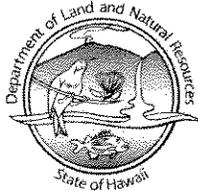


LINDA LINGLE
GOVERNOR OF HAWAII



MAY 23 2007

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BOARD OF LAND AND NATURAL RESOURCES
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 7, 2007

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

RE: Finding of No Significant Impact (FONSI) for the Kanaele Bog Protective Fence Project,
TMK 2-4-9-1, Koloa, Island of Kaua'i

Dear Ms. Salmonson:

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 July 23, 2006. The Division has determined that this project will not have significant environmental effects and has issued a Finding of No Significant Impact (FONSI). Please publish this notice in the next Environmental Notice.

We have enclosed a completed OEQC Publication Form and four copies of the final EA. Please call Christine Ogura at 587-0058 if you have any questions.

Sincerely,

for Paul J. Conry
Administrator

OFFICE OF ENVIRONMENTAL
QUALITY CONTROL

07 MAY -9 09:19

RECEIVED

ENVIRONMENTAL ASSESSMENT
FOR
KANAELE BOG
PROTECTIVE FENCE PROJECT

This document prepared pursuant to Chapter 343, HRS

Prepared by
The Nature Conservancy, acting by and through its Hawai'i Chapter,
Kaua'i Program

March 2007
Final



Kanaele Bog, TMK Kaua'i: 2-4-9-1

Kanaele Bog Protective Fence Project Environmental Assessment

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Appendix A: Rare or Endangered Plant Species & Critical Habitats of Kanaele Bog

Appendix B: Kanaele Bog Protective Fence Project Maps 1 and 2

Appendix C: Checklist of Vascular Plants- Kanaele (Wahiawa) Bog

Appendix D: National Tropical Botanical Garden – Fence Line Vegetation Survey

Appendix E: State of Hawai‘i, Office of Hawaiian Affairs & Cultural Surveys Hawai‘i Inc.

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Appendix G: Consulted Agencies and Parties Distribution List

Appendix H: Scoping Letter and Responses, Government and Non-Government

Appendix I: Draft EA Comment Period Letter and Responses

Kanaele Bog Protective Fence Project Environmental Assessment

I. INTRODUCTION: ENVIRONMENTAL ASSESSMENT

Project Name: Kanaele Bog Protective Fence Project

Proposing Agency: Kaua‘i Watershed Alliance c/o The Nature Conservancy in Hawai‘i, Kaua‘i Program

Approving Agency: State Department of Land and Natural Resources (DLNR)

Project Location: Kanaele Bog
TMK Kaua‘i: 2-4-9-1
Moku: Kona; Ahupua‘a: Wahiawa

Property Owner: McBryde Sugar Company, Limited

LU Classification: Conservation, Subzone P7 (Sanctuary)

Anticipated Determination of Environmental Assessment:

A Finding of No Significant Impact (FONSI) is expected for the project.

Agencies and parties consulted during EA Preparation include:

Federal: U.S. Department of Interior
U.S. Fish & Wildlife Service

State: Department of Hawaiian Home Lands
Department of Health
Department of Land and Natural Resources
Division of Forestry and Wildlife
Division of Historic Preservation
Office of Hawaiian Affairs
University of Hawai‘i
Environmental Center

Kaua‘i County: Planning Department
Historic Preservation Review Board
Department of Water

Private: A & B Properties, Inc., Property Manager
Grove Farm Land Corp.
Gay & Robinson, Inc.
Cultural Surveys Hawai‘i Inc.

(See Appendix G: Consulted Agencies and Parties Distribution List for a complete list of consulted agencies and parties)

II. SUMMARY OF PROPOSED ACTIONS

The Nature Conservancy (TNC), with the approval of the landowner, McBryde Sugar Company, Limited, proposes to construct a protective hog wire fence around the perimeter of the Kanaele Bog in the Mount Kāhili area of Kauaʻi to exclude/remove feral ungulates from within the fence enclosure, and to build a boardwalk within the bog perimeter. The objective of this project is to protect approximately 66 acres (ac) of a unique bog ecosystem from damage by feral pigs and to create a low-impact access route within the bog.

The project involves clearing vegetation with hand operated tools (i.e., handsaw, pick ax, weed eater, chainsaw) from a 10 foot (ft) wide corridor around the bog. A 42 inch (in) high fence will be constructed using hog wire fence fabric supported by wooden posts and steel fence posts. The outside of the fence will be skirted along the base with a hog wire apron and a band of bezinal-coated barbwire. After construction, the project will consist of natural resource monitoring, invasive weed control, and fence and boardwalk maintenance to track the recovery of the bog plant community, to reduce or eliminate the primary threats to the bog, and to minimize the impacts of the fence.

The anticipated start date for this project is the third or fourth quarter of the 2006 calendar year. Clearing common native and introduced vegetation for the entire length of the fence corridor will take approximately three (3) months to complete. The fence installation will take approximately six (6) months. The boardwalk is scheduled to receive landowner approval and begin construction in 2009.

This project is funded, in part, from a grant from the U.S. Fish & Wildlife Service, The Nature Conservancy, and the State of Hawaiʻi, Department of Land and Natural Resource, Division of Wildlife and Forestry's FY06 Watershed Management Grant.

A. Project Purpose and Need:

The project is directed at protecting the unique ecosystem within Kanaele Bog, as well as the rare and endangered species it supports (*See Appendix A: Rare or Endangered Plant Species & Critical Habitats of Kanaele Bog*).

Bogs occur on all the high Hawaiian Islands except Niʻihau, Lānaʻi, and Kahoʻolawe. However, they are restricted in distribution because they require special geological and hydrological conditions. Bogs typically receive water only through rainfall and in Hawaiʻi they develop only at high elevation watershed summits. Kanaele Bog is unique in that it is Hawaiʻi's only remaining low elevation bog (lying below 3,000 ft in elevation).

Hawaiian bogs support very specialized plant communities that are susceptible to damage by feral pigs. Feral pigs transport and spread introduced plants on their bodies and overturn soil in search of food, damaging native plants and providing an opportunity for introduced plants to establish themselves. Kanaele Bog is home to a rich diversity of

2007-03 KA FEA Kanaele Bog Protective Fence

unique Hawaiian plants, including an ‘akoko (*Chaemesyce sparsiflora*) that occurs only in this location. One distinct bog species, pincushion sedge (*Oreobolus furcatus*), is almost completely extirpated from Kanaele Bog due to feral pig activity. There are also large areas where all plants have been removed leaving exposed mud surfaces, and introduced species such as *Juncus plantifolia* readily out-compete native species.

Conservation efforts within the Hawaiian Islands have shown that feral pigs are the most significant threat to bog communities. When pigs are removed and the area protected, the bog ecosystem will recover. Experience has also shown that the only successful method of completely protecting a bog from feral pigs is to exclude the animals with wire mesh fence. A boardwalk would provide a hardened path for access and eliminate the damage caused by continuous trampling of the bog’s sensitive vegetation.

B. Project Description and Location:

The project will be located in the Kaua‘i moku of Kona, in the mauka watershed of the Wahiawa Ahupua‘a (Wahiawa drainage) above Kalāheo Town. It is restricted to the flat tableland below Mount Kāhili and east of Wahiawa Stream at 2,100 ft elevation.

The fence would be approximately 6,911 ft in length and will enclose approximately 66 ac of the bog and surrounding forest. The fence would begin about 1,000 ft north of the end of the dirt road. It will run north, roughly following an existing trail almost to the south tributary of Wahiawa Stream and at the base of a prominent pu‘u. The fence would then turn east, paralleling the stream until turning at and following the base of Mount Kāhili. It would then follow a westerly course to its beginning, completely enclosing the bog (*See Appendix B: Kanaele Bog Protective Fence Map 1*).

The fence will be constructed of 42 in-high bezinal coated hog wire fence fabric with a basal strand of bezinal-coated barbwire. The fence fabric will be supported by bezinal coated steel fence posts and treated wood posts placed no more than 10 ft apart the entire length of the fence line. Shorter bezinal coated steel pins will be used as anchors within the 10-ft span. The fence will have an apron of hog wire laid horizontally along the ground outside the fence to prevent pigs from digging underneath. The fence alignment will be cleared by hand to a width of no more than 10 ft.

The boardwalk would run within the perimeter of the fence and will provide a safe, hardened path for access and eliminate the damage caused by continuous trampling of the bog’s sensitive vegetation. The construction shall consist of building supports, trestles, piers, and metal support posts, a deck surface, and metal grate wire on the deck (*See Appendix B: Kanaele Bog Boardwalk Map 2*).

C. Schedule:

The anticipated start date for this project is the third quarter of the 2006 calendar year. This project is anticipated to end in 2009.

I. Fence Corridor Clearing:

Hand clearing of vegetation along the fence corridor will take no more than 3 months.

II. Fence Installation:

The installation will begin after completion of the corridor clearing, and is anticipated to take up to 6 months. Fencing material will be transported to the site by helicopter and all construction (post installation, fence stretching, clipping, etc.) will be done by hand. Therefore the work will be somewhat weather dependent and may not be continuous within the 6-month period.

III. Boardwalk:

The boardwalk will be installed after the completion of the protective fence, in 2009. Construction materials would be transported to the site by helicopter and all construction would be done by hand. The installation time will be influenced by weather conditions.

D. Funding Sources:

This project is funded by U.S. Fish & Wildlife Service (through a grant to The Nature Conservancy), The Nature Conservancy, and the State of Hawai‘i, Department of Land and Natural Resource, Division of Wildlife and Forestry’s FY06 Watershed Management Grant.

III. SUMMARY DESCRIPTION OF THE AFFECTED ENVIRONMENT

A. General:

Wahiawa is a 2,500 ac watershed bordered sequentially on the east by Kalāheo, Lāwa‘i, Kōloa, and Ha‘ikū and on the west by Hanapēpē. Unlike most other drainage systems on the south shore of Kaua‘i, which are narrow with steeply incised walls terminating in waterfalls, upper Wahiawa is relatively broad and ends in a bowl-shaped amphitheater with no significant tributaries and sub watersheds. The flat tablelands of the bog at 2,100 ft elevation sit at the base of Mt. Kāhili and are drained to the west by the upper tributaries of Wahiawa Stream.

There are no available flow records for Wahiawa Stream, but historically it was certainly a large perennial stream, with the bog receiving an average of 158 inches of annual rainfall. Sometime between 1900 and 1907, the Alexander Dam and Reservoir system was completed at 1,600 ft elevation. These structures currently capture and divert all of the base flow of Wahiawa Stream to agricultural irrigation and hydroelectricity.

The bog itself is composed of a shallow layer (*ca.* 10 in) of black peat, which overlays deep gleyed clays, saturated to the surface in wet weather. During dry periods, however,

the upper levels of these clays dry and crack, allowing oxidization of the soil. There are a few, small perennial pools of water scattered throughout the bog. The western edge of the bog is moderately sloped with areas of exposed ironstone seams and basalt boulders.

The site is a proven resource for paleoecological information. The sediment stratigraphy, for instance, is interesting and complex. A 5 m sediment core from the bog collected with a piston-sampler contained a record of sedimentary changes at the site back to about 23,000 radiocarbon years ago (Burney, 2002). Stratigraphic changes reflect climatic and hydrological variation over this time, and probing shows that an even longer paleoecological record is contained in the site, reflecting the bog's great antiquity.

In addition to the reservoir, the McBryde Sugar Co. also attempted to build a ditch irrigation system, tapping upper Wahiawa Stream. Though not functional, much of this system remains a series of ditches and tunnels that traverse the western margin of the bog from Wahiawa Stream to the end of the dirt road.

An un-maintained dirt road and utility lines lead up from Kalāheo and Alexander Reservoir, south-east of the bog and continue up along the eastern ridge to a point below Mt. Kāhili. On this ridge point, several companies maintain communications antennae and repeaters.

B. Flora:

At lower elevations in the watershed, the vegetation is almost entirely non-native, composed of large stands of strawberry guava (*Psidium cattleianum*), *Eucalyptus* spp., and *Albizia chinensis*. The vegetation around and above the bog however, is largely intact lowland wet forest dominated by 'ōhi'a (*Metrosideros polymorpha*), hame (*Antidesma platyphylla*), and 'ōlapa (*Cheirodendron platyphyllum*). While this forest is one of the richer examples of this community type on Kaua'i, it is by no means pristine. It is heavily invaded by weeds such as strawberry guava, downy rose myrtle (*Rhodomyrtus tomentosa*), Asian melastome (*Melastoma candidum*), and Koster's curse (*Clidemia hirta*).

As a community type, the bog itself is described as a 'ōhi'a/kuolohia/uluhe lowland wet mixed community. The dominant ground cover is uluhe (*Dicranopteris linearis*) and kuolohia (*Rhynchospora chinensis*), with high spots supporting shrubby 'ōhi'a (*Metrosideros polymorpha*), 'akoko (*Chamaesyce sparsiflora*), and alani (*Melicope clusiifolia* and *Melicope waialealae*).

Plant surveys have been conducted within the upper watershed of the Wahiawa drainage:

Kenneth R. Wood, a Research Botanist and Conservation Biologist, developed a Wahiawa Bog checklist of vascular plants that would benefit from this project. There are over 27 species of rare plants known in the larger project area of Wahiawa (*See Appendix C: Checklist of Vascular Plants – Kanaele (Wahiawa) Bog*).

The National Tropical Botanical Garden conducted a vegetation survey along the entire fence corridor and no threatened or endangered plants were observed (*See Appendix D: National Tropical Botanical Garden – Fence Line Vegetation Survey*).

C. Fauna:

Historic bird surveys conducted in the area recorded the presence of ‘apapane (*Himatione sanguinea*), ‘i‘iwi (*Vestiaria coccinea*), ‘anianiau (*Hemignathus parvus*), akeke‘e (*Loxops caeruleirostris*), Kaua‘i ‘amakihi (*Hemignathus Kauaiensis*), and Kaua‘i ‘elepaio (*Chasiempus sandwichensis*), all of which are endemic to Kaua‘i or the Hawaiian Islands. More recently, however, the only native forest birds that have been observed are ‘apapane and ‘elepaio. The Hawaiian short-eared owl (*Asio flammeus sandwichensis*) and the white-tailed tropicbird (*Phaethon lepturus*) have been seen in the area.

Historically, there have been colonies of Newell’s shearwater (*Puffinus newelli*) documented on the ridges to the south-east outside of the project area.

No comprehensive surveys of the invertebrate community have been done within the upper Wahiawa system, but given the diversity and relatively intact condition of the native forest, it is suspected this site supports high densities of native arthropods and other native invertebrates. Casual sampling of the arthropod communities in the area confirms this statement. In addition, taxonomic studies show that Wahiawa is an area of endemism for arthropods on Kaua‘i, with several species of spiders, beetles, flies, and crickets endemic to the Wahiawa and Kāhili area.

Non-native animals observed in the project area include feral pigs (*Sus scrofa*), rats (*Rattus spp.*), and feral cats (*Felis domesticus*).

D. Cultural Resources:

The following steps have been taken to determine the cultural and historical significance of the project area:

A cultural impact assessment has been completed for the project. The Summary and Recommendations are as follows:

“Reviewing the information provided by the elements to this cultural impact evaluation – historical documentation, archaeological research, and community contacts – there emerges a more detailed picture of the traditional landscape of Wahiawa Ahupua‘a and the present project area.

[The] nineteenth-century documents – Land Commission Award records and historic maps indicates parcels containing house sites and irrigated taro fields along Stream. These parcels were the likely remnants of the traditional Hawaiian settlement pattern that had survived the first seven decades of western contact. It thus appears that, in traditional Hawaiian times, the lower stream lands were primarily a focus to habitation and agriculture. Additionally, based on an account by a nineteenth century missionary, this area at the foot of Valley was the site of the house of Humehume, son of Kaumuali‘i, the ruling chief of Kaua‘i and Ni‘ihau.

By the early decades of the 20th century, western commercial entrepreneurial interests had transformed the Wahiawa landscape into sugarcane fields and pasture lands, and had dispersed remaining native residents.

In traditional Hawaiian times Kanaele Bog and other *mauka* regions of Wahiawa would have been utilized for a variety of purposes, such as gathering of timber, avian resources, medicinal and ceremonial plants, and famine food resources. By the early decades of the 20th century, the McBryde Sugar Co. irrigation system reached Kanaele Bog where a series of ditches and tunnels traverse the western margins of the bog. The establishment of the ditch system in *mauka* Wahiawa is representative of the major landscape transformations wrought by development of commercial sugar interests. These transformations – and the sense that areas like Kanaele Bog were private property – restricted access to the present project area to sugar company employees for most of the 20th century.

None of the community contacts queried for this assessment identified any cultural sites in the project area, or recalled anyone entering the project area – either in the past or present – for any cultural practice. Based on the evidence gathered, at present no contemporary or continuing cultural practices occur within the project area.

Based on the findings of this assessment, the Kanaele Protective Fence Project and the future maintenance of the fence will have minimal impact upon native Hawaiian cultural resources, beliefs, and practices. It should be noted, however, that there are many native plant species within the project area and as a precautionary measure, personnel involved in the construction of the fence and its maintenance should follow proper procedures to ensure the safety of the many plants native to the bog environment.” (*Mitchell and Hammott, 2005*)

Regarding future access to the bog, the second phase of the Kanaele Protective Fence Project will include the construction of a boardwalk that will create an opportunity for access, as noted in the Memorandum of Understanding between TNC and Alexander & Baldwin Properties, by “TNC Parties” which will include employees and multi-disciplined volunteers.

The pre-consultation and continuing correspondence include the following organizations: State Historic Preservation (SHP) Division; Department of Hawaiian Home Lands (*See Appendix E: State of Hawai‘i, Office of Hawaiian Affairs & Cultural Surveys Hawai‘i Inc*); and Kaua‘i County Historical Preservation Review Board (Planning Department); and;

A SHP office staff archaeologist walked the area of the planned fencing to determine if there were any obvious archaeological features or any features potentially used for cultural reasons (*See Appendix F: State of Hawai‘i, DLNR, Hawai‘i Historic Preservation Division Review*).

