes the Leina-a-ka-'uhane from the fenced-off area. Members of the Hawaiian community have concerns that including the leina in the fenced area would disturb the spiritual atmosphere surrounding the sacred site.

OHA appreciates that the project will protect the populations of area seabirds and enhance the regeneration of native plants. OHA also appreciates that human access to the reserve will not be changed due to the fence. In addition, we will rely on the applicant's assurances that should iwi kūpuna or Native Hawaiian cultural or traditional deposits be found during the construction of the fence, work will cease, and the appropriate agencies will be contacted pursuant to applicable law.

Thank you for the opportunity to comment. If you have further questions, please contact Sterling Wong (808) 594-0248 or e-mail him at sterlingw@oha.org.

Sincerely,

Clyde W. Nāmu'o
Administrator

C: William Ailā Jr.
86-630 Lualualei Homestead Road
Wai'anae, HI 96792

✓ Pauline Sato
The Nature Conservancy of Hawai'i
923 Nu'uanu Avenue
Honolulu, HI 96817

DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 7TH FLOOR • HONOLULU, HAWAII 96813
TELEPHONE: (808) 768-8000 • FAX: (808) 527-6743
INTERNET: www.honolulu.gov • DEPT. WEB SITE: www.honoluludpp.org

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'07 SEP 27 P1:26
FORESTRY & WILDLIFE
STATE OF HAWAII

MUFI HANNEMANN
MAYOR

HENRY ENG, FAICP
DIRECTOR

DAVID K. TANOUE
DEPUTY DIRECTOR

2007/ELOG-2693(AM)

September 26, 2007

Ms. Christen Mitchell
Division of Forestry and Wildlife
Department of Land and Natural Resources
1151 Punchbowl Street, Room 325
Honolulu, Hawaii 96813

Dear Ms. Mitchell:

Subject: Pre-Assessment Consultation
Predator-Proof Fencing
Kaena Point Natural Area Reserve and Kaena Point State Park
Tax Map Keys: 6-9-2: 4, 9, 13, 14; 8-1-1: 22

This responds to your request, received September 20, 2007, for comments on the state's proposal to install a 6.5-foot-high "predator-proof" fence at Kaena Point Natural Area Reserve and Keana Point State Park. We have the following comments.

The project site is located in the Special Management Area (SMA). The proposed fence constitutes "development," as defined by the Revised Ordinances of Honolulu Chapter 25 (the "SMA Ordinance"). Hence, it requires approval of a SMA Use Permit. If the project's valuation is less than $125,000, then it may qualify for an SMA minor permit, which is administratively processed by our department. However, if its valuation exceeds $125,000, then a SMA major permit will be necessary. SMA major permits require the processing of an environmental assessment in accordance with the procedural steps set forth in HRS Chapter 343; involve public hearings; and, are granted by the City Council.

It appears from the attached rendering that the fence is located near the shoreline. In order for us to determine whether the project will be subject to city's shoreline regulations, enumerated in ROH Chapter 23 ("Shoreline Setbacks"), a drawing depicting the fence type and its location relative to the shoreline will be required. If any part of the fence will be located within 55 feet of the shoreline, then a current certified shoreline survey will also be needed.

We note that the proposed fence will be located in the State Land Use Conservation District; therefore, the proposed fence is not subject to the city's Land Use Ordinance.

We would like an opportunity to review the Draft Environmental Assessment when it is circulated for comments. If you have any questions, please contact Ann Matsumura of our staff at 768-8020.

Very truly yours,

Henry Eng, FAICP, Director
Department of Planning and Permitting

HE:cs

doc569385

CITY COUNCIL
CITY AND COUNTY OF HONOLULU
HONOLULU, HAWAII 96813-3065 / TELEPHONE 547-7000

RECEIVED
'07 OCT 11 A11 :18
FORESTRY & WILDLIFE
STATE OF HAWAII

DONOVAN M. DELA CRUZ
COUNCILMEMBER, DISTRICT 2
CHAIR, COMMITTEE ON PUBLIC HEALTH, SAFETY AND WELFARE
TELEPHONE: (808) 547-7002
FAX: (808) 527-5737
EMAIL: dmdelacruz@honolulu.gov

October 8, 2007

Department of Land and Natural Resources
Department of Forestry and Wildlife
1151 Punchbowl Street, Room 325
Honolulu, HI 96813
Attn: Christen Mitchell, DOFAW Planner

Dear Ms. Mitchell:

RE: Predator-Proof Fencing at Kaena Point Natural Area Reserve & Kaena Point

This pristine area is the last remaining undeveloped area on Oahu and protecting the fauna and wildlife is a necessity. Already too many of Kaena Point's wildlife and plants have been affected by human encroachment, especially by motorized dirt bikes and atv's.

As development brings people and their pets closer to this area, this fence will serve to keep these domestic predators out. The world is losing many of its species of birds and plants everyday and this is mainly caused by the lack of futuristic planning.

I support the installation of this predator-proof fencing and the protection of this important Hawaiian cultural site.

Mahalo for bringing this issue and solution forward and thank you for this opportunity to testify.

Sincerely,

Donovan M. Dela Cruz
Councilmember
District II

DMD: rhm
(kaena pt. testimony)

AMERICAN BIRD CONSERVANCY
CONSERVING WILD BIRDS AND THEIR HABITATS THROUGHOUT THE AMERICAS

RECEIVED
'07 OCT 15 A11 :22
FORESTRY & WILDLIFE
STATE OF HAWAII

Christen Mitchell
Department of Land and Natural Resources
Division of Forestry and Wildlife
1151 Punchbowl St
Room 325
Honolulu, HI 96813

October 5, 2007

Dear Ms. Mitchell;

We were pleased to learn of the Predator-Proof Fencing project for Ka'ena Point Natural Area Reserve and Ka'ena Point State Park, O'ahu, and look forward to supporting the project in any way we can. The American Bird Conservancy is the only 501(c)(3) organization that works solely to conserve native wild birds and their habitats throughout the Americas. ABC acts to safeguard the rarest bird species, using the best science available to determine the highest priorities and the best solutions. Protecting seabird nesting habitat from predators is clearly one of the highest priorities to ensure the long term stability of seabird populations and offers one of the most efficient opportunities to have a positive impact.

Throughout the world, non-native animals pose a grave threat to seabird nesting grounds and sometimes even the viability of entire seabird populations. We have followed the successful fencing and eradication projects in New Zealand with interest and continue to encourage a wider use of these methods to protect seabirds. We anticipate a measurable improvement in nest success as a result of the fencing and look forward to seeing the plans for your evaluation of the action. Such demonstrable results are of value to future project development and in compiling best practices and lessons learned.

If you have any questions, please feel free to contact Jessica Hardesty, Seabird Program Director at American Bird Conservancy (jhardesty@abcbirds.org).

Thank you for this opportunity to comment.

Sincerely,

Jessica Hardesty
Seabird Program Director

P.O. BOX 249 ♦ THE PLAINS, VA ♦ 20198
PHONE: 540-253-5780 ♦ FAX: 540-253-5782 ♦ WWW.ABCBIRDS.ORG

HISTORIC HAWAI'I FOUNDATION

RECEIVED

'07 OCT 15 A11 :23

FORESTRY & WILDLIFE
STATE OF HAWAII

October 12, 2007

Christen W. Mitchell
Planner, Department of Forestry and Wildlife
Department of Land and Natural Resources
State of Hawai'i
1151 Punchbowl Street, Room 325
Honolulu, HI 96813

RE: Pre-Consultation on Environmental Assessment for Predator-Proof Fencing at Ka'ena Point Natual Area Reserve and Ka'ena Point State Park, O'ahu

Dear Ms. Mitchell:

Thank you for including Historic Hawai'i Foundation in the consultation process for the proposal to install Predator-Proof Fencing at Ka'ena Point Natual Area Reserve and Ka'ena Point State Park on O'ahu.

Since 1974, Historic Hawai'i Foundation (HHF) has been the statewide leader for historic preservation. HHF's mission is to preserve and encourage the preservation of Hawai'i's historic buildings, places, objects and communities.

Historic Hawai'i Foundation supports your efforts to protect the flora and fauna of Ka'ena Point by excluding predators that impact seabird colonies and other native species. We look forward to reviewing the Environmental Assessment.

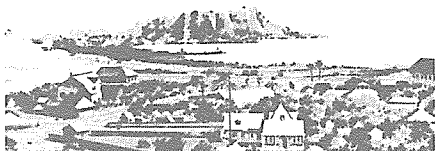
In general, we will are concerned about impacts to historic and cultural sites, both in the finished condition and during construction. Appropriate avoidance, minimization and mitigation actions should be considered in the EA. We are also concerned with potential visual impacts from the two-meter fence and would like to see schematic design and photo simulations of the fence from various viewpoints.

Please let me know if you have any questions. I can be reached at 523-2900 or via email to Kiersten@historichawaii.org.

Very truly yours,

Kiersten Faulkner

Kiersten Faulkner, AICP
Executive Director



680 Iwilei Road, Suite 690 / Honolulu, Hawai'i 96817 / Tel (808) 523-2900 / Fax (808)523-0800
Email preservation@historichawaii.org / Web www.historichawaii.org

MOKULE'IA COMMUNITY ASSOCIATION
68-703 Crozier Drive
Waialua, HI 96791

RECEIVED
'07 NOV -8 P3:37
FORESTRY & WILDLIFE
STATE OF HAWAII

November 7, 2007

Laura H. Thielen
Director
Department of Land and Natural Resources
1151 Punchbowl Street
Honolulu, HI 96813

Aloha Director Thielen,

Best congratulations on your confirmation as Director. That's great news!

At its October 20, 2007 meeting, the Mokule'ia Community Association (MCA) received a presentation on the Ecosystem Restoration Project for the Ka'ena Point Natural Area Reserve (NAR). The project proposes to erect pest-proof fencing to prevent alien feral predators, as well as loose non-feral animals, from entering the NAR and killing its native fauna and flora, particularly its albatross and shearwaters, but also other seabirds, migratory shorebirds, monk seals and native plants.

The rust-proof, fine-meshed, hooded fencing, with a buried skirt was developed in New Zealand and has proven successful in its use there.

After numerous questions and discussion of the project and its benefits, the Mokule'ia Community Association expressed strong support for the project and recommends your and DLNR's support for the initiative.

Sincerely,

Michael Dailey
President

Copies to:
Governor Linda Lingle
Senator Bobby Bunda
Representative Michael Magaoay
Christen Mitchell, DOFAW Planner
North Shore Neighborhood Board No. 27
Hawai'i Chapter, The Wildlife Society

North Shore Neighborhood Board No. 27
P. O. Box 577
Haleiwa, Hawaii 96712
November 12, 2007

Laura H. Thielen, Chairperson
DLNR Natural Area Reserves System
1151 Punchbowl Street
Honolulu, Hawaii 96813

Dear Chairperson Thielen,

At the October 23, 2007 North Shore Neighborhood Board No. 27 Meeting, Lindsay Young and Ati Jeffers (DLNR Natural Reserves System) made a presentation on Ka'ena Point Natural Area Reserve Ecosystem Restoration Project – restoration through fencing. They provided Board members with brochures that were very explicit in delineating the threats to the wildlife at Ka'ena, the solution to the predation, the affect the fencing will have on the community and the community's responsibility to take care of the "aina." It is imperative that this natural area reserve be a safe haven for Hawaii's native plants, seabirds and animals.

Ms. Young and Mr. Jeffers asked the North Shore Neighborhood Board No. 27 for their support of the project, a request that was unanimously affirmed. The Board members were also informed that public comments were welcome and contact information was provided.

Sincerely,

Geraldine "Gerry" Meade, Secretary
(808) 638-8386

3. Lunasco echoed Ng's comment that Wahiawa's water is unusable and is too much water for the amount of land farming. Rep. Magaoay indicated that DLNR and the Department of Ag need to work together on the Wahiawa Dam issue.

Without objections the agenda was taken back to order to hear the report from the Honolulu Fire Department

Honolulu Fire Department (HFD) – Capt. B. Emmons reported for both Waialua and Sunset Beach stations: 1) 6 rubbish and 1 vehicle fire, 36 medical, 1 search/rescue and 4 miscellaneous emergencies. 2) Fire Safety Tip – When selecting Halloween costumes, ensure they are fire-resistant. Keep the length of costumes short to prevent tripping. A natural mask of cosmetics is better than a mask that may restrict breathing or obscure vision. Children should carry flashlights to light their way.

The agenda resumed order. No representatives or reports were available for Senator Bunda and Congresswoman Mazie Hirono.

UNFINISHED BUSINESS: None

NEW BUSINESS / PRESENTATION / ACTION:

Ecological Fencing for Kaena Point – Ati Jeffers, Outreach Coordinator for the Kaena Point Restoration Project at the Natural Area Reserve (NAR) located at the most Northwestern peninsula of Oahu. The NAR is designated as prime areas to be protected by law because of the natural and cultural resources, and the growing population of rare and endangered plants and seabirds. There are four native seabirds noted to nest at Kaena, 11 federally listed endangered plants, and endangered Hawaiian Monk seals that also frequent the area. The colony of native birds and plants are situated on higher ground and with the threat of rising sea level, other colonies in Hawaii may not be able to survive. Plants and birds are constantly threatened by mongoose, cats, dogs, rats and mice. In 2006, more than 100 seabirds were killed by dogs and cats at Kaena Point.

A solution to these threats is a predator approved fencing to protect the NAR and prevents animals from entering into these protected areas. The fencing will use the state of the art technology. Funding for the fence will come from the U.S. Fish and Wildlife Service. While the fence will prevent predators from entering, people will still be able to access the area. Public comment is important as part of the permitting process and public outreach is underway and user surveys have been used on site. A letter was circulated to the Board requesting support of the project.

Almeida moved, Miller seconded that the North Shore Neighborhood Board No. 27 support the Kaena Point Ecosystem Restoration Project's construction of a predator approved fence; and that the letter of support be submitted for input with the EIS (Environmental Impact Statement) currently being prepared.

Discussion followed: 1) Philips favors the proposal but had a question whether it would create an exclusive bio-diversity zone. Lindsey Young, Outreach Coordinator, felt it won't create an exclusive zone but it would allow everything within that area encumber to its fullest potential when protected, creating a source population for better recovery. 2) Jeffers gave the presentation to the Mokuleia Community Association (MCA) on Saturday and unanimously supported the Ecosystem Restoration Project at Kaena Point. MCA will write a letter to DLNR and a copy to the Governor supporting the proposal. 3) Lunasco favors the motion but is cautious that it maybe restricted to hunters. Jeffers agreed and that there should not be restricted access.

Miller called for the question; there were no objections. **The motion was adopted by unanimous consent, 12-0-0. Aye:** Alameida, Hirota, Leinau, Lunasco, Lyons, Matsuura, Meade, Miller, Ng, Philips, Riviere and Scoville.

Hi'ilei Aloha, Waimea Valley – Jonathan Lekeke Scheuer, Director of Land Management, reported that the Audubon announced in January they would not pursue a long-term lease for Waimea. Back in March after hearing the announcement, laid out four main things they would try to address: 1) to immediately try to address the health and safety issues; 2) being long-term planning; 3) spend time working with Audubon staff to try learn and understand the operations; and 4) what to do when Audubon leave. And the options were: a) to manage it as an arm of the Office of Hawaiian Affairs (OHA), having Audubon employees become OHA employees, as a division of OHA; b) look for another Audubon with the expertise in three areas: the business side, the botanical and environmental side, and enhancing the cultural activities side at Waimea; and c) to create a separate entity to manage it as a part of OHA; shielding OHA from the liability associated with land ownership, as well as allowing fundamental decisions about that property to be made at the local level rather than in Honolulu.

7. Waianae High School Challenge Day, January 15 – 18, where freshmen will be challenged to change. Adult volunteers and lunch donations are needed.

8. Kapolei City Lights parade and Christmas tree lighting is scheduled for December 8, 6:00 p.m. at Kapolei Hale.

9. Informational brochures were distributed on the Youth Sea Scouts program, part of the Boy Scouts program.

10. Nanakuli High and Intermediate schools' ho'olaulea, December 8, 9:00 a.m. – 2:00 p.m.

COMMUNITY CONCERNS:

POTHOLE PATCHING – Kurshals noted a recent story in the Advertiser reports that 395 potholes have been patched in the Waianae area this year and there are projections for 416 to be patched next year.

TRAFFIC FLOW ON FARRINGTON HIGHWAY – Silva noted that traffic is flowing better on the highway since due to synchronization of traffic signal lights, and that there had been a problem near the sewage treatment plant. Thanks would like to be extended to whom ever was responsible for the work.

SPEEDING IN NANAKULI BEACH PARK – Manaku relayed concerns from beachgoers about speeding drivers in Nanakuli Beach Park creating a hazard. Suggestions have been made to install speed bumps.

UNFINISHED BUSINESS: None.

NEW BUSINESS:

RECOMMENDATION TO THE WAIANAE COAST NEIGHBORHOOD BOARD NO. 24 TO SUPPORT THE CONCEPT OF THE INSTALLATION OF PREDATOR-PROOF FENCING WITH LEAVING OUT THE LEINA KA UHANE AREA, TO BE INSTALLED AT KA'ENA POINT NATURAL AREA RESERVE AND KA'ENA POINT STATE PARK – Jordan moved for the Parks and Recreation Committee that the Board support concept of the installation of predator-proof fencing with leaving out the Leina Ka Uhane area. Pauline Saito, from the Wildlife Society, Hawaii Chapter, and Randy Kennedy, from the State Department of Land and Natural Resources, provided a brief background on the area. At one time 4x4 vehicles had free access to this area and damaged/killed endangered plants and birds. Since access to 4x4 vehicles was cut off, plants have been recovering. However, dogs, cats, and rodents continue to kill birds which nest on the ground and don't flee from predators. In the preliminary planning stages is a predator-proof fence, running across the point along an existing road that would keep these predators out of this area. Such fences have been used in New Zealand, predators cannot go through, over, or under the fence. People would have access through double gates that allow only one gate to be opened at a time. There would be no vehicle access through the fence.

Questions, answers and comments followed:

1. The project is funded by the U.S. Fish and Wildlife Service.

2. An environmental assessment is in progress for this project.

3. The double gate system will not pose a trapping hazard for persons.

4. The area would be monitored by Department of Land and Natural Resources staff, the legislature has provided funding.

5. Public comment is welcome.

6. Concern was expressed about the use of materials which would have to withstand the salty environment.

7. Cultural sites have been identified. Different alignments have been proposed, Option 2, that protects a cultural site was preferred by a resident.

8. The fence would be six-feet tall and colored green to blend into the surrounding environment. It would be six-feet tall.

The motion carried unanimously.

RECOMMENDATION TO THE WAIANAE COAST NEIGHBORHOOD BOARD TO SEND A LETTER OF SUPPORT TO THE DEPARTMENT OF LAND AND NATURAL RESOURCES FOR A PILOT PROJECT WHICH IS TO BE REVIEWED AT THE END OF THE FIRST QUARTER OF IMPLEMENTATION TO ISSUE PERMITS FOR SHORELINE FISHING WITHIN KEAWAULA LOCATED IN THE MAUKA KE'ENA STATE PARK, OAHU – Jordan reported the area was closed to fishing in 2006, signs were posted in September of 2007, and the pilot project is to allow the State Department of Land and Natural Resources to issue fishing permits in a State park where fishing is normally not allowed. **Jordan moved for the Parks and Recreation Committee that the Waianae Coast Neighborhood Board send a letter of support to the department of land and natural resources for a pilot project which is to be reviewed at the end of the first quarter of implementation to issue permits for shoreline fishing within Keawaula located in the Mauka Ke'ena State Park, Oahu** – Questions, answers and comments followed:

1. The park is closed in the evening.

2. Fishermen should be allowed to bring tents and other gear, not to camp overnight, but to make themselves comfortable while fishing.

3. The "no fishing" rules impose on the conducting of, and should not apply to cultural practices.

The motion carried, 12-0-1. Brown abstained.

PROPOSED PLANS AND REZONING FOR 96 OF THE 236.5 ACRES OF LAND IN LUALUALEI/NANAKULI OWNED BY TROPIC LAND, LLC – Dan Gomes, consultant, reported the land was acquired by Tropic Land in 2005 a past proposal for the site was to develop a golf course. A current proposal is to rezone 96 acres to develop a light industrial park which is needed in this area.

Questions, answers and comments followed:

1. Brown expressed concern about this development adversely impacting the "county feel" of this community. Gomes noted that the project can be developed and the "keep the country, country" feeling maintained.

2. In response to Aipolani, the types of businesses accommodated in this industrial park could include high tech as well as low tech industries.

3. Guests expressed concern about the loss of agriculture land and Saylors said that residents have told her of their concerns of loss of agricultural land while other residents have told her that the land is simply coral and not suitable for farming. Saylors added that Tropic Land has said that the land that they want rezoned is not suitable for farming but there is nothing in their written material supporting that. If you have some proof, please share it with us. The lack of youths interested in farming was noted. Saylors said to Tropic Land that your thought to add employment to Waianae is not falling on deaf ears.

4. Saylors and Hew Len noted that if the industrial park is developed, they would like to see some guarantees the businesses hire area residents for the construction.

5. Hew Len expressed concern about adverse health impacts from the adjacent PVT landfill could have on employees of businesses in the industrial park as residents living near the landfill have reported adverse impacts on their health. Gomes noted the industrial park would be developed according to any requirements, it would not have an impact on view planes, there are no cultural sites on the land, and there's guarantee jobs would go to area residents.

6. Kelii noted there has been community support for development of an industrial park and the jobs it would bring. He also expressed concern about the ability of the area's infrastructure to accommodate the park.

From: MicheleB (bachmanm001@hawaii.rr.com)
To: kaenapoint@yahoo.com
Date: Tuesday, October 23, 2007 3:52:09 PM
Subject: Can I help?

While visitning Kaena point this weekend I met some of your representatives and recieved an educational broucheur. I have lived near to, and visited this area many times. I think what is happening out there is GREAT!. What a difference after being nearly run out by the weekend ATV group, and the often present "scary" coalition I am excited by what you are doing. I think the fence looks like a great idea, too bad we need it, but we do.
I would also like to help if I can. I work Saturday and SUnday, but may have other ways of helping. I can type, file, phone, design, mail...let me know how I can get involved. We need to protect Kaena Point as well as many of our other open space.
Michele Bachman
bachmanm001@hawaii.rr.com

RECEIVED

'07 SEP 25 A11 :33

FORESTRY & WILDLIFE
STATE OF HAWAII

John D. Bennett
45-340 Mokulele Dr.
Kaneohe, HI 96744-2245
E-Mail: bennettj009@hawaiiantel.net

September 23, 2007

Christen W. Mitchell
Dept. of Land & Natural Resources,
Div. of Forestry & Wildlife
1151 Punchbowl St., Rm. 325
Honolulu, HI 96813

Re: Kaena Point Natural Area Reserve, proposed predator-proof fence

Dear Christen:

My interest in the Kaena Point Natural Reserve is chiefly in its recent military history, and I am mainly concerned with preservation of the extant structures that are found on the slopes of Puu Pueo that were used in conjunction with Oahu's coast artillery, and the early warning radar station built during World War Two.

As a historian and preservationist, I feel that a predator-proof fence would greatly assist in preserving the albatross colonies from wild dogs, cats, and the mongoose. Man is one of the greatest hazards to native plants by stepping on them and running them over with mountain bicycles.

Having well-defined trails in the preserve would greatly assist in preserving the nesting birds and native plants, however, the remoteness of the area precludes having a ranger or other enforcement type of officer present at all times.

