

APR 23 2011

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OFFICE OF ECONOMIC DEVELOPMENT

County of Kaua'i, State of Hawai'i

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April 11, 2011

Mr. Gary Hooser
Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, Hawai'i 96813

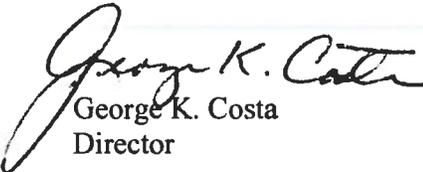
Dear Mr. Hooser:

Subject: Draft Environmental Assessment for Kīlauea Agricultural Park, Kīlauea,
Kaua'i, Hawai'i, TMK: (4) 5-2-004:099

The County of Kaua'i Office of Economic Development has reviewed the Draft Environmental Assessment for the subject project, and anticipates a Finding of No Significant Impact. Please publish notice in the next available OEQC Environmental Notice.

We have enclosed a completed OEQC Publication Form and one (1) copy of the document in pdf format on a CD; and one (1) hardcopy of the Draft EA. Please call me at (808) 241-4949 or e-mail me at gcosta@kauai.gov if you have any questions.

Sincerely,


George K. Costa
Director

Draft Environmental Assessment

Kīlauea Agricultural Park

Kīlauea, Kauaʻi, Hawaiʻi

Tax Map Key (4) 5-2-004:099

April 2011

Prepared For:

County of Kauaʻi
Office of Economic Development
4444 Rice Street
Līhuʻe, Hawaiʻi 96766

DRAFT ENVIRONMENTAL ASSESSMENT

Kīlauea Agricultural Park

Tax Map Key: (4) 5-2-004:099

April 2011

Prepared For:

County of Kaua‘i Office of Economic Development
4444 Rice Street
Līhu‘e, Hawai‘i 96766

Prepared by:

R. M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawai‘i 96819-3494
1-21760-00

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Appendix B Memo relating to Irrigation Supply for the Proposed 54-Acre Agricultural Park in Kīlauea, Kauai, Tom Nance Water Resource Engineering, March 28, 2011.

Appendix C Natural Resources Surveys for the proposed Kīlauea Agriculture Park, Kīlauea, Kaua‘i (TMK:5-2-004: 099), by AECOS Consultants, February 22, 2011.

Appendix D Traffic Assessment of the Proposed Kīlauea Agricultural Park, Kīlauea, Kaua‘i, Hawai‘i, by Julian Ng, Incorporated, March 4, 2011.

Appendix E Applicant Certification Clause

Appendix F Energy Park Concept Plan, Insynergy Engineering, Inc., 2011.

Appendix G Archaeological Inventory Survey for the 75-Acre Kīlauea Agricultural Park Project, Kīlauea Ahupua‘a, Hanalei District, Kaua‘i Island TMK:[4] 5-2-004:099.

Appendix H Cultural Impact Assessment for the 75-Acre Kīlauea Agricultural Park Project, Kīlauea Ahupua‘a, Hanalei District, Kaua‘i Island TMK: [4] 5-2-004:099, Cultural Surveys Hawai‘i, March 2011.

Acronyms

ADA	Americans with Disabilities Act
BMPs	Best Management Practices
CWA	Clean Water Act of 1972, as amended
CWRM	Commission on Water Resource Management, State of Hawai‘i, Department of Land and Natural Resources
CWB	Clean Water Branch, State Department of Health
CZM	Coastal Zone Management
DLNR	State Department of Land and Natural Resources
DOH	State Department of Health
EPA	Environmental Protection Agency
FONSI	Finding of No Significant Impact
GP	General Plan
HAR	Hawai‘i Administrative Rules
HRS	Hawai‘i Revised Statutes
HDOT	State Department of Transportation
IWS	Individual Wastewater System (septic leach field or aerobic unit)
NEPA	National Environmental Policy Act
NOI	Notice of Intent to discharge under NPDES regulations
NPDES	National Pollutant Discharge Elimination System
RMTC	R. M. Towill Corporation
ROW	Right-of-Way
SMA	Special Management Area
USFWS	U. S. Fish & Wildlife Service

Project Summary

Project:	Kīlauea Agricultural Park
Applicant:	County of Kaua‘i Office of Economic Development 4444 Rice Street, Suite 200 Līhu‘e, Hawai‘i 96766-1300
Owner:	County of Kaua‘i
Accepting Agency:	Economic Development Administration (NEPA) County of Kaua‘i, Office of Economic Development (Chapter 343, HRS)
Agent:	R. M. Towill Corporation (RMTC) 2024 North King Street, Suite 200 Honolulu, Hawai‘I 96819
Location:	Kīlauea, Island of Kaua‘i, Hawai‘i
Tax Map Key:	(4) 5-2-004: 099
Proposed Action:	Development of a new agricultural park which includes 14 farm lots, energy farm, composting/recycle/equipment storage area, Sunshine Market, and community gardens.
Land Area:	Approximately 75 acres
Present Use:	Undeveloped open space
State Land Use District:	Agriculture
Kaua‘i General Plan	Agriculture
Zoning	Agriculture
Special Management Area	Southeastern portion of site in SMA
Permits Required:	Natural Resources Conservation Service <ul style="list-style-type: none"> • Conservation Plan State of Hawai‘i <ul style="list-style-type: none"> • Community Noise Control (Noise Permit) • National Pollutant Discharge Elimination System Permit County of Kaua‘i <ul style="list-style-type: none"> • Use Permit • Special Management Area • Roadway Access • Building, Plumbing, Electrical Permits
Anticipated Determination:	Finding of No Significant Impact (FONSI)