Note: Should any iwi or Native Hawaiian cultural or traditional deposits be found during fence construction, work will cease, and the appropriate agencies will be contacted pursuant to applicable law.

E. Sensitive Habitat:

The bog itself is an extremely sensitive area. It is easily disturbed and slow to regenerate. In addition, the larger project area has been designated as critical habitat for 13 species of State and federally listed plants (*Adenophorus periens* (pendent kihi fern), *Bonamia menziesii* (no common name (NCN)), *Cyanea undulata* (hāhā), *Dubautia pauciflorula* (na'ena'e), *Exocarpos luteolus* (heau), *Hesperomannia lydgatei* (NCN), *Isodendrion longifolium* (aupaka), *Labordia lydgatei* (kāmakahala), *Labordia tinifolia* var. *wahiawaensis* (kāmakahala), *Myrsine linearifolia* (kōlea), *Phlegmariurus nutans* (wāwae'iole), *Viola helenae* (NCN), and *Viola kauaiensis* var. *wahiawaensis* (nani waialeale)).

F. Other Uses:

The project area, located on private property, is not open for general public use at this time. The area adjoins Public Hunting Unit C on State land just to the southeast, which is accessible by a dirt road from Kalāheo. Boundaries are not marked in the upper watershed and there is some use of the project area by hunters moving from Unit C (*See Appendix C: Kanaele Bog Fence Map 2*).

On the ridge below Mt. Kāhili, several companies maintain communications antennae and repeaters, but these facilities are usually accessed by helicopter, thus the remaining area, including the dirt roads are unused and in disrepair.

IV. SUMMARY OF MAJOR IMPACTS

A. Major Positive Impacts:

The most significant impact of this project will be the protection and recovery of the Kanaele Bog ecosystem (the last of its kind in existence) and its constituent native species. In the future, it may also increase the level of public awareness of and support for environmental education and conservation programs from an increase in conservation management, monitoring, and observational activities inherent to the project.

B. Major Negative Impacts:

No major negative impacts have been identified. However, there will be some short-term negative impact on the environment associated with fence construction. Disturbance of vegetation and soil will occur in the immediate vicinity of the planned fence line because the work entails clearing the corridor of vegetation. Plants will be pruned to the ground or removed along the entire corridor up to a width of 10 ft. This will involve the removal of common native plants, but no rare or sensitive species. The soil surface will also be disturbed along the fence line. The soil in the bog and surrounding wet forest is sensitive and susceptible to disturbance.

The fence corridor is aligned to avoid the edge of the bog itself, and largely follows the existing foot trail or cuts through the adjacent forest. With the exception of approximately three creek crossings, the area is very level, so there will be little or no sediment movement from the corridor itself. The surrounding lowland wet shrubland and forest will recover once the construction is completed as will the bog ecosystem, once the feral pig disturbance is eliminated. The area impacted by the fence construction would be approximately half an acre or less than one percent of the area to be protected.

Disturbance of the ground surface along the fence line and trail corridor and transport of material and equipment from off-site may increase the potential accidental introduction of non-native plants to the project site or spread existing weeds into new areas.

V. PROPOSED MITIGATION MEASURES

A. Vegetation and Soil Disturbance:

The fence corridor alignment was placed to reduce cutting the amount and quality of native vegetation. For example, on the western edge of the project area the alignment crosses a tributary of Wahiawa Stream to run north through a large, disturbed open grassland rather than cut through native forest on the edge of the bog.

Because of the saturation of the soils around the bog, disturbance is unavoidable, particularly during vegetation clearing. After clearing, the fence material will be dropped by helicopter approximately every 300 ft along the corridor, and the fence mesh unrolled to lay flat on the ground. Workers will walk on the mesh as they install the fence, and then walk on the outside apron portion of the fence after it is erected. This will greatly reduce soil disturbance caused by the activity of fence construction. When constructed, the boardwalk will also reduce vegetation and soil disturbance within the fenced area.

B. Weed Introductions:

Throughout the project and subsequent access strict protocols will be used to: 1) clean and inspect all gear (fencing material and personnel gear) to prevent the introduction of alien species (seeds, plants, and insects); 2) monitor and remove any weeds that become established or expand as a result of the disturbance during construction or maintenance of fence line; and 3) remove all rubbish and waste from work sites.

C. Cultural Access:

Access to the area is controlled by the landowner and is not within the purview of this project. However, the landowner has indicated that they honor native Hawaiian gathering rights. During interviews with cultural practitioners regarding this project, no individuals or groups were identified who currently use the area for gathering. There are no culturally significant plants (e.g. maile, liko, pālapalai) that occur within the fence area that do not also occur immediately outside the area. In addition, any person physically capable of hiking to the fence should not have any problem crossing it. The construction of access

gates and the construction of a boardwalk will mitigate this possible impediment. If cultural sites or activities are identified which might be impacted by the project, then the design, construction, or alignment of the fence will be altered.

VI. ALTERNATIVES CONSIDERED

A. Alternative: No Action

This action effectively accepts the continued degradation of the Kanaele Bog ecosystem and its constituent species by feral pigs. This alternative is not consistent with the landowner's sense of responsible stewardship. The no action alternative will result in far greater and more damaging (potentially irreversible) environmental impacts than the fence project.

VII. ANTICIPATED DETERMINATION

Based on the assessment above we conclude that the Kanaele Bog Fence will not have any significant adverse impacts on the environment. Therefore, we anticipate a FONSI.

VIII. FINDINGS AND REASONS SUPPORTING THE DETERMINATION

The environmental impacts of the Kanaele Bog Protective Fence Project have been evaluated in relation to the thirteen significance criteria listed in the Guidebook for the State Environmental Review Process. The criteria and the effects this project will have are listed:

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

The purpose of this project is to protect the Kanaele Bog ecosystem from damage by feral pigs. Rather than destroy natural resources, this project will lead to greater protection and management.

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

The Kanaele Bog is a unique and fragile system. It functions largely as a watershed catchment and storage area and as habitat for native species. This project will strengthen rather than curtail those functions. Possible educational, cultural, and scientific uses will be enhanced by the completion of the project.

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

The project complies with the state's long-term environmental policies and goals that promote understanding and protection of Hawai'i's natural resources. Therefore, this project does not conflict with the state's long-term environmental policies or goals.

4. Substantially affects the economic, social welfare, and cultural practices of the community or state.

The project will not impact either the economic or the social welfare, nor the cultural practices of the community or state as there is no evidence that the bog is currently utilized for such activities nor is there evidence of plans for such use.

5. Substantially affects public health.

This project will not substantially impact public health, as it is located in a remote portion of the mountains.

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

The remoteness and rugged terrain of the project area precludes any impact on population or public facilities.

7. Involves a substantial degradation of environmental quality.

The purpose of this project is to improve the quality of a unique Hawaiian environment. This project requires limited removal of common native plants and some short-term soil disturbance. However, this activity is necessary to protect the integrity of the bog ecosystem and is intended to result in a net long-term benefit to the habitat.

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

This project will have a positive effect on the environment and will not involve a commitment to larger actions. It is designed to significantly support ongoing and future management and protection of Kanaele Bog.

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

This project will benefit the unique species that inhabit Kanaele Bog. It will not adversely impact any endangered species. In addition, this project is consistent with the following tasks outlined in the U.S. Fish and Wildlife Service's 1994 recovery plan for the Wahiawa plant cluster: secure current habitat 11 (negotiate a cooperative agreement with the McBryde Sugar Co.), manage Wahiawa populations 1311 (construct and maintain fencing), 1312 (establish a feral ungulate control program), 1321 (schedule weeding to control alien plants), and 1322 (monitor alien plants).

This project will also benefit the designated critical habitat for 13 listed plant species by improving the quantity and quality of the habitat and by decreasing threats to the habitat.

10. Detrimently affect air or water quality or ambient noise levels.

Helicopters will transport construction materials to the project site. These flights will occur during normal work hours and will not fly over residences. Thus, noise level will be elevated during the installation flights, but it will be minor and short term.

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

This project is located in an environmentally sensitive area (bog); however, the intent of the project is environmental protection of this habitat. The best management practices are in place to prevent and minimize any anticipated short-term impacts and are not anticipated to result in long-term damage to the habitat. This project is located in an upland area and will not detrimentally affect any coastal areas or other bodies of water. The project will not negatively affect an environmentally sensitive area or damage a flood plain, tsunami zone, beach, erosion-prone area, or geologically hazardous land.

12. Substantially affect scenic vistas and view planes in county or state plans or studies.

The project area has not been identified as a scenic vista or view plane. The project will be located more than five miles from the coast and is not within line of sight of any point on the coast. Thus, the fence cannot be seen from any public or privately accessed viewing site.

13. Requires substantial energy consumption.

The major energy consumption for this project will be the fuel required for helicopter flights to the station sites and the embodied energy of the construction materials which are not anticipated to be substantial.

IX. PERMITS REQUIRED

This project requires a board permit from the Board of Land and Natural Resources (Section 13-5-33 Hawai'i Administrative Rules) because the project falls in a Protective (P) subzone, Conservation Use District. This Conservation District Use Permit will be requested in the third quarter of 2006.

X. EA PREPARATION

This Environmental Assessment was prepared in consultation with the land owner McBryde Sugar Co. and land manager A&B Properties, Inc.

A pre-consulting draft EA was performed by The Nature Conservancy in May 2006. Comments were incorporated into a draft EA. The scoping letter and the responses are attached (*See Appendix H: Scoping Letter and Responses*).

A thirty-day comment period was performed July 23 to August 22, 2006. The correspondence from this period and a summary published by the Office of Environmental Quality Control is attached (*See Appendix I: DEA Comment Period*).

The EA was prepared primarily by:

The Nature Conservancy (TNC)
Kaua'i Program
Līhu'e Town Plaza
4180 Rice Street, Suite 102B
Līhu'e, HI 96766

The Cultural Survey (Cultural Impact Assessment) was prepared by:

Cultural Surveys Hawai'i Inc.
P. O. Box 1114
Kailua, Hawai'i 96734

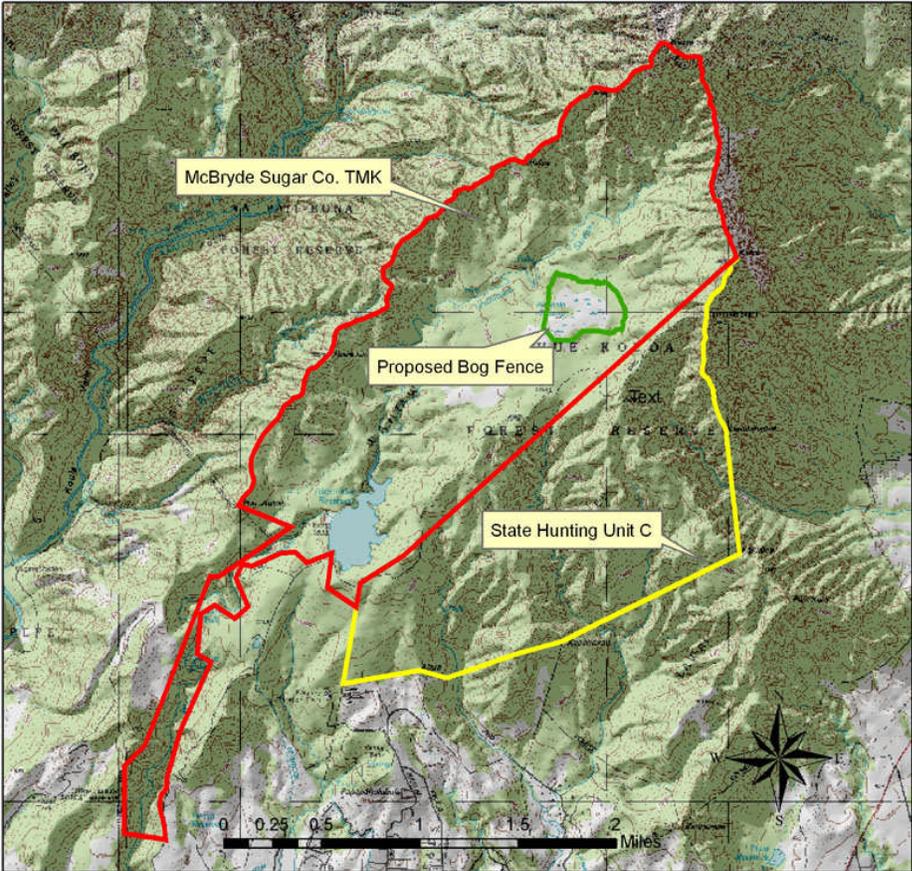
A copy of the Cultural Survey is available, to the public, upon request.

XI. REFERENCES SITED

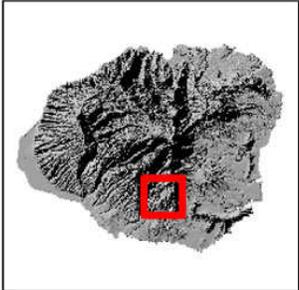
Burney, D.A., 2002. Late Quaternary chronology and stratigraphy of twelve sites on Kaua'i. *Radiocarbon* 44(1):1-32.

Mitchell, A. and Mammott, H. H. Ph.D., 2005. *Cultural Impact Assessment for the Kanaele Protective Fence Project in the Uplands of Wahiawa*. Prepared for The Nature Conservancy.

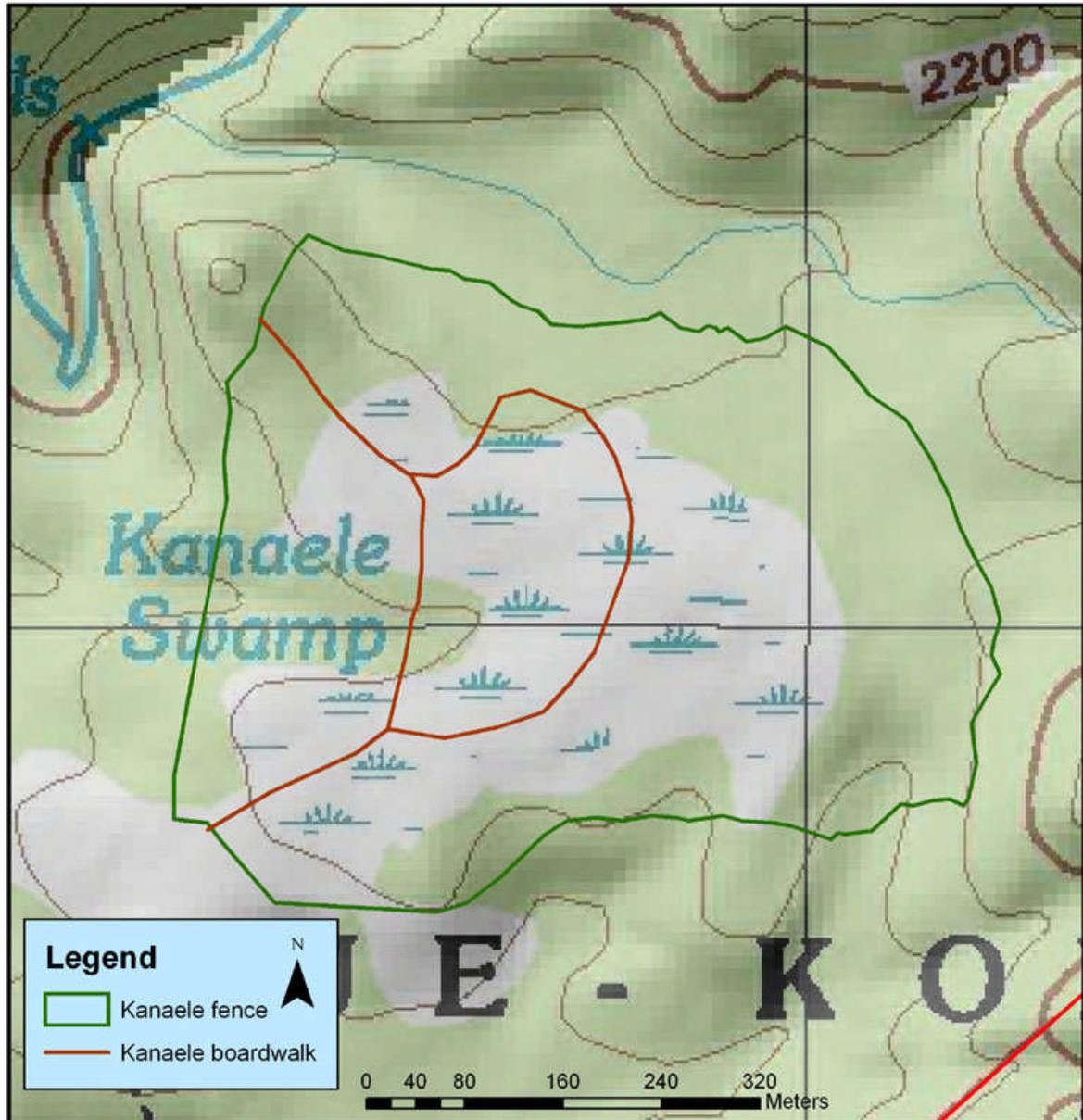
Proposed Kanaele Bog Fence



- Legend**
- Proposed Kanaele Bog Fence
 - State Hunting Area C
 - McBryde Sugar Co. TMK



Proposed Kanaele Bog Boardwalk



Map produced by S. Newton, The Nature Conservancy, 5/10/06

**Checklist of Vascular Plants
Kana`ele (Wahiawa) Bog
Wahiawa, Kaua`i, Hawai`i
2000**

K. R. Wood, Research Botanist
National Tropical Botanical Garden
3530 Papalina Rd, Kalaheo, Kaua`i, Hawai`i 96741
kenwood@ntbg.org