Sincerely Yours,

John D. Bennett

John D. Bennett

YAHOO! MAIL Classic

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From: "Bremer" <bremerd001@hawaii.rr.com>

To: kaenapoint@yahoo.com

CC: greenamyr001@hawaii.rr.com

Subject: Kaena Point restoration

Date: Fri, 5 Oct 2007 08:35:35 -1000

Ati Jeffers-Fabro
Outreach Coordinator
Kaena Point Ecosystem Restoration Project

Hello,

Along with Rich Greenamyer, who recently wrote to you in support of your efforts to control predators at Kaena Point, I also enjoy mountain biking with Rich around Kaena Pt every month or so. We appreciate the signs and marking of the paths to assist bikers in staying on the trail and off the fragile plants and dunes. Perhaps we could assist in monitoring if we knew how to report dog owners who walk dogs unleashed in the area or cyclists who may stray off the marked trails. We usually try to remind such individuals of the need to protect the area, and it may be difficult to do more than that since DLNR obviously lacks resources to regularly patrol such a remote location. But let us know if you have any suggestions or would like us to report on any violations we might observe.

We would also support any efforts to further restrict motor vehicles from entering beyond the parking lot on the Mokuleia side. We've noticed recent increased erosion and denuding of the dunes that appears to be the result of 4-wheel drive trucks using the area for recreational racing or mud wallowing. That's another very difficult activity to prevent, and there may be legitimate access needs of fisherman who travel in to reach shoreline fishing spots. My impression is that the fisherman tend not to be the source of major abuse of the ecosystem, though some may tend to leave rubbish on the beaches.

Also if there is anyway to construct a pedestrian bridge across the washed out trail on the Waianae side of point, that would enhance legitimate recreational access to the point. I think it's important to keep the region open to responsible users to maintain public awareness of and support for your conservation efforts.

We very much appreciate your work in protecting and restoring the area. It's nice to see the native plants and seabirds thriving beyond the gated area.

Aloha,

David Bremer

randy ching
<oahurandy@yahoo.com>
09/25/2007 10:36 AM

To christen.w.mitchell@hawaii.gov
cc
bcc
Subject Kaena Pt fence project

Aloha Christen. Pauline Sato of The Nature Conservancy gave the Sierra Club, Oahu Group a presentation on the project. It looks great! I hope it happens soon. If you need volunteers to help with the project, the Oahu Group would be willing. Let me know.

Randy Ching
Sierra Club, Oahu Group chair

Boardwalk for $500? In 2007? Ha! Play Monopoly Here and Now (it's updated for today's economy) at Yahoo! Games.
http://get.games.yahoo.com/proddesc?gamekey=monopolyherenow

From: Rich Greenamyer (greenamyr001@hawaii.rr.com)
To: kaenapoint@yahoo.com
Date: Tuesday, September 25, 2007 3:02:35 PM
Subject: Kaena Point

As a frequent mountain biker at Kaena Point, I am in favor of protecting the unspoiled environment of the area. I am in favor of installation of a pest proof fence as long as it allows hikers and mountain bikes to traverse.

However, I have other recommendations. One is to keep the area unspoiled by not extending paved roads any further than they already are. A real parking lot should be built at the existing dirt lot on the Moluleia side with restroom facilities (like that on the Waianae side) and allow access to hikers and bikers. The other is to repair the washout on the Waianae side by putting in a reinforced wall like other areas of the path (old railroad bed) on that side.

Rich Greenamyer

Smvl520@aol.com
10/30/2007 10:29 PM

To [redacted],
cc [redacted]
bcc
Subject Kaena...

October 29, 2007

Christen W. Mitchell
DOFAW Planner

Re: Request for a Traditional Cultural Properties (TCP) model - assessment, study and report - for your organization's proposed undertaking that may adversely affect our Ohana/families sites under the protection
and recognition of 'Aha Kukaniloko/Koa Mana lineal descendants and those lineal descendants that we represent...

aloha mai e:

Thank you for considering a recommendation from 'Aha Kukaniloko/Koa Mana lineal descendants and those
lineal descendants that we represent:

* substantive consultation with 'Aha Kukaniloko/Koa Mana spokesperson
* why do we see different boundaries
* to know, to follow, to support protection law... [NHPA Section 106 TCP model law] the significance of interpretation for the "meaning of place" is critical to the spirit and intent of protection law and we understand that TCP law is hidden within the environmental law of the State of Hawaii
* those identified sites and those sites that are not, are protected and recognized as national treasures by 'Aha Kukaniloko/Koa Mana and Ohana and we request that these sites and our traditional practices of care
be protected to the utmost of the spirit and intent pursuant to domestic and international law
* Ohana obligation to protect prior and continued traditional practices of care, sacred historic sites and inheritance upon Kaena, Oahu and all other like kind traditional cultural properties, connect [traditionally connect] to the "piko" Kukaniloko through published and verified documentation and Ohana cultural education programs and workshops
* Following our programs and workshops, kupuna asks, "Now that you have learned about our connections,
kuleana and concerns, what are we going to do to help us preserve, protect and perpetuate the right and kuleana for those Ohana/kanaka mauli yet to come?"

'owau no me ka ha'a ha'a

Tom Lenchanko
kahuaka'i ola ko laila waha olelo 'Aha Kukaniloko/Koa Mana
mea ola kanaka mauli
349-9949

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Response to The Kaena Point Fence Project by DLNR

Keona Mark
P.O. Box 2
Haleiwa, HI 96712
673-2778

This is in response to your handout regarding the proposed Fence Project at Kaena Point.

I am the 7th generation of my family who have been gathering pa'akai, limu, opihi, pipipi, lole, and I'a in Waialua Moku, from Waimea Valley to Kaena Point.
Any fencing at Kaena point will be detrimental to humans, birds and plants. By installing a fence you will not "preserve a precious piece of Hawai'I for future generations", you will be changing that piece of land forever. It will be an eyesore and it will not stop predatory dogs who are "brought by their owners" because "access will remain the same". The fence will "run along the base of the Waianae Mountains..and come down to the high tide line." How can you possibly say that it will not be an eyesore. No fence, especially at Kaena Point, can be "painted to blend into the background". Have you seen sunsets at Kaena? Have you been there at the break of day to see the changing colors of the ocean and the mountains?
The Laysan Albatross are some of the biggest and clumsiest birds who frequent Kaena. Although they are graceful in flight, their takeoff's and landings are influenced by the gusty winds of Kaena. Any fence will be harmful to these birds.
Almost every time DLNR tries to introduce measures (a fence in this case) that supposedly will compensate for threats to the survival of native species (tampering with Mother Nature) it backfires.
Is this fence the best alternative or the cheapest alternative you found? It won't keep out predatory dogs or cats. Have you thought of having personnel at Kaena Point and having access hours? Have you thought of leaving Mother Nature alone?
The challenge is not to build fencing at Kaena Point, it is to manage the people that frequent the area with no regard to plants, animals, or other people. I have been out there to see all the rubbish, road ruts, plows through native vegetation to create new 4wd paths, fireworks, pistol and rifle target practices, and fishing debris that people leave on the beaches and reefs. This fencing project is not the way to protect the area. It will irreparably harm the very uniqueness of Kaena you talk about.
I strongly oppose this fence project.

Reed H. Matsuura
P.O. Box 11
Waialua, HI 96791
rmatsuura@honolulu.gov - phone – 223-1808

Ms. Christen Mitchell
Department of Land and Natural Resources
Division of Forestry and Wildlife
1151 Punchbowl Street, Room 325
Honolulu, HI 96813

Dear Ms. Mitchell:

RE: Predator-Proof Fencing at Ka`ena Point Natural Area Reserve and Ka`ena Point State Park, Oahu.

Being a lifetime resident of Mokuleia, Kaena Point has been my fishing and salt gathering area for years. I support the fencing as long as it does not prevent the users like myself from entering the area. The preservation of the fauna and wildlife must be a mandate for this last remaining pristine area of Oahu.

Kaena Point, was known as the jumping off point for Hawaiians. This sacred area must be protected. I have witnessed dirt bikes and atv's that have just torn up the area and have total disregard of the fauna or bird nesting areas.

Thus, I am in total support for this fencing and the protection of this area. Mahalo for accepting this testimony!

Sincerely,

Reed Matsuura

Cynthia K.L. Rezentes
87-149 Maipela Street
Wai`anae, HI 96792-3154
E-mail: rezentesc@aol.com

October 15, 2007

Department of Land and Natural Resources
Division of Forestry and Wildlife
1151 Punchbowl Street, Room 325
Honolulu, HI 96813

Attn: Christen Mitchell

RE: Pre-Consultation on Environmental Assessment for Predator-Proof Fending at Ka`ena Point Natural Area Reserve and Ka`ena Point State Park, O`ahu, TMKs: 6-9-02:4, 9, 13, 14; 8-1-01:22

Aloha,

Thank you for the opportunity to provide comments regarding the proposed project for the Ka`ena Point Natural Area Reserve and Ka`ena Point State Park.

In general I do not support fencing of public natural areas which are accessible to the public.

In this case, due to the tremendous pressures being placed upon the natural resources of the area and the destruction that is occurring due to natural predators of the ground nesting birds and vegetation, I would reluctantly agree to a predator-proof fence in the area.

Of the options presented in your letter, I would support Option 2, which allows free access from both the Mokuleia and Wai`anae sides to *Leina a Ka Uhane,* a recognized significant cultural site.

In addition, I would recommend consultation with Native Hawaiian elders and organizations from both the Mokuleia and Wai`anae sides of Ka`ena Point to determine the impacts on any further cultural sites, e.g. the Night Marchers Path that is known to many, burials, ect.

This fence would benefit the natural resources at Ka`ena Point and also protect a little bit of what can be found in the Northwestern Hawaiian Islands for the residents of O`ahu who do not have the opportunity to experience that unique resource.

Sincerely,

Cynthia K.L. Rezentes
Wai`anae Resident

From: Steve Rohrmayr (crider2-2@hotmail.com)
To: kaenapoint@yahoo.com
Date: Wednesday, September 26, 2007 7:21:57 PM
Subject: Fence

I hope when this fence is constructed you will take into consideration the FACT that there is a trail going up the end of the Wai`anae Mt. range to various WW 2 pill boxes. Please DO NOT block this trail with any less access than the point in general.

Kick back and relax with hot games and cool activities at the Messenger Café. http://www.cafemessenger.com?ocid=TXT_TAGHM_SeptHMtagline1

APPENDIX G

Comments Received on Draft EA During Public Comment Period

The Draft EA was published in the December 23 2007 OEQC Bulletin. During the public comment period, written comments were received, via postal mail and email (including emails to kaenapoint@yahoo.com), from the following:

- U.S. Department of Agriculture, Natural Resources Conservation Service
- U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service
- U.S. Army Garrison, Directorate of Public Works
- State Department of Transportation, Airports
- Office of Hawaiian Affairs
- City and County Department of Planning and Permitting
- City and County of Honolulu Board of Water Supply
- ‘Ahahui i ka Lokahi
- Hawaii Conservation Voters
- The Nature Conservancy
- Pacific Seabird Group
- Mary Bicknell
- Norma Bustos
- Patrick Conant
- Dr. Sheila Conant
- Dr. Don Drake
- Dr. David Duffy
- Ann Egleston
- Aaron Hebshi
- Jan Henderson
- Tom Lenchanko
- Ross Moody
- Joseph O’Malley
- Wm. Michael Ord
- Neil Shim
- Thomas Shirai, Jr.
- Forest and Kim Starr
- Paulette Tam
- Dr. Eric VanderWerf
- Lindsay Young.

Media stories about the project were published in the Honolulu Star Bulletin and the Honolulu Advertiser at the end of January 2008 and in the Hawaii Fishing News in February 2008. As a result, some comments (likely prompted by the media coverage) were received by telephone from the following persons. To fully reflect the comments received, a summary of their comments appears below and the Final EA has been amended, where appropriate, to address the

concerns. However, because these individuals did not submit their comments in writing, they will not receive individual written responses.

- Fisherman (anonymous): concerned about retaining vehicular access to Kaena Point, but upon receiving confirmation that the predator proof fence will be located beyond the existing boulder barricade, he had no additional comments or concerns.
- Sara Eppling: Makaha resident in 100% support of the fencing project.
- Demarius Martinez: Farrington Highway resident in support of the fencing project; wish it started sooner and protected more area
- Julie: supports the fence as a “necessary evil” and slightly concerned about the effectiveness of the hood and the visual impacts of the fence
- Jim Howe: City and County of Honolulu Ocean Safety, Operations Chief: confirmed that fencing will not interfere with access by boats into bays, confirmed that there will be no change to the current vehicular access; confirmed that access doors will accommodate a stretcher if necessary; supportive of the project.
- John: in support of the project and wanted to say thanks for the recovery already seen at Kaena Point to date.

Media and outreach efforts (including site visits) have continued during the preparation of this Final EA and include:

- television stories on Outside Hawaii (OC 16) in March 2008, KHNL News 8 in May 2008, and William Aila Presents (Olelo) in December 2008; and
- site visits with the Native Hawaiian Historic Preservation Council of the Office of Hawaiian Affairs (March 2008); community members (April 2008, October 2008).

'Ahahui Malama i ka Lokahi

P.O. Box 751

Honolulu, HI 96808

February 15, 2008

Christen Mitchell
DOFAW/NARS Planner
Department of Land & Natural Resources
Division of Forestry & Wildlife
1151 Punchbowl Street, Room 325
Honolulu, HI 96813

Dear Ms. Mitchell:

'Ahahui Malama i ka Lokahi offers the following comments on the Draft Environmental Assessment (DEA) for the Ka'ena Point Ecosystem Restoration Project. We support the proposed project. We believe it will greatly aid in the ecosystem restoration goals of the Ka'ena Point Natural Area Reserve (NAR).

Ka'ena Point NAR is a jewel of a native coastal ecosystem on the remote end of O'ahu that has the potential to become even better. With effective protection from invasive species that present a constant threat, and removal of predators in the Ka'ena Point NAR, the result will be an increase in the existing population of nesting seabirds, enhanced regeneration of native plants, and be of benefit to the endangered monk seals. We are hopeful that restoration of this area using a fencing technique proven effective in New Zealand will encourage its use at other sites in Hawai'i.

We are supportive of the outreach efforts of project coordinators to ensure that stakeholders are engaged in the planning process and have the opportunity to share their concerns so that the project can be implemented in a way that is sensitive to biology, sacred sites, and traditional access. With proper implementation it can be supported by the community at large and be a successful restoration measure for the area's legacy.

We would like to see the State Department of Land and Natural Resources and U.S. Fish and Wildlife Service, key partners in this project, share the knowledge gained from this important project, from planning to actual construction and maintenance, so that other organizations, like ours, may benefit from their experience.

Please contact me should you have any questions.

Malama 'aina,

Sincerely,

Rick Ka'imi Scudder

Rick Ka'imi Scudder
Administrator

LINDA LINGLE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

May 14, 2009

Mr. Rick Scudder
'Ahahui Malama i ka Lokahi
PO Box 751
Honolulu, HI 96808

Subject: Comment Letter on Draft Environmental Assessment
Ka'ena Point Ecosystem Restoration Project
Wai'anae and Waialua Districts, O'ahu
TMKs 8-1-001:06; 8-1-001:022; 6-9-001:30; 6-9-002:04; 6-9-002:09; 6-9-002:13

Dear Mr. Scudder:

Thank you for the letter dated February 15, 2008 on the Draft Environmental Assessment (EA) for the Ka'ena Point Ecosystem Restoration Project. We appreciate your support for the project, agree with your comments that this project will aid in the ecosystem restoration goals of the area, and hope that use of this fencing technology will encourage its use in other areas. We confirm that we plan to share the knowledge gained from this project with other organizations so that other areas can benefit from this experience. Thank you for your participation in the environmental review process. Should you have any future questions or concerns about this project, please feel free to contact Emma Yuen at (808) 587-4170 or by email at Emma.Yuen@hawaii.gov.

Sincerely,

For:

Christen Mitchell
Planner, Division of Forestry and Wildlife

Hawaii Conservation Voters

P.O. Box 781

Kaneohe, Hawaii 96744

Christen Mitchell

Department of Land and Natural Resources,

Division of Forestry and Wildlife, 1151

Punchbowl Street, Room 325,

Honolulu, Hawai'i 96813.

RECEIVED
'08 JAN 22 P2:42
FORESTRY & W.L.
STATE OF HAWAII

Subject: Support for **Ka'ena Point Ecosystem Restoration Project**

Alien species are devastating native ecosystems throughout Hawaii. Fencing and hunting, plus weeding to protect native plants, are the only management tools we have to protect our native heritage.

At Kaena Point you can see all the ground-nesting birds, maybe whales, dolphins, monk seals and turtles all at once. It is a place where people can see a little bit of what the Northwest Islands may be like. The fence will not prevent fishermen, hikers or bikers from entering the area. It is a relatively low cost project that will protect vital endangered and threatened species.

The fence will also protect 'ohai, an endangered plant that lives only at Ka'ena and whose seeds are eaten by mice and rats, she said. Other native plants including 'akoko, naio, 'ilima and naupaka also are expected to thrive behind the fence.

We submit this testimony in support of this project.

Bill Sager, ED, Hawaii Conservation Voters

Visit our blog at http://hawaiiconservationvoters.blogspot.com/

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
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LAND
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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 15, 2009

Mr. Bill Sager
Hawaii Conservation Voters
PO Box 781
Kaneohe, HI 96744

Subject: Comment Letter on Draft Environmental Assessment
Ka'ena Point Ecosystem Restoration Project
Wai'anae and Waialua Districts, O'ahu
TMKs 8-1-001:06; 8-1-001:022; 6-9-001:30; 6-9-002:04; 6-9-002:09; 6-9-002:13

Dear Mr. Sager:

Thank you for the letter received January 22, 2008, on the Draft Environmental Assessment for the Ka'ena Point Ecosystem Restoration Project. We appreciate your testimony in support of this project and agree with your comments that this project will benefit ground-nesting birds and native plants without preventing fishermen, hikers or bikers from entering the area and enjoying the natural resources found within Ka'ena Point. Thank you for your participation in the environmental review process.

Should you have any future questions or concerns about this project, please feel free to contact Emma Yuen at (808) 587-4170 or by email at Emma.Yuen@hawaii.gov.

Sincerely,

for: Christen Mitchell
Planner, Division of Forestry and Wildlife

The Nature Conservancy
Protecting nature. Preserving life.

The Nature Conservancy of Hawai'i
923 Nu'uanu Avenue
Honolulu, HI 96817

Tel (808) 537-4508
Fax (808) 545-2019

nature.org/hawaii

February 13, 2008

Christen Mitchell
DOFAW/NARS Planner
Department of Land & Natural Resources
Division of Forestry & Wildlife
1151 Punchbowl Street, Room 325
Honolulu, HI 96813

Dear Ms. Mitchell:

The Nature Conservancy provides the following comments on the Draft Environmental Assessment (DEA) for the Ka'ena Point Ecosystem Restoration Project. We support the proposed project, which is centered on the construction of a predator-proof fence within the Ka'ena Point Natural Area Reserve (NAR).

Ka'ena Point NAR is a wonderful example of a native coastal ecosystem reminiscent of those of the Northwestern Hawaiian Islands. It is a jewel on the western extremity of O'ahu that has the potential to become even more brilliant if it can be effectively protected from invasive species that present a constant threat. We concur that the exclusion and removal of predatory animals will result in an increase in the existing population of nesting seabirds, enhance regeneration of native plants, and benefit endangered monk seals. We are hopeful that restoration of this area using a fencing technique proven effective in New Zealand will be a model for other sites in Hawai'i.

Erecting a fence in a natural area is not to be taken lightly, especially in sites that have significant biological, cultural and recreational resources. We are encouraged by the outreach efforts of project coordinators to ensure that stakeholders are engaged in the planning process and have the opportunity to share their concerns so that the project can be implemented in a way that is sensitive to biology, sacred sites, and traditional access. Done properly it can be supported by the community at large and be a successful protective influence for the area's legacy. We urge continued dialogue with community stakeholders throughout the process.

We also encourage the State Department of Land and Natural Resources and U.S. Fish and Wildlife Service, key partners in this project, to facilitate the sharing of knowledge gained from this project, from initial planning to actual construction and maintenance, so that other organizations may benefit from their experience.

Please contact me should you have any questions about our comments.

Ho'omalu i ka pā'ū o Hi'iaka,

Samuel M. Gon III, Ph.D.
Senior Scientist and Cultural Advisor

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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 15, 2009

Mr. Sam Gon
The Nature Conservancy of Hawaii
923 Nuuanu Avenue
Honolulu, HI 96817

Subject: Comment Letter on Draft Environmental Assessment
Ka'ena Point Ecosystem Restoration Project
Wai'anae and Waialua Districts, O'ahu
TMKs 8-1-001:06; 8-1-001:022; 6-9-001:30; 6-9-002:04; 6-9-002:09; 6-9-002:13

Dear Mr. Gon:

Thank you for the letter dated February 13, 2008 on the Draft Environmental Assessment (EA) for the Ka'ena Point Ecosystem Restoration Project. We appreciate your support for the project and agree with your comments that this project will result in an increase in the existing population of seabirds, enhance regeneration of native plants, and benefit endangered monk seals. We confirm that we plan to continue the outreach effort about this project and maintain a dialogue with community stakeholders throughout the process, and that we plan to share the knowledge gained from this project with other organizations so that other areas can benefit from this experience. Thank you for your participation in the environmental review process. Should you have any future questions or concerns about this project, please feel free to contact Emma Yuen at (808) 587-4170 or by email at Emma.Yuen@hawaii.gov.

Sincerely,

for: Christen Mitchell
Planner, Division of Forestry and Wildlife

"Kanehisa, Dale T Ms CIV USA USARPAC" <dale.kanehisa@us.army.mil>

01/31/2008 01:21 PM

To <christen.w.mitchell@hawaii.gov>

cc

bcc

Subject EA for the Kaena Point Ecosystem Restoration (UNCLASSIFIED)

Classification: **UNCLASSIFIED**
Caveats: NONE

Hi Christen,
Our office was recently in receipt of the Draft Environmental Assessment for the Kaena Point Ecosystem Restoration. We'd like to thank you for the opportunity to review and comment on the proposed project. While we do not have any specific comments to the DEA, we would like to request a copy of the EA once it is finalized. I would appreciate it if you could send a copy of the final document to our office at:

Department of the Army
USAG-HI, Directorate of Public Works
Environmental Division (IMPC-HI-PWE)
947 Wright Ave., Wheeler Army Airfield
Schofield Barracks, HI 96857-5013
Attn: Dale Kanehisa

Thank you in advance.

Respectfully,
Dale Kanehisa
Environmental Protection Specialist
Directorate of Public Works, USAG-HI
Phone: (808)656-2878 ext. 1036
Fax: (808)656-1039

Service is our Job! Excellence is our Goal!

Your comments are important to us.
Logon:
http://ice.disa.mil/index.cfm?fa=card&service_provider_id=F3121&site_id=48&service_category_id=5

Classification: **UNCLASSIFIED**
Caveats: NONE

LINDA LINGLE
GOVERNOR OF HAWAII

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LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 14, 2009

Mr. Dale Kanehisa
Department of the Army
USAG-HI, Directorate of Public Works
Environmental Division (IMPC-HI-PWE)
947 Wright Avenue, Wheeler Army Airfield
Schofield Barracks, HI 96857-5013

Subject: Comment Letter on Draft Environmental Assessment
Ka'ena Point Ecosystem Restoration Project
Wai'anae and Waialua Districts, O'ahu
TMKs 8-1-001:06; 8-1-001:022; 6-9-001:30; 6-9-002:04; 6-9-002:09; 6-9-002:13

Dear Mr. Kanehisa:

Thank you for the email dated January 31, 2008 on the Draft Environmental Assessment (EA) for the Ka'ena Point Ecosystem Restoration Project. We understand that you have no specific comments on the Draft EA and confirm that we will provide you with a copy of the Final EA, as requested, when finalized. Thank you for your participation in the environmental review process.

