

FINAL ENVIRONMENTAL ASSESSMENT

KAPUNA WATERSHED PROTECTION PROJECT  
PAHOLE NATURAL AREA RESERVE

Kapuna and Keawapilau Drainages  
Pahole Natural Area Reserve & Mokuleia Forest Reserve  
Waialua District  
Northern Wai'anae Mountains  
Island of O'ahu

In accordance with  
Chapter 343, Hawai'i Revised Statutes

Proposed by:

State of Hawai'i  
Department of Land and Natural Resources  
Division of Forestry and Wildlife  
Natural Area Reserves System

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## I. SUMMARY

<u>Project Name</u>	Kapuna Watershed Protection Project Pahole Natural Area Reserve
<u>Project Location</u>	Kapuna and Keawapilau Drainages Pahole Natural Area Reserve/Mokuleia Forest Reserve Waialua District Northern Wai‘anae Mountains Island of O‘ahu TMK 1-6-8-001-002 (State of Hawai‘i) (Pahole NAR) TMK 1-6-8-001-001 (State of Hawai‘i) (Mokuleia FR)
<u>Land Use</u>	Conservation District, Protective Subzone
<u>Proposing Agency</u>	State of Hawai‘i Department of Land and Natural Resources Division of Forestry and Wildlife Natural Area Reserves System
<u>Approving Agency</u>	State of Hawai‘i Department of Land and Natural Resources
<u>Agencies Consulted</u>	Federal: U.S. Army Garrison, Hawai‘i U.S. Department of Agriculture, Natural Resources Conservation Service U.S. Department of Interior, Fish and Wildlife Service U.S. Geological Survey, Biological Resources Division  State: Department of Agriculture Department of Business, Economic Development and Tourism, Office of Planning Department of Defense Department of Hawaiian Home Lands Department of Health Department of Land and Natural Resources Division of Conservation and Resource Enforcement Division of Forestry and Wildlife Division of Historic Preservation Division of Land Management Division of State Parks NARS Commission Office of Conservation and Coastal Lands Land Use Commission Office of Hawaiian Affairs

Office of Environmental Quality Control  
University of Hawai‘i, Dr. Michael  
Hadfield  
University of Hawai‘i, Environmental  
Center

County: Board of Water Supply  
Department of Planning and Permitting  
North Shore Neighborhood Board  
Wahiawa Neighborhood Board  
Waianae Neighborhood Board

Private: Ahahui Malama I Ka Lokahi  
Bishop Museum  
Conservation Council of Hawai‘i  
Earthjustice Legal Defense Fund  
Hawai‘i Audubon Society  
Hawai‘i Trail and Mountain Club  
Historic Hawai‘i Foundation  
Ilio‘ulaokalani Coalition  
Kahea – the Hawaiian Environmental  
Alliance  
Ko‘olau Mountains Watershed Partnership  
O‘ahu Invasive Species Committee  
Pig Hunters Association of O‘ahu  
Sierra Club, Oahu Chapter  
The Nature Conservancy of Hawai‘i  
Waialua Hawaiian Civic Club  
Waianae Hawaiian Civic Club  
Steve Montgomery  
Jonah Ioane

### Summary of Action

The Hawai‘i Department of Land and Natural Resources, Division of Forestry and Wildlife proposes to construct a network of fences in the uppermost portion of the Kapuna and Keawapilau drainages, between the 1,500 and 2,590 foot elevation, in the Pahole Natural Area Reserve and extending slightly into the Mokuleia Forest Reserve, in the northern Wai‘anae Mountains on the island of O‘ahu. By eliminating the destructive impact of feral pigs in the project area, this project is directed at the protection of the watershed as well as rare and endangered species.

The proposed fencing will have a combined length of approximately 3.5 miles, enclosing approximately 235 acres. The proposed action is part of an ongoing effort by DOFAW, USFWS, the United States Army, hunting clubs, and community volunteers to protect native ecosystems, watershed, and habitat for native species. At least eighteen species of listed, proposed, candidate or rare

plants and several rare and/or endangered native snail species are found in the project area.

Fence construction will involve hand clearing of a corridor no more than 10 feet wide and erecting a fenceline. The planned fence will be approximately three feet tall, made of hogwire. Where necessary, the outside of the fence will be skirted along the base with a hogwire apron. Management activities planned after the fence is completed include feral animal and weed control and outplanting of native species to restore the dryland forest.

Potential impacts include short-term increase in soil disturbance along the fenceline, disturbance and damage to common native plants, and effects on rare and endangered plant and animal species, cultural resources, public hunting, and the Mokuleia Trail. Impact mitigation measures include conducting expert surveys of the fence route to ensure that no biological or cultural resources are within the fence clearing corridor, implementing measures to decrease the potential for accidental introduction of non-native species, and retaining the integrity of the Mokuleia Trail.

## **II. PROJECT PURPOSE & NEED**

The Hawaiian Islands are known as the endangered species capital of the world. Approximately half the native rain forest and 90 percent of the native dry forest in Hawai'i have been lost. Over one-third of the threatened and endangered species in the United States are unique to Hawai'i, and more plant and bird extinctions have been recorded from the islands than anywhere else in the country.

The Natural Area Reserves System (NARS) was established in 1970 by the State Legislature 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 Hawaii." Chapter 195, HRS. The 658-acre Pahole Natural Area Reserve was established in 1981 to protect rare lowland native mesic and dry forest and habitat for endangered species. Pahole Natural Area Reserve supports the endangered O'ahu 'elepaio (*Chasiempis sandwichensis ibidis*), the endangered O'ahu tree snail (*Achatinella mustelina*), at least 18 species of endangered plants, candidate plants, and plant species of concern, and additional native species of plants and animals.

The Forest Reserve System was established in 1903 to protect the vital mountain watersheds. The Mokuleia Forest Reserve surrounds Pahole Natural Area Reserve and also supports the endangered O'ahu 'elepaio as well as various species of rare, threatened and endangered plants.

The proposed action focuses on protecting some of the best examples of lowland native mesic forest remaining in the Hawaiian Islands. Protecting and actively managing native ecosystems on a landscape level is necessary to secure the long-term viability of these systems and to recover endangered species. The

ecosystem approach to managing the Pahole Natural Area Reserve is consistent with the NARS mandate to protect natural communities in perpetuity. This strategy is also consistent with the USFWS policy of protecting large, intact, native ecosystems whenever possible.

The proposed action will reduce the negative impacts of feral pigs on native forest, watershed, and habitat for native plants and animals, including endangered species. The installation of a ridgeline fence by the U.S. Army Garrison Hawai'i along the entire southeastern border of the Reserve and continuing east on the crest of West Makaleha Gulch has resulted in a dramatic increase in feral pig activity in the upper Kapuna and Keawapilau drainages. Feral pigs pose a major threat by consuming and destroying native understory plants, creating conditions favoring non-native plant infestation and establishment, preventing the establishment of ground-rooting native plants, and disrupting soil nutrient cycling. The cumulative effect of these activities is the decline of native forests, watersheds, and suitable habitat for native plants and animals.

The proposed action will enhance the Wai'anae Mountains watershed, which serves the North Shore and Leeward O'ahu communities. Fencing and removing feral pigs will enhance surface and ground water resources by reducing soil erosion and runoff.

The project area, Pahole Natural Area Reserve and Mokuleia Forest Reserve, is State owned land within the Conservation District, which triggers the need for an Environmental Assessment to be written in accordance with Chapter 343, HRS.

### **III. PROJECT DESCRIPTION**

#### *General*

The Division of Forestry and Wildlife (DOFAW) proposes to construct a network of fences in the uppermost portion of the Kapuna and Keawapilau drainages, between the 1,500 and 2,590 feet elevation, in the Pahole Natural Area Reserve and the Mokuleia Forest Reserve, in the northern Wai'anae Mountains on the island of O'ahu. The project area is owned by the State of Hawai'i and lies within the Conservation District. A map of the project area and proposed fence lines is included in Appendix A.

The goals of the project are to: 1) protect native forest, watershed, and habitat for native species from feral pigs (*Sus scrofa*); and 2) secure outplanting sites for endangered plants. The proposed action is part of an ongoing effort by DOFAW, USFWS, the United States Army, hunting clubs, and community volunteers to protect native ecosystems, watershed, and habitat for native species.

The project involves constructing a network of fences around four habitat management units that still support relatively intact native forest, watershed, and habitat for native species. The habitat management units range in size from eight to 207 acres. A perimeter fence will be installed around the fenced habitat management units, protecting a total of approximately 235 acres. The fences will be approximately three feet high with a combined length of approximately 3.5 miles.

The proposed fencing is located primarily within Pahole Natural Area Reserve, but extends into a portion of the Mokuleia Forest Reserve to the east of Pahole. The proposed fence line was selected based on the need to minimize impacts of fence construction on native plant communities; ease of fence installation and maintenance; and long-term survival of the fences from vegetative encroachment, erosion, and slides.

The fences will be constructed on remote ridges dominated by non-native plants to avoid disturbing sensitive species, slopes, and gulches. Helicopters and existing trails and roads will be used to transport fence materials and crews. A corridor no wider than 10 feet along the proposed fence line will be cleared by hand and with small power tools, if necessary. The fences will be made of steel and wood posts, hog wire, and a single strand of barbed wire along the bottom of the fence to prevent feral pigs from entering the fenced areas. Where necessary, the fences also will be skirted along the bottom of the fence with a horizontal 24-inch wide wire apron.

The fenceline crosses the Mokuleia Trail in two locations. Gates or stiles will be constructed at these locations to preserve access along the trail for public users, such as hikers and hunters, and for resource managers conducting management activities within the Natural Area Reserve.

Once the fences have been installed, feral pigs will be removed from the fenced areas. A comprehensive threat-control program will be implemented, invasive weed species and predatory rats (*Rattus* spp.) will be monitored and controlled, and human disturbance minimized.

### *Fencing Specifications*

Fence construction will involve driving steel T-posts and treated wood posts into the ground no more than 10 feet apart along the fence routes using powered drills and post pounders. One strand of galvanized barbed wire will be clipped to the posts and nailed to the poles at ground level. Bezinol-coated hog wire will be stretched and clipped or nailed to the standing posts and poles. Bezinol steel pins will be used as anchors within each 10-foot span. Where necessary, the bottom of the fence will be anchored with posts to ensure that the wire fabric is kept close to the ground. A 24-inch-wide apron of hog wire will be laid horizontally on the ground and attached to the outside of the standing fence where needed to curtail pig grubbing and consequent erosion along the fences.