Note: Names for flowering plants follow W. L. Wagner et al. 1990. Names for pteridophytes follow unpublished checklist by D. Palmer in addition to a few taxa recognized in an earlier unpublished checklist by W. H. & F. Wagner

Kana`ele Bog represents a *Metrosideros polymorpha* mixed shrub lowland bog system which is located in the Wahiawa Drainage system of southern Kaua`i at an elevation of ca. 2140 ft. The bog could be fenced for protection with approximately 1,300 m of linear fencing around the perimeter. The perimeter fence would include around 155,000 sq meters of lowland bog within the enclosure. The following checklist is a preliminary vascular plant species list:

Symbols: E = Endangered
end = Endemic
ind = Indigenous
nat = Naturalized
R = Rare
V = Vulnerable

Angiosperms-Dicots

Apiaceae

Centella asiatica (L.) Urb. (nat)

Aquifoliaceae

Ilex anomala Hook. & Arnott (ind)

Araliaceae

Cheirodendron platyphyllum (Hook. & Arnott) Seem. subsp. *kauaiense* (Kraj.) Lowry (end)

Asteraceae

Bidens forbesii Sherff subsp. *kahiliensis* Ganders & Nagata (end)

Dubautia imbricata St. John & G. Carr subsp. *imbricata* (end R)

Dubautia raillardioides Hillebr. (end)

Campanulaceae

Cyanea fissa (H. Mann) Hillebr. (end)

Lobelia kauaensis (A. Gray) A. Heeler (end R)

Droseraceae

Drosera anglica Huds. (ind)

Epacridaceae

Styphelia tameiameia (Cham. & Schlechtend.) F.v. Muell. (ind)

Ericaceae

Vaccinium calycinum Sm. (end)

Vaccinium dentatum Sm. (end)

Euphorbiaceae

Antidesma platyphyllum H. Mann var. *hillebrandii* Pax & K. Hoffm. (end)

Chamaesyce sparsiflora (A. Heeler) Koutnik (end R)

Goodeniaceae

Scaevola gaudichaudiana Cham. (end)

Melastomataceae

Melastoma candidum D. Don (nat)

Pterolepis glomerata (Rottb.) Miq. (nat)

Myrsinaceae

Myrsine helleri (Degener & I. Degener) St. John (end)

Myrtaceae

Melaleuca quinquenervia (Cav.) S.T. Blake (nat)

Metrosideros polymorpha Gad. var. *glaberrima* (H. Lev.) St. John (end)

Metrosideros polymorpha Gad. var. *incana* (H. Lev.) St. John (end)

Metrosideros waialealae (Rock) Rock var. *waialealae* (end)

Psidium cattleianum Sabine (nat)

Rhodomyrtus tomentosa (Aiton) Hassk. (nat)

Syzygium sandwicensis (A. Gray) Nied. (end)

Rubiaceae

Coprosma granadensis (L. fil.) Heads (ind)

Hedyotis terminalis (Hook. & Arnott) W. L. Wagner & Herbst (end)

Psychotria mariniana (Cham. & Schlechtend.) Fosb. (end)

Psychotria wawrae Sohmer (end R)

Rutaceae

- Melicope feddei* (H. Lév.) T. Hartley & B. Stone (end)
Melicope waialealae (Wawra) T. Hartley & B. Stone (end)
Melicope wawraeana (Rock) T. Hartley & B. Stone (end)

Santalaceae

- Santalum freycinetianum* Gad. var. *pyrularium* (A. Gray) Stemmermann (end)

Thymelaeaceae

- Wikstroemia oahuensis* (A. Gray) Rock var. *palustris* (Hochr.) Peterson (end)

Violaceae

- Viola kauaensis* A. Gray var. *wahiawaensis* C. N. Forbes (end E)

Viscaceae

- Korthalsella complanata* (Tiegh.) Engl. (ind)
Korthalsella remyana Tiegh. (end)

Angiosperms--Monocots

Cyperaceae

- Carex alligata* Boott (end)
Gahnia beecheyi H. Mann (end)
Gahnia vitiensis Rendle subsp. *kauaiensis* (Benl) T. Koyama (end)
Machaerina angustifolia (Gaud.) T. Koyama (ind)
Machaerina mariscoides (Gaud.) J. Kern subsp. *meyenii* (Kunth) T. Koyama (end)
Morelotia gahniiformis Gaud. (end)
Rhynchospora chinensis Nees & Meyen subsp. *spiciformis* (Hillebr.) T. Koyama (ind)
Rhynchospora rugosa (Vahl) Gale subsp. *lavarum* (Gaud.) T. Koyama (ind)

Juncaceae

- Juncus planifolius* R. Br. (nat)

Orchidaceae

- Arundina graminifolia* (D. Don) Hochr. (nat)
Phaius tankervilleae (Banks ex L'Her.) Blume (nat)

Poaceae

- Andropogon glomeratus* (Walter) E. Britton, Sterns & Poggenb. (nat)
Dichantherium cynodon (Reichardt) C. A. Clark & Gould (end)
Isachne distichophylla Munro ex Hillebr. (end)
Paspalum conjugatum Bergius (nat)
Sacciolepis indica (L.) Chase (nat)
Setaria parviflora (Poir.) Kergulen (nat)

Pteridophytes

Blechnaceae

Sadleria pallida Hook. & Arnott (end)

Cyatheaceae

Cibotium glaucum (Sm.) Hook. & Arnott (end)

Dryopteridaceae

Nephrolepis exaltata (L.) Schott subsp. *hawaiiensis* W.H. Wagner (ined.) (end)

Gleicheniaceae

Dicranopteris linearis (Burm. f.) Underw. f. *linearis* (ind)

Lindsaeaceae

Sphenomeris chinensis (L.) Maxon (ind)

Lycopodiaceae

Lycopodiella cernua (L.) Pichi Serm. (ind)

TRUST SPECIES TO BENEFIT FROM THIS PROJECT

	<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>
plants		<i>Adenophorus periens</i>	E
		<i>Bonamia menziesii</i>	E
	akoko	<i>Chamaesyce remyi</i> var. <i>remyi</i>	SOC
	akoko	<i>Chamaesyce sparsiflora</i>	SOC
	oha wai	<i>Cyanea remyi</i>	E
	oha wai	<i>Cyanea undulata</i>	E
	haiwale	<i>Cyrtandra kealiae</i>	SOC
	haiwale	<i>Cyrtandra limahuliensis</i>	T
	haiwale	<i>Cyrtandra pickeringii</i>	SOC
	naenae	<i>Dubautia imbricata</i> var. <i>imbricata</i>	SOC
	naenae	<i>Dubautia pauciflora</i>	E
	anini	<i>Eurya sandwicensis</i>	SOC
	heau	<i>Exocarpus luteolus</i>	E
		<i>Hesperomania lydgatei</i>	E
	manono	<i>Hedyotis elatior</i>	SOC
	manono	<i>Hedyotis tryblium</i>	SOC
	kokio	<i>Hibiscus kokio</i> var. <i>kokio</i>	
		<i>Joinvillea ascendens</i> var. <i>ascendens</i>	SOC
	kamakahala	<i>Labordia lydgatei</i>	E
	kamakahala	<i>Labordia tinifolia</i> var. <i>wahiawaensis</i>	E
	alani	<i>Melicope quadrangularis</i>	E
	kolea	<i>Myrsine linearifolia</i>	T
		<i>Platydesma rostrata</i>	SOC
		<i>Viola helenae</i>	E
		<i>Viola kauaiensis</i> var. <i>wahiawaensis</i>	E
animals	Newell's shearwater	<i>Puffinus newelli</i>	E



NATIONAL TROPICAL BOTANICAL GARDEN

Chartered by Congress To Create A National Resource In Tropical Botany

Wed. June 30, 2004

Dear: Allan Rietow

When hiking June 18, 2004 at Kanele Bogs
I did not observe any threatened or
endangered plants within two meters
on either side of the line of the
proposed enclosure fence line route.
Natalia Tangalin, National Tropical
Botanical Garden field botanist is
of the same accord.

Robert Nishek

Nursery Manager

National Tropical Botanical Garden

Cultural Surveys Hawai'i, Inc.
Archaeological and Cultural Impact Studies
Hallett H. Hammatt, Ph.D., President



P.O. Box 1114 • Kailua, Hawaii 96734 • Ph.: (808) 262-9972 • Fax: (808) 262-4950
info@culturalsurveys.com • www.culturalsurveys.com

FAX TRANSMITTAL

To: Allen

Fax Number: 808-245-1642

Date: 12 / 4 / 2005

From: Anahi

Subject: OHA Letter copy

Remark: I would like to know if you have
scheduled a visit to Kanaele?
756-4015 cell phone

Please call (808) 262-9972 if you do not receive _____ page(s) including this cover sheet or if transmission was received incomplete.

PHONE (808) 594-1888

FAX (808) 594-1865



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

HRD05/2028

September 28, 2005

Aulii Mitchell
Cultural Surveys Hawaii, Inc.
P.O. Box 1114
Kailua, HI 96734

RE: Cultural Impact Assessment of a Proposed Fencing Installation Surrounding the Kanaele Bog, Wahiawa, Kaua'i, TMK 2-4-09.

Dear Mr. Mitchell,

The Office of Hawaiian Affairs (OHA) is in receipt of your September 2, 2005 request for comment on the above listed proposed project, TMK 2-4-09. We apologize for the slight delay in responding to your request. OHA offers the following comments:

The primary concern for our staff is that Native Hawaiian gathering practices may be impeded by the Kanaele Fence project. Please contact our office if it appears that the project will have an adverse impact on traditional practices. Our office appreciates your continued correspondence.

OHA further requests your assurances that if the project goes forward, should iwi or Native Hawaiian cultural or traditional deposits be found during ground disturbance, 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 or concerns, please contact Jesse Yorck at (808) 594-0239 or jessey@oha.org.

'O wau iho nō,

A handwritten signature in black ink, appearing to read "Clyde W. Nāmu'o".

Clyde W. Nāmu'o
Administrator

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

YVONNE Y. IZU
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

**HAWAII HISTORIC PRESERVATION
DIVISION REVIEW**

Memorandum

Log #: 2004.2118
Doc #: 0407NM09

Applicant/Agency: Allan Rietow, The Nature Conservancy of Hawaii, Kaua'i Field Office
Address: P.O. Box 29, Kilauea, HI 96754
SUBJECT: National Historic Preservation Act – Section 106 Review – USFWS
Fencing Project Around Kanaele Bog
Ahupua`a: Kalaheo/Waihawa
District, Island: Koloa, Kauai
TMK: (4) 2-4-9

1. We believe there are no historic properties present, because:
- a) intensive cultivation has altered the land
 - b) residential development/urbanization has altered the land
 - c) previous grubbing/grading has altered the land
 - d) an acceptable archaeological assessment or inventory survey found no historic properties
 - e) other

2. This project has already gone through the historic preservation review process, and mitigation has been completed ____.

Staff: *Peter T. Young*

Date: *July 16, 2004*

Title: State Historic Preservation Officer

Kanaele Bog Protective Fence
Agencies and Parties Distribution List

First Name	Last Name	Organization Address	Relationship	Status
Dr. David	Burney	National Tropical Botanical Garden	Local Agency	R
Margaret	Clark		Local Resident	R
Ian	Costa	County of Kaua'i Planning Dept.	County Agency	M
Ellen	Coulombe	c/o National Tropical Botanical Garden	Local Resident	R
Howard	Greene	Gay & Robinson, Inc.	Local Land Owner	R
Alvin	Kyono	DLNR - Division of Forestry & Wildlife	State Agency	M
Sam	Lemmo	DLNR - Office of Conservation & Coastal Land	State Agency	M
Roland	Licona	Department of Hawaiian Home Lands	State Agency	M
Paul	Massey	Kauai Native Plant Society	Local Agency	R
Aulii	Mitchell	Cultural Surveys Hawaii Inc.	Local Agency	R
Leland	Nishek	c/o Kauai Landscaping, Inc.	Local Business	R
Christine	Ogura	DLNR - Division of Forestry & Wildlife	Accepting Authority	M
Benton	Pang	USFWS Pacific Island Ecoregion	Federal Agency	M
Tom	Shigemoto	A & B Properties Inc.	Land Manager	M
Donn	Soares	Kauai Coffee Company, Manager	Local Business	R
Neil	Tagawa	Grove Farm Properties	Local Land Owner	R
Jeyan	Thirugnanam	Office of Environmental Quality Control	State Agency	M
Chipper	Wichman	National Tropical Botanical Garden	Local Agency	R
Ken	Wood		Local Resident	R
Peter	Young	DLNR - Historic Preservation Division	State Agency	R
		McBryde Sugar Company, Limited	Land Owner	M
		Department of Health	State Agency	R
		Hanapepe Public Library	State Library - Nearest	M

KEY

M = Mandatory

R = Recommended

December 20, 2005

Allan Rietow
Field Representative
TNC, Kauai Program
Lihue Town Plaza
4180 Rice St., Suite 102B
Lihue, HI 96766

Re: Pre-Consultation on Environmental Assessment for Protective Fencing around Kanaele Bog, Island of Kauai.

Dear Sir:

As a resident of Kalaheo Town for the past eleven years I feel qualified to speak regarding access issues affected by the proposed fence construction.

The Kanaele Bog is located in the Wahiawa watershed; areas privately owned and not open for public use at this time. In the recent past, the area was not restricted by the currently locked gate, and vehicular traffic was allowed on the dirt road leading to Alexander Reservoir. Residents in the area still hope to see the situation resolved and the gate reopened.

However, whether or not that occurs, the proposed fence around Kanaele Bog will not restrict use, as the eighty acre area can easily be circumvented. The value accrued to the fragile ecosystem by the construction of the proposed fence mitigates any negative impacts which may arise.

Ellen Coulombe
Administrative Assistant
Conservation Department
National Tropical Botanical Garden
3530 Papalina Rd.
Kalaheo, HI 96741

December 30, 2005

Allan Rietow, Kaua`i Field Representative
The Nature Conservancy
Lihu`e Town Plaza
4180 Rice Street
Suite 102 B
Lihu`e, HI 96766

Dear Mr. Rietow:

My apologies for this belated response to your request for comments on the preliminary Draft EA for the Kanaele Bog protective fence.

I have read the document and looked over the accompanying species lists, and find it to be generally acceptable and on a par with many similar documents I have reviewed in the past. There are some typographical and punctuation errors, but not very many, and I trust that these will come out in subsequent revision. If you wish, I can return my copy with these marked in red.

I only have a few suggestions, these related to the cultural and historical aspects:

1. Cultural factors are obviously the weakest part of the document, with only very scant information. I suggest, in order to obtain more information regarding traditional usage, that you contact Dr. Carlos Adrade, of the UH-Manoa Hawaiian Studies program. He has devoted a lot of time in recent years to interviewing elderly local people concerning traditional land usage. Although his efforts have focused on the Ha`ena area and Niihau, I suspect he may have some relevant information. You may also want to contact Ms. LaFrance Kapaka-Arboleda, of the Kaua`i Office of Hawaiian Affairs. She has long experience with the Island Burial Council and other local groups concerned with preservation of cultural materials. I can supply phones, addresses, and emails for these folks if you don't have access to them.
2. The site is a proven resource for paleoecological information, but this is not acknowledged in the document. The sediment stratigraphy, for instance, is much more interesting and complex than implied here. A 5 m sediment core from the bog collected with a piston-sampler contained a record of sedimentary changes at the site back to about 23,000 radiocarbon years ago (Burney, 2002). Stratigraphic changes reflect climatic and hydrological variation over this time, and probing shows that an even longer paleoecological record is contained in the site, reflecting the bog's great antiquity. There is also intermittent preservation of fossil pollen, providing a record of past vegetation. However, preservation is much better in many of our other sites, so we have not studied the palynology of the bog in detail. It is not surprising that the location contains so many narrow endemics, as it has provided a stable habitat for bog plants for a very long time.

December 30, 2005

Allan Rietow, Kaua`i Field Representative
The Nature Conservancy
Lihu`e Town Plaza
4180 Rice Street
Suite 102 B
Lihu`e, HI 96766

Dear Mr. Rietow:

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I have read the document and looked over the accompanying species lists, and find it to be generally acceptable and on a par with many similar documents I have reviewed in the past. There are some typographical and punctuation errors, but not very many, and I trust that these will come out in subsequent revision. If you wish, I can return my copy with these marked in red.

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December 11, 2005

Kaua`i Field Representative, Allan Rietow
The Nature Conservancy in Hawai`i
Kaua`i Program
Lihu`e Town Plaza
4180 Rice Street, Suite 102 B
Lihu`e, Kaua`i, HI 96766

Dear Mr. Rietow,

I have reviewed the Preliminary Draft Environmental Assessment for the proposed Protective Fencing around Kanaele Bog, on Kaua`i. I have also reviewed the list of the plants which would be protected by the fence.

As a member of Kaua`i Native Plant Society, and an employee of the National Tropical Botanical Gardens' Conservation Department, I am aware of the absolute necessity of excluding feral ungulates if the endangered rare plants of Kaua`i are to be saved from extinction. If anything it appears that ungulate pressure in Kaua`i's native forests have increased in the last few years.

I am not aware of cultural sites or traditional gathering in the area. While doing interviews for Hui o Laka's strategic planning process, I became aware that some West Kaua`i hunters may be under the impression that the fence will impact their activities. For this reason, I assume some direct dialogue with their association may be needed to enlist their support in this fencing project.

Kaua`i Native Plant Society is very supportive of this project, and we hope to assist in any way we can with its success.

Best wishes with your effort. Please keep me informed as the process continues.