Should you have any future questions or concerns about this project, please feel free to contact Emma Yuen at (808) 587-4170 or by email at Emma.Yuen@hawaii.gov.

Sincerely,

for: Christen Mitchell
Planner, Division of Forestry and Wildlife

Elton Teshima/ADMIN/HIDOT@HIDOT
01/24/2008 04:16 PM

To christen.w.mitchell@hawaii.gov
cc Lynette Kawaoka/AIR/HIDOT@HIDOT
bcc
Subject Kaena Point Ecosystem Restoration project - Draft EA

Sorry for this late reply. In your listing of agencies & organizations consulted, you listed State DOT, Airports Division. We would appreciate if you could please provide us with any information as to who you may have consulted.

Our Airports Division Planning Office have the following comment to "Air Traffic" on page 42 of the subject Draft EA:

1. Please utilize the current FAA Advisory Circular 150/5200-33B Hazardous Wildlife Attractants On or Near Airports, dated 8/28/07, for the Draft EA. The FAA Advisory Circular 150/5200-33A, dated 7/27/04, has since been cancelled.

2. Per FAA Advisory Circular 150/200-33B, the FAA recommends a 5 statute miles distance from the Dillingham Airfield's air operations area (AOA) and the hazardous wildlife attractant if the attractant could cause hazardous wildlife movement into or across the aproach or departure airspace. We are concerned that the protected area at Kaena Point will provide an attraction to nesting birds which will increase the population and activity of birds in the area. This may become a potential hazard for aircraft operating at Dillingham Airfield.

3. Operations at Dillingham Airfield are not limited to daytime operations only. While the daytime activities are civil general aviation traffic, occasionally, the military conducts night training operations. These could include helicopters and fixed wing up to medium category cargo aircrafts.

Please reply if our comments can still be accepted or too late to be accepted. If comments are still begin accepted, we will forward a formal letter.

LINDA LINGLE
GOVERNOR

40913

BRENNON T. MORIOKA
INTERIM DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:

STP 8.2759

February 4, 2008

TO: THE HONORABLE LAURA THIELEN, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
DEPARTMENT OF LAND AND NATURAL RESOURCES

ATTN: MR. PAUL CONRY
FORESTRY AND WILDLIFE DIVISION

FROM: Francis Paul Keeno for BRENNON T. MORIOKA
INTERIM DIRECTOR OF TRANSPORTATION

SUBJECT: KAENA POINT ECOSYSTEM RESTORATION PROJECT
DRAFT ENVIRONMENTAL ASSESSMENT (DEA)

Thank you for providing the subject Draft EA for our review. This letter is provided as a follow-up to earlier verbal comments provided by State Department of Transportation (DOT) staff. DOT's comments are as follows:

1. The "Air Traffic" section of the Draft EA should be revised to reflect that FAA Advisory Circular 150/5200-33A, dated 7/27/04, has been cancelled and superceded by FAA Advisory Circular 150/5200-33B, Hazardous Wildlife Attractants On or Near Airports dated 8/28/07.

2. The subject project may impact air traffic operations at the Dillingham Airfield. FAA Advisory Circular 150/5200-33B recommends that hazardous wildlife attractants maintain a 5-statute-mile distance from the Dillingham Airfield's air operations area (AOA) if the attractant could cause hazardous wildlife movement into or across the approach or departure airspace. We are concerned that the protected area at Kaena Point will provide an attraction to nesting birds, which will in turn increase the population and activity of birds in the area. This may become a potential hazard for aircraft operating at the Dillingham Airfield.

3. Operations at Dillingham Airfield are not limited to daytime operations. While civil general aviation traffic constitutes the bulk of the daylight activities, military training operations occasionally occur at night. These military operations include helicopters and fixed-wing cargo aircrafts.

We appreciate the opportunity to provide comments. Should you have any questions regarding Air Traffic operations, please contact the Airports Division, Planning Office.

c: Laurence Lau, Office of Environmental Quality Control

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
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DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 15, 2009

Mr. Brennon Morioka
State Department of Transportation
869 Punchbowl Street
Honolulu, HI 96813

Subject: Comment Letter on Draft Environmental Assessment
Ka'ena Point Ecosystem Restoration Project
Wai'anae and Waialua Districts, O'ahu
TMKs 8-1-001:06; 8-1-001:022; 6-9-001:30; 6-9-002:04; 6-9-002:09; 6-9-002:13

Dear Mr. Morioka:

Thank you for the letter dated February 4, 2008 on the Draft Environmental Assessment (EA) for the Ka'ena Point Ecosystem Restoration Project.

We have responded to your comments (summarized in italics) below:

1) *The "Air Traffic" section of the Draft EA should be revised to reflect that FAA Advisory Circular 150/2500-33A dated 7-27-04 has been cancelled and superseded by FAA Advisory Circular 150/2500-33B, Hazardous Wildlife Attractants On or Near Airports dated 8-27-07.*

The Final EA has been modified to reflect the updated Advisory Circular. Thank you for this information.

2) *The subject project may impact air traffic operations at the Dillingham Airfield. FAA Advisory Circular 150/2500-33B recommends that hazardous wildlife attractants maintain a 5-statute-mile distance from the Dillingham Airfield's air operations area (AOA) if the attractant could cause hazardous wildlife movement into or across the approach or departure airspace. We are concerned that the protected area of Kaena Point will provide an attraction to nesting birds, which will in turn increase the population and activity of birds in the area. This may become a potential hazard for aircraft operating at the Dillingham Airfield.*

Several areas along the north shore of Oahu are already attractive to nesting seabirds, including Kaena Point, Kuaokala, and cliff areas near Dillingham Airfield. DLNR believes that it is possible that this project will reduce (rather than increase) hazards, by providing a more attractive nesting location at Kaena Point that draws birds away from the nest locations that are

closer to Dillingham. Moreover, because the type of air traffic at Dillingham utilizes a distance shorter than five miles for approach and departure patterns and because the fencing project is almost at the recommended distance of five miles away, DLNR considers it unlikely that the proposed fencing will cause hazardous wildlife movement into or across the approach or departure space actually used.

3) *Operations at Dillingham Airfield are not limited to daytime operations. While civil general aviation traffic constitutes the bulk of the daylight activities, military training operations occasionally occur at night. These military operations include helicopters and fixed wing cargo aircrafts.*

Our source for the statement that air traffic at Dillingham is limited to daytime operations was the DOT-Airports website, formerly located at http://www6.hawaii.gov/dot/airports/oahu/hdh/index.htm (enclosed). We have made changes to the Final EA to incorporate the updated information you have provided regarding nighttime activities.

Thank you for your participation in the environmental review process.

Should you have any future questions or concerns about this project, please feel free to contact Emma Yuen at (808) 587-4170 or by email at Emma.Yuen@hawaii.gov.

Sincerely,

For: Christen Mitchell
Planner, Division of Forestry and Wildlife

DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 7TH FLOOR • HONOLULU, HAWAII 96813
TELEPHONE: (808) 768-8000 • FAX (808) 527-6743
INTERNET: www.honolulu.gov • DEPT. WEB SITE: www.honoluludpp.org

MUFI HANNEMANN
MAYOR

HENRY ENG, FAICP
DIRECTOR

DAVID K. TANOUE
DEPUTY DIRECTOR

2007/ELOG-3579(AM)

January 14, 2008

Ms. Christen Mitchell
Department of Land and Natural Resources
Division of Forestry and Wildlife
1151 Punchbowl Street, Room 325
Honolulu, Hawaii 96813

'08 JAN 15 P2:29

Dear Ms. Mitchell:

Subject: Draft Environmental Assessment (EA)
Ka'ena Point Natural Area Reserve (NAR) Ecosystem Restoration
State of Land and Natural Resources (DLNR)
Kaena Point - Waianae
Tax Map Keys 8-1-1: 6, 22; 6-9-1: 30; 6-9-2: 4, 9 and 13

The Department of Planning and Permitting (DPP) has reviewed the Draft EA for the above-referenced project received on December 20, 2007. In addition to our preliminary comments of September 26, 2007, we have the following comments:

1. Section III, Project Description, page 11: Any ground preparation work that involves a change in the drainage pattern and/or excavation of 50 cubic yards or more requires a grading permit from the DPP, Civil Engineering Branch.

2. Section VI, Anticipated impacts of the preferred alternative and proposed mitigation measures, Viewplanes, page 38: In addition to the analysis mentioned herein, please include a discussion and analysis of view planes relative to the 1987 Coastal View Study [i.e., Makua and Northshore (Kaena) Viewsheds].

3. Section VI, Anticipated impacts of the preferred alternative and proposed mitigation measures, Public Access, page 41: Regarding the proposed location of the access doors between the fencing, explain whether these are currently points of entry by which people access the shoreline, bike, hike, etc.

4. Please expand Section VI and include a discussion on near-shore water quality and how liquid/solid wastes are currently disposed of (if applicable), and whether construction will have any impact.

Thank you for the opportunity to review the above-referenced Draft EA. If you have any questions, please contact Ann Matsumura of our staff at 768-8020.

Very truly yours,

Henry Eng, FAICP, Director
Department of Planning and Permitting

HE:cs

cc: Office of Environmental Quality Control

g:posseworkingdirectory\ann\2007elog3579.doc

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 15, 2009

Mr. Henry Eng, Director
Department of Planning and Permitting
City and County of Honolulu
650 South Beretania Street, 7th Floor
Honolulu, HI 96813

Subject: Comment Letter on Draft Environmental Assessment
Ka'ena Point Ecosystem Restoration Project
Wai'anae and Waialua Districts, O'ahu
TMKs 8-1-001:06; 8-1-001:022; 6-9-001:30; 6-9-002:04; 6-9-002:09; 6-9-002:13

Dear Mr. Eng:

Thank you and your staff for the comment letter dated January 14, 2008, on the Draft Environmental Assessment (EA) for the Ka'ena Point Ecosystem Restoration Project.

We have responded to your comments (summarized in italics) below:

1) *Section III, Project Description: Any ground preparation work that involves a change in the drainage pattern and/or excavation of 50 cubic yards or more requires a grading permit from the DPP, Civil Engineering Branch.*

While the Ka'ena Point Ecosystem Restoration Project is not anticipated to change drainage patterns, we have re-computed the total amount of soil to be disturbed during ground preparation for fence construction. It is likely that the total amount moved will exceed 50 cubic yards, so we intend to apply for a grading permit and have amended the Final EA (Section IX. Permits) to indicate that a grading permit will be required.

2) *Section VI, Anticipated Impacts: Viewplanes: In addition to the analysis mentioned, please include a discussion and analysis of viewplanes relative to the 1987 Coastal View Study (i.e., Makua and Northshore (Kaena) Viewsheds).*

Section IV of the Final EA, Visual Resources, and Section VI, Anticipated Impacts: Viewplanes have been amended to include the information from the 1987 Coastal View Study. Specifically, Section IV of the Final EA now recognizes that both Makua and Kaena Viewsheds were classified as Type 1 viewsheds that demonstrate high levels of visual intactness. Section VI of the Final EA now evaluates how the proposed fencing is consistent with the design guidelines

recommended by the Coastal View Study to minimize conflict within the Special Management Area. Specifically, the Final EA now includes the following analysis:

The design and alignment of the fencing is consistent with the applicable guidelines contained in the 1987 Coastal View Study commissioned by the City and County of Honolulu as follows:

1. Guideline 1.1 recommends that "building forms should neither encroach into nor penetrate the ridgeline of significant land forms or descending ridges, nor should buildings be sited that create silhouettes against the seaward horizon…" The fencing as planned does not extend above existing ridgelines nor create silhouettes against the horizon.
2. Guideline 1.2 recommends that "existing continuous views from the coastal highway should remain unobstructed." The fencing as planned will not be visible at all from the coastal highways due to the distance and the relatively short height of the fence.
3. Guideline 1.3 recommends that "alteration to existing natural features such as coastal land forms, drainage patterns, and stands of existing trees should be discouraged…" Alteration to existing features is not planned; the fencing will be constructed on an existing World-War II era roadbed then contour down a loose rock slope. There are no stands of existing trees within the planned fence alignment and no drainage patterns will be altered.
4. Guidelines 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, 4.3, 4.4, 5.1, and 5.2 are not applicable to this project as it is not located along a coastal highway or in a highly urbanized area, landscaping in the traditional sense would not be appropriate in this natural area, and the fence project is not a development in the sense meant in Principle 5.

3) *Section VI, Anticipated Impacts: Public Access: Regarding the proposed location of the access doors between the fencing, explain whether these are currently points of entry by which people access the shoreline, bike, hike, etc.*

We confirm that the proposed locations of two access doors are the current points of entry for visitors wishing to visit the actual point, to bike or hike across Ka'ena Point to the other side of the island, or to access shoreline locations within the project area. A third access door will also be incorporated into the fencing as a result of additional consultation with cultural practitioners. This third access door is not a current point of entry into the Reserve, but will be incorporated to to provide souls coming down the mountain to the Leina a ka 'Uhane similar access into the reserve as offered to the public. This section of the Final EA has been slightly modified for clarification.

4) *Please expand Section VI and include a discussion of near-shore water quality and how liquid/solid wastes are currently disposed of (if applicable), and whether construction will have any impact.*

Due to the remote nature of Ka'ena Point, there are few water quality studies of the near-shore waters. Moreover, the recently completed *Atlas of Hawaiian Watersheds* includes no discussion of the watershed within the project area – primarily as there are no perennial streams in the area. Because of the limited development and the characteristics of the land adjacent to the ocean as a restored coastal ecosystem, it is assumed for the purposes of the EA that near-shore water quality is pristine. Due to the methods of fence construction planned, the underlying soil characteristics, the lack of streams, and the generally arid nature of the project area, no run-off is anticipated to

occur into near-shore waters and no noticeable impacts are expected. The Final EA has been modified to reflect this information.

Ka'ena Point Natural Area Reserve is undeveloped, and there are no public facilities, such as restrooms, within the project area. Thus, there is no current method disposal of liquid and solid wastes. Because most visitors hike in and out of the area for short visits, rather than remain in the area for extended camping stays, human waste is not currently a problem within this reserve. Because of the extended hours on-site and the distance to the nearest toilet facility, we do intend to have the fence contractor provide a port-a-potty for use by laborers during construction.

Should you have any future questions or concerns about this project, please feel free to contact Emma Yuen at (808) 587-4170 or by email at Emma.Yuen@hawaii.gov.

Sincerely,

for: Christen Mitchell
Planner, Division of Forestry and Wildlife

RE
'08 JAN 23 P4:55
STATE OF HAWAII

University of Hawai'i at Mānoa

Department of Zoology
Edmondson Hall 152
2538 McCarthy Mall • Honolulu, Hawaii 96822-2279
Telephone: 808-741-9479 • Facsimile: 808-956-9812
23 January 2008

Dear Christen,
I am writing this letter in full support of the proposed predator proof fence at Kaena Point Natural Area Reserve.

For the last five years I have conducted my Ph.D. research on the Laysan Albatross at Kaena Point Natural Area Reserve and have participated in numerous service visits, bird counts and educational hikes in the area. I have had the pleasure of observing the astounding increases in seabird nesting success with the current predator control program, but I have also had the displeasure of documenting the still frequent predation events. Despite ongoing predator control that allows the birds to nest there at all, the rates of predation (up to 15% per year) are too high to allow the long term recovery of the existing seabird populations, and are likely preventing other seabird species from colonizing the area. The installment of a predator proof fence would eliminate all predation and give more sensitive seabird species the opportunity to re-colonize the area.

This is an excellent project, and I commend DLNR, DoFAW and the Natural Area Reserve System for pursuing such a cutting edge solution to their conservation needs. I look forward to seeing the fence built, and more importantly, to watching the ecosystem recover.

If you have any questions, or would like more information please do not hesitate to contact me.

Sincerely,

Lindsay Young

Ph.D. Candidate
University of Hawaii
Department of Zoology

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
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CONSERVATION AND COASTAL LANDS
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KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 15, 2009

Ms. Lindsay Young
University of Hawaii at Manoa
Department of Zoology
Edmondson Hall 152
2538 McCarthy Mall
Honolulu, HI 96822

Subject: Comment Letter on Draft Environmental Assessment
Ka'ena Point Ecosystem Restoration Project
Wai'anae and Waialua Districts, O'ahu
TMKs 8-1-001:06; 8-1-001:022; 6-9-001:30; 6-9-002:04; 6-9-002:09; 6-9-002:13

Dear Ms. Young:

Thank you for the letter received January 23, 2008 on the Draft Environmental Assessment (EA) for the Ka'ena Point Ecosystem Restoration Project. We appreciate your support of this project and acknowledge the additional information you provided regarding the existing rates of predation at Ka'ena Point and the anticipated benefits of this project. Thank you for your participation in the environmental review process.

Should you have any future questions or concerns about this project, please feel free to contact Emma Yuen at (808) 587-4170 or by email at Emma.Yuen@hawaii.gov.

Sincerely,

for Christen Mitchell
Planner, Division of Forestry and Wildlife

RE

'08 JAN 23 P4:55

FORESTRY & W
STATE OF HAWA

Dr. Eric VanderWerf
Pacific Rim Conservation
3038 Oahu Avenue
Honolulu, HI 96822

Department of Land and Natural Resources
Attn: Christen Mitchell
1151 Punchbowl Street, Room 325
Honolulu, Hawaii 96813

Dear Ms. Mitchell,

I am writing in support of the proposed predator-proof fence and ecosystem restoration project at Kaena Point, Oahu. I believe a predator-proof fence would result in substantial benefits to a variety of natural resources, and that there would not be any significant impacts to the environment, endangered species, or other natural or cultural resources.

Management at Kaena Point, such as exclusion of off-road vehicles and control of alien predators, has already enhanced the environment at Kaena Point, but construction of a predator-proof fence and removal of alien predators within the fence would substantially improve restoration efforts, and would also be more cost-effective in the long-term. Native birds such as the Laysan Albatross and Wedge-tailed Shearwater have increased in number at Kaena Point but still suffer predation from feral dogs, cats, mongoose, and possibly rats on an annual basis. Exclusion and eradication of these predators would improve survival and reproduction of these seabirds and perhaps encourage other seabirds that have been extirpated from Oahu to re-establish colonies. Similarly, rodents destroy the seeds and adults of rare native plants such as ohai and sandalwood at Kaena Point. Elimination of this predation would allow greater natural regeneration of these and other species.

Construction of a predator-proof fence to prevent alien animals from entering the area where they could cause damage would minimize the need to trap or poison them. A predator-proof fence is thus more humane in the long-run than controlling alien predators indefinitely.

In my opinion the presence of such a fence would not detract from the views and scenery at Kaena Point. The fence will be relatively low in stature, would be an inconspicuous color that would blend with the surroundings, and would be concealed by terrain in some areas. Moreover, to me the fence would represent efforts to protect Hawaii's unique and valuable natural resources, and as such I would regard it as a welcome addition to the views at Kaena Point.

Sincerely,

Dr. Eric VanderWerf

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

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LAND
STATE PARKS

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DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 15, 2009

Mr. Eric VanderWerf
Pacific Rim Conservation
3038 Oahu Avenue
Honolulu, HI 96822

Subject: Comment Letter on Draft Environmental Assessment
Ka'ena Point Ecosystem Restoration Project
Wai'anae and Waialua Districts, O'ahu
TMKs 8-1-001:06; 8-1-001:022; 6-9-001:30; 6-9-002:04; 6-9-002:09; 6-9-002:13

Dear Mr. VanderWerf:

Thank you for the letter received January 23, 2008 on the Draft Environmental Assessment (EA) for the Ka'ena Point Ecosystem Restoration Project. We appreciate your support of this project and agree with your comments on the anticipated benefits of this project and with your opinion that construction of the fence is more humane than ongoing animal control. In addition, we acknowledge your opinion that the fencing would not detract from the views or scenery of the area due to its design and placement and because of its role in protecting Hawaii's unique and valuable natural resources. Thank you for your participation in the environmental review process. Should you have any future questions or concerns about this project, please feel free to contact Emma Yuen at (808) 587-4170 or by email at Emma.Yuen@hawaii.gov.

Sincerely,

for Christen Mitchell
Planner, Division of Forestry and Wildlife

DLNR.CO.PublicDLNR/DLNR/StateHiUS

01/24/2008 05:04 PM

To Christen W Mitchell/DLNR/StateHiUS@StateHiUS

cc

bcc

Subject Fw: comments on draft EA for fencing at Kaena Pt

----- Forwarded by DLNR.CO.PublicDLNR/DLNR/StateHiUS on 01/24/2008 05:04 PM -----

"Hebshi Aaron Contr 15 CES/CEVP" <aaron.hebshi.ctr@hickam.af.mil>

01/23/2008 12:20 PM

To <dlnr@hawaii.gov>

cc

Subject comments on draft EA for fencing at Kaena Pt

To whom it may concern,

I sincerely appreciate DLNR's effort to conserve the biologically diverse and valuable habitat at Kaena point. I also value the effort of a thoughtful and well-reseaarched environmental analysis of the proposed predator-proof fence. I fully support the preferred alternative of constructing a predator-proof fence at the site in order to more fully protect the site from invasive mammals such as dogs, cats, mongoose, and rodents. Either of the two alignment options on the Mokuleia end of the fence-line would provide ample protection to nesting birds, although the option considering alignment along the existing barricade would protect slightly more habitat.

Although I work in support of the Air Force's natural resources program, this email does not reflect an official Air Force statement of support.

Sincerely,
Aaron Hebshi

Aaron Hebshi
Natural Resources Program Technical Support
Booz Allen Hamilton
15CES/CEVP
Hickam AFB, HI 96853
(808) 449-3198
aaron.hebshi.ctr@hickam.af.mil

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

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LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 15, 2009

Mr. Aaron Hebshi
Natural Resources Program Technical Support
Booz Allen Hamilton
15CES/CEVP
Hickam Air Force Base, HI 96853
Via email: aaron.hebshi.ctr@hickam.af.mil

Subject: Comment Letter on Draft Environmental Assessment
Ka'ena Point Ecosystem Restoration Project
Wai'anae and Waialua Districts, O'ahu
TMKs 8-1-001:06; 8-1-001:022; 6-9-001:30; 6-9-002:04; 6-9-002:09; 6-9-002:13

Dear Mr. Hebshi:

Thank you for the email dated January 23, 2008 on the Draft Environmental Assessment (EA) for the Ka'ena Point Ecosystem Restoration Project. We appreciate your support of DLNR's efforts to conserve the biologically diverse and valuable habitat at Ka'ena Point and your support for the preferred alternative of constructing a predator-proof fence. Thank you for your participation in the environmental review process.

Should you have any future questions or concerns about this project, please feel free to contact Emma Yuen at (808) 587-4170 or by email at Emma.Yuen@hawaii.gov.