Section 1 – Introduction

1.1 Project Overview

The County of Kaua‘i Office of Economic Development proposes a new agricultural park on County-owned land in Kīlauea, Kaua‘i (Tax Map Key: (4) 5-2-004:099). The subject property is a curvilinear shaped approximately 75 acre parcel of land which is bounded by Kīlauea Lighthouse Road, Quarry Road and the Seacliff Plantation. The property is located approximately 1,100 feet northeast of Kīlauea Town and 1,200 feet southeast of Crater Hill. The Kaua‘i Christian Academy is located across Kīlauea Lighthouse Road from the project site.

The plans call for the creation of 14 farm lots ranging in size from 1.0 acre to 6.93 acres. The intent is to have a range of conventional, organic, incubator and orchard farm lots. An energy farm, compost/recycling/co-op/equipment storage facility, community garden, and an area for a Sunshine Market (farmer’s market) are also integral parts of the proposed action.

Figure 1-1 shows the regional context of the project, which lies makai of the town of Kīlauea.

1.2 Purpose and Need

The proposed project is designed to provide diversified agricultural opportunities to small scale farmers on the island of Kaua‘i by utilizing former plantation agricultural land that is presently fallow. Barriers to the development of small scale diversified agricultural farming include high development costs for infrastructure including grading for access roads and drainage, and the development of irrigation water. The Kīlauea Agricultural Park is intended to remove these traditional barriers which discourage farming. The beneficiaries of the project are new and established small farmers on Kaua‘i who would establish or relocate their farms to the area because of the availability of new agricultural land.

The project complements the desire to increase agricultural sustainability in the State of Hawai‘i. It is envisioned that the project can increase local production of fresh foods as well as demonstrate a system of sustainable agricultural production. The general beneficiaries of increased local production of fresh foods are the entire island of Kaua‘i.

The concern for sound environmental stewardship in the use of resources such as energy and recycling are also prime needs to be fulfilled in the implementation of the project. An indirect beneficiary is the State of Hawai‘i. Lastly, the project will serve to fulfill the need for a unique agricultural based gathering place to enhance community life which benefits the Kīlauea and North Shore community in particular.

1.3 Purpose of the Environmental Assessment

This Environmental Assessment is prepared to address the requirements of Federal and State of Hawai‘i laws that include:

1. The National Environmental Policy Act (NEPA): The Federal Economic Development Administration (EDA) is assisting the County Office of Economic Development (OED) with the review of a Federal grant for the proposed project. The planned use of Federal funds for development requires the preparation of a NEPA compliant Environmental Assessment.
2. Hawai‘i Revised Statutes (HRS), Chapter 343, Environmental Impact Statements, and Hawai‘i Administrative Rules (HAR), Chapter 11-200, Environmental Impact Statement Rules: The proposed project will involve the use of County land and funds for development thereby requiring the preparation and review of an Environmental Assessment for the proposed action.

1.4 Project Background

1.4.1 Kīlauea Agricultural Park Master Plan

In 2006, the County of Kaua‘i acquired the subject 75-acre parcel of land in Kīlauea identified as TMK: (4) 5-2-004:099. The land was conveyed by the developer of the adjacent Seacliff Plantation subdivision as a condition of development. Kimura International, Inc. was retained by the County of Kaua‘i to formulate a master plan utilizing an inclusive planning process (Kimura International, Inc., 2009).

Community outreach began in March 2008 with a site visit and meetings with stakeholders. Three plan alternatives were developed between May and August of 2008 and posted on the County’s website for public review. A final plan was prepared based on comments received, and this plan was presented to the County administration in December 2008 and to the County Council in February 2009 (Kimura International, Inc., 2009).

The master plan provides a physical layout for the future agricultural park and conceptual descriptions of specific land use elements. Also included in the master plan are discussions of the infrastructure needed to support agricultural park activities and cost estimates. The master plan does not include a market study or any evaluation of unfulfilled product demand, marketing channels, or potential profitability for any fruit, vegetable, or horticultural crop (Kimura International, Inc., 2009).

1.5 Project Schedule and Cost

The Federal and State environmental process is anticipated to conclude during summer of 2011.

After that, there are several important steps which need to be taken before the commencement of construction.

The County of Kaua‘i intends to apply for an EDA construction grant.

A Use Permit and Special Management Area permit need to be done. The Kaua‘i Planning Commission is the decision making body on the Use Permit. A Special Management Area (SMA) Minor Permit may be required if the proposed construction within the SMA is less than \$125,000 in value and there are no substantial adverse effects relative to Coastal Zone Management objectives and policies. Otherwise, an SMA Major Permit would be required before the Kaua‘i Planning Commission.