Sincerely,

Margaret A. Clark, J.D., MSW, LLM





The Nature Conservancy in Hawai'i
Kaua'i Program
4180 Rice Street, Suite 102B
Lihue, HI 96766

tel (808) 246-0543
fax (808) 245-1642

nature.org/hawaii

Appendix I: DEA
Comment Period

July 18, 2006

TO INTERESTED AGENCIES, ORGANIZATIONS, AND INDIVIDUALS

Re: Review of Draft Environmental Assessment of the Proposed Kanaele Bog Protective Fence Project (Island of Kaua'i)

The purpose of this letter is to request your participation in the thirty-day review and comment process period of the Draft Environmental Assessment (Draft EA) for the Proposed Kanaele Bog Protective Fence Project. This Draft EA was prepared by The Nature Conservancy (TNC), acting by and through its Hawai'i Chapter, Kaua'i Program, in pursuant to Hawai'i Revised Statutes, Chapter 343.

The project involves the construction of a protective fence around the approximately eighty-acre Kanaele Bog, a boardwalk within the perimeter of the bog, and the removal of destructive feral ungulates from within the fenced bog area. The project will also require a Conservation District Use Permit, which will allow for the fence and boardwalk construction, facilitating the long-term protection of this unique bog ecosystem, and the rare and endangered species it supports. The property, owned by McBryde Sugar Co. Limited, and managed by A&B Properties Inc., is TMK Kaua'i 2-4-9-1. A summary of the project area, including maps with property boundaries, proposed protective fence line and boardwalk, is enclosed.

The Draft EA and supporting documents are available on-line on the Hawai'i's Association of Watershed Partnerships web-site at www.hawp.org. A hard copy will be placed at the Hanapepe Library for review. A hard copy is also available by request by contacting the TNC Kaua'i Program office at (808)246-0543.

The thirty-day review process period **begins July 23 and ends August 22, 2006**. Please let us know, during this period, if you have any comments or concerns so that they may be addressed in the Final Environmental Assessment. Please send original comments, in letter form with your signature (emails not accepted), to:

The Nature Conservancy, Kaua'i Program
Allan Rietow, Field Representative
4180 Rice Street, Suite 102B
Lihue, HI 96766

You may also fax your comments to the TNC Kaua'i Program office at (808) 245-1642.

BOARD OF TRUSTEES

S. Haunani Apoliona Peter D. Baldwin Zadoc W. Brown, Jr. Carl A. Carlson, Jr. Meredith J. Ching David C. Cole Samuel A. Cooke
Jean F. Cornuelle Peter H. Ehrman Kenton T. Eldridge Guy Fujimura J. Stephen Goodfellow Thomas Gottlieb James J.C. Haynes
Ron Higgins Peter Ho Stanley Hong Lawrence M. Johnson Dr. Kenneth Kaneshiro Bert A. Kobayashi, Jr. Faye Watanabe Kurren
Duncan MacNaughton Bill D. Mills Wayne Minami Michael T. Pfeffer H. Monty Richards Jean E. Rolles Scott Rolles
James Romig Jeffrey N. Watanabe Eric Yeaman

Copies of the comments should be sent to Office of Environmental Quality Control (OEQC) and to the approving agency, Department of Land and Natural Resources, Division of Forestry and Wildlife:

Office of Environmental Quality Control
235 S. Beretaina Street, Suite 702
Honolulu, HI 96813

Christine Ogura, Department of Land & Natural
Resources, Division of Forestry & Wildlife
1151 Punchbowl Street, Room 325
Honolulu, HI 96813

All written comments must be received or postmarked by **August 22, 2006**. Please indicate, in your letter, whether you wish to receive a notice of the Final EA when completed. If you have any questions, please contact me, Allan Rietow at arietow@tnc.org or (808) 639-7544. Mahalo for your participation in this EA process.

Sincerely,



Allan Rietow
Kaua'i Program Field Representative

Enclosure(s): Summary of Environmental Notice OECQ Publication

Appendix I: DEA
Comment Period

RECEIVED AUG 07 2006

LINDA LINGLE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

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

ROBERT K. MASUDA
DEPUTY DIRECTOR - LAND

DEAN NAKANO
ACTING DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
MONITORING AND RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENHANCEMENT

ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAOHOLAWE ISLAND RESERVATION COMMISSION
LAND
STATE PARKS

August 7, 2006

Mr. Allan Rietow, Field Representative
The Nature Conservancy, Kauai Program
4180 Rice St, Suite 102B
Lihue, Hawai'i 96766

LOG NO: 2006.2558
DOC NO: 0608NM07
Archaeology

Dear Mr. Rietow:

**SUBJECT: Chapter 6E-42 Historic Preservation Review (County) Draft EA for Proposed
Kanaele Bog Protective Fencing Project
Kalaheo, Koloa, Island of Kaua'i
TMK: (4) 2-4-009: 001**

The aforementioned project consists of a fencing project for Kanaele Bog.

We believe that "no historic properties will be affected" by this undertaking because:

- Intensive cultivation has altered the land
- Residential development/urbanization has altered the land
- Previous grubbing/grading has altered the land
- An accepted archaeological inventory survey (AIS) found no historic properties
- SHPD previously reviewed this project and mitigation has not been completed
- Other: *No subsurface excavation in previously-undisturbed sediments is included in this project.*

In the event that historic resources, including human skeletal remains, are identified during the construction activities, all work needs to cease in the immediate vicinity of the find, the find needs to be protected from additional disturbance, and the State Historic Preservation Division, Kauai Section, needs to be contacted immediately at (808) 742-7033.

Aloha,

Melanie Chinen, Administrator
State Historic Preservation Division

NM:

Cc: OEQC, 235 S. Beretania St., Suite 207 Honolulu, HI 96813
Christine Ogura, D.LNR Forestry & Wildlife Division, 1151 Punchbowl St. m Room 325, Honolulu,
HI 96813



The Nature Conservancy in Hawai'i
Kaua'i Program
4180 Rice Street, Suite 102B
Lihu'e, HI 96766

tel (808) 246-0543
fax (808) 245-1642

nature.org/hawaii

September 21, 2006

Melanie Chinen, Administrator
State Historic Preservation Division
Department of Land and Natural Resources (DLNR)
P.O. Box 621
Honolulu, HI 96809

COPY

Dear Ms. Chinen,

RE: Draft Environmental Assessment (DEA) for the Kanaele Bog Protective Fence Project, Kaua'i, Hawai'i Review

Thank you for your review of the subject DEA. We are now in the process of applying for the Conservation District Use permit to construct the fence and boardwalk.

In the event that historic resources, including human skeletal remains, are identified during the construction activities, all work will cease in the immediate vicinity of the find, the find will be protected from additional disturbance, and we will immediately contact the State Historic Preservation Division, Kaua'i Section.

We will also ensure that no subsurface excavation, in previously-undisturbed sediments, is included in this project.

Please feel free to contact us at (808) 639-7544 or email me at arietow@tnc.org.

Sincerely,

Allan Rietow
Kaua'i Program, Field Representative

cc: Office of Environmental Quality Control 235 S. Beretania St., Suite 207, Honolulu, HI 96813
Christine Ogura, DLNR Forestry & Wildlife Division, 1151 Punchbowl St. Room 325,
Honolulu, HI, 96813

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The Nature Conservancy, Kaua'i Program
Allan Rietow, Field Representative
4180 Rice Street, Suite 102B
Lihue, HI 96766

Dear Mr. Rietow,

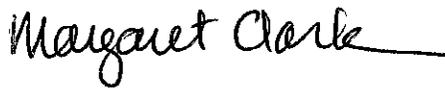
I am writing as a part of the review process for the Draft Environmental Assessment of the Proposed Kanaele Bog Protective Fence Project, on the Island of Kauai. As I stated in my earlier comments, I strongly support the provision of the plan to fence the Kanale Bog and build a boardwalk for access which would not damage the native plant community there.

As a resident of the nearby area, I have had the opportunity to visit the area on a TNC guided hike. I hope to have other opportunities to help as a volunteer in invasive species removal and other conservation activities around the Bog, as it is a special place which should be protected and preserved.

I also work in the conservation field, for the National Tropical Botanical Garden, and have had the responsibility of reviewing several of the endangered plant species in the Wahiawa-Kanaele area for U. S. Fish and Wildlife Department reports. It is clear from that work, that a number of threatened and endangered plants in the area will go extinct within a few years without protection such as this fence.

For these reasons I again wish to express my support for the proposed project and for the Draft EA.

Sincerely



Margaret Clark
P.O. Box 11
Lawai, Kauai 96765
(808) 332-9676
maiapilo@hawaiiantel.net



The Nature Conservancy in Hawai'i
Kaua'i Program
4180 Rice Street, Suite 102B
Lihu'e, HI 96766

tel (808) 246-0543
fax (808) 245-1642

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September 21, 2006

Margaret Clark
P.O. Box 11
Lawai, HI 96765

Dear Ms. Clark,

Re: Review of Draft Environmental Assessment (DEA) for the Kanaele Bog Protective Fence Project, Kaua'i, Hawai'i

Thank you very much for your participation in the subject DEA comment process and for your strong support of this important conservation project. You are one of a growing number of interested people whom have visited the Kanaele Bog and appreciate the need to protect it, and preserve it as soon as is possible.

We sincerely hope that you will continue to support the project, through the permitting process, and will consider at sometime, in the future, supporting the conservation management of the bog, in some manner, as a volunteer.

Best regards,

Allan Rietow
Kaua'i Program, Field Representative

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

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HRD06/2587

August 21, 2006

Alan Rietow, Field Representative
The Nature Conservancy, Kaua'i Program
4180 Rice Street, Suite 102B
Līhu'e, HI 96766

RE: Draft Environmental Assessment for the Proposed Kanaele Bog Protective Fence Project, Kaua'i.

Dear Mr. Rietow,

The Office of Hawaiian Affairs (OHA) is in receipt of your July 18, 2006 submission and offers the following comments:

Our staff has reviewed the Draft Environmental Assessment, as well as participated in a site visit to Kanaele and feels that the project, as defined, will have a beneficial impact on native resources. Thank you for your continued correspondence.

Thank you for the opportunity to comment. If you have further questions or concerns, please contact Jesse Yorck, Native Rights Policy Advocate, at (808) 594-0239 or jessey@oha.org.

Aloha,

A handwritten signature in black ink, appearing to read "Clyde W. Nāmu'o".

Clyde W. Nāmu'o
Administrator

CC: OHA Community Affairs Coordinator (Kaua'i)
3-3100 Kuhio Hwy., Suite C4
Lihue, HI 96766-1153



The Nature Conservancy in Hawai'i
Kaua'i Program
4180 Rice Street, Suite 102B
Lihu'e, HI 96766

tel (808) 246-0543
fax (808) 245-1642

nature.org/hawaii

COPY

September 21, 2006

Clyde W. Nāmu'o
State of Hawaii, Office of Hawaiian Affairs
711 Kapi'olani Blvd. Suite 500
Honolulu, HI 96813

Dear Mr. Nāmu'o,

RE: Review of the Draft Environmental Assessment (DEA) for the Kanaele Bog Protective Fence Project, Kaua'i, Hawai'i

Thank you for your participation in the subject DEA process and your continued support for this important protective fence project for Kanaele Bog. We are now in the process of applying for the Conservation District Use permit.

If we have any further questions or concerns we will contact Jesse Yorck. Please feel free to contact us at (808) 639-7544 or email me at arietow@tnc.org.

Sincerely,

Allan Rietow
Kaua'i Program, Field Representative

cc: Office of Hawaiian Affairs, Community Affairs Coordinator of Kaua'i

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Paul Massey
P.O. Box 2078 Kapaa, HI 96746
(808) 652-7898
paul@kauainature.com

August 22, 2006

The Nature Conservancy, Kaua'i Program
Allan Rietow, Field Representative
4180 Rice Street, Suite 102 B
Lihue, HI 96766

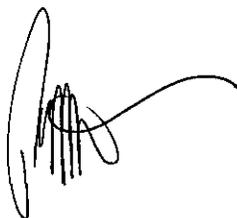
Dear Mr. Rietow,

Thank you for the opportunity to provide comments on the *Draft Environmental Assessment for Kanaele Bog Protective Fence Project*, dated May 2006. I share in the belief that this project is a wise and timely use of conservation resources and effort. I commend the landowner, A&B Properties, Inc., for facilitating the planning of active management of this unique ecosystem, and The Nature Conservancy of Hawai'i, for fostering inclusive participation from the many diverse stakeholders.

The Cultural Impact Assessment prepared for this project stands on its own as an impressively researched historical document of great value to present and future interests in the area. TNCH's commissioning of such a thoughtful report underscores its commitment to respecting the traditional values associated with the project site.

I have one technical recommendation: since it is possible that wildlife capable of leaping over a 42-inch fence (i.e. deer, goats) could feasibly migrate into the project area during the life of the fence, I suggest that posts tall enough to accommodate a possible future vertical fence extension be used. While this may add notable cost on the front end of the project, it may prevent a prohibitively expensive replacement cost down the road.

Sincerely,

A handwritten signature in black ink, appearing to read 'Paul Massey', with a long, sweeping horizontal line extending to the right.

Paul Massey



The Nature Conservancy in Hawai'i
Kaua'i Program
4180 Rice Street, Suite 102B
Lihu'e, HI 96766

tel (808) 246-0543
fax (808) 245-1642

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September 21, 2006

COPY

Paul Massey
P.O. Box 2078
Kapaa, HI 96746

Dear Mr. Massey,

Re: Review of the Draft Environmental Assess (DEA) for the Kanaele Bog Protective Fence Project, Kaua'i, Hawai'i

Thank you for your comments and support of this important conservation project. We appreciate your thoughtful comments. We are hopeful that you will continue to support the project during the permitting process and possibly as volunteer during the ongoing management of the project.

Goats and deer do exist on the island and yes they could feasibly migrate into the project area. We will look at the cost, of such a modification, to our plans and consider your suggestion.

Please feel free to contact me at (808) 639-7544 or email me at arietow@tnc.org.

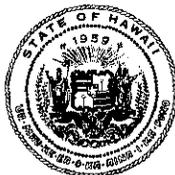
Best regards,

Allan Rietow
Kauai Program, Field Representative

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LINDA LINGLE
GOVERNOR OF HAWAII



GENEVIEVE SALMONSON
DIRECTOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL

235 SOUTH BERETANIA STREET
SUITE 702
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185
FACSIMILE (808) 586-4186
E-mail: oeqc@health.state.hi.us

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August 21, 2006

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

Dear Mr. Young:

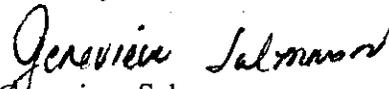
Subject: Draft Environmental Assessment for the Kanaele Bog Protective Fence Project, Kauai

Thank you for the opportunity to review the subject document. We have the following comments.

1. What are the potential impacts on any hunting activities in the area? Please contact existing hunting groups, if any, to determine the impacts.
2. Please print on both sides of the pages in the final document to reduce bulk and save on paper. HRS 342G-44 requires double-sided copying in all state and county agencies, offices and facilities.

Should you have any questions, please call Jeyan Thirugnanam at 586-4185.

Sincerely,


Genevieve Salmonson
Director

c: Nature Conservancy



The Nature Conservancy in Hawai'i
Kaua'i Program
4180 Rice Street, Suite 102B
Lihu'e, HI 96766

tel (808) 246-0543
fax (808) 245-1642

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September 21, 2006

COPY

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

RE: Review of Draft Environmental Assessment (DEA) for the Kanaele Bog Protective Fence Project, Kaua'i, Hawai'i

Thank you for your participation in the subject DEA process and your continued correspondence.

In response to your question concerning potential impacts on any hunting activities in the area, no known access hunting trails will be obstructed by the proposed fence and a minimum of two gates will be installed during the fencing project to allow access. Additionally, the project area and surrounding parcel are managed by the land owner. For any additional information please refer to the "Cultural Impact Assessment for the Kanaele Protective Fence Project in the Uplands of Wahiawa (Mitchell and Hammatt 2005)."

As instructed, and to save on paper and bulk, the final subject document will be on double sided copy.

Please feel free to contact me at (808) 639-7544 or email me at arietow@tnc.org.

Sincerely,

Allan Rietow
Kaua'i Program, Field Representative

cc: Thomas Shigemoto, A&B Properties, Inc.
Peter Young, Department of Land and Natural Resources

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Cultural Impact Assessment
for the Kanaele Protective Fence Project in the Uplands of
Wahiawa
Ahupua'a, Kona District, Island of Kaua'i
TMK: [4] 2-4-009

by
Auli'i Mitchell, B.A.
and
Hallett H. Hammatt, Ph.D.

Prepared for
The Nature Conservancy Hawai'i, Kaua'i Program

Prepared by
Cultural Surveys Hawai'i, Inc.
Kailua, Hawai'i
(WAHI 6)

December 2005

O'ahu Office
P.O. Box 1114
Kailua, Hawai'i 96734
Ph.: (808) 262-9972
Fax: (808) 262-4950

www.culturalsurveys.com

Maui Office
16 S. Market Street, Suite
2N
Wailuku, Hawai'i 96793
Ph: (808) 242-9882
Fax: (808) 244-1994

Management Summary

Report Reference	Cultural Impact Assessment for the Kanaele Protection Fence Project in the Uplands of Wahiawa Ahupua'a, Kona District, Island of Kaua'i (Mitchell and Hammatt 2005)
Project Number	Cultural Surveys Hawai'i, Inc. (CSH) Job Code: WAHI 6
Location	Kaua'i Island, Kona District, Wahiawa Ahupua'a, TMK (4) 2-4-009, Hanapēpē Quad USGS 7.5 Minute Topographic Quadrangle Map
Date Submitted	December 2005
Agencies	State Historic Preservation District, Department of Health (DOH), Office of Environmental Quality Control (OEQC), The Nature Conservancy Hawai'i (TNC)
Land Jurisdiction	Alexander & Baldwin
Development Project Description and Acreage	The project involves hand-clearing vegetation with hand operated tools (i.e., handsaw, pick ax, weed eater, chainsaw) from a 10 foot wide corridor around the Wahiawa Bog. The proposed fence would be approximately 2000 ft in length and enclose approximately 80 acres of the bog and surrounding forest. A 42-inch high fence will be constructed using hog wire fence fabric supported by wooden posts and steel fence posts. The outside of the fence will be skirted along the base with a hog wire apron and a band of beznal coated barbwire.
Area of Potential Effect (APE)	The area of potential effect (APE) includes the enclosure of approximately 80 acres of the bog and surrounding forest.
Document Purpose	The project requires compliance with the State of Hawai'i environmental review process [Hawai'i Revised Statutes (HRS) Chapter 343], which requires consideration of a proposed project's effect on traditional cultural practices. At the request of The Nature Conservancy, CSH undertook this cultural impact assessment to provide information pertinent to the assessment of the proposed project's impacts to cultural practices. The document is intended to support the project's environmental review through cultural consultation efforts [per the OEQC's <i>Guidelines for Assessing Cultural Impacts</i>]. The report may also serve to support the project's historic preservation review under HRS Chapter 6E-42 and Hawai'i Administrative Rules Chapter 13-284.