*Timing & Costs*

Fence construction is planned to occur in two phases because of funding constraints. Units 1, 2 and 3 will be constructed sequentially during Phase I of the project, and Unit 4 will be constructed during Phase II. Units 1, 2 and 3 will create three separate fenced enclosures, while Unit 4 is a perimeter fence that will enclose a larger area that includes Units 1, 2 and 3. (See map in Appendix A).

The cost estimates for each unit are as follows:

<b>Item</b>	<b>Unit 1</b>	<b>Unit 2</b>	<b>Unit 3</b>	<b>Subtotal</b>	<b>Unit 4</b>	<b>Total</b>
Linear feet of Fencing	3,080	1,509	4,307	8,896	9,518	18,414
Supplies/ Fencing Materials	\$6,006	\$2,943	\$8,399	\$17,348	\$18,560	\$35,908
Fence line clearing	\$8,121	\$3,967	\$11,412	\$23,500	\$15,648	\$39,148
Fence Construction (Labor Costs)	\$15,400	\$7,545	\$21,535	\$44,480	\$128,493	\$172,973
Helicopter Sling Loads	\$1,440	\$1,440	\$1,440	\$4,320	\$4,320	\$8,640
<b>Totals</b>	<b>\$30,967</b>	<b>\$15,895</b>	<b>\$42,786</b>	<b>\$89,648</b>	<b>\$167,021</b>	<b>\$256,669</b>

Material costs are based on a cost of \$1.95 per foot of fence constructed. Fencing materials for all phases of the project have been purchased and currently being stored at the Pahole Rare Plant Nursery.

Fence clearing costs are based on a labor cost of \$13.50 per hour plus 15% benefits. The amount of time estimated for fence clearing for Units 1, 2 and 3 is based on the amount of time it took to clear a similar amount of fence line on the original fence constructed in the Pahole Natural Area Reserve in 1995-1996. The clearing cost for each of the 3 units is based on the percentage of linear feet of fence that contributed to the combined total of the three units. The amount of time estimated for fence clearing for Unit 4 is based on past experience and the terrain.

Fence construction costs are based on cost estimates obtained from an experienced fencing contractor. The cost for fence construction is estimated at \$5.00 per linear foot for Units 1, 2 and 3 and at \$12.00 to \$15.00 per linear foot for Unit 4. The estimate for Unit 4 is higher because of the steepness of the terrain and because the proposed fenceline crosses several gulches. Construction costs in the table above utilize a cost of \$13.50 per linear foot.

The funds for the fence materials were provided to DOFAW in a grant of \$36,000 from the U.S. Fish & Wildlife Service. Fence clearing will be



completed by DOFAW personnel with help from cooperating natural resource organizations such as The Nature Conservancy and the U.S. Army Environmental staff, or by contract labor supervised by DOFAW staff, or a combination of the above. Additional funds for fence construction labor will be provided through an Endangered Species Act Section 6 Candidate Conservation Grant in the amount of \$35,250.

Construction of Units 1, 2 and 3 will proceed as soon as all necessary approvals have been granted and is estimated to commence in the third quarter of 2003. Construction of these Units should take approximately one year.

While the materials for the construction of Unit 4 have been purchased, the State will be seeking additional funds for construction of Unit 4. The timing of Phase II of this project depends upon the availability of additional funds for construction.

#### **IV. SUMMARY DESCRIPTION OF AFFECTED ENVIRONMENT**

The proposed fencing is located primarily within Pahole Natural Area Reserve, enclosing a small portion of the Mokuleia Forest Reserve to the east of Pahole. Pahole Natural Area Reserve is surrounded by the United States Army's Makua Military Reservation to the west, the Mokuleia Forest Reserve to the northeast and southwest, and privately owned pasture to the northeast adjacent to the lowermost boundary of the Reserve.

Pahole Natural Area Reserve occupies 658 acres on the northeastern face of the Wai'anae Mountain Range in the district of Waialua on the island of O'ahu. Mokuleia Forest Reserve occupies approximately 3,341 acres, to the east and west of Pahole Natural Area Reserve. The project area is located entirely within the Conservation District, within the Protective subzone.

Pahole Natural Area Reserve ranges in elevation from approximately 1,200 to 2,590 feet, and receives an average annual rainfall of 57 to 66 inches. The runoff is rapid, and erosion occurs on the well-drained soils on slopes along drainage ways. Eroded spots, stony areas, and outcrops are present in the Reserve. The lower elevations of the Reserve contain dark friable soils with a surface layer of silt clay that is moderately to strongly acidic. At the upper elevations, the well-drained soil is strongly to extremely acidic. The surface layer of this soil is reddish-brown silt clay overlying ironstone or saprolite. Environmental conditions for the portion of Mokuleia Forest Reserve within the project area are similar to those of Pahole Natural Area Reserve.

A privately controlled paved road to the abandoned Nike site and Pahole Rare Plant Nursery runs close to the north side of the Reserve. A jeep trail abuts the paved road near Peacock Flat and traverses the Mokuleia Forest Reserve upslope to the Mokuleia Trail head and Pahole Natural Area Reserve entrance. The trail continues into Pahole Natural Area Reserve, runs along its eastern boundary, and continues beyond the Reserve's northeastern boundary.

The Pahole Natural Area Reserve is accessible to the public by way of an improved road and the Mokuleia Trail. Activities that are compatible with the NARS mandate are allowed, including scientific research, hiking on designated trails, camping, public hunting during designated seasons, and cultural practices are allowed in the Reserve. Some of these activities require permits. Motorized vehicles and mountain bikes are not permitted.

### *Flora*

The Pahole Natural Area Reserve protects some of the best examples of lowland native mesic and dry forest remaining in the Hawaiian Islands. These forests are noted for their species diversity and richness, and are becoming increasingly uncommon. Native natural communities within the Reserve include koa/‘ohi‘a (*Acacia/Metrosideros*) lowland mesic forest, ‘ohi‘a/uluhe (*Metrosideros/ Dicranopteris*) lowland mesic forest, lonomea (*Sapindus*) lowland dry forest, O‘ahu diverse mesic forest, ‘a‘ali‘i lowland dry shrubland, and an intermittent stream.

The species richness in the project area is found in the sub-canopy trees, shrubs, and ferns. At least 168 native plant taxa have been reported from the Reserve, including 58 rare and endangered species. Several of these plants are locally common in the Pahole Natural Area Reserve, but are not found elsewhere in Hawai‘i. At least 18 endangered plant species, candidate plant species, and plant species of concern are present within the project area and are listed in Appendix C.

A sizeable portion of the Reserve is dominated by non-native vegetation. The near extirpation of native plants and their replacement by alien species in these areas are the result of rooting, disturbance of native ground cover, and weed dispersal by feral pigs.

### *Fauna*

Native birds known to occur in the Pahole Natural Area Reserve are the ‘apapane (*Himatione sanguinea*), ‘amakihi (*Hemignathus virens*), kolea or Pacific golden plover (*Pluvialis fulva*), and the endangered O‘ahu ‘elepaio (*Chasiempis sandwichensis ibidis*). One lone male ‘elepaio, but no nesting pairs, has been observed in the project area.

One species of the endangered O‘ahu tree snail (*Achatinella mustelina*), three snail species of concern, and at least three additional snail species have been reported from the Reserve. Given the relatively intact condition of the native forests in the project area, it can be assumed that the site supports native insects and other invertebrates as well. A list of native animals known from the Reserve is contained in Appendix D.

Non-native feral pigs (*Sus scrofa*), rats (*Rattus* spp.), mice (*Mus* spp.), mongooses (*Herpestes auropunctatus*), and the predatory land snail (*Euglandina rosea*) occur in the Reserve.

### *Significant and Sensitive Habitats*

The entire Pahole Natural Area Reserve is considered to be a sensitive habitat, particularly for the endangered O‘ahu ‘elepaio (*Chasiempis sandwichensis ibidis*), one species of the endangered O‘ahu tree snail (*Achatinella mustelina*), three snail species of concern, and many rare native plant species. Pahole Natural Area Reserve has been designated as critical habitat for the ‘elepaio and for 25 threatened and endangered plants on O‘ahu by the U.S. Fish and Wildlife Service; a list of species with designated critical habitat in the project area is contained in Appendix E. The Natural Area Reserve also includes lowland native mesic and dry forests, which are becoming increasingly rare in Hawai‘i.

### *Archaeological & Cultural Resources*

An archaeological reconnaissance of the planned fence route was performed by Loren Zulick, Cultural Resources Specialist, Environmental Division, Directorate of Public Works (DPW), U.S. Army Garrison Hawai‘i to assess the potential impacts to known and previously unrecorded cultural sites. The full report is included as Appendix F.

The archaeological reconnaissance survey involved walking the entire planned route for the fenceline. No extant cultural resources on the surface of the ground, including temporary shelters or other natural or constructed features, were observed within the project area. In addition, no cultural resources or historic properties were identified along the proposed fenceline routes. The closest known cultural site is State Site #50-80-03-5920, a habitation/agricultural complex located within Makua Valley, 1,000 meters to the southwest. The report concluded that Site 5920 would not be impacted by the proposed project.

The report also noted that construction of the proposed exclosures may impact the Mokuleia Trail, as the fence will cross the trail twice, and suggested mitigation measures to minimize the potential impact. The report concluded that no cultural resources will be impacted by the proposed project.

A search for relevant studies at the University of Hawai‘i and in the Hawaiian and Pacific Collection did not turn up any historical information regarding the site. A review of *Sites of Oahu* disclosed no specific sites, legends, traditions, or other information relating to the project area. Finally, during pre-consultation, the Office of Hawaiian Affairs, the Ilio‘ulaokalani Coalition, and Kahea – the Hawaiian Environmental Alliance were requested to share any information they had regarding traditional use of the area or to identify any groups or individuals who may use the area. No traditional or cultural practices occurring in the project area were identified through this

process. Collection of plants within a Natural Area Reserve is restricted and requires a Special Use Permit, and there have been no applications for Special Use Permits for traditional and cultural activities within Pahole Natural Area Reserve. Finally, as the project site is in a remote wilderness, visitation to the area apart from hunters and resource managers is minimal and is primarily limited to the area surrounding the Mokuleia Trail. Based on all the available information, there are no known traditional and cultural activities associated with the project area that might be impacted by fence construction.

Because of the use of Federal funds, the U.S. Fish and Wildlife Service (as the funding agency) will be conducting a Section 106 consultation for this project.

## **V. GENERAL DESCRIPTION OF THE ACTION INCLUDING ENVIRONMENTAL AND SOCIOECONOMIC CHARACTERISTICS**

### ***Environmental Impacts***

#### **Short-Term Impacts**

The primary short-term environmental impacts of the proposed action are associated with fence construction. Disturbance of vegetation will occur along the fence line in a corridor no wider than 10 feet. Some common native plants may be damaged, but not to any significant degree. Disturbance of the vegetation will be limited to areas that do not contain sensitive resources.