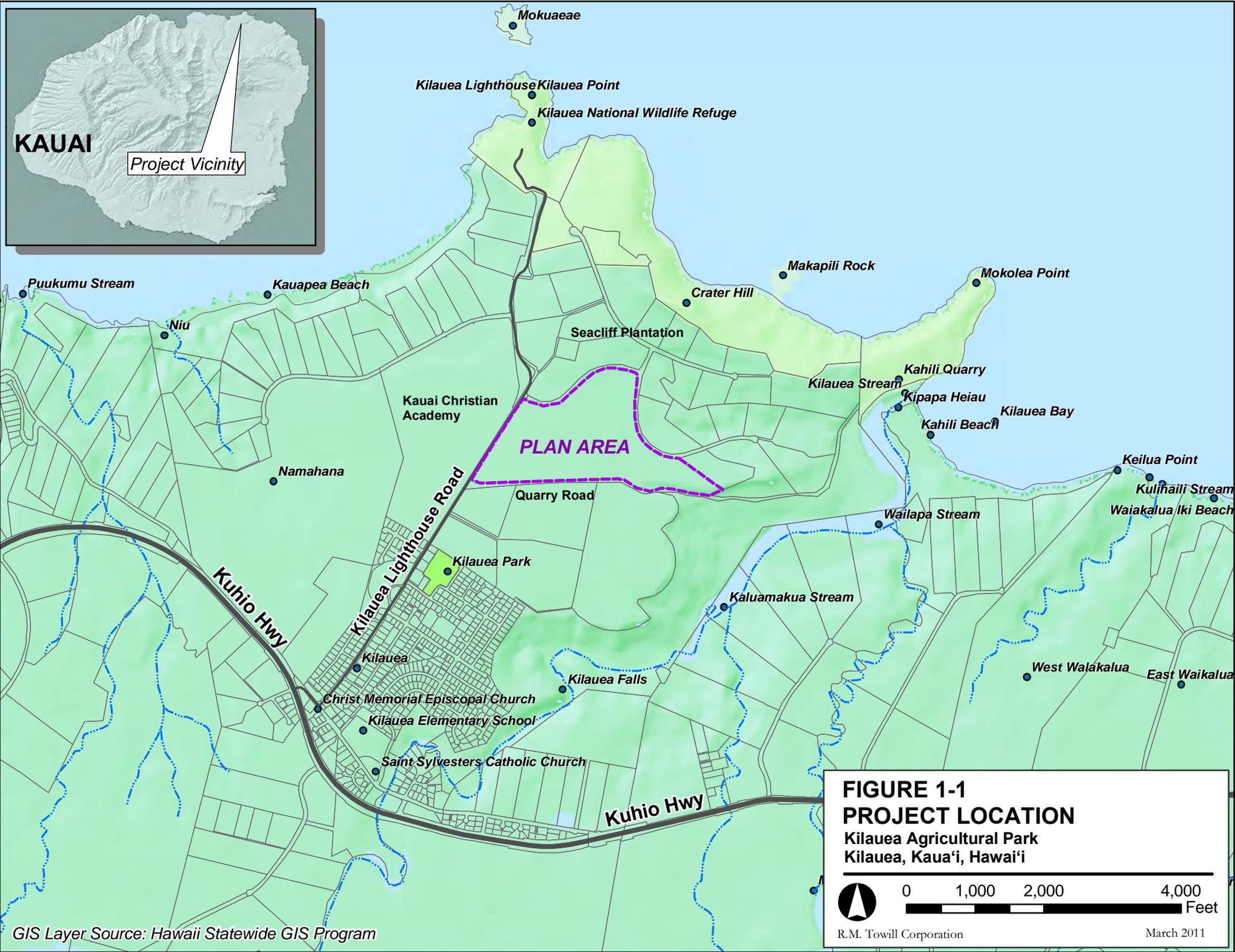
The final design will need to be undertaken and construction related and ministerial permits will need to be approved prior to the start of construction. The construction and ministerial permits are anticipated to include but are not limited to: conservation plan approval; building, plumbing and electrical permits; and the National Pollutant Discharge Elimination System permit. The design and permitting phase is anticipated to take one year after approval of appropriation of funding.

The estimated cost of the construction is approximately \$5.05 million. Approximately \$1.8 million is estimated for much of the site work including clearing and grubbing (for infrastructure purposes), roadway, drainage, detention basin, and waterline improvements. Approximately \$3.25 million is estimated for three irrigation wells, storage tank, and a booster pump.

Figures

Section 1 - Introduction

Figure 1-1
Project Location



KAUAI

Project Vicinity

PLAN AREA

**FIGURE 1-1
PROJECT LOCATION**
Kilauea Agricultural Park
Kilauea, Kaua'i, Hawai'i



0 1,000 2,000 4,000 Feet

R.M. Towill Corporation

March 2011

GIS Layer Source: Hawaii Statewide GIS Program

Section 2 – Project Description

2.1 Existing Land Use

Most of the project area is comprised of former sugarcane land previously cultivated by Kīlauea Sugar Company from 1880 to 1971. Since the closure of Kīlauea Sugar Company, the land has remained undeveloped. In the southeastern portion of the project area, a natural drainage ditch has been utilized for the growing of peanuts, bananas and avocados. Abandoned vehicles also litter the site and would need to be removed to fully utilize the project site. The surrounding area is primarily rural, dominated by agricultural and large house lot development.