Consultation Effort	Hawaiian organizations, agencies and community members were contacted in order to identify potentially knowledgeable individuals with cultural expertise and/or knowledge of the project area and the vicinity. The organizations consulted included the SHPD, the Office of Hawaiian Affairs (OHA), the Kaua'i/Ni'ihau Islands Burial Council, the Kaua'i Historic Preservation Review Commission, and Hui Malama I Nā Kūpuna O Hawai'i Nei. Cultural anthropologist Aulii Mitchell conducted the consultation effort under the general supervision of Hallett H. Hammatt, Ph.D. (principal investigator).
Identified Cultural Issues	None of the community contacts queried for this assessment identified any cultural sites in the project area, or recalled anyone entering the project area – either in the past or present – for any traditional cultural practice. Based on the evidence gathered, at present no contemporary or continuing cultural practices occur within the project area.
Cultural Impact Recommendations	Based on the findings of this assessment, the Kanaele Protective Fence Project and the future maintenance of the fence will have minimal impact upon native Hawaiian cultural resources, beliefs and practices. It should be noted, however, that there are many native plant species within the project area and as a precautionary measure, personnel involved in the construction of the fence and its maintenance should follow proper procedures to ensure the safety of the many plants native to the bog environment.

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Section 1 Introduction

1.1 Project Background

At the request of The Nature Conservancy Hawai'i, Kaua'i Program, Cultural Surveys Hawai'i Inc. has conducted a cultural impact assessment for an approximately 80 Acre Kanaele Fence Project in the uplands of Wahiawa Ahupua'a, Kona District, Island of Kaua'i, (TMK: [4] 2-4-009) (Figures 1, 2 & 3).

According to The Nature Conservancy Hawai'i, Kaua'i Program:

The project will be located in the Kona Moku on the island of Kaua'i, in the mauka watershed of the Wahiawa Ahupua'a (Wahiawa drainage) above Kalāheo Town. It will be restricted to the flat tableland below Mount Kāhili and east of Wahiawa Stream at 2,100 ft elevation. The proposed fence would be approximately 2,100 feet in length and enclose approximately 80 acres of the bog and surrounding forest. The fence would begin about 1,000 ft north of the end of the dirt road. It will run north, roughly following an existing trail almost to the dirt road. It will run north, roughly following an existing trail almost to the south tributary of Wahiawa Stream and at the base of a prominent pu'u. The fence would then turn east, paralleling the stream until turning at and following the base of Mount Kāhili. It would then follow a westerly course to its beginning, completely enclosing the bog.

The fence will be constructed of 42-inch high bezenal-coated hog wire fence fabric with a basal strand of bezenal-coated barbwire. The fence fabric will be supported by bezenal-coated steel fence posts and treated wood posts placed no more than 10 ft apart the entire length of the fence line. Shorter bezenal-coated steel pins will be used as anchors within the 10 ft span. The fence will have an apron of hog wire laid horizontally along the ground outside the fence to prevent pigs digging under. The fence alignment will be cleared by hand to width of no more than 10 feet.

After fence construction, the project will consist of natural resource monitoring, invasive weed control, and fence maintenance to track the recovery of the bog plant community, to reduce and/or eliminate the primary threats to the bog, and to minimize the impacts of the fence.

The project requires compliance with the State of Hawai'i environmental review process [Hawai'i Revised Statutes (HRS) Chapter 13-343], which requires consideration of a project's effect on traditional cultural practices. This CIA provides information pertinent to the evaluation of the project's cultural impacts. This document is intended to facilitate the project's state environmental review (per the Office of Environmental Quality Control's *Guidelines for*

Assessing Cultural Impacts). This report provides documentation of the project's consultation efforts under applicable state historic preservation legislation. A companion CSH archaeological inventory survey for the same project area provides further documentation to facilitate the project's required historic preservation review and consultation.

1.2 Scope of Work

The scope of work included:

- 1) Examination of historical documents, Land Commission Awards, historic maps, with the specific purpose of identifying traditional Hawaiian activities including gathering of plant, animal and other resources or agricultural pursuits as may be indicated in the historic record.
- 2) A review of the existing archaeological information pertaining to the general region as it may allow us to reconstruct traditional land use activities and identify and describe the cultural resources, practices, and beliefs associated with the harbor area prior to construction.
- 3) Contact persons knowledgeable about the historic and traditional practices in the study area and region by letter and telephone.
- 4) Preparation of a report on items 1-3 summarizing the information gathered related to traditional practices and land use. The report will assess the impact of the proposed action on the cultural practices and any features identified.

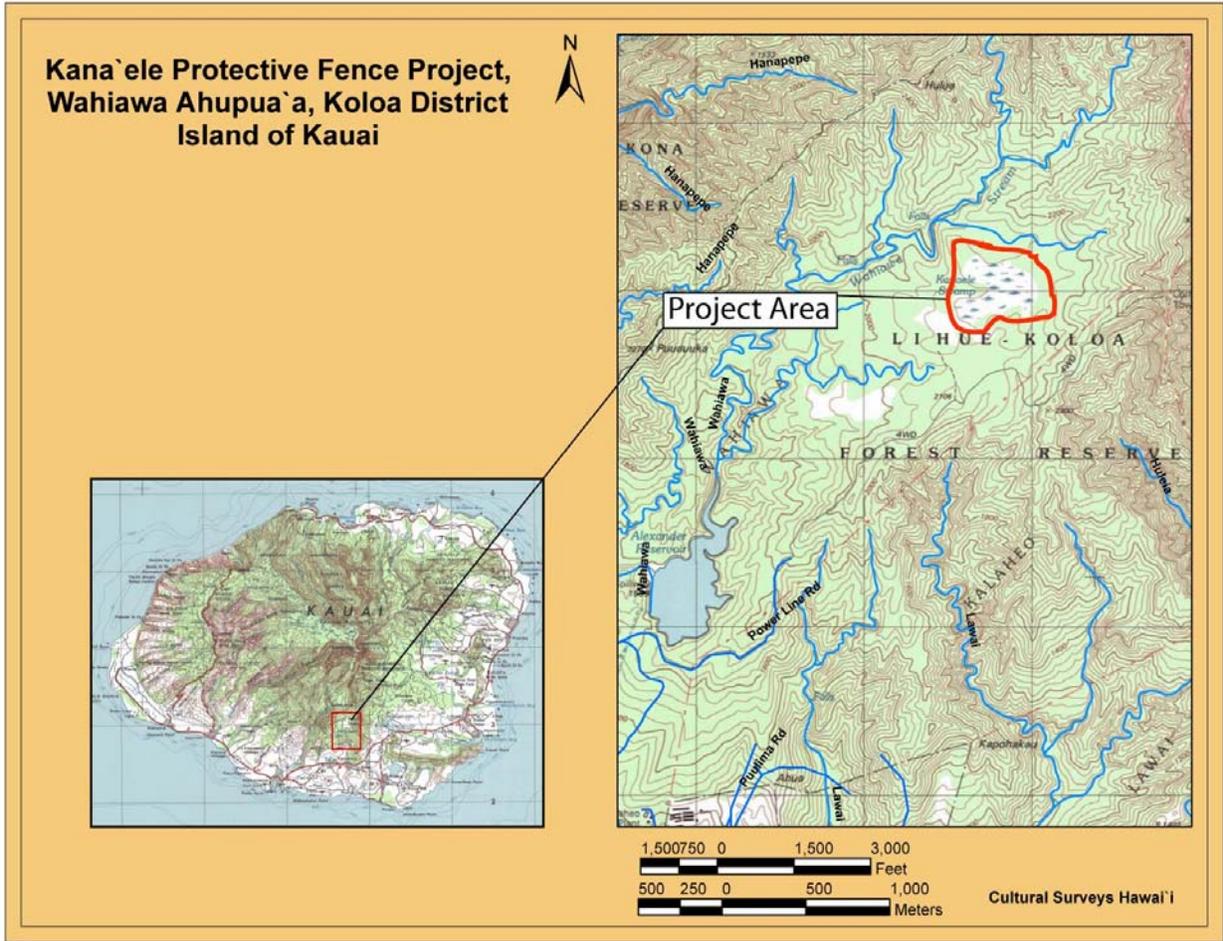
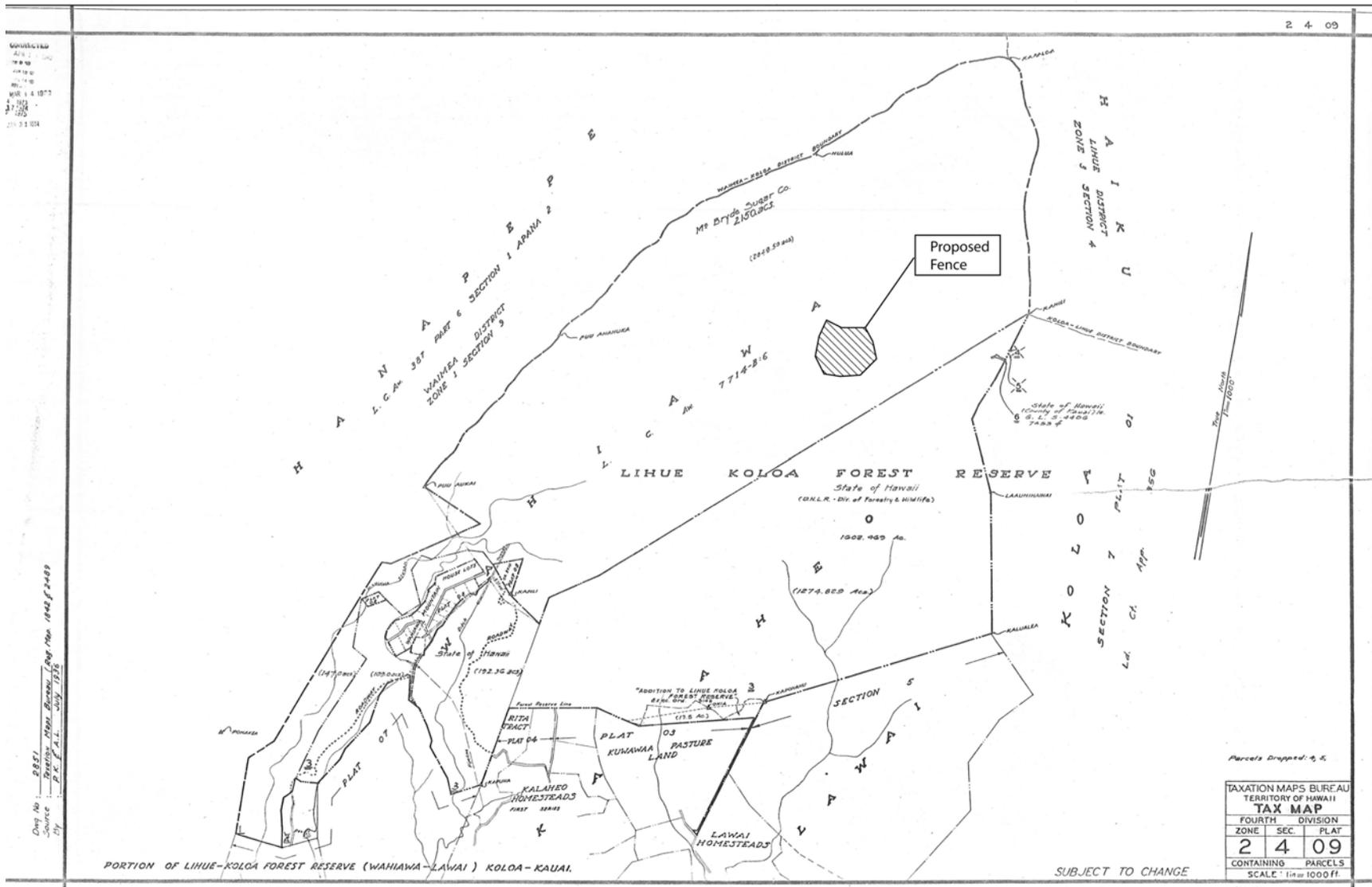


Figure 1 USGS map showing location of proposed Kana'ele Protective Fence project area



Kana'ele Bog

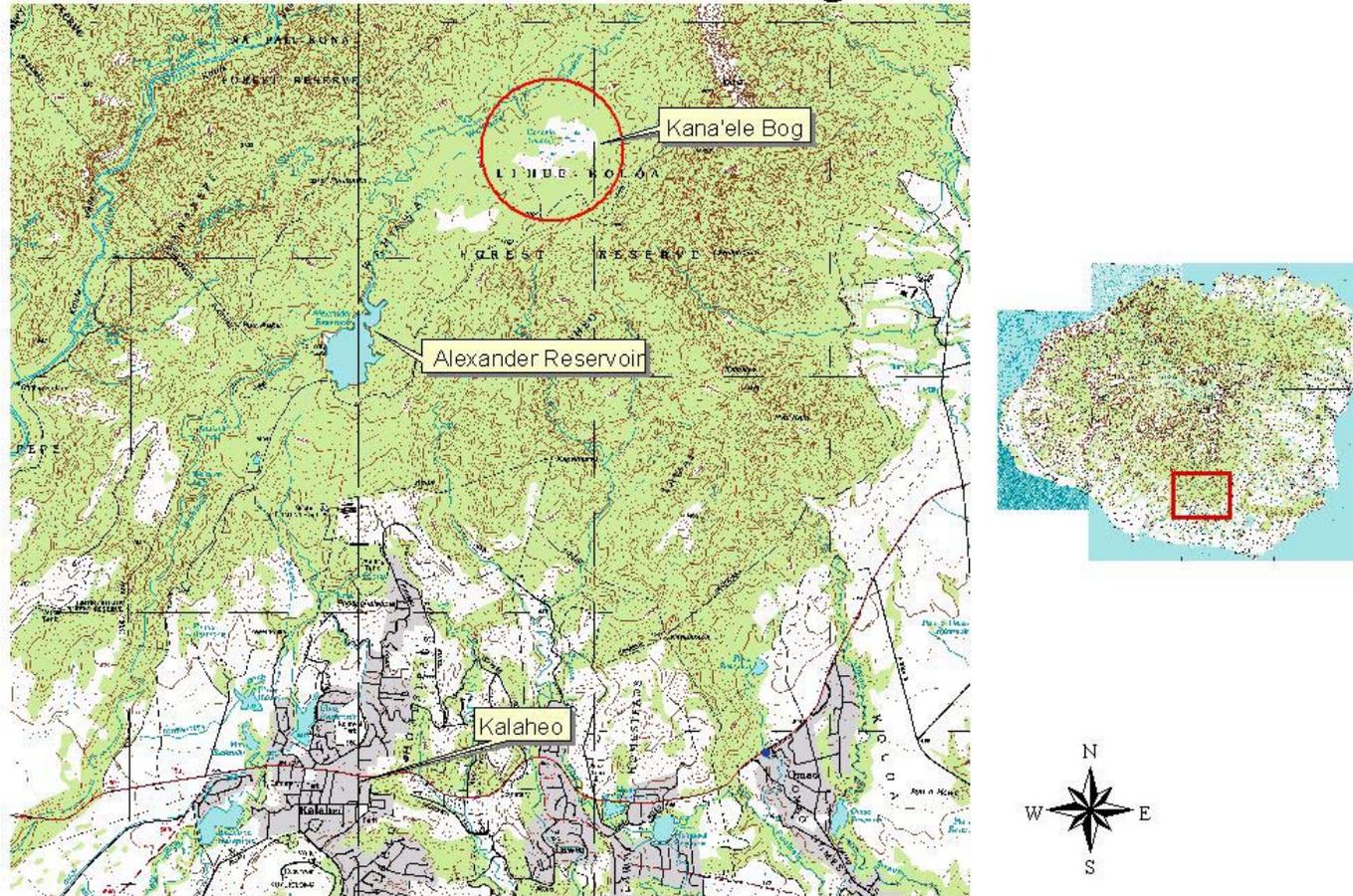


Figure 3 Kanaele Protective Fence Project Map Showing Location of Project Area



Figure 4 Kanaele Bog photograph The Nature Conservancy Kaua'i Program

1.3 Work Accomplished

Historical documents, maps, and photographs were researched at: the Kaua'i Historical Society, the Hawai'i State Archives; the Survey Office of the Department of Accounting and General Services; the Hawai'i State Library; the Bernice Pauahi Bishop Museum archives and library; Hamilton Library at the University of Hawai'i at Mānoa; the Mission Houses Museum Library; the State Historic Preservation Division (SHPD) library; and the library of Cultural Surveys Hawai'i.

Hawaiian organizations, government agencies, community members and cultural and lineal descendants with ties to Ahupua'a and the Kona District of Kaua'i were contacted to: (1) identify potentially knowledgeable individuals with cultural expertise and knowledge of the study area and the surrounding vicinity, and (2) identify cultural concerns and potential impacts within the study area. Results of the community contact process are presented in Section V.