Soil will be disturbed along the proposed fence line. Soil disturbance will be short-term, and no changes in the normal runoff or percolation patterns are expected. The proposed project may enhance water quality in nearby intermittent streams by reducing feral pig activity.

Noise and air pollution from helicopter sling loads and the use of small power tools will be unavoidable during fence construction. Increased human activity in the project area resulting from fence construction will be necessary. This increase in activity may temporarily disturb native birds in the immediate vicinity.

#### **Long-Term Impacts**

The long-term impacts of the proposed action are associated with the proposed fencing and removal of feral pigs, which may alter the vegetation in the project area. Fence construction would entail clearing a corridor no wider than 10-feet to remove hazards to fence construction crews and facilitate fence construction. Although most of the vegetation is expected to grow back, fence inspection and maintenance will require that the fence line be kept cleared of vegetation. The proposed fence construction may also affect plant species known to support the endangered O'ahu tree snail, *Achatinella mustelina*.

Soil disturbance along the proposed fence line, as well as the transport of fence materials and crews, will increase the potential accidental introduction of non-native plants to the project site. Species, such as *Triumfetta semitriloba* and *Clidemia hirta*, which occur in the project area, could be spread by fence construction workers, and new alien species could be introduced.

Native plant populations, including populations of endangered species, should increase in numbers once feral pigs are removed from the fenced areas. At the same time, the removal of feral pigs could result in an increase in non-native plants that are currently suppressed by feral pig activity. However, non-native plants that are spread by feral pigs in the proposed fenced areas may decrease once the pigs are removed.

### *Socio-Economic Impacts*

The proposed action will require spending the funds necessary for the project. Fencing materials have been purchased, and fence crews and helicopter operators will be contracted. Positive economic impacts will result from the release of project funds into the O‘ahu economy through the purchase of fence materials and employment of fence crews. The proposed action may attract additional funding for watershed protection, reforestation, and endangered species recovery.

With respect to long-range planning policies, the project is consistent with Section 3.1.3, Guidelines for Open Space and the Natural Environment of the North Shore Sustainable Communities Plan, relating to identification and protection of endangered species, native ecosystems, and other important ecologically sensitive areas and with Section 3.4.3, Planning Guidelines for the Preservation of Forest Lands of the Wai‘anae Sustainable Communities Plan, relating to the protection of rare and endangered species and preventing the introduction of alien species.

The proposed action will result in the loss of approximately 250 acres to public hunting. Under current DOFAW rules, public hunting of game mammals in Pahole Natural Area Reserve is restricted, requiring an entry permit from the O‘ahu NARS Manager and requiring hunters to be accompanied by a DOFAW staff member. The reduction in hunting acreage resulting from the proposed action is not expected to be significant because little hunting occurs in the relatively remote, upper elevations of the Pahole Natural Area Reserve. Further, the project area represents a small portion of the hunting land in the general area, most of which will remain open for public hunting in the foreseeable future. Finally, the planned fencing will not restrict access for hunters crossing Pahole Natural Area Reserve to get to other hunting areas.

A portion of the proposed fence runs along and crosses the Mokuleia Trail. The trail is maintained and is used by hikers, hunters, and naturalists. In comparison to other trails on O‘ahu, Mokuleia Trail is not commonly used by the public because of the limited vehicular access to the trailhead.

Fence construction could interfere with public access to portions of the Reserve for a short period of time. Appropriate public access to, and use of the area will not be affected in the long-term by the proposed action. After fencing, the project area will remain open space and will continue to be managed as a Natural Area Reserve. Public hiking, nature study, research, cultural practices, hunting, and other permitted activities will still be allowed in the Pahole Natural Area Reserve, subject to existing NARS rules.

Finally, the positive socio-economic impacts of the proposed action include protecting native forest and watershed in the Wai‘anae Mountains, which support the leeward and north shore communities of O‘ahu. The proposed fences will contribute to the recovery of unique and critically endangered Hawaiian species and create additional opportunities for nature appreciation, education, and research.

### *Cultural Impacts*

The proposed action is not expected to adversely affect cultural practices. As noted earlier, there are no known traditional and cultural activities associated with the project area that might be impacted by fence construction. Because public access to the area will not be affected in the long-term by the proposed action and gates or stiles will be constructed to ensure access where the fencing crosses Mokuleia Trail, the project should not impact access for Native Hawaiian cultural practices that may be in existence but are currently unknown. Construction of fences will have no effect on existing regulations restricting the collection of plants in Natural Area Reserves, and thus should not affect Native Hawaiian gathering rights. Finally, as the intent of the fence is to protect and restore native natural resources, the long-term impact on gathering rights may be positive.

For example, the proposed action will protect and enhance the habitat for many native plant species that are essential to the Native Hawaiian culture, including palapalai (*Microlepia strigosa*), wiliwili (*Erythrina sandwicensis*), maile (*Alyxia oliviformis*), ieie (*Freycinetia arborea*), koa (*Acacia koa*), ohia (*Metrosideros* spp.), and papala kepau (*Pisonia* sp.).

As these plants and the forest recover, it may be possible to allow limited collecting of certain species (via special use permits) for traditional practices. Thus, the proposed action is anticipated to enhance traditional and customary practices by protecting and actively managing the native forest and watershed in the Pahole Natural Area Reserve.

## **VI. MITIGATION MEASURES**

Although the proposed action is not expected to have any significant impacts on the environment, the following measures are proposed to mitigate any potential negative impacts resulting from the project.

The proposed fence line was selected based on the need to minimize impacts of fence construction on native plant communities; ease of fence installation and maintenance; and long-term survival of the fences from vegetative encroachment, erosion, and slides. The fence line transects predominantly non-native plant communities, and fence alignment has been designed to minimize the impacts to native species by following existing corridors of disturbance whenever possible.

Prior to vegetation clearing and fence construction, DOFAW staff will re-survey the fence lines to ensure that no rare, threatened or endangered plants or animals are within the area cleared for the fence. Potentially sensitive areas and any rare, endangered or threatened plant or animal species identified in proximity to the project area will be flagged to prevent damage by fence crews. If necessary, minor changes in fence alignment will be made to avoid sensitive sites by a greater distance.

Further, in order to avoid impacts to the endangered O'ahu tree snail, (*Achatinella mustelina*), DOFAW staff will enlist the support of expert biologists to survey the proposed fence line corridor for tree snail populations prior to any vegetation clearing. No large 'ohi'a trees will be removed, and the preferred host tree for the endangered snail, olopua (*Nestegis sandwicensis*), will receive special attention. Any trimming or cutting of trees or shrubs will be done only after the vegetation has been carefully inspected for snails. Staff knowledgeable about tree snail protocols will do the clearing. Whenever possible, the cleared vegetation will be placed on native vegetation so that any undetected native tree snails will have an opportunity to reach a replacement host plant.

Vehicular traffic will be restricted to existing roads and jeep trails, and existing foot trails will be used during fence construction. All fence construction workers will be instructed on specific procedures to prevent the spread or introduction of noxious plants in the project area. Known problem species, such as *Triumfetta semitriloba* and *Clidemia hirta*, that are currently found along the proposed fence lines will be removed from the project area prior to fence construction. Vehicles and equipment will be inspected prior to entering the project area.

Upon initial completion of the fences, any feral pigs remaining in the fenced areas would be penned in temporarily until they are removed. This may result in intensified damage to native resources by animals that might otherwise be passing through the area. DOFAW staff will immediately implement intensive control efforts to eliminate any feral pigs remaining in the enclosed area. Volunteer hunters from the public will be used as the method-of-choice to remove feral pigs from the project area before and after fence construction. No further ingress to, or recruitment of, feral pigs in the project area is anticipated. Staff will perform periodic monitoring to insure that all pigs are removed and do not harm native resources within the fenced areas.

Most of the proposed fencing will be installed along ridges dominated by non-native vegetation, minimizing the likelihood that any archaeological or historic sites in the Reserve would be affected. Fencing and removing feral pigs from the project area will be the first step toward the protection of any archaeological sites that might be discovered in the future. Feral pigs and other hoofed mammals are known to disturb archaeological sites elsewhere in Hawai'i by knocking over stone walls, turning over soil, spreading noxious weeds, and accelerating erosion and landslides. Vegetation clearing and fence construction will cease if any archaeological, historical, or cultural sites are encountered during construction, and the State Historic Preservation Division will be consulted immediately.

The proposed action will not restrict travel on the Mokuleia Trail, and the integrity of the trail will be kept intact. For the most part, the fences will not be visible from the trail and will not impact any view planes. The fence line has been routed away from the Mokuleia Trail wherever possible, and will cross the trail in only two places. Stiles or gates will be installed to facilitate the safe and easy crossing of the fence in these two areas, and gates may be installed in other locations for fence maintenance and management purposes. The stiles and gates should be more than sufficient for any continued use of the project area.

To mitigate the loss of public hunting opportunities in the project area, efforts will be made by DOFAW staff to provide additional public hunting opportunities elsewhere in the Mokuleia Forest Reserve by enhancing access to the lower Kaala and West Makaleha areas, where hunting pressure on feral pigs is currently low.

## **VII. ALTERNATIVES CONSIDERED**

Five project alternatives were considered and are described here.

*Alternative # 1: Construct a network of habitat management unit fences surrounded by a perimeter fence in uppermost portion of the Pahole Reserve as proposed (preferred alternative).*

This is the preferred alternative because it is the most efficient way to protect native resources and watershed, and control feral pigs. In the long-term, it is more cost-effective to subdivide the 235-acre project site into habitat management units to facilitate feral pig control and fence maintenance. The habitat management fences (Units 1, 2 and 3) would secure high-priority natural areas, and the perimeter fence (Unit 4) would provide adjacent protected areas for reforestation and future outplanting of endangered species and reforestation. Public hunting would be used as the method-of-choice for initially removing feral pigs from the fenced areas. Invasive species would be monitored and controlled.

*Alternative # 2. Construct small fenced exclosures around existing rare and endangered plant species in Pahole Natural Area Reserve.*



This alternative is impractical because most of the rare and endangered plants in the Reserve exist on steep slopes, partly as a result of selective pressure by feral pigs. Fence construction in these relatively remote areas would be difficult and expensive, and would damage the steep sensitive slopes targeted for protection. By fencing only existing populations of endangered species, this alternative would preclude reforestation of the area and the recovery of endangered species.

*Alternative # 3. Construct a perimeter fence around the entire Pahole Natural Area Reserve to protect approximately 658 acres.*

This alternative would require approximately 29,000 feet of fencing and would be expensive to implement. This alternative would entail fencing portions of the lower Reserve (below approximately 1,600 feet) that do not warrant intensive management at this time because of a proliferation of invasive species and extensive damage caused by feral pigs.