2.2 Existing Access

The property can be accessed through Kīlauea Town via the Kīlauea Lighthouse Road which is a County road. However, access into and out of the property via Kīlauea Lighthouse Road is not permitted at the present time. A formal access request must be submitted to the Department of Public Works. The segment of Kīlauea Lighthouse Road abutting the western boundary of the property is straight with good sight distance.

Quarry Road abuts the southern boundary of the project site. This is a 15-foot wide private road owned by the Kahili Quarry Road Property Owners, with a full easement in favor of the County. The County can maintain the roadway but is not obliged to do so. The County has paved a portion of the roadway abutting the project site and this is the only area where access is currently permitted.

2.3 General Site Plan

The proposed Kīlauea Agricultural Park general site plan is based on a County master plan for development of the site (Kimura International, Inc., 2009). The master plan included a community based planning effort. The proposed general site plan provides additional review and analysis, and revision to the original layout for the site. See **Figure 2-1** for the Kīlauea Agricultural Park Proposed Plan. **Figure 2-2** is an Aerial View of Project Vicinity.

The site plan includes a total of 14 farm lots separated into three sectors. The conventional farming sector is located along the southern boundary and is divided into 6 lots, ranging in size from 2.66 acres to 5.45 acres. A 4.44 acre farm lot which may be utilized as an orchard is located at the southeast corner of the property. This site is essentially the remnants of a former banana patch and is in a drainageway. Organic farm lots are located in the northern portion of the property. This sector includes 4 lots ranging in size from 4.15 acres to 6.93 acres. The organic farms are thus located upwind of conventional farms. Four incubator farm lots are located near the eastern boundary of the project site and range in size from 1.00 acres to 1.04 acres. Together, the farm lots occupy 51.19 acres or approximately 68.25 percent of the area of the agricultural park.

A site for the Sunshine Market is provided adjacent to Kīlauea Lighthouse Road near the southwest corner of the site. This location offers the farmer's market excellent visibility and convenient access. This is situated on 3.27 acres which is intended to accommodate the main commercial area and a parking lot. It is envisioned primarily as an open gravel lot, but limited improvements may be considered in the future, such as portable restrooms, picnic benches, or a small storage facility.

Community gardens are located adjacent to the Sunshine Market site. A 2.3 acre site is set aside for this purpose with the potential to provide as much as 250 garden plots assuming an average size of 400 square feet. Both the Sunshine Market and the community gardens are intended to be hubs of social interaction, where people can share knowledge and experience about local food production. The parking area for both uses can also be shared.

Three on-site wells are proposed to be implemented along Quarry Road near the community gardens. Intended for irrigation purposes, each of the wells are rated at a capacity of 100 gallons per minute. A 300,000 gallon storage tank is also proposed near this area.

A 4.15 acre energy farm site is included within the project. The intent is a facility which would produce electrical energy from one or more renewable sources, such as concentrating solar power or photovoltaic panels. The power could be used to pump irrigation water, regulate hothouses, and cool produce until it can be delivered to markets fresh picked from the fields. Surplus energy could possibly be sold to the local electrical utility. The energy farm has been located in an area abutting Kīlauea Lighthouse Road. This is proposed in order to be in close proximity to existing power lines as well as to on-site wells.

A 2.46 acre area for recycling green waste and composting is provided. Disposing of and reusing green waste on-site would complement sustainability efforts. Efforts to recycle other farm wastes, such as plastics containers and sheeting would be considered in this area as well. A portion of this site is also envisioned as a fenced, secured baseyard area where the farmers can store their vehicles and equipment.

Principal access to the site is planned off of Kīlauea Lighthouse Road. This would require permission from the County of Kauaʻi but would be essential for Sunshine Market vendors and customers. Secondary access would be from Quarry Road. Farmers and agriculture suppliers would be encouraged to use Quarry Road when the market is open. All interior roads are intended to be built to County agricultural standards. These roads would be 20 feet in width, and gravel covered with grass shoulders.

A windbreak is also envisioned along the northern and eastern boundaries of the project. This is to provide protection from the prevailing northeast tradewinds and salt spray as well as creating a visual barrier between the farm lots and neighboring residential properties.

A 1.98 acre site is intended for drainage detention purposes. This is near the southeastern portion of the property within a naturally occurring depression.

2.4 Agricultural Assessment

A Preliminary Agricultural Assessment was completed by Calvin H. Oda, DBA North Shore Pineapple Company, and Development Strategies LLC in late 2010 (see **Appendix A**). The following is a summary of the Assessment.

The agricultural assessment identified, screened, and selected tropical fruit and vegetable crops that have potential for cultivation within the Kīlauea Agricultural Park. The preliminary screening criteria used in the crop selection process included:

1. Suitability for cultivation under the climatic and growing conditions at the project site;
2. Potential for replacement of intra-state and Mainland imports to Kauaʻi;
3. Revenue potential per acre per year; and
4. Other benefits/considerations (i.e., export potential, reduction in water demand, potential synergies with existing growers on the island, etc.) (Oda/Development Strategies LLC, 2010).