Sincerely,

for Christen Mitchell
Planner, Division of Forestry and Wildlife

From: Janet Henderson (janethawaii@hawaii.rr.com)
To: kaenapoint@yahoo.com
Date: Monday, January 21, 2008 12:12:05 PM
Subject: fence

Yes, it is a must to fence this area to protect the rare birds that are ground nesting there. Dogs must be kept out and should be shot on sight or trapped and turned in to the humane society, cats too.
Jan Henderson

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
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LAND
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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 15, 2009

Ms. Janet Henderson
janethawaii@hawaii.rr.com

Subject: Comment Letter on Draft Environmental Assessment
Ka'ena Point Ecosystem Restoration Project
Wai'anae and Waialua Districts, O'ahu
TMKs 8-1-001:06; 8-1-001:022; 6-9-001:30; 6-9-002:04; 6-9-002:09; 6-9-002:13

Dear Ms. Henderson:

Thank you for the email dated January 21, 2008 on the Draft Environmental Assessment (EA) for the Ka'ena Point Ecosystem Restoration Project. We appreciate your support of the project. Thank you for your participation in the environmental review process.

Should you have any future questions or concerns about this project, please feel free to contact Emma Yuen at (808) 587-4170 or by email at Emma.Yuen@hawaii.gov.

Sincerely,

for: Christen Mitchell
Planner, Division of Forestry and Wildlife

Smvl520@aol.com
12/23/2007 09:22 PM

To Christen.W.Mitchell@hawaii.gov, Laura.Thielen@hawaii.gov, vhauser@achp.gov, dklima@achp.gov
cc kaim@oha.org, jeromey@oha.org, haunania@oha.org, clyden@oha.org
bcc

Subject Re: Draft EA available: Kaena Pt Ecosystem Restoration project

History: This message has been forwarded.

aloha,

Request for a Traditional Cultural Properties (TCP) model study for the prior and continued practices of care
at Kaena, O'ahu and their relationship to the "piko" Kukaniloko.

mahalo no 'I'o lako ua mau ke ea o ka 'aina i ka pono

'owau no me ka ha'a ha'a

Tom Lenchanko
kahuaka'i ola ko laila waha olelo 'Aha Kukaniloko/Koa Mana mea ola kanaka mauli
349-9949
smvl520@aol.com

See AOL's top rated recipes and easy ways to stay in shape for winter.

349-9949

Start the year off right. Easy ways to stay in shape in the new year.
----- Message from Smvl520@aol.com on Mon, 24 Dec 2007 02:22:00 EST -----

To: Christen.W.Mitchell@hawaii.gov, Laura.Thielen@hawaii.gov, vhauser@achp.gov, dklima@achp.gov

cc: kaim@oha.org, jeromey@oha.org, haunania@oha.org, clyden@oha.org

Subject: Re: Draft EA available: Kaena Pt Ecosystem Restoration project

aloha,

Request for a Traditional Cultural Properties (TCP) model study for the prior and continued practices of care
at Kaena, O'ahu and their relationship to the "piko" Kukaniloko.

mahalo no 'I'o lako ua mau ke ea o ka 'aina i ka pono

'owau no me ka ha'a ha'a

Tom Lenchanko
kahuaka'i ola ko laila waha olelo 'Aha Kukaniloko/Koa Mana mea ola kanaka mauli
349-9949
smvl520@aol.com

Smvl520@aol.com

01/10/2008 05:55 AM

To gov@hawaii.gov, ltgov@hawaii.gov, vhauser@achp.gov, dklima@achp.gov, Laura.Thielen@hawaii.gov, christen.w.mitchell@hawaii.gov, psato@tnc.org, Peahi@webtv.net, haunania@oha.org, clyden@oha.org, kaim@oha.org, jeromey@oha.org, David.Sanborn@osd.mil

cc cdexk@yahoo.com, kalimapau@hotmail.com, skroy@hawaiiantel.net, Everydaymystic@aol.com, Glen_Kila/KAMAILE/HIDOE@notes.k12.hi.us, BHelemano@aol.com, ihussey@hawaii.edu, kelii_s@hotmail.com, KEONAHALEIWA@aol.com, laiekupuna@yahoo.com, palolo@hawaii.rr.com, Malamapono@aol.com, marthanoyes@hawaii.rr.com, meheula@pacificlaw.com, meakauarockdahale@yahoo.com, mookahan@yahoo.com, STKUTAKA@ksbe.edu, unclepaulo@hawaiiantel.net, leea030@hawaii.rr.com, whitedog@hawaii.rr.com, Wilma_Kalawa/KAMAILE/HIDOE@notes.k12.hi.us, ramico@hawaii.rr.com, repmagaoay@Capitol.hawaii.gov, manulani@hawaii.edu, kanialaiwaipiouka@yahoo.com

Subject Fwd: Draft EA available: Kaena Pt Ecosystem Restoration project

Januray 10, 2008

Governor
State of Hawaii

Re: request for a Traditional Cultural Properties (TCP) model study for the prior and continued traditional practices of care at Kaena, O'ahu, moku o Waialua, O'ahu, moku o Wai'anae, O'ahu and their relationship to the "piko" Kukaniloko; and substantive consultation with the spokesperson for 'Aha Kukaniloko/Koa Mana and the lineal descendants and the "traditions and values" that they represent

aloha mai e:

Substantive consultation with the spokesperson for 'Aha Kukaniloko/Koa Mana and the lineal descendants and the "traditions and values" that they represent.

National Historic Preservation Act, Section 106; Hawaii Revised Statute, Chapter 6E-42; Hawaii Administrative Rules 13-264, 13-275, 13-300...

TCP obligation is hidden within the state environmental law...

mahalo no 'I'o lako ua mau ke ea o ka 'aina i ka pono

'owau no me ka ha'a ha'a

Tom Lenchanko
kahuaka'i ola ko laila waha oleo 'Aha Kukaniloko/Koa Mana mea ola kanaka mauli

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
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KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 15, 2009

Mr. Tom Lenchanko
Smvl520@aol.com

Subject: Comment Letter on Draft Environmental Assessment
Ka'ena Point Ecosystem Restoration Project
Wai'anae and Waialua Districts, O'ahu
TMKs 8-1-001:06; 8-1-001:022; 6-9-001:30; 6-9-002:04; 6-9-002:09; 6-9-002:13

Dear Mr. Lenchanko:

Thank you for the email dated January 10, 2008, as well as your previous emails, on the Draft Environmental Assessment (EA) for the Ka'ena Point Ecosystem Restoration Project requesting a "Traditional Cultural Properties (TCP) model study for the prior and continued practices of care at Kaena, Oahu and their relationship to the 'piko' Kukaniloko."

DLNR-DOFAW recognizes the importance of identifying cultural practices and cultural properties, and evaluating the impact this proposed project may have on cultural practices and cultural resources. As part of the environmental review process, DLNR made every effort to solicit information and concerns from individuals associated with the area. In addition to speaking with lineal descendants such as Thomas Shirai and stakeholders from both the Mokulē'ia and Wai'anae coasts, DLNR consulted with the Office of Hawaiian Affairs and its Native Hawaiian Historic Preservation Council. Through this process, traditional cultural properties, such as the Leina a ka 'Uhane, were identified in and near the project area, and appropriate measures to minimize impacts on these properties were developed. One specific action that was developed through this consultation was incorporating a third door into the fence uphill from the Leina a ka 'Uhane, to ensure that souls are provided the same access in and out of the project area as living individuals.

In addition, a section 106 consultation is underway for this project by the US Fish and Wildlife Service. Archaeological sites, historic structures, and traditional cultural properties are all cultural resources to be considered during this process. While we believe that the TCP study is a valuable model, at the moment, we have concluded that, based on the size and nature of this project (a restoration project involving fencing and predator control of 59 acres), conducting a TCP study that connects to Ka'ena to Kukaniloko exceeds our available resources. Further, while a TCP study could provide additional insight, we believe that the process used during planning for this project has been sufficient to identify traditional cultural properties and practices and to evaluate potential impacts. Finally, we intend to continue the dialogue with consulted parties as the project is implemented so that the project avoids impacts to cultural resources.

Thank you again for your participation in the environmental review process.

Should you have any future questions or concerns about this project, please feel free to contact Emma Yuen at (808) 587-4170 or by email at Emma.Yuen@hawaii.gov.

Sincerely,

for: Christen Mitchell
Planner, Division of Forestry and Wildlife

The idea to fence off Ka'ena is a great one only please do NOT cut off access to the ridge trail that goes up to the bunkers. Our scouts think this is a great experience and offers a beautiful view of North and West shores. Perhaps one of the gates you propose could maintain access to this special trail."

Mahalo.

Ross Moody SM. T108
Wanalua

RECEIVED
'08 JAN 11 P2:57
FORESTRY & WILDLIFE
STATE OF HAWAII

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
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DEPUTY DIRECTOR - WATER

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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 15, 2009

Mr. Ross Moody
68-682 Crozier Drive
Waialua, HI 96791

Subject: Comment Letter on Draft Environmental Assessment
Ka'ena Point Ecosystem Restoration Project
Wai'anae and Waialua Districts, O'ahu
TMKs 8-1-001:06; 8-1-001:022; 6-9-001:30; 6-9-002:04; 6-9-002:09; 6-9-002:13

Dear Mr. Moody:

Thank you for the letter received January 11, 2008, on the Draft Environmental Assessment for the Ka'ena Point Ecosystem Restoration Project. We appreciate your support of this project and acknowledge your concern about cutting off access to the ridge trail that goes to the bunkers. The fence design has been planned so that the access to the ridge trail will remain open and accessible by following the outside of the fence. In addition, access doors at the two primary entrances to Ka'ena Point are planned so that visitors can easily combine a hike to the ridge with a visit to the point. Thank you for your participation in the environmental review process.

Should you have any future questions or concerns about this project, please feel free to contact Emma Yuen at (808) 587-4170 or by email at Emma.Yuen@hawaii.gov.

Sincerely,

for Christen Mitchell
Planner, Division of Forestry and Wildlife

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Pacific Islands Regional Office
1601 Kapiolani Blvd., Suite 1110
Honolulu, Hawaii 96814-4733
(808) 944-2200 • Fax: (808) 973-2941

→ CM - [illegible]

JAN 18 2008

Division of Forestry and Wildlife
Department of Land and Natural Resources
1151 Punchbowl Street, Ste. 325
Honolulu, HI 96813

This letter serves as the National Marine Fisheries Service, Pacific Islands Regional Office (PIRO) official comments on the Ka`ena Point Ecosystem Restoration Project proposed for the Wai`anae and Waialua Districts on the Island of Oahu. The PIRO Protected Resources Division (PRD) staff has reviewed the Draft Environmental Assessment (DEA) prepared for the project and provides the following comments and recommendations.

We support the efforts of the State of Hawaii to protect this important habitat from the impacts of feral dogs, cats, and other non-native predatory species which may carry diseases that are harmful to protected marine species. In particular, we support the increased protections afforded by the project to the endangered Hawaiian monk seal (*Monachus schauinslandi*), which is known to use the area of Ka`ena Point on a regular basis for hauling out to rest, giving birth, and rearing of pups. However, there are some details of the project that we request more information on before agreeing with paragraph 4, page 36, which asserts the "construction is not anticipated to affect (monk seals)", and that the "proposed conservation activities are likely to benefit monk seals."

PIRO agrees that the construction sites are sufficiently distant from the area used by monk seals, so that noise generated by the use of heavy equipment would not disturb them. Should helicopters be used to transport the materials to the sites, it is important that we know where the flight path of the aircraft would be located in relation to the seal haul-out site. We recommend that the helicopter avoids flying over or near the seal haul-out site, but instead flies directly from the south to the fenceline and returns in the same manner.

The timing of the construction is planned for October to early November, or for July and August (pg. 15 par. 4). Hawaiian monk seals typically give birth to and rear their pups in the spring and summer. If construction is scheduled during the spring and summer months, we recommend contacting us beforehand to provide recommendations for any additional measures of protection, thereby avoiding any risk of disturbance to pupping or nursing seals.

The DEA reveals that predator control methods may include trapping, shooting, and the use of EPA-approved toxicants (pg. 15, par. 2). PIRO PRD requests more information on the type of toxicants that may be used, and the method of use. For example, would the toxicant be a liquid that is sprayed or a solid that is placed in traps or scattered on the ground surface? How

frequently would it be applied? What monitoring would be done to assure that it is used properly and not displaced by wind or rain to areas where non-target species could be exposed?

We are also concerned over the possible use of firearms for predator control. This method presents a risk of disturbance to seals from the sounds of gunfire, as well as a risk of injury from stray or ricocheting bullets. PIRO PRD therefore recommends that protocols be established to avoid any disturbance of seals, such as surveying the area thoroughly for seals before use of firearms. This method should not be used if seals are present or close enough to hear the shots, particularly during the spring/summer pupping season. Mother seals have been known to abandon their pups if disturbed; therefore, use of firearms during this critical time period should be avoided altogether.

PIRO PRD would like to assist however we can to assure that the project is completed in a manner that does not adversely affect protected marine species. David Schofield, our Marine Mammal Response Coordinator, would be available if requested to meet with your contractors prior to construction and answer any questions they may have on avoiding impacts to Hawaiian monk seals.

Should you have any questions regarding these comments, please contact David Schofield of my staff at (808) 944-2269, or at the e-mail address david.schofield@noaa.gov. Thank you for working to protect our nation's living marine resources.

Sincerely,

Chris E. Yates
Assistant Regional Administrator
for Protected Resources

RECEIVED
'08 JAN 22 P3:48
FORESTRY & W
STATE OF HAWAII

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

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LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 15, 2009

Mr. Chris Yates
US Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Services
Pacific Islands Regional Office
1601 Kapiolani Boulevard, Suite 1100
Honolulu, HI 96814

Subject: Comment Letter on Draft Environmental Assessment
Ka'ena Point Ecosystem Restoration Project
Wai'anae and Waialua Districts, O'ahu
TMKs 8-1-001:06; 8-1-001:022; 6-9-001:30; 6-9-002:04; 6-9-002:09; 6-9-002:13

Dear Mr. Yates:

Thank you for the letter dated January 18, 2008 on the Draft Environmental Assessment (EA) for the Ka'ena Point Ecosystem Restoration Project. We appreciate your statement in support of the project, due to the increased protections afforded by the project to the Hawaiian monk seal. However, we recognize that you have some additional questions before agreeing with our conclusion that construction is not likely to affect monk seals and that the proposed conservation activities are likely to benefit monk seals.

We have responded to your comments (summarized in italics) below:

1) *PIRO agrees that the construction sites are sufficiently distant from the area used by monk seals, so that noise generated by the use of heavy equipment would not disturb them. Should helicopters be used to transport materials to the sites, it is important to know the flight path of the aircraft in relation in the seal haul-out site. We recommend that the helicopter avoid flying over or near the seal haul-out site, but instead fly directly from the south to the fenceline and return in the same manner.*

Thank you for your recommendation. Should helicopters be used, we will include your comments as we plan logistics with the helicopter contractor.

2) *The timing of the construction is planned for October to early November or for July and August. Hawaiian monk seals typically give birth to and rear their pups in the spring and summer. If construction is scheduled during the spring and summer months, we recommend contacting us beforehand to provide recommendations for any additional*

measures of protection, thereby avoiding any risk of disturbance to pupping or nursing seals.

Thank you for your recommendation. We appreciate the offer of assistance to develop additional measures to prevent disturbance to pupping or nursing seals and will remain in contact as this project progresses.

3) *The DEA reveals that predator control methods may include trapping, shooting, and the use of EPA-approved toxicants. PIRO PRD requests more information on the type of toxicants that may be used and the method of use. For example, would the toxicant be a liquid that is sprayed or a solid that is placed in traps or scattered on the ground surface. How frequently would it be applied? What monitoring would be done to assure that is used properly and not displaced by wind or rain to areas where non-target species could be exposed?*

The toxicants under consideration for use in this project are diphacinone and brodifacoum. Both the anticoagulant rodenticide diphacinone (0.005% active ingredient) and the anticoagulant brodifacoum (0.0025% active ingredient) have been approved for conservation use by the U.S. Environmental Protection Agency (EPA). Both toxicants come in small pellet form suitable for broadcast. We are currently analyzing pre-eradication pest species monitoring data to determine which would be the most appropriate and most effective toxicant for the project. Distribution of the bait will likely be done by hand-broadcast at up to three separate intervals as determined by the final approved toxicant label. The operation will be conducted during the winter months (December through February) when the rat population is low, few if any new rats are born, native non-target migratory bird species are not present or present in low numbers, and outside monk seal pupping season. Bait will only be applied during optimal weather conditions (low rain and winds <35mph).

To minimize non-target impacts to both birds and marine species, the following procedures would be followed:

- During the entire eradication period (up to several months), the reserve will be staffed daily to monitor the eradication.
- If any broadcast of rodenticide pellets occurs after Laysan albatross chicks hatch, bait will not be distributed in a 6 foot buffer zone around the nest so that chicks, which are not yet mobile, cannot play with, or ingest bait pellets accidentally.
- In shoreline areas, bait will be placed by hand directly in burrows or other areas deemed to be high quality rat habitat to minimize risk of bait being swept or blown in the ocean and/or coming into contact with monk seals, sea turtles or migratory shorebirds.
- If any monk seals are present during the eradication operations, crews conducting hand broadcast of rodenticide pellets will maintain a 100-foot buffer from all seals.
- Samples of near-shore marine invertebrates, reef fish, and sea water will be collected for possible testing if non-target impacts are suspected.
- Results of a previous risk analysis by USFWS in the context of the rodent eradication at Lehua through the use of aerial and hand broadcast of anticoagulant rodenticide pellets indicated that bait pellets will not present a poisoning hazard to foraging seals or sea turtles. Staff involved in the Ka'ena Point Ecosystem Restoration project will remain in communication with USFWS regarding the ongoing restoration at Lehua for mitigation measures, if required.

4) *We are also concerned over the possible use of firearms for predator control. This method presents a risk of disturbance to seals from the sounds of gunfire, as well as a risk of injury from stray or ricocheting bullets. PIRO PRD therefore recommends that protocols be established to avoid any disturbance of seals, such as surveying the area thoroughly for seals before use of firearms. This method should not be used if seals are present or close enough to hear the shots, particularly during the spring/summer pupping season. Mother seals have been known to abandon their pups if disturbed; therefore, use of firearms during this critical time period should be avoided altogether.*

Thank you for your recommendation. The use of firearms remains an important predator control tool necessary to dispatch animals in a humane manner and prevent unnecessary seabird deaths. Current protocols involve surveys of the area before conducting any shooting, for public safety reasons. Your request to include a survey for seals can readily be incorporated into existing procedures. In addition, it should be noted that the majority of animals dispatched with firearms are at least 200 meters away from the shoreline, on the mauka side of the sand dunes, and are dispatched with buckshot (rather than bullets), which minimizes disturbance and risk of injury to monk seal populations. Moreover, the use of a suppressor is used on occasion during predator control and may further reduce the possibility of disturbance to seals, if use of firearms is unavoidable during pupping season.

5) *PIRO PRD would like to assist however we can to assure that the project is completed in a manner that does not adversely affect protected marine species. David Schofield, our Marine Mammal Response Coordinator, would be available if requested to meet with your contractors prior to construction and answer any questions they may have on avoiding impacts to Hawaiian monk seals.*

Thank you for your recommendation. We appreciate the offer of assistance as we share the goal of completing this project in a manner that does not adversely affect protected marine species. We will remain in contact as this project progresses and will work cooperatively with Mr. Schofield to coordinate meetings with our contractors as necessary.

Thank you for your participation in the environmental review process.

Should you have any future questions or concerns about this project, please feel free to contact Emma Yuen at (808) 587-4170 or by email at Emma.Yuen@hawaii.gov.

Sincerely,

for: Christen Mitchell
Planner, Division of Forestry and Wildlife

United States Department of Agriculture

NRCS

Natural Resources Conservation Service
P.O. Box 50004 Rm. 4-118
Honolulu, HI 96850
808-541-2600

January 7, 2008

Christen Mitchell, Planner
State of Hawaii
Department of Land and Natural Resources
Division of Forestry and Wildlife
P. O. Box 621
Honolulu, Hawaii 96809

Dear Ms. Mitchell,

We have reviewed the Draft Environmental Assessment (DEA) for the Ka'ena Point Ecosystem Restoration Project documents. We have no comment to offer at this time.

Thank you for the opportunity to comment.

Sincerely,

LAWRENCE T. YAMAMOTO
Director
Pacific Islands Area

RECEIVED
'08 JAN 11 P12:22
STATE OF HAWAII

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

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KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 15, 2009

Mr. Lawrence Yamamoto
Director, Pacific Islands Area
Natural Resources Conservation Service
PO Box 50004, Room 4-118
Honolulu, HI 96850

Subject: Comment Letter on Draft Environmental Assessment
Ka'ena Point Ecosystem Restoration Project
Wai'anae and Waialua Districts, O'ahu
TMKs 8-1-001:06; 8-1-001:022; 6-9-001:30; 6-9-002:04; 6-9-002:09; 6-9-002:13

Dear Mr. Yamamoto:

Thank you for the letter dated January 7, 2008, on the Draft Environmental Assessment for the Ka'ena Point Ecosystem Restoration Project. We acknowledge that NRCS has reviewed the Draft Environmental Assessment and has no comments at this time. Thank you for your participation in the environmental review process. Should you have any future questions or concerns about this project, please feel free to contact Emma Yuen at (808) 587-4170 or by email at Emma.Yuen@hawaii.gov.

Sincerely,

for: Christen Mitchell
Planner, Division of Forestry and Wildlife

PHONE (808) 594-1888

FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

HRD07/3231C

January 31, 2008

Christen Mitchell, Planner
Division of Forestry and Wildlife
Department of Land and Natural Resources
1151 Punchbowl St. Rm. 325
Honolulu, HI 96813

RE: Request for comments on Draft Environmental Assessment for Ka'ena Point Ecosystem Restoration Project at the Ka'ena Point Natural Area Reserve and Ka'ena Point State Park, O'ahu, TMKs: 6-9-001: 030; 6-9-02: 4, 9, 13; and 8-1-001:006 & 022.

Dear Christen Mitchell,

The Office of Hawaiian Affairs (OHA) is in receipt of the above-referenced request for comments on a project that calls for the installation of a two-meter-high fence that will prevent predators from entering into the Natural Area Reserve. OHA appreciates the opportunity to provide input into the project and offers the following comments.

OHA appreciates that the project will protect the populations of area seabirds and enhance the regeneration of native plants. OHA also appreciates that human access to the reserve will not be changed due to the fence. In addition, we will rely on the applicant's assurances that should iwi kūpuna or Native Hawaiian cultural or traditional deposits be found during the construction of the fence, work will cease, and the appropriate agencies will be contacted pursuant to applicable law.

In addition, OHA requests that the applicant detail the predator eradication techniques that will be employed subsequent to the installation of the fence, and whether these methods will have impacts on the area's native fauna. We have concerns that toxicants such as rodenticides could have a negative impact on native birds, monk seals and fish, which maybe exposed to eradication chemicals that wash into the ocean during heavy rains. We ask the applicant to establish mitigation measures for any potential negative impacts resulting from the project's "intensive eradication efforts."

OHA will continue to consult with the Native Hawaiian community on the impact this project will have on Native Hawaiian culture resources, and traditional and customary rights.

We look forward to making a site visit to Ka'ena Point to survey the project area on March 24 with Pauline Sato, of the Nature Conservancy, and Chris Swenson, of the U.S. Fish and Wildlife Service. Thank you for the opportunity to comment. If you have further questions, please contact Sterling Wong (808) 594-0248 or e-mail him at sterlingw@oha.org.