*Alternative # 4. No fences constructed in the Pahole Natural Area Reserve; rely on public, staff, and aerial hunting, snaring, and trapping to control feral pigs.*

Although public hunting occurs in the Pahole Natural Area Reserve, without easy access to the project area and physical barriers, such as fences, to restrict the movement of feral pigs, public hunting cannot keep the number of pigs low enough to protect the Reserve and recover endangered species. Staff hunting and other methods of controlling feral pigs are more effective in reducing animal damage than relying on public hunting alone and may be less expensive than fencing large areas in the short term. However, as long as the Reserve boundaries are open, there will be ingress of feral pigs from adjacent lands. Animal control would have to continue indefinitely. Staff and aerial hunting, snaring, and trapping would be expensive, unpopular, and perceived by the hunting community as an ongoing waste of meat. The best long-term solution to the feral pig problem in the Pahole Natural Area Reserve is to fence large habitat management units and remove feral pigs as quickly as possible.

*Alternative # 5. No action.*

This alternative is inconsistent with the NARS mandate to protect native ecosystems and geological sites in perpetuity, pursuant to Chapter 195, HRS. This alternative is contrary to the State's legal obligation to protect and recover threatened and endangered species, as required by Chapter 195D, HRS. The no-action alternative effectively accepts the deterioration and eventual loss of unique and rare native forest and watershed, and would preclude endangered species recovery efforts in the Reserve.

## **VIII. DETERMINATION**

It is not expected that this project will have a significant negative impact on the surrounding environment, and thus, it is anticipated that the proposed action will result in a Finding of No Significant Impact.

## **IX. FINDINGS, AND REASONS SUPPORTING THE DETERMINATION**

The goal of the proposed action is to benefit native forests, watershed, and habitat for native species, including endangered species. Creating permanent barriers to exclude feral pigs will enhance reforestation efforts and remove a major threat to the continued survival of rare and endangered species. Conservation efforts throughout Hawai'i have consistently shown that removing feral pigs and other invasive species is an important first step toward protecting and restoring native ecosystems. If animals are removed before the damage is widespread and severe, native vegetation is often able to recover naturally and the spread of invasive weeds can be stopped. Unless the pervasive disturbance of feral pigs is removed, native resources in the Pahole Natural Area Reserve will continue to decline.

Mitigation measures will be implemented to insure that sensitive natural resources will not be harmed by the proposed action. Implementing a weed-control program will increase the likelihood of native vegetation recovery and prevent the establishment of new noxious plants. The short-term damage to vegetation and soil as a result of building the fences will be more than offset by the regeneration that will take place once the feral pigs have been removed. The proposed action will protect watershed and habitat for native species that are an integral part of the Native Hawaiian culture. Efforts will be taken to minimize the effects of the proposed action on public use and enjoyment of the project area.

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 will provide long-term protection for native forest, watershed, and habitat for native plants and animals, including endangered species. Fencing and the removal of feral pigs will enhance reforestation and protect watershed values. The project will secure outplanting sites for endangered species and aid in their recovery. The positive results of the project are expected to more than offset any short-term damage incurred during fence construction.

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

The proposed action will not curtail beneficial uses of the environment. The project will improve and protect native forest, watershed, and habitat for native plants and animals, including endangered species. Fencing and actively managing the project area will help to insure that the range of beneficial uses continue in the Pahole Natural Area Reserve.

- 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 following: a) environmental policies established in Chapter 344, Hawai'i Revised Statutes (HRS); b) the State's mandate for the NARS set forth in Chapter 195, HRS and guidelines for activities in the Natural Area Reserves; and c) the State's mandate to conserve threatened and endangered species, as required by Chapter 195D, HRS.

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

The proposed action will not adversely affect the economic welfare of the community or state. The ecosystem-restoration goals of the project will directly benefit the economic, cultural, educational, and recreational interests of the community and state.

- 5) *Substantially affects public health.*

Public health will not be harmed by the proposed action. The proposed action will have a positive impact on public health by protecting native forest, removing feral pigs from the watershed, and improving water quality in streams and the nearshore marine environment. Feral pigs release pathogens into the environment that can cause diseases such as leptospirosis. Foraging by feral pigs results in soil erosion, threatens water quality, and creates wallows for breeding mosquitoes that can become vectors for potentially fatal human diseases. Removal of feral pigs from the watershed will reduce these public health risks.

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

The proposed action will not result in any substantial secondary impacts, such as population changes or effects on public facilities.

- 7) *Involves a substantial degradation of environmental quality.*

Environmental quality will improve with the implementation of the proposed action. Fence construction and the removal of feral pigs will

enhance environmental quality by improving the health of the native forest, watershed, and habitat for native species.

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

The proposed action is limited to fence construction and the removal of alien species. Regeneration of native plants after fencing and the removal of feral pigs will offset any short-term disturbance to vegetation or soil during fence construction. When considered in context with the other existing fences in the area, the Pahole Gulch fence and the East Rim Fence, the proposed action provides a cumulative benefit to threatened and endangered species by expanding the amount of native habitat protected from feral pigs.

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

The proposed action will have a positive impact on eleven endangered plant species and seven plant species of concern. If no action is taken, further declines and extinction will be inevitable. Fencing will provide a protected area for future outplanting programs for rare, threatened and endangered plants, which will increase the likelihood of their recovery and increase the diversity of available habitat.

The proposed action will also benefit the endangered O‘ahu tree snail, (*Achatinella mustelina*), the endangered O‘ahu ‘elepaio (*Chasiempis sandwichensis ibidis*), and at least 25 threatened and endangered plant species by protecting their habitat. The project area has been designated critical habitat by the U.S. Fish and Wildlife Service for the ‘elepaio and for 25 plant species. Exclusion of feral pigs with fencing has been shown repeatedly to be one of the most important actions that can be taken to protect rare, threatened, and endangered species and their habitat.

- 10) *Detrimentially 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. Water quality will be improved in the long-term by removing feral pigs from the watershed, reducing soil erosion, and limiting the input of pathogenic microorganisms into streams by feral pigs. Helicopter and fence construction noise will 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 is proposed in the uppermost section of the Pahole Natural Area Reserve between 1,500 and 2,590 feet elevations. There is a remote possibility that the fences could be damaged by a natural disaster or catastrophic event. The proposed action will not damage or adversely affect any environmentally sensitive areas. Fencing and removing feral pigs from the watershed will have a positive effect on the watershed and water quality by reducing the erosion of soil into the ocean. No known geological hazards are present in the project area.

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

For the most part, the fence will not be visible to most people using the Pahole Natural Area Reserve. The proposed fence is located in a remote area and will not affect scenic vistas or views.

- 13) *Requires substantial energy consumption.*

The project will consume an insignificant amount of energy during fence construction. Small amounts of energy will be consumed to transport fence materials and crews, and in the use of small power tools when necessary.

## **X. LIST OF PERMITS REQUIRED FOR THIS PROJECT**

Construction of this project requires approval by the Department of Land and Natural Resources. No other permits are anticipated.

## **XI. EA PREPARATION INFORMATION**

This Environmental Assessment was prepared by:

State of Hawai'i  
Department of Land and Natural Resources  
Division of Forestry and Wildlife  
Natural Area Reserves System Program  
1151 Punchbowl Street, Room 224  
Honolulu, Hawai'i 96813  
Phone (808) 587-0051  
Fax (808) 587-0064

## **XII. REFERENCES**

Hawai'i Heritage Program, The Nature Conservancy of Hawai'i and Division of Forestry and Wildlife, Department of Land and Natural Resources. State of Hawai'i Natural Area Reserves System Biological

Resources and Management Priorities, Appendices. Honolulu, Hawai‘i. 1989.

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State of Hawai‘i, Department of Land and Natural Resources, Natural Area Reserves Program. Plant Survey of the Pahole Natural Area Reserve. May 1988.

State of Hawai‘i, Na Ala Hele Program. [www.hawaii Trails.org](http://www.hawaii Trails.org). accessed on June 16, 2003. (Mokuleia Trail).

Sterling, Elspeth. Sites of Oahu. Honolulu: Bishop Museum Press. 1993 (rev. ed.).

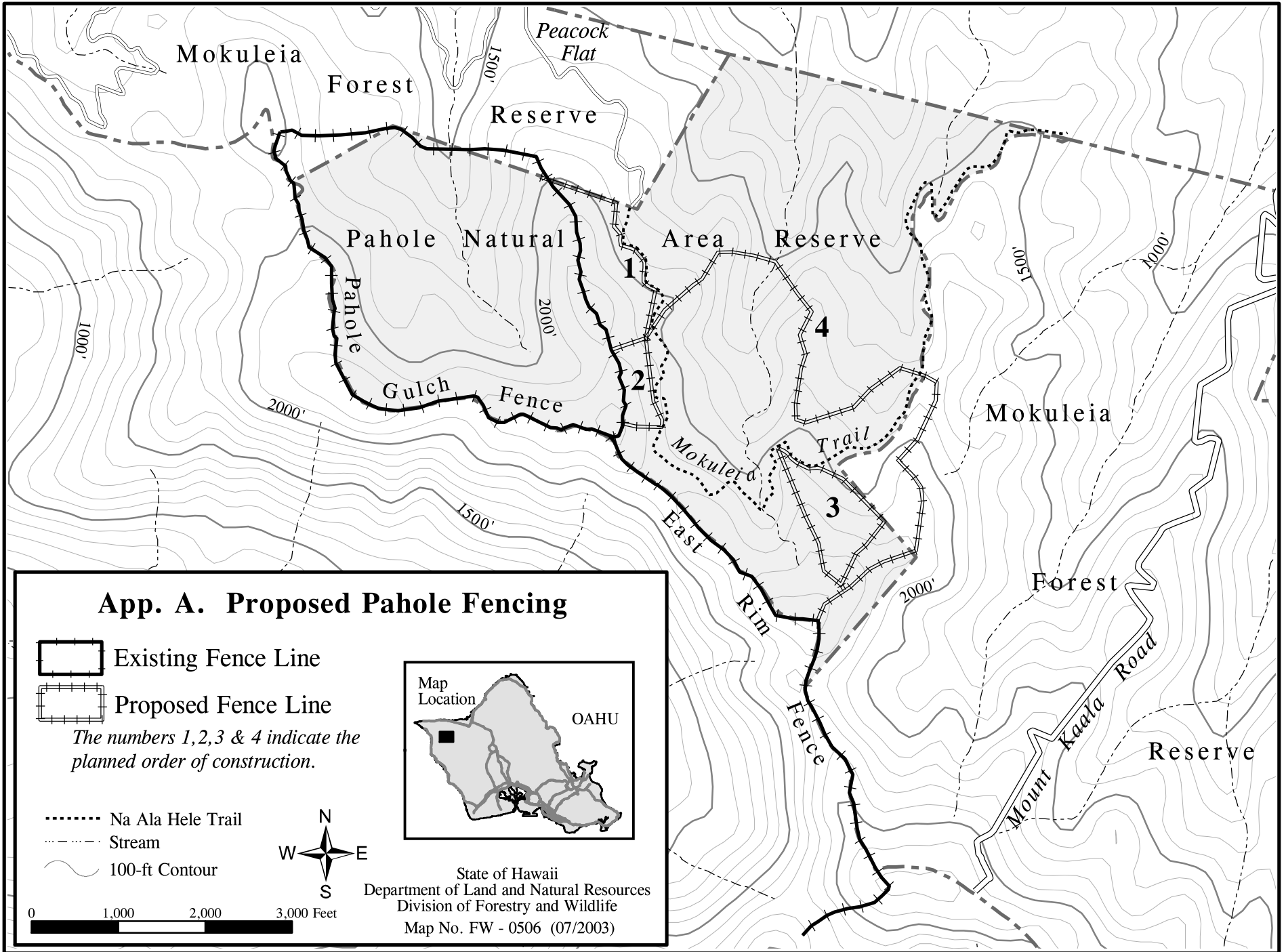
U.S. Department of the Interior, Fish & Wildlife Service. Final Rule: Final Designations or Nondesignations of Critical Habitat for 101 Plant Species from the Island of Oahu, Hawaii. June 17, 2003. 68 FR 35949.