The preliminary crop list includes 25 acres of pineapple/papaya and 29 acres of vegetable and root crops. The crop list is shown in **Table 2-1** (Oda/Development Strategies LLC, 2010).

Table 2-1. Preliminary Crop List

Crop	Acres
Pineapple	10
Papaya	15
Green Onion	3
Sweet Potato	6
Cucumber	4
Eggplant	2
Tomato	3
Ginger Root	5
Sweet Corn	6
Total	54

It is noted that weather conditions at the site are generally acceptable for the cultivation of tropical crops. However, the climate during the wet winter months is not ideal for vegetable crops. Thus, vegetable crop production is recommended during the drier months from April to October in order to mitigate plant disease risks during periods of high rainfall (Oda/Development Strategies LLC, 2010).

In later phases of the planning process, the actual crop list and subsequent field layout should be based on the viability of grower proposals and the amount of irrigation water that is available (Oda/Development Strategies LLC, 2010).

2.4.1 Tropical Crops

According to the Preliminary Agricultural Assessment, a variety of tropical crops were reviewed. The study notes that tropical crops are well suited to the climatic and growing conditions at the site. The study assessed extra sweet gold pineapple, papaya, banana, ginger root, and dry land taro (Oda/Development Strategies LLC, 2010).

Pineapple may represent the ‘best case’ crop for intra-state import replacement. Under Hawai‘i State law, pineapple cannot be imported into the State from foreign growing areas. Production on O‘ahu and Maui are the primary sources of pineapple consumed in the State. A percentage of the current production is shipped to the Mainland making the relatively small Kaua‘i market less important to sales and marketing plans for current pineapple growers (Oda/Development Strategies LLC, 2010).

Pineapple is a very efficient water user and can be grown without irrigation. Unirrigated pineapple culture provides both capital and operating costs savings potentially increasing profitability. However, the initial investment to enter into the pineapple business is relatively high. The largest initial investment is seed development or planting material production. Pineapple may also require soil fumigation to control nematodes. This requires specialized bedding equipment and use of agricultural mulches which is a significant cost component (Oda/Development Strategies LLC, 2010).

Papaya is the most likely crop of choice for production at the site. Kaua‘i growers have extensive experience in growing papaya. All of the papaya grown on Kaua‘i is consumed on the island. If the Kaua‘i market is already saturated, it may not be practical for new growers to compete with existing production for the local market. Currently, there is no papaya packing plant on the island that is operational. Papaya grown at the Kīlauea Agricultural Park cannot be exported to Mainland markets until the papaya packing facility is re-activated (Oda/Development Strategies LLC, 2010).

Banana has been previously grown at the site. Banana, however, has a high water requirement and is impacted by pests and diseases that are difficult to control. Banana can be imported into the State making it more difficult for small growers to successfully compete in the local market (Oda/Development Strategies LLC, 2010).

Dry land taro for luau leaf may also be a good candidate for both conventional and organic production. However, it makes little practical sense to grow dry land taro when the best taro growing area is located a few miles down the road. Dry land taro leaf was thus eliminated from further consideration in the assessment (Oda/Development Strategies LLC, 2010).

Ginger root can be grown with good drainage in wet, windy growing environments. The high revenue per acre per year and ability to export excess production makes ginger root a good candidate for growers at the Kīlauea Agricultural Park. (Oda/Development Strategies LLC, 2010).

2.4.2 Vegetable Crops

According to the Preliminary Agricultural Assessment, vegetable crops are more sensitive to climatic and growing conditions than tropical fruit crops. Vegetable crops are normally grown in hot, dry growing environments with irrigation to facilitate rapid plant growth and minimize losses from plant and fruit diseases (Oda/Development Strategies LLC, 2010).

Climatic conditions during the wet winter months at the Kīlauea Agricultural Park are not ideal for cultivation of vegetable crops. Monthly rainfall is fairly well distributed during the year. However, the winter months are too wet to grow vegetable crops even with good drainage. Storm events can cause catastrophic losses when crops die in waterlogged soils. Excessively wet growing conditions requires very frequent pesticide applications to control plant diseases (Oda/Development Strategies LLC, 2010).

The recommended vegetable growing season at the Kīlauea Agricultural Park is April to October based on an evaluation of weather data. During dry years, it may be possible to extend the vegetable growing season from March to November. The number of growing days in the April to October and the March to November growing seasons are 213 and 274 days, respectively (Oda/Development Strategies LLC, 2010).

The number of growing days required from planting to harvest is one of the primary crop characteristics that must be considered in any production plan. Growing crops or varieties within a crop category with shorter growing cycles may reduce crop water and fertilizer requirements, reduce pest and disease pressures, and decrease risks of crop failure due to poor weather (Oda/Development Strategies LLC, 2010).

For vegetable crops, it is critical to maintain rapid and vigorous growth with good growing site selection and effective field maintenance (fertilization, irrigation, and pest and disease control) to grow and harvest crops at the estimated growing days within the growing season. Extending the growing cycles of vegetables may lead to severe disease outbreaks and crop failure. Due to the relatively short vegetable growing season, it may be practical to grow and harvest only one vegetable crop per acre per season (Oda/Development Strategies LLC, 2010).