1.4 Natural Setting

Wahiawa Ahupua'a is located in the Kona District of southern Kaua'i, bordered by Kalāheo Ahupua'a to the east and Hanapēpē Ahupua'a to the west. In general, the *makai* portion of Wahiawa Ahupua'a consists of a gently rolling, raised plateau, with Wahiawa Valley running along the western border of the *ahupua'a*.

Section 2 Mythological and Traditional Associations of Wahiawa Ahupua'a

(Wahi-awa) Valley, or “milkfish place,” was said to have been named after the tradition of the Pōhakuawa stone (Kikuchi 1963). The Pōhakuawa stone is a large boulder with a bowl carved into its surface, formerly located “about a mile west of Brydeswood on the trail to the upper lands” (Sandison 1956). It is noted that the stone was used in traditional Hawaiian times by fisherman transporting *awa* (milkfish) from the brackish Nōmilu fishpond to a large pool in the Wahiawa Stream. “The fisherman stopped the night at Pōhakuawa and kept his catch alive in cool fresh water in the bowl of the rock that was draped over with vines to keep the stone cool and keep the fish from jumping out” (Sandison 1956).

Legendary accounts place a battle occurring at between members of the ruling family of Kaua'i (Fornander 1959). 'Aikanaka, the then king of Kaua'i, had recently been defeated in battle by his younger brother, Kawelo. Following the conquest, Kawelo divided the lands to his choosing, leaving 'Aikanaka to live in poverty with no lands and no home. 'Aikanaka settled in upland Hanapēpē, where he was later visited by Kaeleha, and the son of Kawelo. The two met at, at the home of Ahulua. Kaeleha was shown great kindness and hospitality by 'Aikanaka, and therefore felt indebted to him.

Taking pity on 'Aikanaka for the way he was forced to live, Kaeleha instructed him on how to defeat his father, Kawelo, in battle. 'Aikanaka was told to fight Kawelo with stones because he was never taught to dodge stones thrown at him. Learning of the possible uprising by 'Aikanaka, Kawelo sent Kamalama to confirm the rumors. Kamalama returned news that 'Aikanaka and Kaeleha were gathering stones and making preparations for war. With great anger that his son would join 'Aikanaka and rebel against him, Kawelo immediately traveled to Wahiawa:

When he [Kawelo] arrived at, he saw several war canoes belonging to Kaeleha and Aikanaka, just back of the great mounds of stones. On the sides of the mounds of stones, he saw women and children with stones in their stands, and all were apparently ready for the conflict. All Kawelo had in his hands were his war club, Kuikaa, and his wife's pikoi, two weapons to defend himself with.

...In the fight, Kawelo was not able to dodge the stones that were hurled at him, for a great many of them were thrown at the same time, therefore he stood in one place while the stones were hitting him from all sides. In the course of time, Kawelo was completely covered by the stones, the stones rising until his height was reached...After a while the mound of stones over Kawelo grew higher and higher, when at last nothing else could be seen but a great mound of stones which was like a grave for Kawelo. (Fornander 1959:104-108)

Kawelo's body was later removed from the mound of stones. The people beat his lifeless body with clubs to insure that he was dead. The body was then carried from Wahiawa to 'Aikanaka's temple at Maulili in Kōloa.

Traditional accounts of Wahiawa indicate the environment in the *ahupua'a* was suitable for the development of an extensive agricultural system that likely supported a sizable native

Hawaiian population. Adequate rainfall, mild temperatures, and abundant spring and stream water in close association with arable land were ideal conditions for the cultivation of taro and other traditional staple foods. The following account is given by Keahi Luahine, a *kama'āina* raised in Wahiawa Valley:

...the taro terraces extended all the way down the valley to the *muliwai* (inlet). A short distance above the present highway bridge was a spring named Ka'ulupaniau, which watered a small group of terraces. Inland from this was Kawaikapulalo [The-sacred-water-below], and here were terraces and *wauke* (paper mulberry) plantations. Above this was *kula* land named Kawaikapuluna [The-sacred-water-above], on which were the houses and sweet-potato plantations. Continuing upstream to a point opposite Pu'u Aukai there were other terraces in the stream bed, with houses and sweet-potato plantations on *kula* land above. (Handy and Handy 1972:428-429)

Valley was also the location of the legendary stone, Kaua'i-iki (Little Kaua'i). A legend explains that in the process of clearing their *lo'i* of stones, a Hawaiian family came across this stone. Resembling a map of Kaua'i, they left the stone in place and gave it its name (Sandison 1956). An additional account by Keahi Luahine makes reference to the large stone that was shaped like the island of Kaua'i:

At Wahiawa on Kauai was a stone called Kauai-iki which stood in a taro patch also called Kauai-iki. The taro that grew there was the finest and the largest on the island, said to be made so by the stone. When the paved road was built Alexander McBride (sic) removed the Kaua'i-iki stone so that it should not be blasted and ground up by the road workers...In ancient times people used to say that even though you had seen the entire island of Kauai and had not seen Kauai-iki, then you had not seen all of Kauai. This small taro patch and stone were much visited in the old days. (Pukui in Handy 1940:65)

Section 3 Historical Background

3.1 Early Historic Period

During the early historic period, Wahiawa was again the setting of a battle over control of Kaua'i. In 1824, Kaumuali'i, the ruling chief of Kaua'i and Ni'ihau, became gravely ill. Nearing death, Kaumuali'i declared "our son" be his successor and "Let the lands be as they are; those chiefs who have lands to hold them, those who have not to have none" (Kamakau 1961:265). Following his death, Kahalai'a, nephew of Kaumuali'i and chief from Hawai'i Island, was announced as the new ruler over Kaua'i and Ni'ihau. However, the people of Kaua'i, both chiefs and commoners, expected one of Kaumuali'i's sons, Keali'iahonui or Humehume, to be named as successor.

Kahalai'a traveled to Kaua'i and settled at the former Russian Fort Elizabeth at Waimea. Soon after, a hostile sentiment spread among the people of Kaua'i over being ruled by an *ali'i* from Hawai'i. During this uneasy period, Rev. Hiram Bingham traveled to Wahiawa, leaving the following account:

I visited the disaffected George [Humehume] at his estate - the little secluded Wahiawa. It was a small valley, running back from the sea to the mountains, containing some twenty small habitations, about a hundred souls, and some hundred acres, very little cultivated, yielding a scanty amount of the common productions of arum, bananas, cocoanuts, potatoes, sugar-cane, squashes, melons, and wild apples. At the foot of this valley, I found George living much in the original native style, in a dingy, dirty, thatched house at the sea-side, just where the surf washes a small beach between two rocky cliffs. (Bingham 1847)

The Kaua'i warriors, led by Humehume, subsequently rebelled and attacked the fort at Waimea, where the Hawai'i chiefs had gathered. Armed with guns, the men of Hawai'i were able to hold off the rebels until the arrival of reinforcements from O'ahu. More than ten ships later arrived (Kamakau 1961):

On August 8 [1824] the battle of Wahiawa was fought close to Hanapēpē, where a fort had been hastily erected and a single cannon (named Humehume) mounted as a feeble attempt to hold back the enemy. In the evening there was an advance made, but the forces of Hawai'i retired to Hanapēpē for the night...Large numbers of Kaua'i soldiers had gathered on the battleground, but they were unarmed save with wooden spears, digging sticks, and javelins. Many women were there to see the fight. The men acted as if death were but a plaything. It would have been well if the gods had stepped in and stopped the battle. No one was killed on the field, but as they took to flight they were pursued and slain...For ten days the soldiers harried the land killing men, women, and children. (Kamakau 1961:268)

The battle of Wahiawa was later known as the “‘Pig eating’ (*Aipua‘a*) because the dead were left lying for the wild hogs to devour” (Kamakau 1961:233). Following the battle it was also noted:

A great deal of property was taken, among other things horses and cattle, which had become numerous on Kaua‘i because the foreigners had given many such to Kaumuali‘i...After the battle the chiefs all came together and Kalanimoku redistributed the lands of Kaua‘i ...It was decided that Kahalai‘a should not remain as ruler, but the islands be turned over to the young king, and Kaikio‘ewa was appointed governor and Kahalai‘a recalled. (Kamakau 1961:268-269).

3.2 Mid- to late-1800s

3.2.1 Early Sugar Culture on Kaua‘i

In 1835, a Honolulu firm, Ladd & Company, secured tenancy rights to a tract of land near Kōloa on Kaua‘i for silk and sugar culture. Early accounts tell of plows being drawn by natives, crude milling methods and low sugar yields (Thrum 1901). In spite of these handicaps, 5,000 pounds of sugar and 400 gallons of molasses were produced in 1839. Early references to the use of irrigation were noticeably absent. At that time, ownership of land was vested with the Kingdom. Prior to 1848, individuals and commoners were not able to hold title to land and any appurtenant water rights.

Although the *Māhele* of 1848 should have stimulated sugar enterprises, the industry declined due to a drought in 1851, and low sugar prices. The first use of irrigation to increase sugar yields occurred on the island of Kaua‘i. William Harrison Rice engineered a causeway to divert water from upland streams in 1852; and finished construction of eleven miles of ditches for the Makee Plantation in 1857 (H.S.P.A. 1920). With the Union States’ embargo of southern sugar plantations during the American Civil War, prices for Hawaiian sugar improved greatly in the 1860’s (Dorrance 2000).

3.2.2 The *Māhele*

The Organic acts of 1845 and 1846 initiated the process of the *Māhele* - the division of Hawaiian lands - that introduced private property into Hawaiian society. In 1848, the crown and the *ali‘i* (royalty) received their land titles. The common people received their *kuleana* (individual parcels) in 1850. It is through records for Land Commission Awards (LCAs) generated at the *Māhele* that the first specific documentation of life in Wahiawa Ahupua‘a, as it had evolved up to the mid-19th century, come to light (Indices of Awards 1929) (Table 1).

Table 1. Ahupua'a Land Commission Awards Summary

LCA #	Claimant	'Ili	Land Use	Claims Awarded
387	ABCFM (Mission)		Agriculture	2 'āpana, kula, lo'i
3215	Niha	Maloloiki	Habitation, Agriculture	2 'āpana, 1 house lot, 1 kula, 18 lo'i
3285	Waolani	Kanuimomai	Agriculture	2 'āpana, 1 kula, 30 lo'i, 1 pigpen
3323	Papohaku	Nana	Habitation, Agriculture	1 'āpana, 1 house lot, 1 kula, 40 lo'i
3356	Nahuina	Kukuioio	Agriculture	1 'āpana, 1 kula, 14 lo'i
3413	Pooahi	Malolonui, Kapaniau	Agriculture	2 'āpana, 2 kula, 30 lo'i
3595	Kanupaka	Malolonui	Habitation, Agriculture	2 'āpana, 1 house lot, 1 kula, 18 lo'i, 1 pigpen
5350	Puahiki, Nawaalau	Puuokahala	Habitation, Agriculture	1 'āpana, 1 house lot, 1 kula, 12 lo'i, 1 pigpen
5446	Nawaalau, Ezekiela	Puuokahala, Nana	Habitation, Agriculture	2 'āpana, 1 house lot, 1 kula, 18 lo'i
6325	Kekauonohi	(ahupua'a)	Agriculture	1 'āpana, 1 cattle enclosure (not awarded)
6557	Pohakahi	Kamokila	Habitation, Agriculture	1 'āpana, 1 house lot, 13 lo'i
7714B	Kekuaiwa (Kekuanaoa)	(ahupua'a)		All unclaimed land within the ahupua'a
8010	Aikala	Kauikuimomai	Habitation, Agriculture	1 'āpana, 1 house lot, 1 kula, 30 lo'i
8256	Hohoiea	Malolonui	Habitation, Agriculture	2 'āpana, 1 house lot, 1 kula, 2 lo'i
9057	Kaanaana	Waikupenau	Habitation, Agriculture	2 'āpana, 1 house lot, 1 kula, 23 lo'i (not awarded)
10273	Meheula	Nupaiki	Habitation, Agriculture	2 'āpana, 1 house lot, 1 kula, 19 lo'i, 1 goat pen
10632	Pahao	Kahookaoe, Palanohi	Agriculture	1 'āpana, 14 lo'i, 1 pigpen (not awarded)

LCA #	Claimant	'Ili	Land Use	Claims Awarded
10686	Paele	Nupa	Habitation, Agriculture	2 'āpana, 1 house lot, 1 kula, 21 lo'i, 1 pigpen
10946	Wailele	Kaluhi	Agriculture	1 'āpana, 1 kula, 10 lo'i
11088	Kui	Kukuiopio	Habitation, Agriculture	1 'āpana, 1 house lot, 1 kula, 7 lo'i, 1 pigpen

During the *Māhele*, the *ahupua'a* of Wahiawa, consisting of approximately 5,857 acres, was awarded to Moses Kekuaīwa (LCA 7714-B). Kekuaīwa was the grandson of Kamehameha I, and as a Hawaiian *ali'i*, he was not required to prove his tenure on the land. An additional 18 claims for *kuleana* parcels within Wahiawa were made by commoners able to prove their occupation and cultivation of the land. Of the 18 claims, 15 were awarded for parcels ranging in size from less than 1 acre to a maximum of 5 acres (LCA 10273 to Meheula). In general, the *kuleana* awards in Wahiawa were for 1 to 3 acres, which is typical of LCAs in the vicinity. The awarded lands were also situated within, or in the immediate vicinity of Wahiawa Valley and Stream, the main source of fresh water for domestic and agricultural usage within the *ahupua'a*. No maps indicating the precise locations of each of the LCAs were readily available. However, the numerous *'ili* (land section within an *ahupua'a*) names, and references to landmarks such as *pu'u* or the seashore, in the LCA documentation indicate widespread settlement throughout both the *mauka* and *makai* regions of the Wahiawa Valley. References are also made to the "community of Wahiawa" located in the vicinity of the Government Road (present day Kaumuali'i Highway) (N.R. Vol. 9, p. 388-389), indicating the focus of settlement within Wahiawa Ahupua'a was likely at this locale. The LCA documentation also indicated that nearly all of the claimants received their *kuleana* land at the time of Kaikio'ewa, evidence of the major redistribution of land within Wahiawa as a result of the battle of 1824.

Land Commission documents recording these *kuleana* land claims further clarify our understanding of the *'āina* from the perspective of the native Hawaiians in traditional times by defining specific land use practices within the claimed parcels (see Table 1). As the majority of the LCAs were located within Wahiawa Valley, adjacent to Wahiawa Stream, land use was focused on the cultivation of wetland taro (*lo'i*). A definite pattern is observed in the available documentation, indicating dense cultivation of taro, as evidenced by large numbers of *lo'i* within relatively small parcels of land. The claimant's house lot was also typically located within the same *'āpana* (land parcel) as his *lo'i*. Additional *'āpana* of an individual LCA were generally for discrete *kula* land located outside of Wahiawa Valley. For example, within an approximately 1 acre parcel, David Papohaku (LCA 3323) claimed 40 *lo'i*, *kula* (pasture) land, as well as a house lot. Also within the LCA 3323 documentation was the following testimony given by G.B. Rowell, a foreign missionary living in the islands:

I send survey of a house lot of above which Mr. Pease refused to survey, joining the lot which Mr. P surveyed for him, who chose to pass his boundary line close by this house, so as to have cut the yard, rather than go round the house to give him his due, though but a few minutes labor. It belongs to Papohaku from ancient times & there is not the slightest ground for opposing the claim.

I am told that Mr. Pease refused to survey the house lots of nearly all the Claimants in the Valley of Wahiawa . It is the opinion of the natives that he was bribed to do so by the konohiki. I have no time to attend to those lots, though pressed to do so by the people and I fear they must be deprived of them. G.B. Rowell (F.T. Vol. 12, p. 242)

The passage indicates one of the numerous roadblocks commoners faced in receiving their *kuleana* lands. Therefore, while LCA documentation can provide insight into land use practices and other facets of traditional life, it may not always be a good indication of actual population at

the time of the *Māhele*. Settlement and cultivation of lands were likely much greater than is represented by *kuleana* land awards.

The American Board of Commissioners for Foreign Missions (ABCFM) was also awarded a parcel of land within Wahiawa Valley (LCA 387:2). Testimony describing the claimed land indicated it was used for the cultivation of taro and was “known by the name of Kauaiki” (F.R. Vol. 2, p. 44). LCA 387:2 is located on the TMK map, immediately *makai* of Kaumuali'i Highway. The description of the parcel as taro land known as Kaua'i 'iki, along with the account stating that the Kaua'i 'iki stone was removed from a taro patch during road building activities (see A: Mythological and Traditional Accounts) suggests that LCA 387:2 was the original location of the legendary Kaua'i 'iki stone and taro patch.

The earliest documentation of the population of the district of Kōloa, including Wahiawa, appears in the 1850s when missionary censuses recorded a total population of 1,296 (Schmitt 1977:12). Population totals of the entire island of Kaua'i prior to 1850 had shown rapid decline, suggesting that similar trends most likely occurred in Kōloa and Wahiawa. By 1878, the population of Kōloa bottomed out at 1,008, and then began steadily increasing to 1,500 in 1884, 1,835 in 1896 and 4,564 by 1900 (Schmitt 1977:13). Other nearby *ahupua'a* of Kaua'i demonstrates similar trends.

3.2.3 Wahiawa Ranch

Major foreign interests in Wahiawa began in the mid to late 19th century, following acts allowing for foreigners to own lands in Hawai'i. The development of large scale agricultural ventures were also stimulated by treaties governing trade between the Kingdom of Hawai'i and the United States, namely the Reciprocity Treaty of 1875. The Reciprocity Treaty allowed for certain goods, including sugar, to be exported to the U.S. duty-free.