U.S. Department of the Interior, Fish & Wildlife Service. Final Rule: Determination of Critical Habitat for the Oahu Elepaio (*Chasiempis sandwichensis ibidis*). December 10, 2001. 66 FR 63751.

### **XIII. LIST OF APPENDICES**

Appendix A	Map of Project Site and Fence Line
Appendix B	Fence Design Details
Appendix C	Endangered Plants, Candidate Plants, and Plant Species of Concern Known from the Project Area
Appendix D	Native Animals Known from the Project Area
Appendix E	Species with Designated Critical Habitat in the Project Area
Appendix F	Archaeological Reconnaissance Report
Appendix G	Comments Received During Public Comment Period and Responses

**Appendix A**  
**Map of Project Site and Fence Line**



Mokuleia

Forest

Reserve

Peacock  
Flat

Pahole Natural

Area Reserve

Pahole

Gulch Fence

1

4

Mokuleia

Mokuleia

Trail

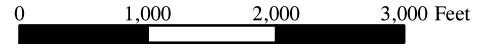
3

Forest

East  
Rim  
Fence

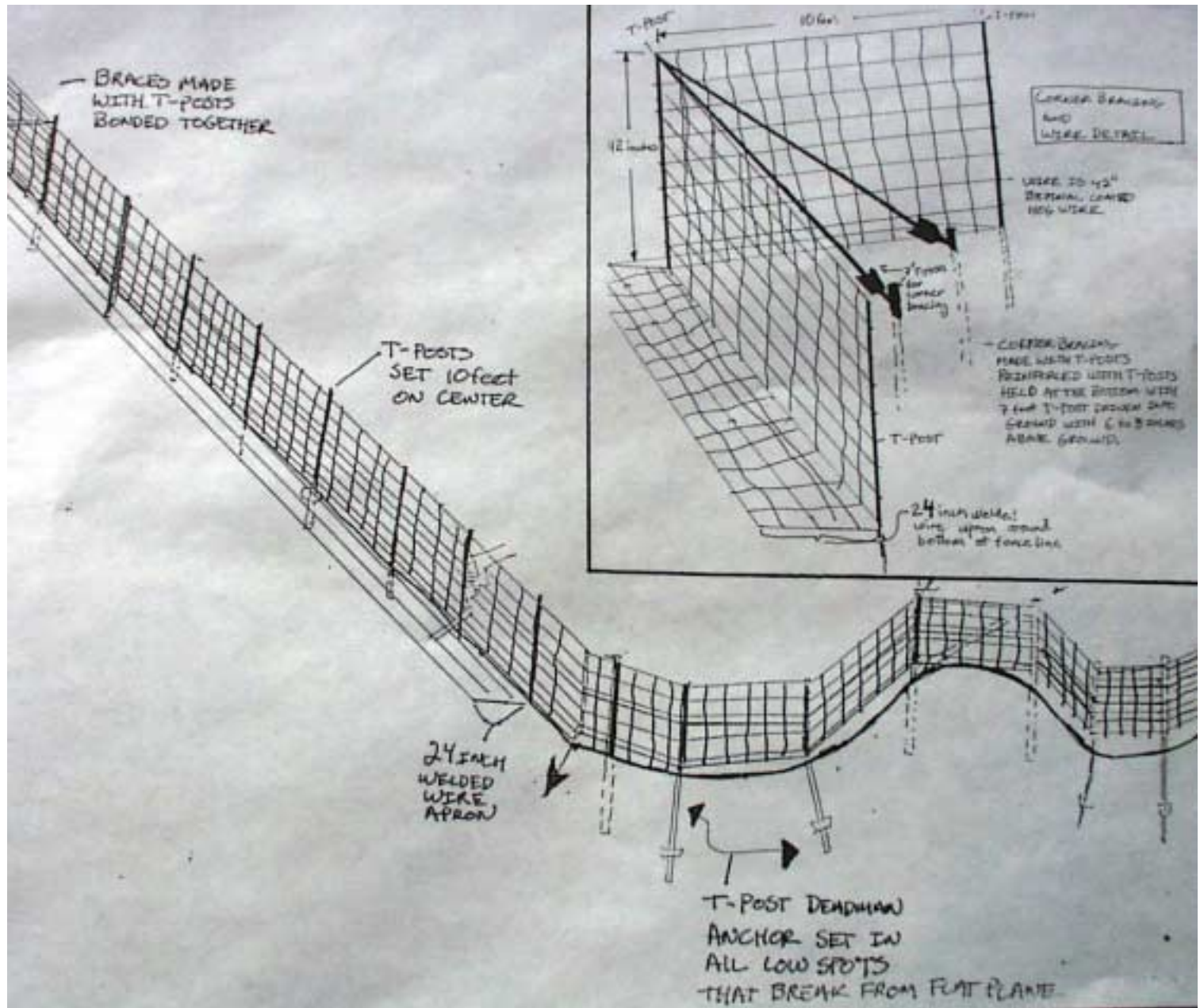
Mount  
Kaala  
Road

Reserve





## Appendix B Fence Design Details



\* Fence height is anticipated at 39 inches, rather than the 42 inches indicated above.

**Appendix C**  
**Endangered Plants, Candidate Plants,**  
**and Plant Species of Concern**  
**Known from the Project Area**

<b>Scientific Name</b>	<b>Common Name</b>	<b>Federal Status</b>
<i>Alectryon macrococcus</i> var. <i>macrococcus</i>	Mahoe	Endangered
<i>Alsinidendron obovatum</i>	None known	Endangered
<i>Chamaesyce herbstii</i>	Akoko	Endangered
<i>Cyanea longiflora</i>	Haha	Endangered
<i>Cyrtandra dentata</i>	Haiwale	Endangered
<i>Diellia falcata</i>	None known	Endangered
<i>Delissea subcordata</i>	None known	Endangered
<i>Flueggea neowawraea</i>	Mehamehame	Endangered
<i>Hesperomannia arbuscula</i>	None known	Endangered
<i>Phyllostegia kaalaensis</i>	None known	Endangered
<i>Schiedea nuttalli</i>	None known	Endangered
<i>Platydesma cornuta</i> var. <i>decurrens</i>	None known	Candidate
<i>Pteralyxia macrocarpa</i>	Kaulu	Candidate
<i>Cyanea membranacea</i>	Haha	Species of Concern
<i>Labordia kaalae</i>	Kamakahala	Species of Concern
<i>Melicope cinerea</i>	Alani	Species of Concern
<i>Melicope sandwicensis</i>	Alani	Species of Concern
<i>Ochrosia compta</i>	Holei	Species of Concern

**Appendix D**  
**Native Animals Known from the Project Area**

<b>Scientific Name</b>	<b>Common Name</b>	<b>Federal Status</b>
<b><i>Vertebrates</i></b>		
<i>Chasiempis sandwichensis ibidis</i>	O‘ahu ‘Elepaio	Endangered
<i>Himatione sanguinea</i>	‘Apapane	-
<i>Hemignathus virens</i>	‘Amakihi	-
<i>Pluvialis fulva</i>	Kolea	-
<b><i>Invertebrates</i></b>		
<i>Amastra rubens</i>	none (snail)	Species of Concern
<i>Achatinella mustelina</i>	Pupu Kani Oe	Endangered
<i>Auriculella ambusta</i>	none (snail)	-
<i>Auricullela (new sp. aff.) perpusilla</i>	none (snail)	-
<i>Leptachina sp.</i>	none (snail)	Species of Concern
<i>Pleuropoma sandwichiensis</i>	none (snail)	Species of Concern

## Appendix E

### Species with Designated Critical Habitat in the Project Area

Scientific Name	Common Name
<b>Vertebrates</b>	
<i>Chasiempis sandwichensis ibidis</i>	O‘ahu ‘Elepaio
<b>Plants</b>	
<i>Alsinidendron obovatum</i>	None known
<i>Cenchrus agrimonoides</i>	Kamanomano
<i>Chamaesyce herbstii</i>	‘Akoko
<i>Colubrina oppositifolia</i>	Kauila
<i>Cyanea grimesiana</i> spp. <i>obatae</i>	Haha
<i>Cyanea longiflora</i>	Haha
<i>Cyanea superba</i>	Haha
<i>Cyrtandra dentata</i>	Ha‘iwale
<i>Diellia falcata</i>	None known
<i>Delissea subcordata</i>	None known
<i>Flueggea neowawraea</i>	Mehamehame
<i>Hedyotis degeneri</i>	None known
<i>Hesperomannia arbuscula</i>	None known
<i>Isodendrion laurifolium</i>	Aupaka
<i>Mariscus pennatifolius</i>	None known
<i>Melicope pallida</i>	Alani
<i>Neraudia angulata</i>	None known
<i>Nototrichium humile</i>	Kulu‘i
<i>Phyllostegia kaalaensis</i>	None known
<i>Plantago princeps</i>	Ale
<i>Schiedea hookeri</i>	None known
<i>Schiedea kaalae</i>	None known
<i>Schiedea nuttalli</i>	None known
<i>Solanum sandwicense</i>	Popolo ‘aiakeakua