The Preliminary Agricultural Assessment notes that vegetable crops that may be adapted to climatic and growing conditions at the Kīlauea Agricultural Park with acceptable growing cycles include green bean, bittermelon, Chinese cabbage, mustard cabbage, sweet corn, cucumber, eggplant, lettuce, green pepper, pumpkin, squash, sweet potato, tomato, and watermelon (Oda/Development Strategies LLC, 2010).

The foregoing list of potential vegetable crops was preliminarily screened against the potential competitive advantage for Kauaʻi production and potential revenue per acre per year. Vegetable production by large growers on Oahu makes it difficult to compete for Kauaʻi market share for specific crops. Inter-island freight savings probably do not offset the competitive advantages that the Oahu growers have for watermelon, green pepper, tomato, head cabbage, and melons (Oda/Development Strategies LLC, 2010).

It is noted that the crops mentioned in the Preliminary Agricultural Assessment represent the logical first step for growers and is not intended to discourage evaluating and growing different crops at the Kīlauea Agricultural Park. The crops that are ultimately selected and acres grown should be based on the viability of the grower proposals (Oda/Development Strategies LLC, 2010).

2.4.3 Organic Crop Production

The Preliminary Agricultural Assessment notes that organic crop production requires better growing site selection and planning than conventional crop production. The climatic conditions at the site will increase pest and disease risks in organic crops. Plant nutrition is more difficult due to limitations on the types and quantities of fertilizers that can be used. Cover crops are required to improve soil health and soil nutrient content before planting of organic crops. Irrigation management has to be more precise than conventional crops to minimize plant stresses that accelerate the spread of diseases. Weed control is very difficult in wet windy growing conditions due to heavy weed pressure from wind blown weed seeds (Oda/Development Strategies LLC, 2010).

The site may be suitable for organic tropical fruit production. However, the study notes that it is important to recognize that organic tropical fruit production will produce lower yields with less control over fruit delivery schedules when compared to conventional tropical fruit crops (Oda/Development Strategies LLC, 2010).

Although organic crop production does not use a wide range of pesticides, it may present odor nuisances from use of manures, fish meals, and composts that may not be acceptable to the neighboring community. Similar to conventional crop production, organic growers should prepare grower proposals to evaluate the efficiency, productivity, sustainability, and profitability of small scale organic farms (Oda/Development Strategies LLC, 2010).

The Preliminary Agricultural Assessment notes that organic crop production should focus primarily on growing tropical crops like pineapple, papaya, and banana while conducting small scale studies to determine if organic vegetables can be grown economically (Oda/Development Strategies LLC, 2010).

2.4.4 Recommendations for Future Action

As planning proceeds on the Kīlauea Agricultural Park, there is a need to consider recommendations for future action. These recommendations should be considered in the finalization of the implementation plan and budget for the initial development and ongoing operation of the agricultural park (Oda/Development Strategies LLC, 2010).

An overall viable sales and marketing plan based on sales to retail, resort, and farmer's markets needs to be done in order to ensure that all of the production at the Kīlauea Agricultural Park is

sold on an island wide basis. This means that grower proposals need to be scrutinized carefully with an eye on Production Guide and Production Plans. These plans should discuss mitigation of growing risks, projected yields and quality goals as well as delivery schedules. Crop management plans are also important to prevent outbreaks of pests and diseases that can jeopardize not only the individual grower's crops but his neighbor's crops as well (Oda/Development Strategies LLC, 2010).

The formation of a Kīlauea Agricultural Park Growers Association will be essential to success of the project. The responsibilities of the Association may include operation and maintenance of the Soil Conservation Plan, community relations, grower relations, interaction with government officials, operation and maintenance of the water source, storage and irrigation system, compliance with permit requirements, coordination of planting sequences, road maintenance, and security (Oda/Development Strategies LLC, 2010).

By-Laws for the Association should be formulated and adopted. After all of the responsibilities are identified and associated cost estimates are developed, it will be appropriate to assess Association fees by acres leased (or some other measurable, non-confidential information). The small number of acres will not support collection of high Association fees. Therefore, the growers will need to decide what services should be provided by the Association and services that will be assigned to individual growers (Oda/Development Strategies LLC, 2010).

The growers should elect a voluntary Board of Directors to address Association business. The Board requires three to five directors to ensure fair voting on issues (Oda/Development Strategies LLC, 2010).

Most importantly, all growers must be willing to work together as a team. Growers who do not manage their fields properly will adversely affect their neighbors. All growers must be good neighbors to their fellow growers and to the Kīlauea community (Oda/Development Strategies LLC, 2010).