Sincerely,

Clyde W. Nāmu'o
Administrator

C: William Ailā Jr.
86-630 Lualualei Homestead Road
Wai'anae, HI 96792

Pauline Sato
The Nature Conservancy of Hawai'i
923 Nu'uanu Avenue
Honolulu, HI 96817

Chris Swenson
Craig Rowland
U.S. Department of the Interior
Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Blvd., Rm. 3-122
Box 50088
Honolulu, HI. 96850

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
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HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 15, 2009

Mr. Clyde Nāmuʻo
Office of Hawaiian Affairs
711 Kapiolani Boulevard, Suite 500
Honolulu, HI 96813

Subject: Comment Letter on Draft Environmental Assessment
Kaʻena Point Ecosystem Restoration Project
Waiʻanae and Waialua Districts, Oʻahu
TMKs 8-1-001:06; 8-1-001:022; 6-9-001:30; 6-9-002:04; 6-9-002:09; 6-9-002:13

Dear Mr. Nāmuʻo:

Thank you for the letter dated January 31, 2008 on the Draft Environmental Assessment (EA) for the Kaʻena Point Ecosystem Restoration Project.

We have responded to your comments (summarized in italics) below:

1) *OHA appreciates that the project will protect the populations of area seabirds and enhance the regeneration of native plants. OHA also appreciates that human access to the reserve will not be changed due to the fence. In addition, we will rely on the applicant's assurances that should iwi kūpuna or Native Hawaiian cultural or traditional deposits be found during the construction of the fence, work will cease and the appropriate agencies will be contacted pursuant to applicable law.*

We agree that the project is anticipated to benefit seabirds and native plants in the area, and confirm that all work will cease and appropriate agencies contacted pursuant to applicable law, if iwi kūpuna or Native Hawaiian cultural or traditional deposits are found during construction.

2) *In addition, OHA requests that the applicant detail the predator eradication techniques that will be employed subsequent to the installation of the fence and whether these methods will have impacts on the area's native fauna. We have concerns that toxicants such as rodenticides could have a negative impact on native birds, monk seals and fish, which may be exposed to eradication chemicals that wash into the ocean during heavy rains. We ask the applicant to establish mitigation measures for any potential negative impacts resulting from the project's "intensive eradication efforts."*

Thank you for your comment; we have modified the Final EA to provide additional detail about the predator eradication techniques planned for this project. A summary of the information now

included in the Final EA follows: The techniques required to remove all dogs, cats, mongoose, rats, and mice from inside the fencing will vary according to the target species. In general, the techniques used will be those that have proven successful at eradicating vertebrates from other islands. It is assumed that large mammals (remnant hooved animals and dogs) will leave the area before fences are complete and that most cats and mongoose will escape the area by climbing out the fence (the hood acts as a one-way barrier to prevent entry, but allow exit by non-native species). Surveys will be conducted to confirm the absence of these animals and any remaining animals will be shot, or trapped and humanely euthanized using existing protocols.

Due to their small size and small home ranges, rodents are likely to remain within the fenced area after construction and the technique for removal will primarily involve the use of toxicants. The toxicants under consideration for use in this project are diphacinone and brodifacoum. Both the anticoagulant rodenticide diphacinone (0.005% active ingredient) and the anticoagulant brodifacoum (0.0025% active ingredient) have been approved for conservation use by the U.S. Environmental Protection Agency (EPA). Both toxicants come in small pellet form suitable for broadcast. We are currently analyzing pre-eradication rodent monitoring data to select the appropriate toxicant for the project. Distribution of the bait will likely be done with by hand-broadcast at up to three separate intervals as determined by the final approved toxicant label. The operation will be conducted during the winter months (December through February) when the rat population is low, few if any new rats are born, and native non-target migratory species are not present or present in low numbers. Bait will only be applied during optimal weather conditions (low rain and winds <35mph).

Our conclusion that the use of toxicants will not have an adverse impact on the area's native fauna relies heavily on the data compiled and presented in the Draft Supplemental Environmental Assessment for the Lehua Island Ecosystem Restoration Project, published in July 2008. The Final EA has been modified to include this EA as an appendix, and Section VI. of the Final EA now includes the following analysis regarding the potential impacts of the use of toxicants on native fauna at Ka'ena.

Native birds: During the rodent eradication phase of the project, the use of toxicants is not anticipated to negatively impact native bird populations. First, rodent eradication will take place during the winter months (December through February) when native non-target migratory bird species are not present or present in low numbers.

Second, birds can be exposed to rodenticide in two ways: they can eat the bait pellets (direct ingestion) or they can eat prey organisms that have been contaminated by eating rodenticide (indirect ingestion). The primary birds at Ka'ena are seabirds, which do not generally eat things they find on land, but feed on fish and marine organisms caught in the open ocean. As discussed further below (marine species), marine organisms are not anticipated to be affected by the use of toxicants, and so it is highly improbable that adult seabirds would feed on or bring fish with rodenticide residues back to their chicks.

For native birds present at Ka'ena that do forage on land (e.g., Pacific golden plover and wandering tattler), it is unlikely that these birds would forage on pellets, given their normal feeding behavior and the low density of pellets in the intertidal area due to the planned delivery method of hand placement of bait adjacent to the shoreline. Further, previous studies on the effects on birds of direct and indirect ingestion of bait indicate that it is physically impossible for birds to eat enough diphacinone pellets or tainted prey to cause death.

Finally, the native pueo has been observed on occasion at Ka'ena. Its diet consists of rats, mice, small mongoose, and possibly small birds; as a result, it is unlikely to directly ingest bait pellets. However, they could eat rats or mice carrying rodenticide residues in their tissues prior to dying. Using the analysis contained in the Lehua Supplemental Draft Environmental Assessment for barn owls, the risk of mortality when using diphacinone is nearly zero, due the large numbers of rats that would have to be ingested and the few numbers of pueo seen at Ka'ena. The use of brodifacoum would create a greater risk to pueo due to its higher toxicity to owls. Should brodifacoum be selected as the preferred toxicant, additional review on the potential effects on pueo will be conducted and specific mitigation measures implemented in consultation with the USFWS to ensure that there is no significant adverse impact on the pueo.

In conclusion, no negative impacts to native birds are anticipated as a result of the use of toxicants. However, as an additional precaution, because albatross chicks are known to be curious about objects near their nest and could inadvertently pick up and ingest pellets, if any broadcast of rodenticide pellets occurs after Laysan albatross chicks hatch, bait will not be distributed in a 6 foot buffer zone around the nest so that chicks, which are not yet mobile, cannot play with, or ingest bait pellets accidentally.

Monk seal: Predator control activities that involve the use of firearms may present a risk of disturbance to seals from the sounds of gunfire and a risk of injury from stray bullets. To minimize this risk, current protocols involve surveys of the area before conducting any shooting, for public safety reasons, and will include surveys for monk seals. This risk is further reduced by the fact that the majority of animals dispatched with firearms are at least 200 meters away from the shoreline, on the mauka side of the sand dunes, and are dispatched with buckshot (rather than bullets), which minimizes disturbance and risk of injury to monk seal populations. Moreover, the use of a suppressor is used on occasion during predator control and may further reduce the possibility of disturbance to seals, if use of firearms is unavoidable during pupping season.

Rodent control activities involve the use of toxicants and are not anticipated to negatively impact monk seals for the following reasons. The operation will be conducted during winter months, outside the monk seal pupping season. In shoreline areas, bait will be placed by hand directly in burrows or other areas deemed to be high quality rat habitat to minimize risk of bait being swept or blown in the ocean and/or coming into contact with monk seals. If any monk seals are present during the eradication operations, crews conducting hand broadcast of rodenticide pellets will maintain a 100-foot buffer from all seals.

Continued communication with NOAA's Marine Mammal Response Coordinator throughout the implementation of this project is planned to further minimize impacts to monk seals. Proposed conservation activities are likely to benefit monk seals, by removing predators that act as carriers of diseases identified as threats to monk seal survival.

Marine species: Based on the location of the fencing, activities associated with fence construction are not anticipated to impact marine fish, marine invertebrates, or sea turtles.

During the rodent eradication phase of the project, the use of toxicants is not anticipated to negatively impact marine fish, marine invertebrates, or sea turtles. Marine organisms can be exposed to rodenticides in three ways: they can eat bait pellets; they can eat prey that have

accumulated rodenticide in their tissue; or they can absorb rodenticides that have dissolved in seawater through the skin.

In shoreline areas, bait will be placed by hand directly in burrows or other areas deemed to be high quality rat or mouse habitat to minimize risk of bait being swept or blown in the ocean and/or coming into contact with monk seals, sea turtles or migratory shorebirds. This planned delivery method will reduce the amount of actual bait ending up in the water, minimizing risks to marine invertebrates, fish and turtles.

Both toxicants under consideration (diphacinone and brodifacoum) have low solubility in water and bind tightly to organic material in soil. Water sampling conducted after aerial application of diphacinone pellets to Mokapu island in February 2008 found no diphacinone residues in any of the seawater samples. Water quality data collected in New Zealand after a massive brodifacoum spill into nearshore waters (20 tons of bait spilled into the ocean at a single point), finding that brodifacoum levels were no longer detectable 36 hours after the spill. This low water solubility decreases the likelihood of exposure of marine organisms to dissolved rodenticides.

Direct ingestion of bait and consumption of contaminated prey is also unlikely. Data from field trials in other locations, including in Hawai'i at Lehua and Mokapu, indicates that nearshore fish are unlikely to be attracted to bait pellets. Moreover, sampling results at Mokapu after aerial drops found no detectable rodenticide residues in marine tissues of limpets and fish after two diphacinone applications, and tests after the 20-ton brodifacoum spill (which would exceed any potential exposure at Ka'ena by several orders of magnitude) noted above found unexpectedly low rodenticide levels in marine organisms.

As a result, the impact to marine species at Ka'ena Point is anticipated to be minimal, based on the planned delivery method in shoreline areas to minimize the possibility of bait ending up in the ocean, the fact that the Mokapu aerial drops did not result in detectable rodenticide residues, and the low levels of contamination resulting from a worst-case (20-ton) brodifacoum spill.

In summary, the following procedures are planned to minimize non-target impacts to both birds and marine species:

- During the entire eradication period (up to several months), the reserve will be staffed daily to monitor the eradication.
- If any broadcast of rodenticide pellets occurs after Laysan albatross chicks hatch, bait will not be distributed in a 6 foot buffer zone around the nest so that chicks, which are not yet mobile, cannot play with, or ingest bait pellets accidentally.
- In shoreline areas, bait will be placed by hand directly in burrows or other areas deemed to be high quality rat habitat to minimize risk of bait being swept or blown in the ocean and/or coming into contact with monk seals, sea turtles or migratory shorebirds.
- If any monk seals are present during the eradication operations, crews conducting hand broadcast of rodenticide pellets will maintain a 100-foot buffer from all seals.
- Samples of near-shore marine invertebrates, reef fish, and sea water will be collected for possible testing if non-target impacts are suspected.
- Results of a previous risk analysis by USFWS in the context of the rodent eradication at Lehua through the use of aerial and hand broadcast of anticoagulant rodenticide pellets indicated that bait pellets will not present a poisoning hazard to foraging seals or sea turtles. Staff involved in the Ka'ena Point Ecosystem Restoration project will remain in

communication with USFWS regarding the ongoing restoration at Lehua for additional mitigation measures, if required.

3) *OHA will continue to consult with the Native Hawaiian community on the impact this project will have on Native Hawaiian cultural resources, and traditional and customary rights.*

After publication of the Draft EA we consulted further with cultural practitioners and lineal descendants from the Wai'anae and Mokulē'ia communities regarding the fencing alignment. Based on these discussions, we decided to select Option 1 as the preferred alignment, extending the fence to the boulder barricade and adding a third access door immediately mauka of the Leina a ka 'Uhane. The cultural practitioners and lineal descendants supported this decision, concluding that the third access door would provide the same access for spirits coming to the Leina a ka 'Uhane as that provided to human visitors and that this alignment would have a reduced visual impact on the cultural site due to the increased distance between the Leina and the fencing. The benefits of continued consultation are numerous and we intend to maintain a dialogue with the affected community as this project progresses. We would welcome a continued dialogue with OHA and with the Native Hawaiian community, so that impacts to cultural resources or traditional and customary rights can be minimized.

Thank you for your participation in the environmental review process. Should you have any future questions or concerns about this project, please feel free to contact Emma Yuen at (808) 587-4170 or by email at Emma.Yuen@hawaii.gov.

Sincerely,

for: Christen Mitchell
Planner, Division of Forestry and Wildlife

1/10/2008

Director of DLNR:

'08 JAN 11 P2:53
STATE OF HAWAII

I would like to add my support to the proposed fence at Ka'ena Point, a fragile Hawaiian treasure.

This appears to be an excellent solution to the predation of endangered birds and plants at the point.

My best wishes for its success

Mary Bicknell
300 Wai Nani Way
Apt 230X
Honolulu, HI

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
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LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 14, 2009

Ms. Mary Bicknell
300 Wai Nani Way, Apt. 2304
Honolulu, HI 96815

Subject: Comment Letter on Draft Environmental Assessment
Ka'ena Point Ecosystem Restoration Project
Wai'anae and Waialua Districts, O'ahu
TMKs 8-1-001:06; 8-1-001:022; 6-9-001:30; 6-9-002:04; 6-9-002:09; 6-9-002:13

Dear Ms. Bicknell:

Thank you for the letter dated January 10, 2008, on the Draft Environmental Assessment for the Ka'ena Point Ecosystem Restoration Project. We appreciate your support of this project and your best wishes for its success. We also thank you for your participation in the environmental review process. Should you have any future questions or concerns about this project, please feel free to contact Emma Yuen at (808) 587-4170 or by email at Emma.Yuen@hawaii.gov.

Sincerely,

for: Christen Mitchell
Planner, Division of Forestry and Wildlife

From: Norma Bustos (bustos_norma@yahoo.com)
To: kaenapoint@yahoo.com
Date: Friday, January 18, 2008 2:45:44 PM
Subject: EA Comments

Aloha,
I had several comments and questions regarding the EA drafted for the Kaena Point Fence and Ecosystem Restoration Project:

1. How were the number of WTSH chicks hatching at Kaena obtained (p22)? Is this an extrapolation of data that was previously collected or were 1,500+ burrows actually searched?

2. On page 23 it is stated that "...while not generally observed, the tide pools of the Ka'ena coast could provide temporary habitat for the endangered Hawaiian coot..." I do not agree with this statement and find it to be far reaching. Coots have historically utilized taro patches, ponds, marshes, brackish lakes, resevoirs and streams. I would like to see your reference for this statement as I think it is very presumptuous.

3. On page 25 there is a typo in the last sentence on the top of the page. I think you meant to say coastal dunes not dune.

4. Page 35 - I would strongly urge you to reword the last sentence of the first paragraph to state that all food and refuse must be removed on a daily basis instead of upon completion of work. It is imperative that garbage and food not be present in the area to attract scavengers such as non-native rodents, mongoose ants, and feral cats and dogs which are known predators of native seabirds and their eggs.

5. Page 36 first paragraph - You should also consider use of reflective tape to enhance the fence visibilty for seabirds and/or other birds that may use the area.

6. Economic Impacts - who exactly will benefit from the "opportunities for training". Will this training be available to native Hawaiians and or other local stakeholders? How exactly will this provide a positive economic impact to the area?

Mahalo for taking the time to read my comments. I look forward to your response and support the idea of predator proof fence at Kaena Point as long as it does not restrict access to the area by residents of Hawaii.

Aloha,
Norma Bustos

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LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
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KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 15, 2009

Ms. Norma Bustos
Bustos_norma@yahoo.com

Subject: Comment Letter on Draft Environmental Assessment
Ka'ena Point Ecosystem Restoration Project
Wai'anae and Waialua Districts, O'ahu
TMKs 8-1-001:06; 8-1-001:022; 6-9-001:30; 6-9-002:04; 6-9-002:09; 6-9-002:13

Dear Ms. Bustos:

Thank you for the email dated January 18, 2008 on the Draft Environmental Assessment (EA) for the Ka'ena Point Ecosystem Restoration Project. We appreciate your statement in support of the project, as long as the fence does not restrict access to the area for residents of the State. However, we recognize that you have some additional questions (repeated in italics below) and respond to them as follows:

1) *How were the number of wedge-tailed shearwater chicks hatching at Kaena obtained? Is this an extrapolation of data that was previously collected or were 1,500+ burrows actually searched?*

The number of chicks were obtained by a complete burrow count of the reserve conducted on October 27, 2007. There were over 1,500 chicks and over 2,000 active burrows.

2) *On page 23 it is stated that '...while not generally observed, the tide pools of the Kaena coast could provide temporary habitat for the endangered Hawaiian coot...' I do not agree with this statement and find it to be far reaching... I would like to see your reference for this statement.*

Thank you for bringing this to our attention. After additional review of our sources, we are unable to find the underlying reference for this statement, and based upon your comments and discussions with other biologists, have removed this statement from the Final EA.

3) *On page 25, there is a typo on the last sentence on the top of the page. I think you meant to say coastal dunes not dune.*

Thank you for bringing this to our attention; we have made the correction in the Final EA.

4) *Page 35 – I would strongly urge you to reword the last sentence of the first paragraph to state that all food and refuse must be removed on a daily basis instead of upon completion of work. It is imperative that garbage and foot not be present in the area to attract scavengers such as non-native rodents, mongoose, ants, and feral cats and dogs which are known predators of native seabirds and their eggs.*

We agree with your comments and have reworded this section of the Final EA accordingly.

5) *Page 36 first paragraph – you should also consider use of reflective tape to enhance the fence visibility for seabirds and/or other birds that may use this area.*

It is anticipated that the reflective hood will provide sufficient visibility to seabirds and other birds using the area. However, the fence will be monitored after construction to ensure that it is visible. We will consider use of reflective tape and any other available method to enhance visibility for seabirds, as needed.

6) *Economic impacts – who exactly will benefit from the opportunities for training? Will this training be available to native Hawaiians and/or other local stakeholders? How exactly will this provide a positive economic impact to the area?*

Positive economic impacts will result from the release of project funds into the State economy and the opportunities for training in the methods for building predator-proof fences. Staff of other conservation agencies interested in constructing predator-proof fencing will have an opportunity to observe the construction in progress, possibly reducing the need for future contracting of these services, while the contractor will hire a limited number of local residents as part of the fence construction crew, providing these short-term employees with a new skill. The proposed action may attract additional funding for habitat restoration, predator control, research, or monitoring activities because of the presence of a predator-proof fence

Thank you for your participation in the environmental review process.

Should you have any future questions or concerns about this project, please feel free to contact Emma Yuen at (808) 587-4170 or by email at Emma.Yuen@hawaii.gov.

Sincerely,

for

Christen Mitchell
Planner, Division of Forestry and Wildlife

From: Hibankerbird@aol.com (Hibankerbird@aol.com)
To: kaenapoint@yahoo.com
Date: Wednesday, January 9, 2008 9:29:08 AM
Subject: Ka'ena Point Ecosystem Restoration draft EA

I am delighted to see that after many years Ka'ena Point Natural Area Reserve is finally being fenced.

I have had the pleasure of visiting Ka'ena Point on numerous bird watching trips since 1961. I remember well the days when you could drive around the Point from Wai'anae to Mokule'ia but I also remember the destruction that was taking place in those days and there was little or no bird nesting activity at all. With the creation of the Natural Area Reserve in 1983 and the blockage of vehicles being allowed into the area except for dirt bikes, Ka'ena Point began to heal.

I fully support the building of the fence and can support either option proposed. The inclusion of Le'ina a ka "Uhane is probably a plus in that it should help eliminate any further deterioration in that ancient site. My only concern with the fence is also noted in the draft Environmental Assessment - namely, the 10 to 15 foot opening at either end of the fence down to the high water mark. The Assessment does note this concern and adequately reflects that this will be monitored for maximum positive results.

I am familiar with this type of fence proposed having seen same in New Zealand. I believe it will be as effective in Hawaii as it is in New Zealand. I also believe that it will set an excellent precedent for both the Department of Land and Natural Resources and the U.S. Fish and Wildlife Services to follow in other reserves around the islands. Keeping dogs, cats, mongooses, rats and other rodents out of the area will be most beneficial for the birds and the plants but equally important will be the beneficial impact for tourists, school tours and other scientific purposes.

If I can respond to any questions please do not hesitate to contact me.

Wm Michael Ord
1178 Hunakai Street
Honolulu, Hi 96816
808 737 8433

NB: I should note that I do volunteer work for both the U.S. Fish and Wildlife Service and the DLNR's Division of Forestry and Wildlife (State Water Bird Survey)

Start the year off right. Easy ways to stay in shape in the new year.

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
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STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 15, 2009

Mr. Wm Michael Ord
1178 Hunakai Street
Honolulu, HI 96816

Subject: Comment Letter on Draft Environmental Assessment
Ka'ena Point Ecosystem Restoration Project
Wai'anae and Waialua Districts, O'ahu
TMKs 8-1-001:06; 8-1-001:022; 6-9-001:30; 6-9-002:04; 6-9-002:09; 6-9-002:13

Dear Mr. Ord:

Thank you for the email dated January 9, 2008 on the Draft Environmental Assessment (EA) for the Ka'ena Point Ecosystem Restoration Project. We appreciate your support of the project and your input regarding the potential alignment. Through additional consultation and review, we have determined that Option 1 (which includes the Leina a ka 'Uhane) is the preferred alignment, with the addition of a third access door in the fence immediately mauka of Leina a ka 'Uhane. We believe that this solution will minimize impact on the cultural significance of the area and protect more coastal habitat.

We recognize the concern you raise about the openings in the fence at the shoreline and appreciate your comment that the Draft EA adequately reflects that these openings will be monitored for maximum positive results.

We also appreciate your statements about similar fences in New Zealand. We agree that this project provides an excellent opportunity to test the effectiveness of this type of fencing in Hawaii and hope it will encourage the use of predator-proof fencing in other areas.

Thank you again for your participation in the environmental review process.

Should you have any future questions or concerns about this project, please feel free to contact Emma Yuen at (808) 587-4170 or by email at Emma.Yuen@hawaii.gov.

Sincerely,

Christen Mitchell
for: Planner, Division of Forestry & Wildlife

Patrick Conant
P.O. Box 1172
Volcano HI 96785

January 10, 2008

Ms. Christen Mitchell, Planner
Department of Land and Natural Resources
Division of Forestry and Wildlife
1151 Punchbowl St.
Room 325
Honolulu, HI 96813

I have reviewed the Environmental Assessment (EA) for the predator proof fence proposed for Kaena Point and I fully support this endeavor. I remember Kaena Point before it was managed as a Natural Area Reserve and it was a sad sight indeed. The resurgence of the native plants, the return of laysan albatross and monk seals shows the great potential the site has for protection of native Hawaiian flora and fauna. The construction of the predator proof fence is exactly what is needed to make sea bird colonies large enough to weather storms or Tsunami and become permanent breeding sites in the future. With such protection, other sea bird species not seen breeding in the main Hawaiian islands in many years may reappear.

The Mokuleia Community Association, which is composed of the closest residences to Kaena point, supports the project, as does the North Shore Neighborhood Board No. 27.

The EA makes it clear that fishing and mountain biking will not be prohibited from the site so those special interest groups should also show their support for the protection of this priceless natural resource they already use.

The alternatives to the fence are unacceptable. Predator control will never be adequate since the State cannot afford to provide effective 24 hour management, nor would it be prudent. This fence design has already been proven effective at excluding predators in New Zealand on a much larger scale. Some people just do not like fences, but fences are the necessary price we pay for human introduction of invasive alien species. Without fences in our forests, and now on small parts of our coasts, we will lose what little truly native Hawaiian habitats are left. So maybe they don't look so natural. I say get used to it.