**Appendix F**  
**Archaeological Reconnaissance Report**

## MEMORANDUM FOR RECORD

SUBJECT: Trip Report, Archaeological Reconnaissance of Multiple Fence Line Routes for Proposed Enclosures Within the Pahole Nature Area Reserve (NAR), Wai'anai Mountain Range, O'ahu Island, Hawaii

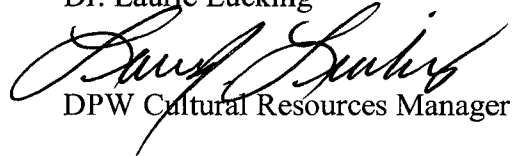
1. Loren Zulick, Cultural Resources Specialist, Environmental Division, Directorate of Public Works (DPW), USAG-HI performed an archaeological reconnaissance of the fence line routes for proposed enclosures within the Pahole NAR on 20 March and 3 June 2003 (Figure 1). He accompanied and was guided by Talbert Takahama, Natural Area Reserves Specialist, Oahu Division of Forestry and Wildlife, Department of Land and Natural Resources, State of Hawaii.
2. The purpose of this report is to share findings on cultural resources resulting from the archaeological reconnaissance survey of several proposed fence lines within the Pahole NAR (Figure 2). The intent of this project is to construct four enclosures (enclosures 1-4 on Figure 2). Three of the enclosures (1, 2, and 4) will consist of fence lines that tie-in to existing fences. Enclosure 3 is the only proposed stand-alone enclosure. Enclosures 2 and 3 will be contained within the largest, enclosure 4. Enclosure 1 will abut enclosures 2 and 4 and tie-in to the existing "Pahole Gulch fence". Enclosure 2 will be contained within enclosure 4, abut enclosure 1, and tie-in to the existing "Pahole Gulch fence" to the west. Enclosure 3 will be contained entirely with enclosure 4. Enclosure 4 will intersect with enclosures 1 and 2 to the north, and tie-in to the "East Rim fence" on the summit boundary of Makua Military Reservation (MMR). These fence lines will create four ungulate enclosures designed to keep out feral pigs, aid in securing a natural ecosystem, provide habitat for rare plants, and serve as a site for rare species outplanting. This reconnaissance was performed to assess potential impacts to cultural resources prior to construction of the enclosures. The author performed this fieldwork to determine impacts, if any, to known and previously unrecorded cultural sites.
3. To access the project area, the participants drove to the Mokuleia Trailhead. They walked into the NAR to the northwest corner of enclosure 1 where it will intersect with the "Pahole Gulch fence" (see Figure 3). From there, the proposed fence line was followed to the three-way intersection of enclosures 1, 2, and 4 along Mokuleia Trail (see Figure 4). The southerly route of enclosure 2 was followed to its intersection with "Pahole Gulch fence" (see Figure 5). Survey continued by following the existing "Pahole Gulch fence" to the north where enclosure 4 ties-in. From this point, the entire length of enclosure 4 was surveyed ending at the point where it ties-in to the "East Rim fence" (see Figure 6). There are two points along the Mokuleia Trail where enclosure 4 will cross the trail. In considering impacts to the Mokuleia Trail, the fence line routes were adjusted away from the trail whenever possible. The perimeter of enclosure 3 was surveyed on 3 June 2003.
4. The Cultural Resources Specialist did not identify any cultural resources or historic properties along the proposed fence line routes. The closest known cultural site is State Site #50-80-03-5920, a habitation/agricultural complex. This site is located within Makua Valley, 1,000 meters to the southwest. Site 5920 will not be impacted by the proposed project. During survey, the author looked for temporary shelters and other natural and constructed features on the proposed fence line routes. No extant cultural resources on the surface of the ground were

observed within the project area. Construction of the proposed exclosures may impact the Mokuleia Trail, as the fence will cross the trail twice. One measure used to help minimize this potential impact is to align the fence line route at a distance from the trail whenever possible. Additionally, the building of crossovers will help mitigate access impacts. It is the determination of the author that no cultural resources will be impacted by the proposed project.

Loren Zulick

  
DPW Cultural Resources Specialist

Dr. Laurie Lucking

  
DPW Cultural Resources Manager

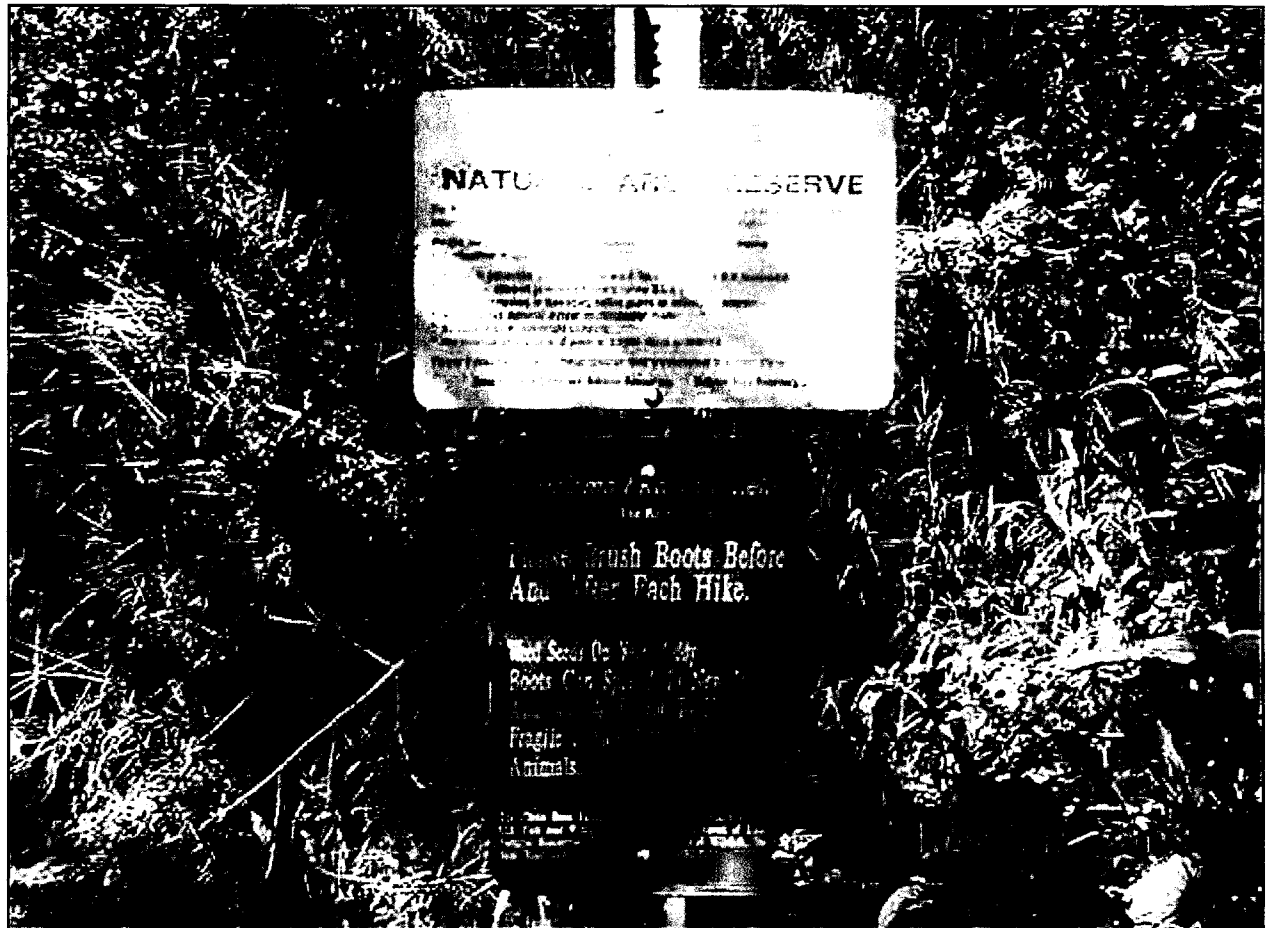


Figure 1 Mokuleia Trailhead at Pahole NAR entrance.

# Cultural Resources in Proximity to Proposed Ungulate Enclosures Within Pahole NAR, Oahu

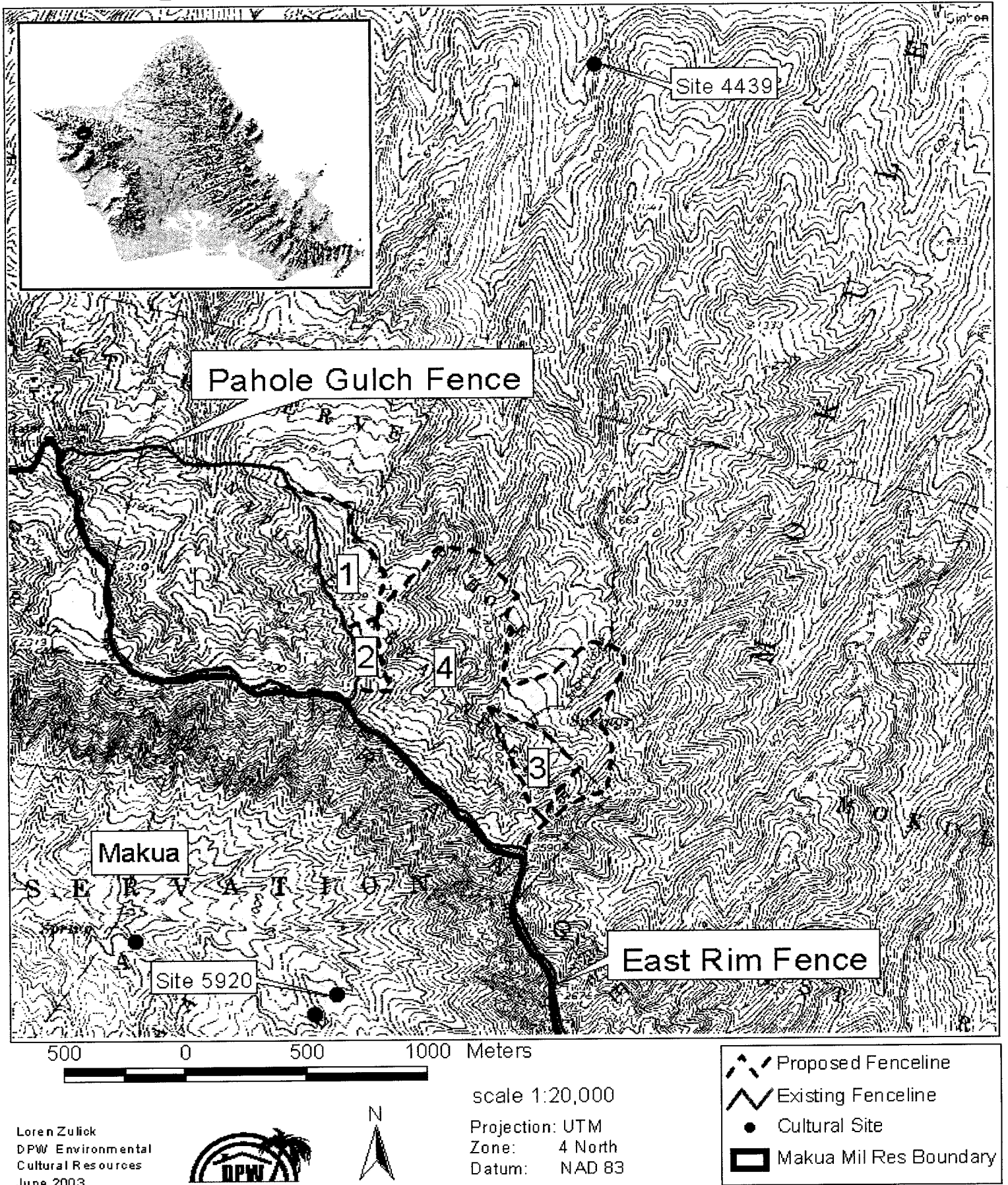


Figure 2 Map showing location of proposed Pahole NAR, and nearest cultural resources.