Duncan McBryde relocated to Wahiawa from his estate in Wailua *circa* 1860 (Damon 1931). He acquired a lease for lands at Wahiawa from Victoria Kamāmalu, sister of Moses Kekuaiwa. Kamāmalu inherited the unclaimed lands at Wahiawa following the untimely death of Kekuaiwa in 1848. McBryde drove his herd of cattle across the island and began the development of the extensive Wahiawa Ranch. The McBryde family estate, known as Brydeswood, was built in the uplands of Wahiawa, *mauka* of the government road. By 1870, in addition to ranching, McBryde also ventured into sugar cane cultivation in Wahiawa and surrounding lands at Kalāheo and Lāwa'i (Damon 1931). Duncan McBryde died in 1878 at the age of 52, leaving behind his widow and six children. Soon after the death of Duncan McBryde, Mrs. Elizabeth McBryde entered into a partnership forming the 'Ele'ele Sugar Plantation.

A map of 'Ele'ele to Kōloa by M.D. Monsarrat indicates the location of various structures within Wahiawa Ahupua'a *circa* 1896. Additional structures were located both within, as well as outside of Wahiawa Valley, *mauka* and *makai* of the government road. A substantial arrangement of wall segments was also located *mauka* of the government road, likely related to the Wahiawa Ranch. In the upland region of Wahiawa Valley, the 'Ele'ele Ditch had also been constructed to take water from Wahiawa Stream to water the cane lands of the 'Ele'ele Sugar Plantation.

3.2.4 The Hawaiian Sugar Company at Makaweli

The history of the water system found at the present-day lands of the McBryde Plantation actually owes its existence to Maui plantation owners Henry Perrine Baldwin and Samuel Thomas Alexander. In 1878, the two men had demonstrated the feasibility of carrying water from East Maui's windward region of high rainfall and delivering it to the arid, fertile isthmus of Central Maui. In 1889, Alexander & Baldwin, Ltd., had secured a long-term lease to a tract of land on the island of Kaua'i, and established the Hawaiian Sugar Company at Makaweli. In order to expand crop yields, H. P. Baldwin engineered an aqueduct to be constructed on the Kaua'i property similar to one he had built on Maui. It consisted of 13½ miles of tunnels, open ditches, and flumes that ended with four siphons to carry the flow across the Hanapēpē River. The reported cost was \$152,000 and the work was completed by April, 1891. (Thrum 1892).

Following the success of the Hawaiian Sugar Company's Hanapēpē Ditch, a 13 mile canal from Olokele Valley was constructed in 1902 (Burns 1991). Other Kaua'i plantations followed suit. The 'Ele'ele Plantation, which bordered the Hawaiian Sugar Company, relied on the surface water of the Wahiawa River. The 'Ele'ele Plantation was founded in 1884 after Bernice Pauahi Bishop sold the lands to Mrs. Duncan McBryde and August Dreier. The plantation supported its own mill and its own landing at 'Ele'ele (Conde 1973). The small plantation was then purchased in 1899 by Benjamin F. Dillingham, who then incorporated the Ranch, 'Ele'ele Plantation and the Kōloa Agricultural Company to form the McBryde Sugar Company. During this incorporation, more surface water sources were developed; including the Lāwa'i, and Kamo'o watersheds. However, in order for the McBryde Sugar Company to become profitable, underground sources of water at the headlands of the Lāwa'i and Hanapēpē Valleys were required, and reservoirs would need to be sited to impound those water sources (Gilmore 1936).

3.3 1900s

The 1900s were dominated by the Plantation era and the development of McBryde Sugar Company. It was also a time of concerted effort at consolidation and improvement in sugar cane industry infrastructure on Kaua'i.

3.3.1 The Plantation Era

In 1899, Walter D. McBryde, son of Duncan McBryde, and W.A. Kinney founded the McBryde Sugar Company. The plantation consisted mostly of land already owned by the McBryde Estate, including the Wahiawa Ranch and lands in neighboring Kalāheo and Lāwa'i. In addition, lands owned by the former Kōloa Agriculture Company and 'Ele'ele Sugar Plantation was also incorporated. To irrigate the mid-sized plantation (approximately 4,700 planted acres), between 1900 and 1907 the McBryde Plantation constructed 30 large and small reservoirs, as well as an extensive system of ditches to collect water from the uplands (Yamanaka and Fuji 2001). These ditches and reservoirs are visible on historic USGS maps of the vicinity. McBryde Plantation constructed a "New Mill" (Numila) in Wahiawa. Transportation of the cane from the fields, which stretched from Kōloa in the east to Hanapēpē in the west, to the Numila Mill, and on to the harbors of Port Allen and Nāwiliwili, required the construction of a substantial system of rail lines. A map of the McBryde sugar lands shows the extent of the plantation and rail lines.

Plantation development consisted of extensive sugar cane cultivation, with associated irrigation ditches, on the upper plateau areas outside of Wahiawa Valley. It is also noted that in addition to the 'Ele'ele Ditch, several other ditches were constructed in order to take water from Wahiawa Stream to the McBryde Sugar Company cane lands. The McBryde ditch irrigation system reached Kanaele Bog where a series of ditches and tunnels traverse the western margins of the bog (Figures 5 & 6) (The Nature Conservancy Kaua'i Program 2005: 6).

A railroad line was also constructed *mauka*, running from the McBryde Plantation Mill in the east, through Wahiawa Valley, and on to 'Ele'ele Landing in the west. Extensive development of plantation camps was made to house the large numbers of plantation laborers. The structures were concentrated in the vicinity of the rail line crossing (present day Halewili Rd.), located both within Wahiawa Valley, as well as along the upper edge of the valley. Additional plantation camp structures were located in the *makai* portion of Wahiawa Valley.

In 1927, the construction of Alexander Dam was initiated under the supervision of Joel B. Cox, civil engineer (and later President and Chair of the Engineering Association of Hawaii). This dam was to be one of the highest hydraulic fill dams in the western United States and was designed to capture water for irrigation of McBryde Sugar Company, Ltd. sugarcane fields, and later hydroelectric power (August 1995 ASCE Newsletter, Hawaii Section). The dam failed and collapsed on March 25, 1930 with six lives lost. The collapse of Alexander Dam in 1930 also attracted the attention of Karl Terzaghi (1883-1963). Karl Terzaghi is often referred to as "The Father of Soil Mechanics" and published the first seminal study of soil mechanics entitled "Erdbaumechanik" in 1925. Terzaghi also pioneered a variety of methods and techniques for investigation, testing, data analysis, and practice that defined much of the field of geotechnical engineering. Terzaghi became interested in the collapse of Alexander Dam because of his engineering background and interest in soil mechanics. Joel Cox reconstructed the dam under the guidance and correspondence of Karl Terzaghi. Today the dam remains one of the highest hydraulic fill dams in the western United States. The collapse of Alexander Dam is currently listed among Hawai'i's greatest catastrophes with loss of life (*State of Hawaii Data Book 2001*, <http://www.state.hi.us/debt/>). The collapse of Alexander Dam also played a significant role in leading to a greater emphasis on the importance of site geology in civil engineering projects and is listed among a number of high-profile dam failures between 1928 and 1938 (Rogers n.d.) such as St. Francis Dam near Los Angeles in March 1928 and Saluda Dam (second largest earth fill dam in the world) near Columbia, South Carolina in February 1930.

3.3.2 McBryde Sugar Company, Ltd.

McBryde Sugar Company, Ltd., cultivated 20,000 acres in Kalāheo, Hanapēpē, 'Ele'ele, Lāwa'i and Kōloa, including an ahupua'a that reached the top of Mount Kāhili (Wilcox 1996). By 1903, the company had developed a series of reservoirs with a combined capacity of 800 million gallons. However, surface water sources were inadequate for the plans of the plantation, and new groundwater sources were sought.

Following the example of the S.T. Alexander and H.P. Baldwin system of developing water sources further a field, engineers for the McBryde Sugar Company discovered concentrated flows of fresh water in a lava tube 50 feet below sea level in the Hanapēpē River Valley. At first, the pumps for raising the underground waters to the required elevations to irrigate the upland

fields were operated by steam. Built between 1900 and 1905, these coal burning pumping plants were very expensive to operate. Drilling for additional underground water sources under the



Figure 5 Jesse Yorck at the entrance of an irrigation ditch immediately below the Kanaele Bog



Figure 6 Photograph showing the inside of the irrigation ditch immediately below Kanaele Bog

Lāwa'i River Valley was successful, yet still subject to the expense of steam powered pumps. (Gilmore 1954).

Under the direction of McBryde Sugar Company, the Kaua'i Electric Company built a hydroelectric plant at Wainiha in order to replace the coal burning steam pumps with more economical electric pumps. Wainiha, is located on the northern, windward side of Kaua'i. The waters of the Wainiha River were diverted at the Wainiha East and Wainiha West channels (Larrison 1915), which were then delivered through 32 tunnels, with a total length of 17,400 feet, and eight ditches with a total length of 5,600 feet; to a point above the power plant. Water was received into a concrete-lined forebay and then dropped through a 1,612 foot long penstock pipeline. On August 4, 1906, electricity was transmitted across the island to the leeward coast. Thirty-four miles of utility poles delivered electricity to the plantation pump system. At the time, the Wainiha Power Plant generated a higher voltage than any other plant west of the Rockies (Dean 1950).

As a subsidiary of the McBryde Sugar Company, the Kauai Railway Company was organized in 1906 to operate the landing at 'Ele'ele and transport sugar from both the Hawaiian Sugar Company and the McBryde Sugar Company Mills to steamers anchored in the harbor. In 1908, the Hawaiian Sugar Company built an expensive, substantial bridge across the Hanapēpē River in order to reduce the costs of sugar transportation to the harbor.

In 1909, Alexander & Baldwin, Ltd., assumed management of McBryde Sugar, and its two subsidiaries. The Benjamin F. Dillingham-backed enterprise had expanded too quickly, and in order to save the plantation from bankruptcy, Alexander & Baldwin, Ltd., assumed both management and agency positions. In the 1910-1919 decade, McBryde Sugar made a profit every year except 1910. Earlier bonded debts had been reduced by over a million dollars, over \$720,000 had been spent on improvements, and another million dollars had been returned to investors (Dean 1950).

In 1915, McBryde Sugar installed a third generator unit at the Wainiha Power Plant, increasing its capacity even further. By the end of 1919, McBryde Sugar had received such good prices for sugar during World War I, that almost half of the company's previous debts had been retired. Kauai Railway Company had become a sound operating company and was paying its' own dividends. McBryde Sugar was able to purchase the Kaua'i Electric Company as a wholly owned subsidiary. The original Wahiawa sugar mill, built in the 1890's, was entirely remodeled between 1928 and 1929 (Dean 1950).

Section 4 Archaeological Research in Wahiawa Ahupua'a

The earliest attempt to record archaeological remains in Wahiawa Ahupua'a was made by Thrum (1906) (Table 2). *Heiau* located throughout the state were documented, with four *heiau* reported in Wahiawa. Kaunuolono, located in Wahiawa, was described as "a large heiau of square shape; part of its walls are still standing. Class unknown" (Thrum 1906:37). Kahilinai, located in Wahiawa-uka, was described as "a walled heiau of large size, long since destroyed" (Thrum 1906:37).

Wendell C. Bennett performed the first systematic archaeological survey of the island of Kaua'i in 1929 (Bennett 1931). Bennett attempted to relocate sites previously described by Thrum, as well as identify additional significant sites. In the *ahupua'a* of Wahiawa, he records three sites (Sites 61-63).

Site 61, designated as taro terraces in Wahiawa Valley, is described as "remarkable in places for their number on a small area of land" (Bennett 1931:115). Bennett also noted "there are platform house sites in the valley; burial caves and petroglyphs also reported" (Bennett 1931:115). Sites 62 and 63 are *heiau* originally described by Thrum (1906) and relocated by Bennett in 1929. However, both were destroyed by the time of Bennett's survey. Site 62, Waiopili Heiau, was described as:

in Wahiawa Valley, on the bluff on the east side, a short distance on the seaward side of the government road. This structure is described by Thrum as "An oblong heiau of good size, walls still standing." The cane fields have now been run close to the edge of the bluff, and in clearing the fields of stone the heiau has been obscured so far as any plan is concerned. (Bennett 1931:115)

Site 63, Huhu'akai Heiau, was described as:

on Wahulua [Wahiawa] Bay, Wahiawa. Thrum says "A medium sized heiau; portion of its walls may yet be seen. Class unknown." It is mostly destroyed. A platform of irregular shape is left, the front part of which is paved with small stones and the rest roughly paved. Nothing that would identify it as a heiau now remains. (Bennett 1931:115).

In 1963, Kikuchi conducted an archaeological reconnaissance survey of the Kona District of Kaua'i, from Makaweli in the west to Kīpū-Kai in the east (Kikuchi 1963). In Wahiawa Ahupua'a, Kikuchi revisited Bennett's sites, as well as recorded newly identified sites in the area. A total of 15 sites were described, 8 encircling Ahulua (Wahiawa) Bay and 7 located *mauka* of the Halewili Bridge over Wahiawa Stream. The *mauka* cluster of sites (i.e. Sites 8-14), included a shelter cave, petroglyphs, a grind stone, a house site, and an old Japanese plantation camp (Kikuchi 1963). Along the coast, on the western edge of Ahulua (Wahiawa) Bay, Kikuchi described Sites 15 through 19, including a cave shelter, a rock pile, calcified midden, and an adze grinding stone (Kikuchi 1963). Site 20, near the sandy shoreline of Ahulua Bay, was "Camp One," a plantation camp that was destroyed by the tidal wave of 1946 (Kikuchi 1963).

Kikuchi designates Site 21 as potential remains of Hu'ahu'akai Heiau, one of the two *heiau* described by Bennett, and offers the following description:

Table 2. Previous Archaeological Investigations in Wahiawa *Ahupua'a*

Reference	Type of Investigation	General Location	Findings
Thrum 1906	Documentation of <i>Heiau</i>	Island Wide, including Wahiawa	Four <i>heiau</i> reported in Wahiawa Ahupua'a
Bennett 1931	Reconnaissance Survey	Island Wide, including Wahiawa	Three sites, agricultural terraces and two previously documented <i>heiau</i>
Kikuchi 1963	Reconnaissance Survey w/ Subsurface Testing	Kona District, including Wahiawa	15 sites, shelter caves, petroglyphs, grind stones, house site, old plantation camps, rock pile, calcified midden, and previously described <i>heiau</i>
Hammatt 1992	Inspection of Exposed Burials	Wahiawa, Kaua'i Aggregates Quarry	Site -1893, 6 pre-historic burials exposed, likely burial ground
Glidden et al. 1993	Archaeological Monitoring	Wahiawa, McBryde Sugar Mill	No sites identified
Tulchin and Hammatt 2004	Archaeological Inventory Survey	Kaua'i Aggregates Quarry	The survey identified two sites comprising three features. Sites are 50-30-09-393 and 50-30-09-1893 (previously located –see Hammatt 1992).

Along the eastern slope of the mouth of Wahiawa valley, on the slopes facing Ahulua [Wahiawa] Bay, a peculiar wall was seen about 30 feet above the road leading to the shore... Upon closer examination the wall proved to be quite thick, 4-5 feet, and about 5 feet high. No other structures were seen back of the wall. The wall may prove to be just another wall constructed during recent times but it may also be the portion of Hu'ahu'akai *heiau* that Bennett described (Kikuchi 1963:18).

Site 22 refers to the Weli shelter site excavated by the Bishop Museum in the summer of 1959, in which the entire area is "now considered hopelessly destroyed [by vandals] even though small areas are untouched" (Kikuchi 1963:22).

Archaeological monitoring was conducted at the site of the McBryde Sugar Mill at Numila, in association with the proposed construction of a NEXRAD Radar Station (Glidden et al. 1993). Monitoring of the removal of a large boulder pile did not reveal the presence of any cultural material.

In May 1992, the State Historic Preservation Division was notified of the discovery of human remains adjacent to the Kaua'i Aggregates Quarry (Log No. 5330, Doc. No. 1925w). The burials were located near the mouth of Wahiawa Stream. The SHPD was informed that in December 1991, during efforts to improve the drainage of Wahiawa Stream, heavy equipment had exposed human burials along the west bank of Wahiawa Stream. An SHPD archaeologist and burials program staff people made a field check of the exposed burials, and determined that human burials had been inadvertently disturbed. Work in the area was halted and the SHPD recommended the Kaua'i Aggregates Quarry hire a consulting archaeological firm to further assess the situation.

Hammatt (1992) made an inspection of the inadvertently exposed human burials along the western bank of Wahiawa Stream. The burials, designated as State Site 50-30-09-1893, were located approximately 500 ft. (152 m) *mauka* of the stream outlet into Wahiawa Bay. A minimum of six individuals was exposed, situated in flexed positions indicating a pre-contact age. Inspection of the surrounding slope area revealed the presence of numerous *ahu* (cairns) and pavings interpreted to be probable burial sites. One burial was also located in an overhanging ledge in the vicinity. It was also noted:

It is likely that the entire slope between the stream level and the top of the cliff, which covers an area of perhaps ½ acre, contains Hawaiian burials interred in the rocky slope deposits. (Hammatt 1992:6)

Recommended treatment of the exposed human remains included restoration of the stream bank with soil and boulder fill.

In 2004, archaeologists from Cultural Surveys Hawai'i, Inc., conducted an archaeological inventory survey for a proposed construction waste disposal facility at the Kaua'i Aggregates Quarry (Tulchin and Hammatt 2004). The total survey area was approximately 28 acres. There were two historic properties comprising three individual features located along the western bank and upper slopes of Wahiawa Valley. State site 50-30-09-393 consists of two terraces along the western bank and is believed to be a prehistoric temporary habitation. Site 50-30-09-1893 is a single human burial located within an overhanging ledge and adjacent burial ground. Although field personnel were not able to relocate the adjacent burial ground it was still believed to be present. Both sites and areas were recommended for preservation through avoidance.