Aloha,

Patrick Conant

Patrick Conant

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'08 JAN 14 A6:49
FORESTRY & WILDLIFE
STATE OF HAWAII

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
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BOARD OF LAND AND NATURAL RESOURCES
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DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 15, 2009

Mr. Patrick Conant
PO Box 1172
Volcano, HI 96785

Subject: Comment Letter on Draft Environmental Assessment
Ka'ena Point Ecosystem Restoration Project
Wai'anae and Waialua Districts, O'ahu
TMKs 8-1-001:06; 8-1-001:022; 6-9-001:30; 6-9-002:04; 6-9-002:09; 6-9-002:13

Dear Mr. Conant:

Thank you for the letter dated January 10, 2008, on the Draft Environmental Assessment for the Ka'ena Point Ecosystem Restoration Project. We appreciate your support of this project and agree with your comments that the predator-proof fencing may encourage the reappearance of other species of seabirds. We also thank you for your participation in the environmental review process. Should you have any future questions or concerns about this project, please feel free to contact Emma Yuen at (808) 587-4170 or by email at Emma.Yuen@hawaii.gov.

Sincerely,

Christen Mitchell
For: Planner, Division of Forestry and Wildlife

University of Hawai'i at Mānoa

Department of Zoology
Edmondson Hall 152
2538 McCarthy Mall • Honolulu, Hawaii 96822-2279
Telephone: 808-956-8617 • Facsimile: 808-956-9812

20 January 2008

To Whom It May Concern:

From: Sheila Conant, Ph. D.
Professor and Chair

Subject: Comments on Proposed Predator Proof Fence at Ka`ena Point Natural Area Reserve

The proposal to construct a state-of-the-art predator proof fence at Ka`ena Point Natural Area Reserve (NAR) offers a number of benefits to the people of Hawai`i as well as some of its native plants and animals. When Ka`ena Pt. NAR was first established, the primary target of conservation and natural resource management was the native coastal plants such as naio, naupaka, `ohelo kai and the endangered `ohai, akoko, nehe and hinahina and associated invertebrates like the yellow faced bees that pollinate the plants. When resource managers were able to build a barrier to exclude off road vehicles, the plant community immediately began to recover until today it is an outstanding example of a native coastal shrubland. Over the last 30 years, on an annual or semi-annual basis, I have assigned students to carry out plant monitoring projects at Ka`ena Pt. The very first group of students hiked to the point and searched diligently for `ohai. They found six plants. Today, as a result of recovery and outplanting there are thousands.

Ka`ena has long been a place where people can enjoy scenic vistas, and see native plants, large spinner dolphin pods jumping into the air and humpback whales breaching and tail-slapping offshore. During the 1990s the process of ecosystem recovery really began to catch the public's eye when some new, charismatic species started using the area. Endangered Hawaiian monk seals now haul out on the beaches at the point, and last year the first pup was born there. Most exciting for me, though, was the colonization of the Reserve by Laysan Albatross. Birds first began nesting in 1989 and the first chick fledged in 1992. Reproductive success was low at first, due in large part to predation, especially by dogs. Since that time, predator control has been initiated, and the colony has grown rapidly until 21 chicks fledged last year, and more than 50 nests were discovered this year. The Wedge-tailed Shearwater colony at Ka`ena has also grown dramatically in recent years. Current estimates for this species are over 2000 nesting pairs and a number of young birds seeking mates.

The predator (dogs, cats, mongoose, and rodents) control program at the point has made the area more hospitable for the seals (which may be harassed by dogs), albatross and shearwaters, no doubt accounting for the success of these species in the NAR. Still predation remains a serious threat to these animals. One day in the fall of 2006, I accompanied biologists studying the

albatross colony. That day we found 22 dead shearwaters, all obviously killed by dogs--probably just one dog. We saw large paw prints throughout the seabird colonies. Clearly the large signs notifying visitors that dogs are not allowed in the NAR were not effective. Dogs are brought into the reserve by people who do not observe the prohibition and dogs from neighboring communities find there way to the Point alone.

Construction of a predator proof fence will provide a level of protection from predators that no other nature reserve in the Hawaiian Islands currently enjoys. I fully expect that additional seabird species, such as the Black-footed Albatross and Bulwer's Petrel will begin nesting there if predators are removed. Removal of predators, primarily cats and rats, in a number of small island wildlife refuges in the Pacific (e.g., Midway and Kure Atolls in the Northwestern Hawaiian Islands, Rose Atoll, Jarvis Island, Wake Island) has been followed by dramatic increases in breeding seabirds.

Perhaps the most important benefit a predator proof fence would be an increase in public awareness of the benefits of natural resource conservation measures. Rarely seen, charismatic vertebrates, such as magnificent albatrosses and rare seals, are usually of great interest to the public. The construction of a predator proof fence will call their attention to the serious threat posed by alien predators for all of Hawaii's native plants and animals. Because Ka`ena Pt NAR is so accessible, it is an ideal location for environmental education. This project will have highly positive educational impacts as well as extremely effective conservation benefits.

Since the late 1970s, I have served on the Natural Area Reserves System Commission for two terms and a total of more than ten years. I have seen the system grow from a single reserve with virtually no budget for management or education to a system of 18 reserves protecting in perpetuity a great diversity of Hawai`i's unique biological and geological resources. In many ways Ka`ena Point Natural Area Reserve is the System's greatest asset because of its beauty, its unique biological and geological resources and its accessibility to the public. This project will greatly enhance those values.

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'08 JAN 24 A11:23
FORESTRY & WILDLIFE
STATE OF HAWAII

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DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 15, 2009

Dr. Sheila Conant
University of Hawaii at Manoa
Department of Zoology
Edmondson Hall 152
2538 McCarthy Mall
Honolulu, HI 96822

Subject: Comment Letter on Draft Environmental Assessment
Ka'ena Point Ecosystem Restoration Project
Wai'anae and Waialua Districts, O'ahu
TMKs 8-1-001:06; 8-1-001:022; 6-9-001:30; 6-9-002:04; 6-9-002:09; 6-9-002:13

Dear Dr. Conant:

Thank you for the letter dated January 20, 2008 on the Draft Environmental Assessment (EA) for the Ka'ena Point Ecosystem Restoration Project. We appreciate your support of this project. We also acknowledge your experience working at Ka'ena Point and value the information shared about the recovery of this area. We agree that predators remain a problem, despite the ongoing predator control program, and that anticipated benefits of the fencing include the nesting of new seabird species and an increased public awareness of the benefits of natural resource conservation measures. Thank you for your participation in the environmental review process. Should you have any future questions or concerns about this project, please feel free to contact Emma Yuen at (808) 587-4170 or by email at Emma.Yuen@hawaii.gov.

Sincerely,

Christen Mitchell
Planner, Division of Forestry and Wildlife

University of Hawai'i, Manoa
Pacific Cooperative Studies Unit
3190 Maile Way, St. John 410
Honolulu, Hawai'i 96822

DLNR
Division of Forestry and Wildlife attn: Christen Mitchell
1151 Punchbowl Street, Room 325
Honolulu, HI 96813

Re: Environmental Assessment for Kaena Point Ecosystem Restoration Project

Dear Ms. Mitchell:
I would like to offer my views on the Environmental Assessment for the Kaena Point Ecosystem Restoration Project on Oahu. The plan to fence Kaena Point with a predator-proof fence to protect the seabird colonies at the Kaena Point Natural Area Reserve is a major step in conservation for the Hawaiian Islands. The fence will help to eliminate the annual slaughter of shearwaters and albatrosses by feral dogs at the point. It will also allow the regrowth of native vegetation at the Point, offering us an opportunity to recreate and visit a Hawai'i that existed before the onslaught of feral ungulates. The fence will also be an experiment that will offer valuable insights into future efforts into fencing exclosures to protect native forest birds in the rainforests. Finally, as Kaena Point recovers, it will become a significant and sustainable education and tourist resource that will aid the economy of the Waianae Coast.

Sincerely,

David Cameron Duffy Ph.D.
Professor of Botany
And
Unit Leader
Pacific Cooperative Studies Unit

RECEIVED
'08 JAN 11 P2:22
FORESTRY & WILDLIFE
STATE OF HAWAII

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DEPUTY DIRECTOR - WATER

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DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 15, 2009

Dr. David Duffy
University of Hawaii, Manoa
Pacific Cooperative Studies Unit
3190 Maile Way, St. John 410
Honolulu, HI 96822

Subject: Comment Letter on Draft Environmental Assessment
Ka'ena Point Ecosystem Restoration Project
Wai'anae and Waialua Districts, O'ahu
TMKs 8-1-001:06; 8-1-001:022; 6-9-001:30; 6-9-002:04; 6-9-002:09; 6-9-002:13

Dear Dr. Duffy:

Thank you for the letter received January 11, 2008, on the Draft Environmental Assessment for the Ka'ena Point Ecosystem Restoration Project. We appreciate your support of this project and agree with your views that this project is a major step for conservation that 1) will help to eliminate the annual slaughter of shearwaters and albatrosses at the point, 2) will allow the regrowth of native vegetation at the point, 3) will offer an opportunity to recreate and visit a Hawaii that exited before the onslaught of feral animals, 4) will offer valuable insights into future efforts into fencing enclosures in other areas, and 5) will become a sustainable education and visitor resource that can have a positive economic impact. Thank you for your participation in the environmental review process.

Should you have any future questions or concerns about this project, please feel free to contact Emma Yuen at (808) 587-4170 or by email at Emma.Yuen@hawaii.gov.

Sincerely,

For: Christen Mitchell
Planner, Division of Forestry and Wildlife

January 21, 2008

Christen Mitchell
Department of Land and Natural Resources
Division of Forestry and Wildlife
1151 Punchbowl Street, Room 325
Honolulu, HI 96813

Re: Ke'ena Point Ecosystem Restoration Project; predator proof fencing

Dear Christen Mitchell,

I am writing in response to the Draft Environmental Assessment for the Ke'ena Point Ecosystem Restoration Project, specifically the proposal to erect predator proof fencing to prevent feral predators such as dogs, cats, mongoose, and rats from entering into the Ka'ena Point Natural Area Reserve. Considering the importance of this habitat to native seabirds I am in support of the project. Typically, I am not in favor of fencing public areas, but because less invasive means to conserve the area have not produced the desired outcomes more drastic measures, such as the fence, are needed. It is important, however, to not use the fence to restrict access to the Reserve.

It is encouraging to see DLNR actively involved in a restoration project that may actually work.

Sincerely,

Joseph O'Malley

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'08 JAN 23 AM 10:03
FORESTRY & WILDLIFE
STATE OF HAWAII

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
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BOARD OF LAND AND NATURAL RESOURCES
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DEPUTY DIRECTOR - WATER

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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 15, 2009

Mr. Joseph O'Malley
PO Box 1052
Haleiwa, HI 96712

Subject: Comment Letter on Draft Environmental Assessment
Ka'ena Point Ecosystem Restoration Project
Wai'anae and Waialua Districts, O'ahu
TMKs 8-1-001:06; 8-1-001:022; 6-9-001:30; 6-9-002:04; 6-9-002:09; 6-9-002:13

Dear Mr. O'Malley:

Thank you for the letter dated January 21, 2008, on the Draft Environmental Assessment for the Ka'ena Point Ecosystem Restoration Project. We appreciate your support of this project. We further acknowledge that you are not typically in support of fencing public areas, but that you agree that less invasive methods of conservation have not been sufficient to protect native seabirds. We also confirm that the fence will not be used to restrict public access to the reserve; only small predators such as dogs, cats, mongoose, rats, and mice will be excluded by the fencing. Thank you for your participation in the environmental review process.

Should you have any future questions or concerns about this project, please feel free to contact Emma Yuen at (808) 587-4170 or by email at Emma.Yuen@hawaii.gov.

Sincerely,

for: Christen Mitchell
Planner, Division of Forestry and Wildlife

Pacific Seabird Group

DEDICATED TO THE STUDY AND CONSERVATION OF PACIFIC SEABIRDS AND THEIR ENVIRONMENT

Verna Gill
Chair
1101 Lynx Lane
Eagle River, AK 99577
907-250-3721
verna_gill@hotmail.com

Craig S. Harrison, Esq.
Vice Chair for Conservation
4953 Sonoma Mountain Road
Santa Rosa, CA 95404
202-778-2240
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Douglas Bertram
Chair-Elect
Canadian Wildlife Service
9860 West Saanich Road
Sidney, BC V8L 4B2
bertramd@pac.dfo-mpo.gc.ca

January 15, 2008

Christen Mitchell
Department of Land and Natural Resources
Division of Forestry and Wildlife
1151 Punchbowl Street, Room 325
Honolulu, HI 96813

RECEIVED '08 JAN 16 A10:38

Re: Environmental Assessment for Kaena Point Ecosystem Restoration Project

Dear Christen Mitchell:

On behalf of the Pacific Seabird Group (PSG) we offer our views on the Environmental Assessment for the Kaena Point Ecosystem Restoration Project on Oahu with respect to seabirds. PSG is an international, non-profit organization that was founded in 1972 to promote the knowledge, study, and conservation of Pacific seabirds. It has a membership drawn from the entire Pacific basin, including Canada, Mexico, Peru, Chile, Russia, Japan, South Korea, China, Australia, New Zealand, and the USA. Among PSG's members are biologists who have research interests in Pacific seabirds, government officials who manage seabird refuges and populations, and individuals who are interested in marine conservation. Since its inception PSG has been a strong and vocal advocate of removing invasive species from seabird colonies throughout the Pacific region. PSG members are some of the world's experts in island restoration, and many of our members have worked on seabirds in Hawaii.

PSG strongly supports your proposal to erect a predator-free fence at Kaena Point to eliminate the harm that dogs, cats, mongoose and rats cause to seabird colonies at the Kaena Point Natural Area Reserve. Seabird islands throughout the world have been threatened by introduced predators, which plague seabird colonies. In the worst circumstances, a seabird colony can be entirely destroyed; in other situations a colony can be crippled, suffering huge losses each year of eggs, chicks and adult birds. Such changes can disturb the entire island ecosystem. We understand that a least 100 seabirds are killed at this reserve each year, and suspect that this interference is a major obstacle to maintaining healthy wedge-tailed shearwater and Laysan albatross colonies there. If predators are removed and native vegetation restored, colonies of red-footed boobies or

frigatebirds might become established. Indeed, it is possible that storm-petrels and other seabirds might one day occupy the area.

We believe that a fundamental mission of Hawaii's Natural Area Reserve is to restore habitat such as that found at Kaena Point to its natural state, and to allow wildlife such as seabirds to flourish there. Predator-free fencing was pioneered in New Zealand, and the author of this letter recently had the privilege of viewing Karori Wildlife Sanctuary in Wellington, New Zealand, where predator-free fencing has been successfully implemented for more than a decade. We have confidence that if the proposed project is implemented (and that the fence is monitored to keep its integrity), that this project will be a great success for native seabirds and plants. This project may also promote increased tourism in this area, once the seabird colonies have become re-established.

For these reasons, we strongly endorse this proposal. Please contact us if we can be of further assistance in implementing this project.

Sincerely,

Craig S. Harrison

Craig S. Harrison
Vice Chair for Conservation

cc: Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, HI 96813

LINDA LINGLE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
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KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

May 15, 2009

Mr. Craig Harrison, Esq.
Vice Chair for Conservation
Pacific Seabird Group
4953 Sonoma Mountain Road
Santa Rosa, CA 95404

Subject: Comment Letter on Draft Environmental Assessment
Ka'ena Point Ecosystem Restoration Project
Wai'anae and Waialua Districts, O'ahu
TMKs 8-1-001:06; 8-1-001:022; 6-9-001:30; 6-9-002:04; 6-9-002:09; 6-9-002:13

Dear Mr. Harrison:

Thank you and the Pacific Seabird Group for the letter dated January 15, 2008, on the Draft Environmental Assessment for the Ka'ena Point Ecosystem Restoration Project. We appreciate your strong support of this project, acknowledge your confirmation that introduced predators are a significant threat to seabird colonies throughout the world, and agree with your comments that the predator-proof fencing may encourage the reappearance of other species of seabirds. We also recognize your opinion, based on observations of predator-proof fencing in New Zealand, that once implemented (and the fence monitored), this project will be a great success for native seabirds and plants. Thank you for your participation in the environmental review process. Should you have any future questions or concerns about this project, please feel free to contact Emma Yuen at (808) 587-4170 or by email at Emma.Yuen@hawaii.gov.

Sincerely,

for: Christen Mitchell
Planner, Division of Forestry and Wildlife

DLNR.CO.PublicDLNR/DLNR/StateHiUS
01/22/2008 04:54 PM

To Christen W Mitchell/DLNR/StateHiUS@StateHiUS
cc
bcc
Subject Fw: Ka'ena Point Ecosystem Restoration Project

----- Forwarded by DLNR.CO.PublicDLNR/DLNR/StateHiUS on 01/22/2008 04:52 PM -----

Don Drake
<dondrake@hawaii.edu>
01/20/2008 12:44 PM

To dlnr@hawaii.gov
cc
Subject Ka'ena Point Ecosystem Restoration Project

Dear DLNR,

I am writing to express my support for the proposed Ka'ena Point Ecosystem Restoration Project. Ka'ena Point NAR and its surroundings represent the most intact coastal ecosystem on O'ahu, and one of the best in the state. The restoration activities undertaken there during the last few decades have resulted in great improvements. The proposed fence and associated research and management should bring about continued recovery of the flora and fauna and provide excellent opportunities for education and recreation for school children, university students, and the general public. I strongly advocate approval of this proposal.

Sincerely,

Don Drake

Botany Department
University of Hawaii
3190 Maile Way
Honolulu, HI 96822
USA

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
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FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 15, 2009

Dr. Don Drake
Botany Department
University of Hawaii at Manoa
3190 Maile Way
Honolulu, HI 96822

Subject: Comment Letter on Draft Environmental Assessment
Ka'ena Point Ecosystem Restoration Project
Wai'anae and Waialua Districts, O'ahu
TMKs 8-1-001:06; 8-1-001:022; 6-9-001:30; 6-9-002:04; 6-9-002:09; 6-9-002:13

Dear Dr. Drake:

Thank you for the email received January 22, 2008 on the Draft Environmental Assessment (EA) for the Ka'ena Point Ecosystem Restoration Project. We appreciate your strong support of this project and agree with your comments that the proposed fencing, predator control, and research should bring about continued recovery of the flora and fauna and provide opportunities for education and recreation by school children, university students, and the general public. Thank you for your participation in the environmental review process.

Should you have any future questions or concerns about this project, please feel free to contact Emma Yuen at (808) 587-4170 or by email at Emma.Yuen@hawaii.gov.

Sincerely,

for: Christen Mitchell
Planner, Division of Forestry and Wildlife

From: manukolea@hawaiiantel.net (manukolea@hawaiiantel.net)
To: kaenapoint@yahoo.com
Date: Tuesday, January 8, 2008 6:07:40 AM
Subject: fence

I support the fence. I hiked out there a few weeks ago. So good, the progress that has been made to protect the birds.

Mahalo,
Ann Egleston

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
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HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 15, 2009

Ms. Ann Egleston
manukolea@hawaiiantel.net

Subject: Comment Letter on Draft Environmental Assessment
Ka'ena Point Ecosystem Restoration Project
Wai'anae and Waialua Districts, O'ahu
TMKs 8-1-001:06; 8-1-001:022; 6-9-001:30; 6-9-002:04; 6-9-002:09; 6-9-002:13

Dear Ms. Egleston:

Thank you for the email dated January 8, 2008 on the Draft Environmental Assessment (EA) for the Ka'ena Point Ecosystem Restoration Project. We appreciate your support of the project and acknowledgement of the work that has been done to protect nesting seabirds.

Thank you again for your participation in the environmental review process.

Should you have any future questions or concerns about this project, please feel free to contact Emma Yuen at (808) 587-4170 or by email at Emma.Yuen@hawaii.gov.

Sincerely,

For: Christen Mitchell
Planner, Division of Forestry and Wildlife

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

MUFI HANNEMANN, Mayor

RANDALL Y. S. CHUNG, Chairman
SAMUEL T. HATA
ALLY J. PARK
ROBERT K. CUNDIFF
MARC C. TILKER

LAVERNE T. HIGA, Ex-Officio
BRENNON T. MORIOKA, Ex-Officio

CLIFFORD P. LUM
Manager and Chief Engineer

DEAN A. NAKANO
Deputy Manager and Chief Engineer

January 2, 2008

Ms. Christen Mitchell
State of Hawaii
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Dear Ms. Mitchell:

Subject: Your Letter Dated December 19, 2007 Regarding the Draft Environmental Assessment for the Ka'ena Point Ecosystem Restoration Project

Thank you for the opportunity to comment on the proposed project.

We have no objections to the proposed project.

If you have any questions, please contact Robert Chun at 748-5440.

Very truly yours,

for KEITH S. SHIDA
Program Administrator
Customer Care Division

RECEIVED
'08 JAN -6 A8:43
OFFICE OF THE
STATE OF HAW...

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

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LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 15, 2009

Mr. Keith Shida
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, HI 96843

Subject: Comment Letter on Draft Environmental Assessment
Ka'ena Point Ecosystem Restoration Project
Wai'anae and Waialua Districts, O'ahu
TMKs 8-1-001:06; 8-1-001:022; 6-9-001:30; 6-9-002:04; 6-9-002:09; 6-9-002:13

Dear Mr. Shida:

Thank you for the letter dated January 2, 2008, on the Draft Environmental Assessment for the Ka'ena Point Ecosystem Restoration Project. We acknowledge that the Board of Water Supply has no objections to the proposed project.

Should you have any future questions or concerns about this project, please feel free to contact Emma Yuen at (808) 587-4170 or by email at Emma.Yuen@hawaii.gov.

Sincerely,

For Christen Mitchell
Planner, Division of Forestry and Wildlife

January 7, 2008

Christen Mitchell
DOFAW/NARS Planner
Department of Land & Natural Resources
Division of Forestry & Wildlife
1151 Punchbowl Street, Room 325
Honolulu, HI 96813

'08 JAN 15 P2:29
STATE OF HAWAII

RE: Comments Supporting Kaena NARS Fencing Project

Aloha Christen,

Thank you for the opportunity to provide comments regarding the Kaena NARS Fencing Project. I'm currently serve on the Office of Hawaiian Affair's (OHA) Native Hawaiian Historic Preservation Council (NHHPC) which is an advisory group to the Board of Trustee's (BOT) regarding historic preservation. I've also served on the Oahu Island Burial Council (OIBC) as the Waialua Moku Representative. I'm a current member of the Mokuleia Community Association (MCA) which is the immediate community to Kaena NARS. Lastly, I was a member of Na Maka O Kaena and established the interpretive signs posted at the Mokuleia entrance. Although I have these afflications, I'm providing comments as an individual.

I am at least a 10th generation lineal descendant of a Hawaiian family from Waialua Moku with an emphasis along the Northwest coastline that encompasses the ahupua'a of Kamananui, Mokuleia, Aukuu, Kawaihapai, Kealia and Kaena. I'm also a lifetime resident of Mokuleia and being raised a great portion of my life with my Grandparents. I've been recognized by the State Historic Preservation Division (SHPD) with both lineal and cultural descendancy in specific instances in Waialua Moku. Some historical and cultural information contained in this Draft Environmental Assessment (DEA) are information documented by my Kupuna who were informants for the Bishop Museum which is published in their publications entitled "Archeology of Oahu" by McAllister in 1933 and "The Hawaiian Planter" by Handy in 1940. My family onced owned several parcels of land which in some instances the original patents during the Mahele however their habitation and tenure is prior to that time period. Among those parcels was Grant 1665 at Kaena where the Kaena NARS is situated. This is why places like this has great sentimental and cultural values to me where my Grandparents and I went.