Figure 3 Photo of existing "Pahole Gulch fence" where exclosure 1 will tie-in. View to NNW.



Figure 4 Photo of Mokuleia Trail. View to South.



Figure 5 Photo of existing "Pahole Gulch fence" where exclosure 2 will tie-in. View to East.



Figure 6 Photo of typical forest setting along fence line. View to Northeast.

## **Appendix G**

### **Comments Received During Public Comment Period and Responses**

Written comments were received from the following agencies and organizations during the public comment period:

- United States Department of Agriculture, Natural Resources Conservation Service
- State of Hawaii, Department of Land and Natural Resources, Historic Preservation Division
- State of Hawaii, Land Use Commission
- State of Hawaii, Office of Environmental Quality Control
- State of Hawaii, Office of Hawaiian Affairs
- City & County of Honolulu Department of Planning and Permitting
- Kahea – the Hawaiian-Environmental Alliance

Verbal comments were received from the following agency during the public comment period:

- United States Fish and Wildlife Service



Natural Resources Conservation Service  
P.O. Box 50004  
Honolulu, HI 96850  
808-541-2600

United States Department of Agriculture

---

*Our People...Our Islands...In Harmony*

August 18, 2003

Ms. Christen Mitchell  
DLNR, Division of Forestry and Wildlife  
1151 Punchbowl Street, Room 224  
Honolulu, HI 96813

Subject: Kapuna Watershed Protection Project

Attention: Ms. Mitchell,

We have reviewed the above mentioned document and have no comment to offer at this time.

Thank you for the opportunity to review this document.

Sincerely,

A handwritten signature in black ink, appearing to read "Lawrence T. Yamamoto".

LAWRENCE T. YAMAMOTO  
State Conservationist

The Natural Resources Conservation Service provides leadership in a partnership effort to help people conserve, maintain, and improve our natural resources and environment.

An Equal Opportunity Provider and Employer

LINDA LINGLE  
GOVERNOR OF HAWAII



STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

DIVISION OF FORESTRY AND WILDLIFE

1151 PUNCHBOWL STREET  
HONOLULU, HAWAII 96813

PETER T. YOUNG  
CHAIRPERSON  
BOARD OF LAND AND NATURAL RESOURCES

DAN DAVIDSON  
DEPUTY DIRECTOR FOR LAND

ERNEST Y.W. LAU  
DEPUTY DIRECTOR FOR  
THE COMMISSION ON  
WATER RESOURCE MANAGEMENT

AQUATIC RESOURCES  
BOATING AND OCEAN RECREATION  
COMMISSION ON WATER RESOURCE  
MANAGEMENT  
CONSERVATION AND  
RESOURCES ENFORCEMENT  
CONVEYANCES  
FORESTRY AND WILDLIFE  
HISTORIC PRESERVATION  
KAHOOLAWE ISLAND RESERVE  
COMMISSION  
LAND MANAGEMENT  
STATE PARKS

SEP 24 2003

Mr. Lawrence Yamamoto  
State Conservationist  
Natural Resources Conservation Service  
PO Box 50004  
Honolulu, HI 96850

Re: Kapuna Watershed Protection Project; Pahole Natural Area Reserve

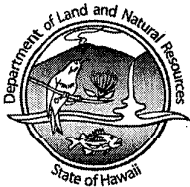
Dear Mr. Yamamoto:

Thank you for taking the time to review the Draft Environmental Assessment for the Kapuna Watershed Protection Project, Pahole Natural Area Reserve. We understand that you have no comments at this time. If you have any future questions or concerns about this project, please feel free to contact me at 973-9783.

Sincerely,

Brent Liesemeyer  
Oahu Natural Area Reserves Specialist

LINDA LINGLE  
GOVERNOR OF HAWAII



PETER T. YOUNG  
CHAIRPERSON  
BOARD OF LAND AND NATURAL RESOURCES  
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON  
DEPUTY DIRECTOR - LAND

ERNEST Y.W. LAU  
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

HISTORIC PRESERVATION DIVISION  
KAKUHIHEWA BUILDING, ROOM 555  
601 KAMOKILA BOULEVARD  
KAPOLEI, HAWAII 96707

AUG 20 2003

Memorandum

LOG NO: 2003.1512  
DOC NO: 0308EJ23

To: Christen Mitchell  
Division of Forestry and Wildlife, Rm 224

From: P. Holly McEldowney, Deputy *P. Holly McEldowney*  
State Historic Preservation Officer

SUBJECT: **Section 106 NHPA Historic Preservation Review Draft  
Environmental Assessment for the Kapuna Watershed  
Protection Project, Pahole Natural Area Reserve and Mokuleia  
Forest Reserve, Waialua, O`ahu  
Mokuleia, Waialua, O`ahu  
TMK: (1) 6-8-001:001-002**

Thank you for the opportunity to provide comment on the proposed undertaking to construct a network of fences in the Kapuna and Keawapilau drainages between the 1,500' and 2,590' elevation in the Pahole Natural Area Reserve and Mokuleia Forest Reserve. The purpose is to create feral pig enclosures to protect the watershed and rare and endangered species. Our review is based on historic maps, aerial photographs, records, and reports maintained at the State Historic Preservation Division; no field inspection was made of the proposed project area. We received the DEA for this action on August 7, 2003.

Ground disturbance includes hand clearing a corridor no more than 10 feet wide and a combined length of 3.5 miles enclosing an area of 325 acres. The USAG-HI conducted an archaeological reconnaissance of the fence line route (*Trip Report, Archaeological Reconnaissance of Multiple Fence Line Routes for Proposed Enclosures Within the Pahole Nature Area Reserve (NAR), Wai`anae Mountain Range, O`ahu Island, Hawaii, Zulick.4 June 2003*). No cultural resources were identified during this reconnaissance. The report however noted that the proposed fence line has the potential to impact the accessibility of the Mokuleia Trail. One measure has been proposed, to realign the fence away from the trail when possible, to minimize impacts to the trail. Because no cultural resources were identified

during the reconnaissance of the fence line and because no traditional or cultural practices occurring in the project were identified during the pre-consultation process, we believe that this project will have "no effect" on significant historic sites.

We understand that Federal funds will be used for this project. We also understand that your effect determination under the National Historic Preservation Act Section 106 process is forthcoming.

Should you have any questions, please feel free to call Sara Collins at 692-8026 or Elaine Jourdane at 692-8027.

EJ:jk

c: OEQC

NGLE  
OF HAWAII



STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

DIVISION OF FORESTRY AND WILDLIFE

1151 PUNCHBOWL STREET  
HONOLULU, HAWAII 96813

SEP 24 2003

PETER T. YOUNG  
CHAIRPERSON  
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DEPUTY DIRECTOR FOR LAND

ERNEST Y.W. LAU  
DEPUTY DIRECTOR FOR  
THE COMMISSION ON  
WATER RESOURCE MANAGEMENT

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COMMISSION  
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Ms. Holly McEldowney  
State Historic Preservation Officer  
Department of Land & Natural Resources  
Historic Preservation Division  
601 Kamokila Boulevard  
Kapolei, HI 96707

Re: Kapuna Watershed Protection Project; Pahole Natural Area Reserve

Dear Ms. McEldowney:

Thank you for taking the time to review the Draft Environmental Assessment for the Kapuna Watershed Protection Project, Pahole Natural Area Reserve.

We appreciate your comment that you believe this project will have "no effect" on significant historic sites based upon your review of historic maps, aerial photographs, records and reports maintained at the State Historic Preservation Division, the results of the archaeological reconnaissance which did not identify any cultural resources, and the fact that no traditional or cultural practices were identified in the project area during pre-consultation.

If you have any future questions or concerns about this project, please feel free to contact me at 973-9783.

Sincerely,

Brent Liesemeyer  
Oahu Natural Area Reserve Specialist



LINDA LINGLE  
BENJAMIN J. CAVETANO-----  
GOVERNOR



ANTHONY J.H. CHING  
EXECUTIVE OFFICER

**STATE OF HAWAII**  
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

**LAND USE COMMISSION**

P.O. Box 2359  
Honolulu, HI 96804-2359  
Telephone: 808-587-3822  
Fax: 808-587-3827

September 3, 2003

TO: Christen Mitchell  
Division of Forestry and Wildlife  
Department of Land and Natural Resources

FROM: Anthony J. H. Ching, Executive Officer

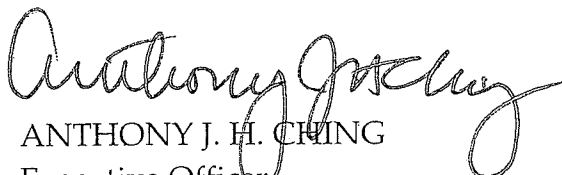
SUBJECT: Kapuna Watershed Protection Project  
Pahole Natural Area Reserve  
Waialua, Oahu  
TMK: 1-6-8-001-001; 1-6-8-001-002

We acknowledge receipt of your request received by the Land Use Commission on August 8, 2003, regarding the above subject project.

Given the location, scope, and nature of the proposed activity, the State Land Use Commission defers to the judgment of the State Department of Land and Natural Resources in this matter. We have no further comments to offer at this time.

Thank you for the opportunity to comment on the subject project. Please feel free to contact me at 587-3822, should you require clarification or any further assistance.