Section 5 Community Contact Process and Results

Throughout the course of this assessment, an effort was made to contact and consult with Hawaiian cultural organizations, government agencies, and individuals who might have knowledge of and/or concerns about traditional cultural practices specifically related to the project area. This effort was made by letter, e-mail, telephone and in person contact. In the majority of cases, letters along with a map of the project area were mailed with the following text:

At the request of The Nature Conservancy Hawai'i, Kaua'i Program, Cultural Surveys Hawai'i is preparing a Cultural Impact Assessment for the approximately 80 Acre Kanaele Protective Fence Project in the Uplands of, Wahiawa Ahupua'a, Kona District, Island of Kaua'i TMK: (4) 2-4-009.

The Nature Conservancy, Hawai'i Kaua'i Program with the approval of the landowner (Alexander & Baldwin), propose to construct a hog-wire fence around the perimeter of Kanaele Bog in the Mt. Kāhili area of Kaua'i and remove feral pigs from within the fences enclosures. The objective of this project is to protect the unique Kanaele Bog ecosystem from damage by feral pigs.

The purpose of the cultural impact assessment is to assess potential impacts to traditional cultural practices as a result of the proposed Kanaele Fence Project.

We are seeking your *kōkua* or help and guidance regarding the following aspects of our study:

General history and present and past land use of the project area.

Knowledge of cultural sites which may be impacted by future development of the project area - for example, historic sites, archaeological sites, and burials.

Knowledge of traditional gathering practices in the project area – both past and ongoing.

Cultural associations of the project area, such as legends and traditional uses.

Referrals of *kūpuna* or elders who might be willing to share their cultural knowledge of the project area and the surrounding *ahupua'a* lands.

Any other cultural concerns the community might have related to Hawaiian cultural practices within or in the vicinity of the project area.

The individuals, organizations, and agencies attempted to be contacted are presented in the table below.

Table 3 Community Contacts and Results

Name	Background, Affiliation	Comments
Ayau, Halealoha	Hui Mālama O Nā Kūpuna O Hawai'i Nei	Contacted. Referred to Kehaulani Kekua.
Holi, Douglas Holi, Gwen	<i>Kama`āina</i>	See Section 6.
Kapaka-Arboleda, La France	Kaua'i/Ni'ihau Island Burial Council/Chair/Office of Hawaiian Affairs/Community Resource coordinator	Contacted. Referred to Wilma Holi. No cultural concerns at this time.
Kekua, Kehaulani / <i>Alaka'i</i> 'Aikane Alapa'i.	<i>Kumu Hula</i> Hālau Palaihiwa O Kaipuwai/ Executive Director Kaua'i Heritage Center of Hawaiian Culture & Arts	Contacted. No cultural concerns at this time.
McMahon, Nancy	State Historic Preservation Division Kaua'i Archaeologist	Contacted. No cultural concerns at this time.
Oi, Thomas	Department of Land and Natural Resources-Land Division	Sent letter; follow-up telephone calls.
O'Keefe, Sean	Hawaiian Commercial & Sugar Company	I am aware of an existing Memorandum of Understanding (MOU) between The Nature Conservancy and McBryde covering the bog. The bog is located within an area designed as critical habitat for some endangered Hawaiian plants. That's about all I know.
Pavao, Patrick	Former McBryde Employee	Contacted. No cultural concerns at this time.
Rietow, Allan	Field Representative The Nature Conservancy Kaua'i Program	See Section 6.
Tsuchiya, Rick	Kaua'i Historic Preservation Review	KHPRC recommends the

	Commission/(KHPRC)	<p>following:</p> <ul style="list-style-type: none"> • That the applicant consult with the State Historic Preservation Division (and Burial Council), the Department of Hawai'i Homelands and the Office of Hawaiian Affairs; • That a community input program (e.g. Flyers, notices, meeting with community association, etc.) be initiated by the applicant to obtain information on cultural practices or resources in the project area; • That opportunities for further consultation with the KHPRC occur as this project progresses; • That individual KHPRC members contact CSH directly with the names of <i>kūpuna</i> in the area who may participate in the consultation process; • That Phil Scott, former manager of McBryde Plantation be contacted as a potential additional source of information.
Yorck, Jesse	Native Rights Policy Advocate for the Office of Hawaiian Affairs	See Section 6.

Section 6 Field Visit and Community Response



Figure 7 Allan Rietow, Douglas Holi, Gwen Holi, Jesse Yorck, `Aikane Alapa`i and Kehualani Kekua at Kanaele Bog 2,100 ft elevation, photograph by Aulii Mitchell November 14, 2005

On November 14, 2005 a field visit was coordinated by Mr. Allan Rietow, Representative for the Nature Conservancy Kaua'i Program. On the site visit were Aulii Mitchell, CSH, Mr. Jesse Yorck, Office of Hawaiian Affairs, *kama`āina* Ms. Gwen Pualani Holi and her nephew Mr. Douglas Kekuaonalanikeawemauhili Holi, and Kumu Hula/Cultural Practitioner Ms. Kehaulani Kekua and her *alaka`i`i`Aikāne Alapa`i*. Subsequently some of the participants communicated their insights to CSH which are presented below.

6.1 Gwen Pualani Holi and Douglas Kekuaonalanikeawemauhili Holi

Ms. Gwen Pualani Holi and her nephew Mr. Douglas Kekuaonalanikeawemauhili Holi are *kama`āina* to Hanapēpē, Kaua'i. Both Gwen and Douglas are very familiar with the project area and its cultural association with the bordering *ahupua`a* of Hanapēpē and Kalāheo. In an interview with CSH following the field trip, Ms. Holi offered these comments:

It is important to look at the adjacent *ahupua`a* to see what the relationship was to the adjoining *ahupua`a* for some of the activities that took place in one *ahupua`a* maybe related to activities that took place in the adjacent *ahupua`a*. Maybe one *ahupua`a* had the *kuleana* of producing *kalo* and fishing in the other.

As we look into the Hanapēpē Valley which quite overgrown today was once full of cultural activities including the planting of kalo. Then we look up towards that mountain peak is the *waiile* or waterfall of Manawaiopuna. It is located at the top and feeds into this valley. Wai'ale'ale is located in the back, so we are looking inside of Kaua'i.

So looking out over this scenery you have Hanapēpē and right next door is Wahiawa and then you have the plains of Wahiawa where we hiked to visit the bog site. There was a heiau hula dedicated to hula in Wahiawa. We also use to fish in the reservoir of Alexander Dam for bass and hunt pig along these trails. You can still find hunter trails off to the side of the trail we are on today.

As we headed up the mountain you can see that the area is still used by pig hunters and you have native plants growing all around. The koa, 'ōhi'a, 'ie'ie, uluhe, mokihana were all seen growing as we hiked up towards the bog (Figures 8-12). It was so special to see the rare 'akoko pointed out by Allan (Figure 13). The native forest is very prevalent still in Wahiawa.

I am very glad that I brought my nephew Douglas with us on the visit to the Kanaele bog so that he knows what resources are here. He took photographs of the native plant species. We do not know what will happen in the future with our native species. They may no longer exist, therefore, if he returns to Kanaele in the future he will have photos to tell him what was there in the past.

6.2 Mr. Allan Rietow

Mr. Rietow's job as a field representative for The Nature Conservancy, Hawai'i Kaua'i Program has been to establish an island program on Kaua'i, as there was none on Kaua'i, in 2001, similar to the established island programs on Maui, Moloka'i, Oahu, and Hawai'i. In doing so Mr. Rietow's most important tasks have been to build trust, meaningful relationships, and partnerships with other conservation groups and interested persons, and raise funding for the Kaua'i program. Mr. Rietow coordinated a field visit as mentioned above, after which he commented in a letter dated November 16, 2005:

My main areas of concentration at this time are preparing our EAs, community and partner outreach, and some on the ground management.

On every field trip I have led to Kanaele, until this field trip with you, Jess, Kehaulani and others, I have been in company of our own staff or other botanists and scientists from the NTBG, the USFSWS or other. These trips have all been related to tasks associated with the physical preservation of this one-of-a-kind native community and of course, all of those on these trips are in wonder of this beautiful place with its rich plant and invertebrate diversity. However, this was my first trip here with people focused with more of an intuitive nature. I could feel the excitement, deep association, and appreciation for everything that we

encountered. The most significant part of the trip had to be sitting peacefully at Kanaele and feeling more than ever, deeply connected to this place. I learned a lot on this trip and I am thinking deeply about how we can all come to some common mission with common goals for the uses and preservation of our precious and threatened forest. I believe that the forest has a certain right to continue to exist in these isolated locations. The forest is important to us for many reasons that many people of Hawai'i lose sight of or were never made aware of : cultural uses, stabilizing our mountains, providing for clean and abundant water, providing for the continuous flow of our streams, protecting our reefs from sedimentation, providing possible medical uses, and places for us to go to meditate and re-center ourselves, to name a few.

6.3 Mr. Jesse Yorck

Mr. Jesse Yorck, Native Rights Policy Advocate for the Office of Hawaiian Affairs offered his comments in a letter dated November 17, 2005:

Per our site visit to the Kanaele Bog on November 14, 2005, OHA understands that gathering rights will not be impeded by the Kanaele Bog Fence Project. For the following reasons, our staff concurs that the fencing project will not adversely impact any Native Hawaiian access rights:

- 1) No known access/hunting trails will be obstructed by the proposed fence, and;
- 2) At least two gates will be installed at during the fencing project to allow access for gathering.

OHA further requests your assurances that if the project goes forward, should iwi or Native Hawaiian cultural or traditional deposits be found during ground disturbance work will cease, and the appropriate agencies will be contacted pursuant to applicable law.



Figure 8 Koa (*Acacia koa*) along trail leading to Kanaele Bog, photograph by Aulii Mitchell 2005



Figure 9 `Ōhi`a lehua (*Metrosideros polymorpha*) along trail leading to Kanaele Bog, photograph by Aulii Mitchell 2005



Figure 10 `Ie`ie (*Freycinetia arborea*) along trail leading to Kanaele Bog, photograph by Aulii Mitchell 2005



Figure 11 Uluhe (*Dicranopetris linearis*) and `Ohia lehua along trail leading to Kanaele Bog, photograph by Aulii Mitchell 2005



Figure 12 Mokihana (*Melicope anisata*) 2100 ft elevation Kanaele Bog, photograph by Aulii Mitchell 2005



Figure 13 `Akoko (*Euphorbia* spp.) located within Kanaele Bog, photograph by Aulii Mitchell 2005

Section 7 Traditional Cultural Landscape of Wahiawa Ahupua'a and the Project Area

Traditional cultural practices are based on a profound awareness concerning harmony between man and our natural resources. The Hawaiians of old depended on these cultural practices for survival. Based on their familiarity with specific places and through much trial and error, Hawaiian communities were able to devise systems that fostered sustainable use of nature's resources. Many of these cultural practices have been passed down from generation to generation and are still practiced in some of Hawaii's communities today.

This project seeks to assess traditional cultural practices as well as resources pertaining to the project area within Wahiawa Ahupua'a. This section will convey the different types of traditional practices, cultural resources associated with the vicinity.

Discussions of specific aspects of traditional Hawaiian culture as they may relate to the project area and Wahiawa Ahupua'a are presented below.

7.1 Hawaiian Habitation and Agriculture

Based on archaeological studies, historical accounts and Land Commission Award records, traditional Hawaiian habitation and irrigated agriculture in Wahiawa Ahupua'a were situated within or in the immediate vicinity of Wahiawa Valley and Stream, the main source of fresh water for domestic and agricultural usage within the *ahupua'a*. No maps indicating the precise locations of each of the mid-nineteenth century Land Commission Award parcels in Wahiawa were readily available. However, the numerous *'ili* (land section within an *ahupua'a*) names, and references to landmarks such as *pu'u* or the seashore, in the LCA documentation indicate widespread settlement throughout both the *mauka* and *makai* regions of Wahiawa Valley. A review of Kaua'i Island tax maps indicates that no kuleana LCAs parcels were awarded in the *mauka* regions of Wahiawa where the Kanaele Bog is located.

7.2 Gathering for Plant Resources

No specific native Hawaiian gathering practices for plant resources were identified within the project area in the historical documentation, archaeological investigations, or community contact process.

Following the field visit of November 14, 2005, *kama'āina* Gwen Holi noted the native plants growing all around the *mauka* regions leading to the bog, including koa, 'ōhi'a, 'ie'ie, uluhe, hapu'u, mokihana and the rare 'akoko.

7.3 Traditional Hawaiian Sites

Historical documentation has not identified any other traditional Hawaiian sites within the project area. None of community contacts were aware of any traditional sites within the project area.

Ms. Gwen Holi mentioned that in ancient times there was a *heiau* dedicated to the hula in Wahiawa Ahupua'a. Only the *wahine* danced in Wahiawa. The *heiau*, however, was not within the project area.

7.4 Burials

No human burials have been identified in historic documentation or in the community consultation process specifically within the present project area.

7.5 Native Hawaiian Hunting Practices

While not specifically documented, it is likely that wild pig hunting occurred within the areas of the present project area during traditional Hawaiian times.

Pua'a (pigs) had been brought to the Hawaiian Islands by the Polynesians and were raised in captivity or hunted in the wild. Rain forest and mountain areas like the present project area were habitats of the *pua'a* which continue to be hunted in the mauka areas of the *ahupua'a*.

Additional hunting practices within the mauka regions of Wahiawā likely include hunting of goat, black-tailed deer, and a variety of game birds. However, all are 20th century introductions (e.g. deer were introduced in 1961) and do not represent traditional Hawaiian hunting game.

Ms. Gwen Holi and Douglas Holi mention that they used to hunt pigs along the pig trails leading to the bog.

7.6 Hawaiian Trails

Trails served to connect the various settlements throughout the ahupua'a and districts of the Hawaiian Islands in traditional times. No traditional trails were identified within the present project area on historic maps or by community informants.

7.7 Wahi Pana (Storied Places)

No storied places were identified within or in the immediate vicinity of the project area.

7.8 The Project area within the Wahiawa Ahupua'a Context

From research of historic documents, cultural documentation, and archaeological studies, it is apparent that traditional Hawaiian habitation and activity within Wahiawa Ahupua'a and the current project area extended well back in pre-contact times. The presence of multiple *heiau* within the *ahupua'a* suggests the relative importance of Wahiawa in traditional times. *Heiau* were located in both the uplands and near the shore. Cultural accounts, as well as LCA documentation indicated settlement within the *ahupua'a* was focused on Wahiawa Valley and the immediate area. Abundant stream and spring water was available for the cultivation of wetland taro, as well as other traditional staple foods, within the fertile stream valley. Research indicated dense agricultural terracing throughout the interior of Wahiawa Valley from the uplands to the sea. Habitation areas were noted both within the valley, as well as on the *kula* land

above. The “Community of Wahiawa” was said to have been centered near the government road (present day Kaunali‘i Hwy.). The sheltered waters and sandy shoreline of Wahiawa Bay would have allowed for harvesting of marine resources and provided an ideal landing site for canoes. Traditional burial interment practices included cave burials within the slopes of Wahiawa Valley, and burials in the sandy sediments on the banks of Wahiawa Stream and *muliwai*.

Forest areas miles inland, like the present Kanaele Protective Fence project area, would have been utilized for a variety of purposes, especially hunting and gathering of timber, avian resources, medicinal and ceremonial plants, and famine food resources. For example, *hala* and *kukui* were probably gathered from *mauka* regions.

The resources of the *mauka* lands of Wahiawa *ahupua‘a* complemented those available in the valleys, coastal plains, and offshore, creating a continuum that sustained life for the Hawaiians of Wahiawa.

Section 8 Summary and Recommendations

Reviewing the information provided by the elements of this cultural impact evaluation – historical documentation, archaeological research, and community contacts – there emerges a more detailed picture of the traditional landscape of Wahiawa Ahupua‘a and the present project area.

Nineteenth-century documents – Land Commission Award records and historic maps – indicate parcels containing house sites and irrigated taro fields along Stream. These parcels were the likely remnants of the traditional Hawaiian settlement pattern that had survived the first seven decades of western contact. It thus appears that, in traditional Hawaiian times, the lower stream lands were primarily a focus of habitation and agriculture. Additionally, based on an account by a nineteenth century missionary, this area at the foot of Valley was the site of the house of Humehume, son of Kaumuali‘i, the ruling chief of Kaua‘i and Ni‘ihau.

By the early decades of the 20th century, western commercial entrepreneurial interests had transformed the Wahiawa landscape into sugarcane fields and pasture lands, and had dispersed remaining native residents.

In traditional Hawaiian times Kanaele Bog and other *mauka* regions of Wahiawa would have been utilized for a variety of purposes, especially hunting, gathering of timber, avian resources, medicinal and ceremonial plants, and famine food resources. By the early decades of the 20th century, the McBryde Sugar Company irrigation system reached Kanaele Bog where a series of ditches and tunnels traverse the western margins of the bog. The establishment of the ditch system in *mauka* Wahiawa is representative of the major landscape transformations wrought by development of commercial sugar interests. These transformations – and the sense that areas like Kanaele Bog were private property – restricted access to the present project area to sugar company employees for most of the 20th century.

None of the community contacts queried for this assessment identified any cultural sites in the project area, or recalled anyone entering the project area – either in the past or present – for any traditional cultural practice. Based on the evidence gathered, at present no contemporary or continuing cultural practices occur within the project area.

Based on the findings of this assessment, the Kanaele Protective Fence Project and the future maintenance of the fence will have minimal impact upon native Hawaiian cultural resources, beliefs and practices. It should be noted, however, that there are many native plant species within the project area and as a precautionary measure, personnel involved in the construction of the fence and its maintenance should follow proper procedures to ensure the safety of the many plants native to the bog environment.

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