After reviewing the Draft Environmental Assessment (DEA), I strongly support Option 1 of this project for the following reasons:

1. Option 1 will not disturb or impose on the cultural significance of Leina Ka Uhana which has been a concern in the Hawaiian community

2. Option 1 will also extend out of the Kaena NARS and cover more land east of Leina Ka Uhane that will be protected and ending at the Mokuleia entrance to Kaena where a boulder barricade is situated.

3. Option 1 will also add to restricting vehicular traffic into the area. During the 2006 legislative session ACT 89 (Relating to Kaena NARS) became law and it's purpose is to prohibit vehicular traffic and restrict it to first responder entities which include enforcement and emergency responsers. I am hopeful that this project will provide monies for DOCARE to have personnel for enforcement

I support this project as a whole because it further protects and prevents a road from from being built around Kaena Point that the Mokuleia Community Association is opposed to and are actively monitoring. There are also other entities that also share the same reason. Documents such as the North Shore Community Sustainability Plan and Waianae Coast Community Sustainability Plan contains this position. The Kaena NARS Fencing Project will now serve multi purposes of protecting the area.

Below are comments and recommendations regarding the cultural and historical section of the Draft Environmental Assessment (DEA):

1. I'd like to share a unique and potentally overlooked relationship of Kaena which is already known that the Demi-God Maui and his brothers went fishing at Kaena and caught the Hawaiian Islands. Having mention that and based on this moolelo, my thoughts are that Kaena is the birth of the Hawaiian Islands and should be discussed and researched. Coinsidently just around on the Waianae Coastline is an Ahupua'a called Makua (Parent).

2. The name of the fishook that Maui used to catch the Hawaiian Islands is called Manaiakalani. Coinsidently, this is part of a tremendous Hawaiian historian named Samuel Manaiakalani Kamakau who was born on October 29, 1815 at Mokuleia, Waialua. I am the proponent of HR 55 which was passed during the 2005 legislative session to recognize this Kupuna.

3. I recommend that on Page 9 (Figure 1) of the Draft Environmental Assessment (DEA) that the term "Souls Leap" in the photo be replaced with Leina Ka Uhane.

In conclusion, I strongly support the Kaena NARS Fencing Project and it's Option 1 which would give this special place the protection that is needed. Please contact me for any inquires regarding this matter. Malama Aina.

Thomas T Shirai Jr
P O Box 601
Waialua, HI 96791

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
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KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 15, 2009

Mr. Thomas Shirai
PO Box 601
Waialua, HI 96791

Subject: Comment Letter on Draft Environmental Assessment
Ka'ena Point Ecosystem Restoration Project
Wai'anae and Waialua Districts, O'ahu
TMKs 8-1-001:06; 8-1-001:022; 6-9-001:30; 6-9-002:04; 6-9-002:09; 6-9-002:13

Dear Mr. Shirai:

Thank you for the letter dated January 7, 2008, on the Draft Environmental Assessment (EA) for the Ka'ena Point Ecosystem Restoration Project. We recognize your connection to this area as a 10th generation lineal descendant and active community member, and we sincerely appreciate the input you have provided throughout this process.

We appreciate your support of the project and your particular support for the alignment identified as Option 1. Through additional consultation with you and others connected to the area, we have determined that Option 1 is the preferred alignment, with the addition of a third access door in the fence immediately mauka of Leina a ka 'Uhane. We believe that this solution will minimize impact on the cultural significance of the area and protect more coastal habitat.

Regarding your specific comments on the Draft EA, we have made the following changes:

1) We have added additional information about the demi-god Maui and the mo'olelo regarding him catching the Hawaiian island with his fishhook Manaiakalani, as well as your thoughts that based on this mo'olelo, Kaena is the birth of the Hawaiian islands. We agree that this possibility should be further researched and will share your ideas with others, such as university students or Hawaiian language scholars, who may have the appropriate background and expertise to conduct further research on the subject.

2) We have incorporated the additional information you provided regarding Samuel Manaiakalani Kamakau to recognize his contribution to recording Native Hawaiian history and his connection to Waialua.

3) We have replaced Figure 1 with a revised map that shows the preferred alignment and that replaces the term "Soul's Leap" with Leina a ka 'Uhane.

Again, we appreciate your continued support of this project, and thank you again for your participation in the environmental review process. Should you have any future questions or concerns about this project, please feel free to contact Emma Yuen at (808) 587-4170 or by email at Emma.Yuen@hawaii.gov.

Sincerely,

For Christen Mitchell
Planner, Division of Forestry and Wildlife

Forest Starr
<fstarr@hawaii.edu>
01/02/2008 06:51 PM

To christen.w.mitchell@hawaii.gov
cc
bcc
Subject Kaena Point Ecosystem Restoration Project

Aloha,

We support the Kaena Point Ecosystem Restoration Project.

We spent three months on Midway Atoll in 1999, two years after rats had been eradicated from the island. We saw first hand the rebounding of both native bird and plant populations that were previously deemed goners.

Kaena Point is a special place, one of the last wild places left in Hawaii. We look forward to the continued protection and restoration of this unique stretch of coast.

Forest & Kim

Forest Starr & Kim Starr
3572 Baldwin Ave.
Makawao, HI 96768

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
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LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 15, 2009

Forest & Kim Starr
3572 Baldwin Avenue
Makawao, HI 96768

Subject: Comment Letter on Draft Environmental Assessment
Ka'ena Point Ecosystem Restoration Project
Wai'anae and Waialua Districts, O'ahu
TMKs 8-1-001:06; 8-1-001:022; 6-9-001:30; 6-9-002:04; 6-9-002:09; 6-9-002:13

Dear Mr. and Ms. Starr:

Thank you for the email dated January 2, 2008, on the Draft Environmental Assessment for the Ka'ena Point Ecosystem Restoration Project. We appreciate your information about the positive impacts of rat eradication at Midway Atoll on the native bird and plant populations and acknowledge your support of this important conservation project to protect a unique stretch of coastline. Thank you for your participation in the environmental review process. Should you have any future questions or concerns about this project, please feel free to contact Emma Yuen at (808) 587-4170 or by email at Emma.Yuen@hawaii.gov.

Sincerely,

Christen Mitchell
For Planner, Division of Forestry and Wildlife

January 8, 2008

Christen M. Mitchell
Dept. of Land and Natural Resources
Division of Forestry and Wildlife
1151 Punchbowl Street Room 325
Honolulu HI 96813

RECEIVED
'08 JAN -9 P1:58
FORESTRY & WILDLIFE
STATE OF HAWAII

Dear Ms. Mitchell:

I support the intent of and "the goal of the proposed action to create a predator-free environment on 59 acres at Ka'ena Point through the use of predator-proof fencing and predator removal of predators from Ka'ena Point peninsula is anticipated to provide long-term benefit to nesting seabirds and to native plants"* while permitting continuance access by fishermen, hikers or bikers. "With out fencing, sustained predator control efforts must continue in order to maintain the status quo levels of predators and predation by feral animals on nesting sea birds and native vegetation will remain a significant problem."*

I also support any City and County of Honolulu and Hawaii State permits necessary to build the predator-proof fencing.

Sincerely,
Paulette Tam
Paulette Tam, P O Box 4787, Kaneohe HI 96744
Concerned Kaneohe Resident

*Note: Above information taken from Page 43 VIII Findings and Reasons supporting Anticipated Determination in the Environmental Assessment, December 2007, for Predator-Proof Fencing at Ka'ena Point Natural Area Reserve and Ka'ena Point State Park, Oahu. TMKs: 6-9-02: 4,9,13,14: 8-1-01:22.

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
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CONSERVATION AND COASTAL LANDS
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HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 15, 2009

Ms. Paulette Tam
PO Box 4787
Kaneohe, HI 96744

Subject: Comment Letter on Draft Environmental Assessment
Ka'ena Point Ecosystem Restoration Project
Wai'anae and Waialua Districts, O'ahu
TMKs 8-1-001:06; 8-1-001:022; 6-9-001:30; 6-9-002:04; 6-9-002:09; 6-9-002:13

Dear Ms. Tam:

Thank you for the letter dated January 8, 2008, on the Draft Environmental Assessment for the Ka'ena Point Ecosystem Restoration Project. We appreciate your support of the goals of this important conservation project and further recognize your support of any county or State permits required to build the predator-proof fencing. Thank you for your participation in the environmental review process.

Should you have any future questions or concerns about this project, please feel free to contact Emma Yuen at (808) 587-4170 or by email at Emma.Yuen@hawaii.gov.

Sincerely,

for: Christen Mitchell
Planner, Division of Forestry and Wildlife

January 11, 200

To: DLNR Natural Area Reserves System
1151 Punchbowl Street
Honolulu, HI 96813

From Neil Shim
1613-A Kam IV Road
Honolulu, HI 96819

I strongly support the erection of a predator ~~proof~~ proof ~~fence~~ as described in Honolulu Advertiser, Jan. 7, 2008.

I would like to see ~~a~~ vehic proof barriers on both sides of Kaena State Park.

I am sixty nine years old. I used to fish at Kaena Point in the 1950s when cars could be driven to Kaena Point.

In the 1960s and 1970s ~~we~~ my family and friends would hike from Camp Erdman toward Kaena Pi

It was a barren shore line but a wild ocean.

(2)

My family and friends now include grandchildren have annually stayed at Camp Erdma and have hiked toward Kae Point. Early 2000-3 the shore line looked well recovere More recently it has ~~deteri~~ deteriorated because off-r vehicles are again by-pass barriers that were installed

I fear one irresponsible off-road vehicle could easily damage the predator-proof barrier that you propose.

I commend you for your efforts. Keep it up. My grandchildren can experience endemic plants and animals of Hawaii again.

Sincerely,

[illegible]

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
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KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 15, 2009

Mr. Neil Shim
1613-A Kam IV Road
Honolulu, HI 96819

Subject: Comment Letter on Draft Environmental Assessment
Ka'ena Point Ecosystem Restoration Project
Wai'anae and Waialua Districts, O'ahu
TMKs 8-1-001:06; 8-1-001:022; 6-9-001:30; 6-9-002:04; 6-9-002:09; 6-9-002:13

Dear Mr. Shim:

Thank you for the letter dated January 11, 2008, on the Draft Environmental Assessment for the Ka'ena Point Ecosystem Restoration Project. We appreciate your support of this project. We also value your recollections of Ka'ena over the past half-century. We acknowledge your support for vehicle-proof barriers on both sides of Ka'ena State Park and your concern that the predator-proof fence could be damaged by one irresponsible off-road vehicle. The potential for damage to the fencing due to off-road vehicles is minimized by locating the fence inside the existing boulder barricade on the Mokulē'ia side and inside the washout on the Wai'anae side. However, the impacts of off-road vehicles in the general area are noticeable, and we will relay your comments regarding vehicular access to State Parks for use in future planning for Ka'ena State Park. Thank you again for your support of this project and for your participation in the environmental review process.

Should you have any future questions or concerns about this project, please feel free to contact Emma Yuen at (808) 587-4170 or by email at Emma.Yuen@hawaii.gov.

Sincerely,

for Christen Mitchell
Planner, Division of Forestry and Wildlife

APPENDIX H

Cultural Impact Assessment

This Cultural Impact Assessment has been prepared pursuant to Chapter 343, Hawaii Revised Statutes. While this information is found in the previous sections of the Environmental Assessment, and was published in the Draft EA, correspondence from the Office of Hawaiian Affairs on another issue included a request that comments and information provided to the applicants in their consultations with Native Hawaiians, community members and lineal descendents be compiled into a Cultural Impact Assessment to be included in the Final Environmental Assessment. As this correspondence was after the Draft EA comment period and regarding a separate issue, this letter was not included in Appendix G of this document. However, the Division of Forestry and Wildlife compiled this information as requested into one section for readers to easily locate cultural impact information. Another resource provided in this Environmental Assessment is Appendix C, “Summary of Known or Possible Historic Properties at Kaena Point.” Appendix C contains additional information which also provides a reference for readers interested in evaluating the cultural and historical significance of this area, as well as the impact of this proposed ecosystem restoration project.

Summary

The proposed action does not involve an irrevocable commitment to loss or destruction of any natural or cultural resource. Instead, the goal of the proposed action is to benefit the natural environment by facilitating the eradication of predators from Ka‘ena Point, important habitat for seabirds and rare plants. No significant adverse effects are anticipated with regard to archaeological features, cultural practices, viewplanes, or public access or use of this area during or after construction of the proposed fencing.

Methods

The following steps were taken to determine the cultural and historical significance of the project area:
(1) field inspections by the Division of State Parks archaeologist;
(2) review of State reports and documents available in the State Parks and State Forestry and Wildlife files;
(3) literature review for sources with information relevance to the project area;
(4) preparation of a Summary of Known and Possible Historic Properties at Ka‘ena Point by the Division of State Parks archaeologist (included as Appendix C);
(5) sending of pre-consultation letters to a wide variety of agencies and organizations that might be interested in the project or have relevant information about archaeological or historic sites or cultural practices, including: US Air Force, Ka‘ena Point Tracking Station, US Army Museum of Hawai‘i, State Historic Preservation Division, Office of Hawaiian Affairs, Department of Hawaiian Home Lands, O‘ahu Island Burial Council, ‘Ahahui Mālama I Ka Lōkahi, Ahupua‘a Action Alliance, Hawaiian Civic Club of

Waialua, Hawaiian Civic Club of Wai‘anae, Hawai‘i Railway Society, Historic Hawai‘i Foundation, Ho‘omau Ke Ola, Hui Mālama I Nā Kūpuna O Hawai‘i Nei, Hui Mālama o Mākua, ‘Ike ‘Āina, KAHEA – The Hawaiian-Environmental Coalition, Kai Makana, Nani ‘O Wai‘anae, Native Hawaiian Legal Corporation, North Shore Kūpuna, and Polynesian Voyaging Society; and
(6) meetings with identified groups or individuals connected to the area.
Media stories about the project were published in the *Honolulu Star Bulletin* and the *Honolulu Advertiser* at the end of January 2008 and in the Hawaii Fishing News in February 2008. Media and outreach efforts (including site visits) have continued during the preparation of this Final EA and include:

1) television stories on Outside Hawaii (OC 16) in March 2008, KHNL News 8 in May 2008, and William Aila Presents (Olelo) in December 2008; and
2) site visits with the Native Hawaiian Historic Preservation Council of the Office of Hawaiian Affairs (March 2008); community members (April 2008, October 2008).

Interviews and meetings with stakeholders, which included lineal descendents of Kaena Point and native Hawaiian cultural practitioners, were conducted as part of the outreach process for this project. The intent of the meetings was to gather input from stakeholders on the project and incorporate their suggestions into the process. During the course of these meetings information on the area’s cultural significance, land-use and history were obtained. However, because the intent of the meetings was to discuss the project and not explicitly gather information on the historical background of Kaena Point, those being interviewed did not formally consent to having the information they discussed included in a cultural impact statement. As a result, unless express permission was obtained, names have not been linked to statements. Instead, a summary has been compiled from all interviews, and a list of who was interviewed and their relationship to Kaena Point provided separately.

Meetings and Presentations	Relationship to Kaena Point	Date	Method
William 'Aila	Lineal descendant & Waianae Harbor Master	8/21/2007	meeting
Eric Enos	Ka`ala Cultural Learning Center	8/22/2007	meeting
Koa Kaulukukui	Earthjustice	8/24/2007	meeting
Greg Dunn	Hawai'i Nature Center	8/29/2007	meeting
Reed Matsuura	Council member Delacruz' office	9/1/2007	meeting
Paul Sensano	Haleiwa Harbor Master	9/1/2007	meeting
Tom Mendes	Hawaiian Trail & Mountain Club	9/6/2007	meeting
Josh Heimowitz	YMCA Camp Erdman Executive Director	9/7/2007	meeting
Kenoa Kaho'okano	Damn Kidz	9/7/2007	meeting
Mac Simpson	O'ahu Railway Society	9/14/2007	phone call/e-mail
Group meeting	Ahahui Malama I ka lokahi	9/16/2007	meeting
Cynthia Rezentes	Wai`anae resident	9/17/2007	meeting
John Bennett	Coastal Defense Study Group	9/19/2007	phone call/e-mail
Group meeting	Sierra Club, O'ahu Executive Committee	9/20/2007	meeting
Todd White	Hale'iwa Off-Road Towing	9/22/2007	meeting
Group meeting	Office of Hawaiian Affairs (NHHPC)	9/24/2007	meeting
Thomas Shirai	Lineal descendant	9/24/2007	meeting
Aunty Betty Jenkins	North Shore Kupuna	9/24/2007	meeting
Uncle Jack Jenkins	North Shore Kupuna	9/24/2007	meeting
Aunty Kanani Awai	North Shore Kupuna	9/24/2007	meeting
Aunty Gladys Lenox-Awai	North Shore Kupuna	9/24/2007	meeting
Coco Leong	North Shore resident	9/24/2007	meeting
Kawika Au	North Shore resident	9/24/2007	meeting
Jr Atisanoe	Wai`anae resident	9/28/2007	meeting
Sparky Rodrigues	Wai`anae resident	10/3/2007	meeting
Eric Imasaka	ulua fishing club president	10/3/2007	meeting
Group meeting	Kaka’ako Fisher Meeting	10/4/2007	meeting
Group meeting	Kamehameha Schools	10/19/2007	meeting
Gege Kawelo	Wai'anae Hawaiian Civic Club	11/2/2007	meeting
Tom Lenchanko	Koa Mana	11/2/2007	meeting
Group meeting	Wai'anae Coast N.B. parks & rec comm	11/8/2007	meeting
Group meeting	Wai'anae fishers	11/13/2007	meeting
Shad Kane	Palehua resident	11/19/2007	meeting
McD Philpotts	Palehua resident	11/19/2007	meeting
Group meeting	Wai'anae Coast Neighborhood Board	12/4/2007	meeting
Various community members	Friends of Ka'ena	ongoing	monthly
Group meeting	Friends of Honouliuli	1/12/2008	meeting
Group meeting	Office of Hawaiian Affairs (NHHPC)	1/28/2008	meeting
Group meeting	Waialua Elementary School Faculty	5/1/2008	presentation
Glen Kila	Kamaile Elementary/Koa Mana	10/7/2008	meeting
Laulani Teale	Native Hawaiian Legal Corp	10/28/2008	phone call
Cynthia Rezentes	Wai`anae resident	10/30/2008	meeting
Faculty and students	Wai'anae Intermediate School	10/31/2008	class presentations
Uncle Black Ho'ohuli	Nanakuli resident	11/7/2008	meeting
Group meeting	Office of Hawaiian Affairs (NHHPC)	11/17/2008	meeting
Carol Silva	Hawai'i State Archives	11/29/2008	phone call
Mel Puu	Wai`anae resident	3/3/09 & 4/13/09	phone call

Site visits			
Office of Hawaiian Affairs (NHHPC)		3/24/2008	site visit
Aila, Shirai, Jenkins, Matthews	North Shore Kupuna	4/24/2008	site visit
Sandra Parks, Fred Mullins, Summer Nemeth, Michael O'Connell	Cultural practitioners and fishers	10/30/2008	site visit
Meeting requested but not conducted			
Kamaki Kanahele			
Agnes Cope			
Frenchy DeSoto			
Mel Puu			

Summary of Archaeological and Cultural Resources at Ka‘ena Point

The Ka‘ena Point area was traditionally separated into different land divisions, with the north side belonging to the Ka‘ena ahupua‘a of the Waialua moku, and the south side of the point belonging to the Keawa‘ula ahupua‘a of the Wai‘anae moku. Ka‘ena, which literally translates as ‘the heat,’ is thought to have been named for a brother or cousin of Pele. Other sources note that Ka‘ena means ‘the end point,’ underlining the area’s cultural significance as a sacred place where the spirit goes after death. Keawa‘ula translates to ‘the red harbor;’ the name comes from the great schools of muhe‘e (cuttlefish) that came into the bay in such numbers, the reddish color of their back under the water gave the water the appearance of being reddish.

Ka‘ena Point itself is a culturally significant landscape. There is a strong relationship in Native Hawaiian culture between the people and the land on which they live. The ‘āina (land), wai (water), and kai (ocean) formed the basis of life and established the spiritual relationship between the people and the environment. This relationship is demonstrated through traditional mele (songs), pule (prayer chants), genealogical records, and stories about particular areas, celebrating the qualities and features of the land. The relationship to the land is also shown through the strong attachments of kama‘āina to their ancestral homelands. For example, Thomas Shirai Jr. traces his genealogy in Waialua at least seven generations, was raised in Mokulē‘ia, and remains active in the Waialua moku. His ancestors, including his great-great-grandfather Kaaemoku Kakulu, his great-great-grandmother Annie Keahipaka, and his great-grandfather David Keao, provided information about Ka‘ena during previous endeavors to record traditional Hawaiian knowledge (Handy’s The Hawaiian Planter and McAlister’s Archaeology of Oahu). Mr. Shirai continues the tradition by sharing family stories that illustrate the importance of Ka‘ena for marine resources.

Mr. Shirai shared that he and his grandparents would periodically go to Ka‘ena to gather shellfish (‘opihi and pipipi), seaweed (limu kohu), sea cucumber (loli), sea urchin (wana, hā‘uke‘uke, and hāwa‘e), and other resources, and that they would make pa‘akai (salt) on a parcel of land his family owned at Ka‘ena. His grandfather was a taro farmer and lobster fisherman, who used Ka‘ena as one of his fishing grounds. His grandfather

learned his skills from his grandfather, Kaaemoku Kakulu, the last konohiki of Kawaihāpai, located between Waialua and Ka‘ena.

In an article published in the Hawai‘i Fishing News, Mr. Shirai connected old family stories to modern events. After relaying a family version of the story of how the Pōhaku o Kaua‘i was formed (repeated below), he tells a story of how Maui caught a huge red fish (kūmū) at Ka‘ena and dragged it to Kuakala Heiau, where the menehune found it, named it Kumunuiakea, and cut it into small pieces. When the sea covered the land, pieces of the fish went back into the ocean, and since then kūmū at Ka‘ena are small. Mr. Shirai then recalls a 1994 Hawai‘i Fishing News story remembering how three scuba divers discovered a pristine kūmū fishing ground, catching many of this species, but of an average size of five pounds, back in 1957.

Mr. Shirai shared a third story, about an octopus called Kakahe‘e that lived at Ka‘ena. Piikoi-a-ak-Alala and his father were traveling to O‘ahu where they sighted a huge octopus. They took aim and shot at Kakahe‘e with a bow and arrow, then landed at Waiakaaiea and proceeded to beat it to death. Kakahe‘e is reported to have shared the same fate as Kumunuiakea, thus creating an abundance of he‘e (octopus). Mr. Shirai then notes that the State record for largest octopus was caught at Ka‘ena, and that the February 1994 issue of Hawai‘i Fishing News featured a fisherman who caught a large octopus at Ka‘ena.

Mr. Shirai further shared his thoughts that Ka‘ena could have further importance as the birthplace of the Hawaiian islands, based on one mo‘olelo of the demigod Maui. Maui went fishing with his brothers, and with his fishing hook Manaiakalani, Maui caught something large. They paddled hard to land it, but when one brother looked back, the line snapped, the hook disappeared beneath the ocean, and the islands of Hawaii remained above water. As discussed further below, there are other versions of this mo‘olelo (that explain how Maui attempted to join Kaua‘i and O‘ahu, forming the Pōhaku o Kaua‘i), and there are other versions of the story detailing the creation of the Hawaiian islands; thus the relationship of Ka‘ena to the birth of the Hawaiian islands is a rich area for further discussion and research.