Figures

Section 2 –Project Description

Figure 2-1
Kīlauea Agricultural Park
Proposed Plan

Figure 2-2
Aerial View of
Project Vicinity

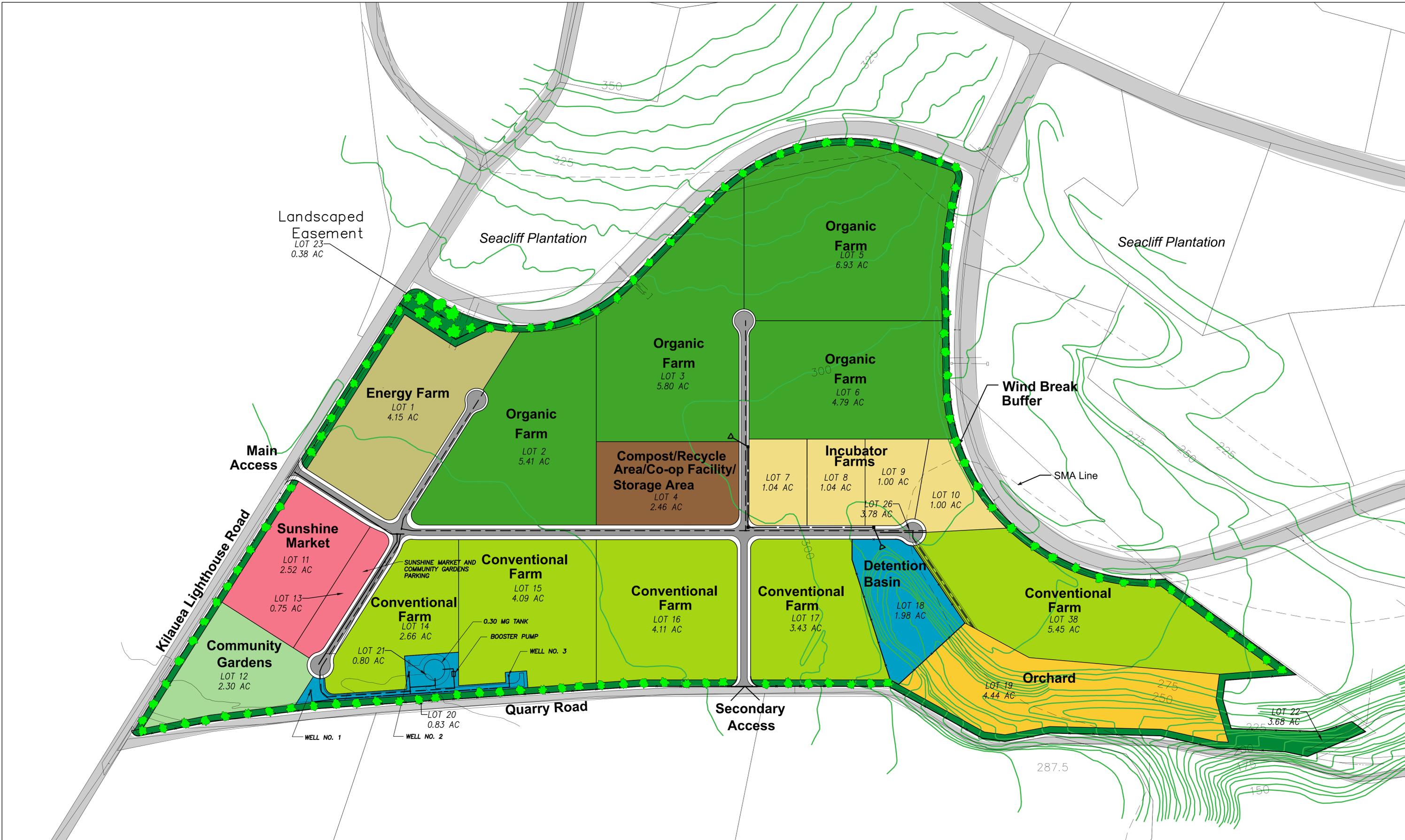


Figure 2-1
Kilauea Agricultural Park Proposed Plan



Source: Google Earth

Figure 2-2

Aerial View of Project Vicinity

Section 3 – Natural Environment

3.1 Climate

The climate in Kīlauea is characterized as semi-tropical and is influenced by Hawai‘i’s geographic location, southwest of the Pacific High or anticyclone region. The outstanding features of the climate are the equable temperatures from day to day and season to season, the persistent northeasterly trade winds and the marked variation in rainfall from the wet to the dry season, and from place to place.

The 10 year average rainfall (between 1999 and 2008) at the site is approximately 62 inches per year. The wettest month during the 10 year period was March with an average of 8.66 inches of rainfall. September was the driest month averaging 3.51 inches of rainfall during the 10 year period. The highest monthly rainfall total was March 2006 at 36.44 inches. The lowest monthly total was May 2000 at 0.71 inch.

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The 10 year annual average air temperature at the site is 74.2 degrees Fahrenheit. Prevailing wind direction is east-northeast with average wind speed of 10 to 20 miles per hour (Oda/Development Strategies LLC, 2010).

Potential Effects and Mitigation

The proposed project will not affect the climate of the region. Climatic conditions at the site are suitable for tropical fruit crops such as papaya, pineapples and banana. However, the site is wetter than desired for vegetable crop production, especially during the winter months. Variations in rainfall dictate careful consideration regarding drainage. The generally windy conditions at the site will increase evapotranspiration thus increasing crop water requirements. Wind sensitive crops may also require installation of wind breaks (Oda/Development Strategies LLC, 2010).