Sincerely,

  
ANTHONY J. H. CHING  
Executive Officer

c: OEQC

LINDA LINGLE  
GOVERNOR OF HAWAII



PETER T. YOUNG  
CHAIRPERSON  
BOARD OF LAND AND NATURAL RESOURCES

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DEPUTY DIRECTOR FOR LAND

ERNEST Y.W. LAU  
DEPUTY DIRECTOR FOR  
THE COMMISSION ON  
WATER RESOURCE MANAGEMENT

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COMMISSION  
LAND MANAGEMENT  
STATE PARKS

SEP 24 2003

Mr. Anthony Ching  
Executive Officer  
Land Use Commission  
PO Box 2359  
Honolulu, HI 96804

Re: Kapuna Watershed Protection Project; Pahole Natural Area Reserve

Dear Mr. Ching:

Thank you for taking the time to review the Draft Environmental Assessment for the Kapuna Watershed Protection Project, Pahole Natural Area Reserve. We understand that given the location, scope and nature of the proposed activity, you defer to the judgment of the Department of Land and Natural Resources and that you have no further comments at this time. If you have any future questions or concerns about this project, please feel free to contact me at 973 -9783.

Sincerely,

Brent Liesemeyer  
Oahu Natural Area Reserves Specialist

LINDA LINGLE

GOVERNOR



46202  
GENEVIEVE SALMONSON  
DIRECTOR

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STATE OF HAWAII  
OFFICE OF ENVIRONMENT QUALITY CONTROL

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235 SOUTH BERETANIA STREET  
SUITE 702  
HONOLULU, HAWAII 96813  
TELEPHONE (808) 586-4185  
FACSIMILE (808) 586-4186

DEPT. OF LAND  
& NATURAL RESOURCES  
STATE OF HAWAII

September 8, 2003

Mr. Peter Young, Chair  
Department of Land and Natural Resources  
P.O. Box 621  
Honolulu, Hawai'i 96809

Dear Mr. Young:

Subject: Draft Environmental Assessment for the Kapuna Watershed Project At Pahole Natural Area Reserve Natural Resources Conservation Project

Thank you for the opportunity to comment. We do not have any comments. Should you have any questions, please call Jeyan Thirugnanam at 586-4185.

Sincerely,

A handwritten signature in cursive script that reads "Genevieve Salmonson".

Genevieve Salmonson  
Director

LINDA LINGLE  
GOVERNOR OF HAWAII



STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES  
DIVISION OF FORESTRY AND WILDLIFE  
1151 PUNCHBOWL STREET  
HONOLULU, HAWAII 96813

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SEP 24 2003

Ms. Genevieve Salmonson  
Director  
Office of Environmental Quality Control  
235 South Beretania Street, Suite 702  
Honolulu, HI 96813

Re: Kapuna Watershed Protection Project; Pahole Natural Area Reserve

Dear Ms. Salmonson:

Thank you and your staff for taking the time to review the Draft Environmental Assessment for the Kapuna Watershed Protection Project, Pahole Natural Area Reserve. We understand that you have no comments at this time. If you have any future questions or concerns about this project, please feel free to contact me at 973-9783.

Sincerely,

Brent Liesemeyer  
Oahu Natural Area Reserves Specialist

PHONE (808) 594-1888

FAX (808) 594-1865



**STATE OF HAWAII**  
**OFFICE OF HAWAIIAN AFFAIRS**  
711 KAPI'OLANI BOULEVARD, SUITE 500  
HONOLULU, HAWAII 96813

HRD03/1090

August 25, 2003

Division of Forestry and Wildlife  
1151 Punchbowl Street, Room 224  
Honolulu, HI 96813

RE: Draft Environmental Assessment, Kapuna Watershed Protection Project, Pahole  
Natural Area Reserve, TMK 1-6-001-001 and 1-6-8-001-002

To whom it may concern:

OHA is in receipt of your request for comments on the above referenced project. We have no comments at this time. However, we will rely on your assurances that should cultural deposits, including human remains be found, you will stop work and contact the appropriate agencies pursuant to applicable law.

Thank you for this opportunity to comment. If you have further questions, please call Pua Aiu or e-mail her at [paiu@oha.org](mailto:paiu@oha.org).

Sincerely,

A handwritten signature in black ink, appearing to read "Peter L. Yee".

Peter L. Yee  
Director  
Nationhood and Native Rights

LINDA LINGLE  
GOVERNOR OF HAWAII



STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES  
DIVISION OF FORESTRY AND WILDLIFE  
1151 PUNCHBOWL STREET  
HONOLULU, HAWAII 96813

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SEP 24 2003

Mr. Peter L. Yee  
Nationhood and Native Rights  
Office of Hawaiian Affairs  
711 Kapiolani Blvd., Suite 500  
Honolulu, HI 96813

Re: Kapuna Watershed Protection Project; Pahole Natural Area Reserve

Dear Mr. Yee:

Thank you for taking the time to review the Draft Environmental Assessment for the Kapuna Watershed Protection Project, Pahole Natural Area Reserve. We understand that you have no comments at this time, and that you are relying upon our assurances that we will stop work and contact the appropriate agencies should any cultural deposits, including human remains, be found during construction. We confirm that vegetation clearing and fence construction will cease if any archaeological, historical, or cultural sites are encountered and the appropriate agencies will be contacted pursuant to applicable law.

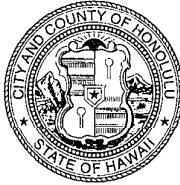
If you have any future questions or concerns about this project, please feel free to contact me at 973-9783.

Sincerely,

Brent Liesemeyer  
Oahu Natural Area Reserves Specialist

DEPARTMENT OF PLANNING AND PERMITTING  
**CITY AND COUNTY OF HONOLULU**

650 SOUTH KING STREET • HONOLULU, HAWAII 96813  
TELEPHONE: (808) 523-4414 • FAX: (808) 527-6743 • INTERNET: www.co.honolulu.hi.us



JEREMY HARRIS  
MAYOR

ERIC G. CRISPIN, AIA  
DIRECTOR

DARDARA KIM STANTON  
DEPUTY DIRECTOR

2003/ELOG-2721 (RY)

August 18, 2003

Ms. Christen Mitchell  
Department of Land and Natural Resources  
Division of Forestry and Wildlife  
State of Hawaii  
1151 Punchbowl Street, Room 224  
Honolulu, Hawaii 96813

Dear Ms. Mitchell:

Draft Environmental Assessment for Kapuna Watershed  
Protection Project, Pahole Natural Area Reserve  
Tax Map Key: 6-8-001: 001 and 002, Waialua

The proposed project (hand clearing of a corridor and erection of a fence line) is designated within the State Land Use Conservation District, zoned P-1 Restricted Preservation District, and located outside of the Special Management Area.

With respect to long-range planning policies, the project is consistent with Section 3.1.3, Guidelines for Open Space and the Natural Environment of the North Shore *Sustainable Communities Plan*, relating to identification and protection of endangered species, native ecosystems, and other important ecologically sensitive areas.

Thank you for the opportunity to comment. If you have any questions, please contact Raymond Young of our staff at 527-5839.

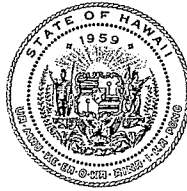
Sincerely yours,

A handwritten signature in black ink, appearing to read "Eric G. Crispin".

ERIC G. CRISPIN, AIA  
Director of Planning and Permitting

EGC:lh  
Doc: 240553

LINDA LINGLE  
GOVERNOR OF HAWAII



PETER T. YOUNG  
CHAIRPERSON  
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DEPUTY DIRECTOR FOR LAND

ERNEST Y.W. LAU  
DEPUTY DIRECTOR FOR  
THE COMMISSION ON  
WATER RESOURCE MANAGEMENT

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SEP 24 2003

Mr. Eric Crispin  
Director, Department of Planning & Permitting  
650 South King Street  
Honolulu, HI 96813

Re: Kapuna Watershed Protection Project; Pahole Natural Area Reserve

Dear Mr. Crispin:

Thank you for taking the time to review the Draft Environmental Assessment for the Kapuna Watershed Protection Project, Pahole Natural Area Reserve.

We appreciate your comments that the project is located outside the Special Management Area, and that the project is consistent with Section 3.1.3 of the North Shore *Sustainable Communities Plan*, relating to identification and protection of endangered species, native ecosystems, and other important ecologically sensitive areas. We will ensure this information is included in the Final Environmental Assessment.

If you have any future questions or concerns about this project, please feel free to contact me at 973-9783.

Sincerely,

Brent Liesemeyer  
Oahu Natural Area Reserve Specialist





Protecting  
Native Hawaiian  
traditional and  
customary rights  
and our  
fragile environment

September 8, 2003

Christen Mitchell  
Division of Forestry and Wildlife  
Department of Land and Natural Resources  
1151 Punchbowl Street  
Honolulu, Hawai'i 96813

Re: Draft Environmental Assessment Kapuna Watershed Protection Project  
Pahole Natural Area Reserve August 2003

Dear Christen:

Aloha. Mahalo nui loa for providing KAHEA the opportunity to comment on the Draft Environmental Assessment of the Kapuna Watershed Protection Project in the Pahole Natural Area Reserve, dated August 2003.

KAHEA supports the proposed action to protect native mesic dry forest, rare and endangered species, and watershed in the Pahole Natural Area Reserve. Fencing and controlling non-native species will enhance the likelihood that this special area will be preserved for the enjoyment and benefit of future generations. The proposed action will have a positive impact on the land and its resources, which support the people of Hawai'i, Native Hawaiian culture, and economy.

If we can be of any assistance in implementing the project in a timely manner, please do not hesitate to contact us.

Sincerely,

  
Marjorie Ziegler  
Program Associate

LINDA LINGLE  
GOVERNOR OF HAWAII



PETER T. YOUNG  
CHAIRPERSON  
BOARD OF LAND AND NATURAL RESOURCES

DAN DAVIDSON  
DEPUTY DIRECTOR FOR LAND

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COMMISSION  
LAND MANAGEMENT  
STATE PARKS

Ms. Marjorie Ziegler  
Program Associate  
Kahea – the Hawaiian-Environmental Alliance  
PO Box 27112  
Honolulu HI 96827

Re: Kapuna Watershed Protection Project; Pahole Natural Area Reserve

Dear Ms. Ziegler:

Thank you for taking the time to review the Draft Environmental Assessment for the Kapuna Watershed Protection Project, Pahole Natural Area Reserve.

We appreciate your comments in support of the project. We agree that the proposal will enhance the likelihood that this special area will be preserved for the enjoyment and benefit of future generations and that it will have a positive impact on the land and its resources.

If you have any future questions or concerns about this project, please feel free to contact me at 973-9783.

Sincerely,

Brent Liesemeyer  
Oahu Natural Area Reserves Specialist