These stories provide invaluable information about Ka‘ena and connect historic events with present use. There are likely many other residents of Wai‘anae and Waialua with similar stories and recollections. While most likely involve the rich marine resources of Ka‘ena, many of the native plants found at Ka‘ena are also associated with traditional cultural practices and may have been used by previous families. ‘Ilima papa vines were used for basketry, the flowers for lei, and parts of the plant for medicinal and ceremonial purposes; hinahina was used for lei and medicinal purposes; and naio provided hard durable wood and was used for medicinal purposes. Likewise, seabirds have cultural significance as well: observations of flight paths and behaviors of certain seabirds were used to predict weather and to reveal schools of fish and to locate islands when navigating, seabirds provided food through their meat and eggs, seabirds provided feathers for kāhili (feather standards), ‘ahu‘ula (feather capes), and lei, and several expressions and legends reference seabirds (e.g., Pōhai ka manu maluna, he i‘a ko lalo.

When the birds circle above, there are fish below. ‘Ōlelo No‘eau, M.K. Pukui 1983, No. 2667, as referenced in *Ko Hema Lamalama,* Kahoolawe Island Reserve 2008).

Sites of O‘ahu (1978) identifies several archaeological sites in the Mokulē‘ia- Ka‘ena region. In Kamananui, on the slopes of the Wai‘anae Mountain Range behind the old Waialua Sugar Company mill, the remains of a heiau were found along with stone piles and burial caves. Makai of these sites, along the coastline, were found a fishing shrine, or ko‘a, and skeletal remains. In western Mokulē‘ia, a heiau site and a ko‘a – both now destroyed – as well as extensive terracing have been recorded. Further into the valley area are sites that indicate that there was once a significant Hawaiian settlement there, including house sites, old coconut trees or dead trunks, and terracing. In Kawaihāpai, between Waialua and Ka‘ena, a heiau, ahu, ko‘a, and extensive terracing were recorded, as well as the four ‘hidden waters,’ the legendary streamlets Ulunui, Koheiki, Ulehulu, and Waiaka‘aiea that Hi‘iaka, one of the sisters of Pele, discovered at Ka‘ena and at which she quenched her thirst. The Keālia Trail, which zigzags up into the Wai‘anae Mountain Range from the coast, provided easy access to the Mokulē‘ia plateau. The Moka‘ena heiau in Kuaokalā, situated on the ridge at 1200 feet in elevation overlooking Ka‘ena Point and Keawa‘ula Bay, has the highest location of any heiau on O‘ahu. At Ka‘ena, the now-destroyed Ulehulu heiau was also located on the mountain ridge.

Historic properties identified so far at Ka‘ena Point within or near the project area fall within one of the following four major time-periods and uses: (1) Native Hawaiian subsistence and cultural uses; (2) Pasturage and ranching; (3) O‘ahu Railway and Land Company (OR&L); and (4) Ka‘ena Point Military Reservation. The following information is based on the Summary of Known and Possible Historic Sites; the full report, with photos, is included as Appendix C.

To date, a total of five extant historic properties that are considered native Hawaiian properties have been documented at Ka‘ena Point. Together they form the Ka‘ena Complex, which was listed on the Hawai‘i Register of Historic Places in 1988. Major features of the Ka‘ena Complex include cultural deposits in the sand dune area, two stone platforms, Pōhaku o Kauai, and Leina a ka ‘Uhane (Soul’s Leap).

The oldest of these properties are the subsurface cultural deposits and burials in the sand dune area near the actual point. These sites were first documented in 1971, and recorded in more detail during a 1982 recovery effort prompted by deterioration of the sand-dune knoll due to off-road vehicle use. As part of the 1982 effort, two partial burials exposed by erosion were removed and placed in a more stable reburial site for protection. Additional data recovery work was conducted in 1989. Prior to 1989, the site was described as having remnant walls constructed of water-worn basalt stones and two distinct buried cultural layers. The two cultural layers were marked by dark, charcoal-stained sand containing coral and basalt ‘ili‘ili (water-worn pebbles), pit features, a few artifacts, and midden composed of bird and fish bone, crab, sea urchin, kukui nut fragments, marine shells, and charcoal pieces. The stone walls had been reduced to foundation alignments in 1982 and 1989, and the upper cultural layer was no longer intact by 1989. An analysis of the lower layer in 1989 indicated the long-standing

importance of fishing and marine resources in this dry environment, and the presence of habitation features suggested a sustained use of the area, whether on a permanent or recurrent basis. Spatially, the cultural deposits extend over an area approximately 30 by 50 meters, and surface midden scatters and darkened sand exposure indicate that the deposits could extend an additional 300 meters to the east and 30 meters to the south.

The two stone platforms included in the Hawai‘i Register complex are thought to have been constructed for religious purposes. One was described in 1988 as a partially buried basalt boulder platform with coral pieces scattered among the boulder paving of the platform. The presence of coral and the location of the platform on a distinct rise above the sand dunes indicate that it could be a fishing ko‘a (shrine or triangulation point). It is possible, but not confirmed, that this could be Alau‘iki, a fishing shrine recorded in 1930 by McAllister.

The second stone feature is upslope from Leina a ka ‘Uhane (Soul’s Leap), above the proposed fence alignment. It has been described as a “small rectangular platform of basalt cobbles, with scattered coral on the surface.” Its possible religious function is suggested by its size, the presence of coral, upright stones along the edge of the platform, and its vantage point. The possible ritualistic nature of these two features is consistent with the prevalence of known fishing shrines in the area and with the richness of its fisheries. McAllister recorded eight named ko‘a between Keawa‘ula and Mokulē‘ia.

Two natural formations compose the remaining two features of the Ka‘ena Complex: Pōhaku o Kaua‘i and Leina a ka ‘Uhane (Soul’s Leap). Both should be considered traditional cultural properties; the identification and evaluation of these otherwise natural features rely on known native Hawaiian traditions and beliefs. Pōhaku o Kaua‘i marks the end of a series of partially submerged rock outcrops that form the westernmost extent of O‘ahu. According to several recorded traditions, this rock formation was once part of Kaua‘i. In one tradition, the demigod Maui attempts to join Kaua‘i and O‘ahu by standing at Ka‘ena Point and using his hook, Manaiakalani[1], to pull Kaua‘i towards O‘ahu. When he pulled the hook, only a single, huge rock from Kaua‘i fell at his feet, to become known as the Pōhaku o Kaua‘i. The hook was attached to ‘ie‘ie cordage, which ended up in Ka‘ie‘ie Channel (between Kaua‘i and O‘ahu) and the hook landed in Pālolo Valley, hollowing out a crater. In a related version told by Annie Keahipaka, a lineal descendant of the area, Maui had many helpers pulling the line. When one disobeyed orders and looked back at Kaua‘i as they pulled it towards O‘ahu, the line broke and Kaua‘i slipped back into the ocean, with only the fragment Pōhaku o Kaua‘i remaining as proof of Maui’s great effort. In a third tradition, a Kaua‘i chief named Ha‘upu hurled a huge boulder from Kaua‘i to O‘ahu to forestall what he thought was a fleet of O‘ahu warriors about to invade Kaua‘i. The group was, in fact, driving fish towards nets laid

[1] Mr. Shirai further relates that Manaiakalani is also the middle name of an important Hawaiian historian, Samuel Manaiakalani Kamakau, who was born on October 29, 1815 at Mokuleia, Waialua. Samuel Manaiakalani Kamakau was recognized by the 2005 Legislature as one of Hawaii’s greatest historians of Hawaiian culture and heritage, for his actions and passion in accurately recording native Hawaiian history, preserving this information for current and future generations.

off-shore of O‘ahu. When the boulder fell, it killed the chief Ka‘ena who was leading the drive and many of his followers. From then on, the point bore the name of this chief and the rock was called Pōhaku o Kaua‘i. Pōhaku o Kaua‘i is also mentioned incidentally in other traditions, demonstrating that it was a commonly known landmark.

Leina a ka ‘Uhane (Soul’s Leap) is a limestone formation approximately 150 meters (500 feet) from the existing boulder barricade, perched between the existing trail and the ocean. It forms a tangible representation of native Hawaiian traditions and beliefs that identify Ka‘ena Point as a place where the fate of departing souls is determined as death nears. Departing souls either passed into one of several spirit realms or were returned to the body to continue life. The fate of these souls often depended on the help or absence of friendly ‘aumakua (ancestral family or personal god) that would guide a soul to the appropriate realm: ao kuewa, a place of wandering souls, ao ‘aumakua, where the soul could be reunited with the souls of ancestors, or au milo or pō pau ‘ole, a place of eternal night. In another version of what happens to souls after death, a soul wanders to Leina a ka ‘Uhane if all its earthly obligations are fulfilled (if they are not, the soul returns to the body), where it is thrown into a pit know as Lua ahi a Kehena, at which time death actually occurs to the body.

A road, following the traditional Wai‘anae-Waialua trail, was constructed through the area and around the point sometime in the 1860s-70s. Several small fishing villages are thought to have existed in the area during this period. A settlement called Nēnēle‘a is documented as being about a mile east of Ka‘ena Point, and several house foundations, measuring 14 x 20 feet, are documented from the area. An 1832 census listed the population of the Ka‘ena ahupua‘a at forty-nine individuals. Based on the known fishing shrines, recorded interviews, and the number of stories, fishing was an important activity. Ka‘ena is noted as an excellent fishing ground, and one story describes how Maui caught a huge red fish, which left a trail from Pōhaku o Kauai to Kuakala heiau (up in the mountains) as he dragged it. The menehune found the fish and cut it into small pieces, which went back in the ocean when the sea covered the land, and is the reason why kūmū (goatfish, *Parapeneus porphyreus*) are now small.

Based on historic accounts and recorded traditions, there may be additional as-yet unidentified historic properties at Ka‘ena Point and would most likely reflect uses and customs associated with the area’s rich fisheries and the lack of any other dominant land use in this waterless hot area. These could include additional ko‘a, the remnants of shelters and settlements for fishermen, burials, canoe landings, and salt-making sites. However, later uses of the area (described further below) have significantly reduced the probability of these properties surviving on the flatter portions of the Point or along lower ridge slopes.

The first reference to lands at Ka‘ena being used for pasturage appear in survey notes by J.S. Emerson for 5 Royal Patent Grants. These government grants reflect a district-wide attempt by Waialua residents to secure land for pasturage and may also provide evidence that permanent settlements were absent along this coast in 1850. Most of the government lands and private lands at Ka‘ena were leased for ranching during the second half of the

1800s and the first half of the 1900s. When the privately-owned lands along the coast were acquired by the State of Hawai‘i in the 1970s to create Ka‘ena Point State Park, all were owned by ranching interests or by families with ranching interests in the area. Despite references to Ka‘ena Point and adjacent lands being used for pasturage, none of the stone features or sites generally associated with grazing or ranching have been identified at the Point or within the project area. There are no stone wall enclosures or corrals, nor do the boundaries of the grants appear to have been walled to contain grazing cattle or horses.

The former alignment and features of the O‘ahu Railway and Land Company (OR&L) railway are among the most visible historic properties at Ka‘ena Point. Completed in 1898, the railway connected Honolulu to Kahuku, via Wai‘anae and Waialua. It was meant to serve plantation towns and ranches, but also became a scenic tour. Railway service ended and the railway was abandoned in 1947, after damage by a 1946 tsunami and a decline in railroad use caused by the increase of personal vehicles. The main railway bed is still visible through its route through Ka‘ena, but no traces of the tracks or railroad ties remain. Today, the railway bed forms the primary path used by visitors hiking out to the Point. Rock-work features associated with the railway such as bridge foundations, culverts, and rock retaining walls can still be observed along the railroad track. In addition to the main railway line, a 15-car siding track once ran from the northern side of the bend to the Point and is depicted on 1929 and 1940 USGS topographic maps. No physical evidence of this siding was apparent during the field inspection.

Finally, Ka‘ena contains historic features associated with its military use. Ka‘ena Point Military Reservation was established in 1923; construction of military defense facilities began in 1924 and continued through 1946, capitalizing on the strategic location of Ka‘ena Point. Four complexes of structures and associated features still exist within or near the project area, and a fifth could be identified with additional field inspections. These include a fire control and base end stations built on a ridge knoll (above Ka‘ena Point) in 1924 and 1934, a radar station used in the 1940s (located on the ridge above Ka‘ena Point), a search light position established in 1942, a cantonment established in 1942 for military personnel manning the various operations (“Camp Ka‘ena,” located on the flat area down at Ka‘ena Point), and a battery begun in 1943. The concrete structures associated with the fire control and base end station remain intact, the concrete foundations of Camp Ka‘ena remain recognizable, and concrete structures associated with a radar station remain visible.

The battery, BCN-409, was designed to support two 8-inch naval guns and army M1 barbette cartridges. It involved the construction of a tunnel complex and was 60% complete when the project was abandoned in 1945, after studies determined that batteries of this type could not withstand modern air attack. Given the elevation of the tunnel entrances, a substantial amount of cut and fill was needed to create the appropriate grade for an access road and maneuvering area in front of the tunnel entrance. Tailings from tunnel excavations were used as fill for the road and terrace, and gunite was pressure-sprayed over the ridge cuts at each tunnel entrance to stabilize the rock face. Much of the

components of BCN-409 are still recognizable; while the tunnel entrances have been sealed, the access road and terrace features and the piles of tailings that form the faces of the terrace are intact. Military use of Ka‘ena Point declined after World War II, with use primarily consisting of small-size maneuvers.

The Ka‘ena Passing Light, operated and maintained by the U.S. Coast Guard, was constructed at Ka‘ena Point in 1920. Initially consisting of a sixty-five foot tall concrete tower, the light was replaced in 1990 by a new beacon on a thirty-foot steel pole. The old light tower, a historic structure, was toppled and lies in the sand at Ka‘ena Point, north of the new beacon.

After the railway closed, a rough track followed the rail grade. A nine-mile dirt road was constructed around the point from 1954-1956, using prison labor. In 1971, the State Department of Transportation developed plans for a two-lane paved road around Ka‘ena Point. Due to significant opposition from the public, the concept was shelved and efforts shifted towards protection of this area. During the 1970s, the State began to purchase lands in the area for a proposed Ka‘ena Point State Park. In 1978, a Ka‘ena Point State Park Conceptual Plan was completed. In 1984, a portion of Ka‘ena Point Military Reservation was declared excess property and deeded to the State for park purposes.

Ka‘ena Point NAR was established in 1983, composed of twelve acres on the leeward side of the point. In 1986, an additional twenty-two acres on the windward side were added to the NAR. Degradation by off-road vehicle use was significant, and the primary management for the new NAR was to close the area to motorized vehicles. Erosion of the roadbed on the Wai‘anae side of the point prevented vehicular entry, and a boulder barricade was erected for this purpose on the Mokulē‘ia side. The results of prohibiting vehicles are positive and noticeable, with the regeneration of native coastal plant communities and the re-establishment of breeding populations of seabirds.

The project area is one of the last relatively wild areas on O‘ahu and has been valued as a natural escape from the pressures of urban life. Ka‘ena Point NAR is accessible to the public by foot or bicycle, and its primary uses include recreation, hiking, nature study, education, and the observation of wildlife. Shore fishing, spear fishing, and gathering of marine resources have traditionally been important uses of the Ka‘ena coast. A site ½ mile off of Ka‘ena Point is used by surfers, and during rare combinations of winter conditions, rideable 50-60 foot surf has been seen.

Analysis of the potential effect of any proposed physical alteration on cultural resources, practices or beliefs; the potential of the proposed action to isolate cultural resources, practices or beliefs from their setting; and the potential of the proposed action to introduce elements which may alter the setting in which cultural practices take place

In general, construction of the fencing primarily on top of the existing gravel road (constructed in the 1940s for military purposes) minimizes the impact to archaeological resources in the project area. This road provides a level, previously-disturbed foundation

for the fence and its position on the slope of the ridge avoids the sand dunes and sandy soils in which subsurface cultural deposits and burials are a high probability. Construction and use of the road from 1943 to 1945 would have destroyed other sites or features associated within preceding periods or uses, and this corridor avoids cultural sites such as fishing shrines or heiau previously documented at Ka‘ena.

Construction of the fencing may, however, have an impact on the following cultural or historic features: Leina a ka ‘Uhane (Soul’s Leap), the OR&L Railway bed and associated features, and the Battery Construction No. 409 (BCN-409).

Leina a ka ‘Uhane (Soul’s Leap) is located near the northern end of the gravel road where the road turns east. While the formation itself can easily be avoided by the fencing, the precise location of the fencing in relation to the formation and the proximity of the fencing to this traditional cultural property may affect cultural beliefs and practices associated with Leina a ka ‘Uhane. Under either fencing alignment, the fence would have a visual impact on this cultural feature due to proximity. In addition, some stakeholders indicated that having the Leina a ka ‘Uhane (Soul’s Leap) enclosed within the fenced unit would prevent souls from coming down from the mountain and leaping off into the next world. Other stakeholders disagreed, feeling that souls can move easily through walls and buildings and so would easily pass through the fencing. Additional consultation, including a site visit, with cultural practitioners and lineal descendants of the area led to the compromise of adding a third access door in the fencing, just mauka of the Leina a ka ‘Uhane. Several members of the community commented that this addition would provide accommodation for souls coming down the mountain to the Leina, and at the same time would reduce the visual impact of the fencing by moving the fencing further away from this cultural feature. While visual and cultural impacts cannot be completely eliminated, the construction of a third gate appeared to address the concerns raised by the stakeholders initially opposed to enclosing the Leina.

On the Mokulēʻia side, two alignments were initially under consideration: the first runs along the roadbed to the existing boulder barricade, then crosses the old railway easement and extends to the ocean along a rocky outcropping; the second turns off the roadbed towards the ocean approximately 150 meters (500 feet) short of the boulder barricade, crosses the old railway easement and extends to the ocean along a rocky outcropping. The primary difference between the two alignments is that the first option encloses the culturally significant site, Leina a ka ‘Uhane (Soul’s Leap), within the fencing, while the second option does not.

After publication of the Draft EA, consideration of public comment, and further consultation with cultural practitioners and lineal descendants from the Wai‘anae and Mokulēʻia communities, a decision was made to extend the fence to the boulder barricade and add a third access door immediately mauka of the Leina a ka ‘Uhane. This alignment will have less visual impact than the alternative due to the proximity to the existing boulder barricade, will protect more habitat for endangered birds and plants, and will reduce the potential for bird strikes as seabird populations increase over time. Minor changes to the alignment are possible based on terrain considerations and permit

requirements. Most of the length of the fencing alignment is within the boundaries of the NAR, but a small portion at the southern end (Wai‘anae side) will cross State Parks land as the fencing leaves the loose rock slope, crosses the railway easement, and extends to the ocean. The area between the doors will be constructed with the same quality and design as the rest of the fence and will be large enough that up to nine people may enter together or so that a person can enter with a bicycle or fishing pole.

The fencing must cross the OR&L Railway bed at the northern and southern ends. At both ends, sections of the railway bed were found during field inspections that can be crossed without altering any of the character-defining features constructed to create the desired grade of the bed (e.g., raised railway bed, trenches, stone retaining walls) or any of the segments with paving slabs. Crossing at these areas would minimize the effect of the fence on the historic integrity of the railway bed and its associated features. On the southern end, the fence would need to breach a low stone wall which parallels the railway bed. The length of the wall and its location make it impossible to avoid. The breach would, however, remove only one relatively small section of the wall, and not a segment that is particularly unique or exemplary. To mitigate the impact of the fencing, the wall will be mapped and photographed, to allow restoration if the fencing is ever removed.

The selected fence alignment is on top of a gravel road that is itself a historic property, as it is over 50 years old and part of the BCN-409 complex. The road itself is not particularly unique or exemplary nor is it a key feature of the BCN-409 complex. The fence is not anticipated to irreparably alter the integrity of this complex as the installation will not disturb the complex’s significant components (e.g., the tunnel entrances, gunnite-coated facings, terrace retaining walls). In addition, construction requires minimal grading and so will not alter the fundamental formation or foundation of the road, which is made of excavated fill and tailings. Road sections will be documented as a form of mitigation, and the manner of fence installation will allow the road’s general appearance to be readily restored if the fence is removed at some point in the future.

Ka‘ena Point itself also has great cultural significance, apart from the individual cultural sites. During the previous public discussions on the concept of a road connecting the North Shore to the Wai‘anae coast through Ka‘ena, it is clear that many Native Hawaiians value the area and would consider any major changes or developments, such as a road, to be a sign of disrespect for the place. As a result, there are some individuals who believe that the proposed fence will have a negative impact on the cultural landscape despite the anticipated benefits. On the other hand, there are individuals who believe that the natural resources are cultural resources, and that a project designed to enhance seabird and native plant populations, without limiting public access, will have a positive impact on cultural resources.

Finally, there are some individuals who believe that the fencing will impact their cultural practices, primarily access for fishing. This belief seems based upon their inability to drive directly into the project area and fish from their vehicles, notwithstanding that vehicular access has been prohibited for over twenty years. Given the continued ability to walk into the fenced area with fishing equipment through accommodations built into

the fencing design, without more specific information, the proposed fencing is not anticipated to impact cultural practices related to fishing.

As mentioned in the previous section, public access is not anticipated to change significantly due to the construction of predator-proof fencing. Access doors are to be incorporated at locations where the fencing crosses the primary trail into and out of the Point, from both the Mokulē‘ia and Wai‘anae sides. This trail is the point of entry by which people bike or hike across Ka‘ena Point or access the shoreline within the project area. On rare occasions, visitors access Ka‘ena Point from the military bunkers along a ridge trail; access for these visitors will be maintained by maintaining a clear path along the outside of the fence alignment to either of the two access doors, a detour of less than 400 meters in either direction, and one which minimizes human disturbance of the best seabird nesting habitat. Access along the shoreline is not anticipated to be affected as the fencing will stop at or before the high tide line. The double-door system will be constructed with the same quality and design as the rest of the fence and will be large enough that up to nine people may enter together or so that a person can enter with a bicycle or fishing pole. As a result, the impacts on public access are not anticipated to be significant.

Based on a review of the circumstances, including the distance from the dune area likely to contain cultural deposits, the disturbed condition of the railway and the military road, the limited permanent impact of the fencing on the remaining historic features, the anticipated benefit to natural resources, the importance of these resources from a cultural perspective, the continuation of public access into the area, the ability to modify the fencing alignment and fencing design through the addition of a third access door to minimize the impact on cultural features, specifically the Leina a ka ‘Uhane, the proposed action is not expected significantly impact archaeological or historic sites or significantly impact Native Hawaiian traditional and cultural practices.

A section 106 consultation has been initiated by the USFWS with SHPD for this project because of the Federal funding. Any mitigation requirements resulting from the section 106 consultation will be incorporated into the project and implemented before or during construction, as appropriate.

While archaeological features or cultural sites are not anticipated to be significantly impacted by the proposed action, should evidence of any archaeological or cultural properties be encountered during construction, vegetation clearing and fence construction would immediately cease and the appropriate parties would be consulted immediately. If necessary, the fence alignment will be adjusted to reduce or eliminate impact to any features located during surveys or construction or as recommended during Section 106 consultation to be conducted for this project.

While some interference with the scenic vistas at Ka‘ena Point may be unavoidable, the fence’s role in helping to improve the wild and natural, predator-free character of the point is anticipated to outweigh these impacts. Continued consultation with appropriate

agencies and groups will occur to minimize the visual impact of the fence upon cultural features at the point, such as Leina a ka ‘Uhane.

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