3.2 Geography, Topography and Soils

Geography

Kaua‘i is the oldest of the Hawaiian Islands. Geologically, the original volcano, located in the middle of the island went through a period of weathering and erosion. There were voluminous rejuvenated stage lavas which represent the later eruptive stages of the volcano. The primary basaltic rocks from the original volcano are the Waimea Canyon series. The innumerable lava flows are divided into three major geologic formations: the Napali formation, the Olokele formation, and the Makaweli formation. The Napali formation of the Waimea Canyon series are the most permeable of the three.

Subsequent to the original flows, the Koloa volcanic series covered most of the eastern part of the island. The Koloa series are less permeable than the Napali formation lavas. The Koloa series of flows were deposited in relatively flat layers compared to the Napali flows. The Olokele and Makaweli formations are also relatively flat but more permeable than the Koloa series.

Topography

The site is relatively flat with a surface elevation ranging from 281 to 325 feet above mean sea level. The site slopes naturally toward the southeast corner of the property. A gulch is located in the southeast corner of the site which leads to a drainageway which connects to the Kīlauea River basin.

Soils

Soils information for the project site was obtained from the Soil Survey of Islands of Kauaʻi, Oʻahu, Maui, Molokaʻi, and Lanaʻi, State of Hawaiʻi, as prepared by the U.S. Department of Agriculture, 1972. See **Figure 3-1**. Most of the project site is within the Lihue series of soils. These are well drained soils on the uplands of Kauaʻi. Lihue silty clay, 0 to 8 percent slopes (LhB) and Lihue gravelly silty clay, 0 to 8 percent slopes (LIB) are the specific soil types within the project site.

Lihue silty clay, 0 to 8 percent slopes is generally located on the tops of interfluves in the uplands. In a representative profile, the surface layer is dusky-red silty clay about 12 inches thick. The subsoil, more than 48 inches thick, is dark-red and dark reddish-brown, compact silty clay that has a subangular blocky structure. The substratum is soft, weathered rock. The surface layer is strongly acid. The subsoil is slightly acid to neutral. Permeability is moderately rapid, runoff is slow and erosion hazard is no more than slight.

Lihue gravelly silty clay, 0 to 8 percent slopes is similar to the Lihue silty clay, 0 to 8 percent slopes soil series, except that it contains ironstone-gibbsite pebbles and has brighter colors in the subsoil horizon.

The drainageway portion of the project site, located in the southeast corner, is classified as Rough broken land (rRR). This consists of very steep land broken by numerous intermittent drainage channels. In most places, it is not stony. This type of soil occurs in gulches and mountainsides.

Most of the project site is classified as Prime Agricultural Land in the Agricultural Lands of Importance to the State of Hawaiʻi. The southeastern portion of the site was not included in the study. See **Figure 3-2**. The Land Study Bureau assigned most of the property a productivity rating of “B” (on a scale of A to E, with A having the highest rating). The southeastern gulch area is classified as “E”. See **Figure 3-3**.

Potential Effects and Mitigation

No significant effects to soils, topography or geology are expected to result from the project. A Soil Conservation Plan will be formulated and implemented in consultation with the Natural Resources Conservation Service to address possible soil conservation and erosion control impacts during the initial land clearing and operational stages. In addition, erosion control measures will be employed during construction.

3.3 Shorelines, Beaches and Dunes, Estuary, and Wetlands

The project does not abut any shorelines, beaches, dunes, estuaries or other inland surface waters. The drainage way located at the southeast portion of the property eventually flows to makai reaches of the Kīlauea Stream.

There are no known wetlands in the project vicinity.

Potential Effects and Mitigation

No adverse effects to shorelines, beaches, dunes, estuaries and surface waters are expected to result from the project. The potential for adverse effects associated with storm water runoff from construction activities will be addressed by compliance with regulatory standards in Hawai‘i Administrative Rules (HAR) 11-54 Water Quality Standards; HAR 11-55, Water Pollution Control; and other standards as prescribed by law. A National Pollutant Discharge Elimination Systems (NPDES) permit will be obtained for the project and best management practices (BMPs) will be employed to prevent soil loss and sediment and pollutant discharges from work sites.

BMPs will include structural (e.g., silt fences, berms, barriers, filter fabric), vegetative (e.g., grass, mulch, ground cover, soil stabilization), and management measures (e.g., project scheduling and phasing, material storage and equipment maintenance procedures, BMP monitoring), as necessary.

In addition, the Soil Conservation Plan will be prepared to address soil conservation and erosion control during construction and farming operations.

3.4 Groundwater

A Technical Memorandum relating to *Irrigation Supply for the Proposed 54-Acre Agricultural Park in Kīlauea, Kaua‘i* was undertaken by Tom Nance Water Resource Engineering and completed in March 2011 (see **Appendix D**). The following summarizes the findings of the Technical Memorandum relating to groundwater considerations.

The Memorandum notes that successful well development for the Park’s irrigation needs to consider the following factors:

This area of the island sits on the later stage Kōloa volcanic series which overlies the older shield building Waimea series volcanics. The Kōloa volcanic series are typically of low to moderate permeability and highly variable over short distances. In the Kīlauea area, the Kōloa lava flows are typically interbedded with soil horizons which have been weathered to clay. This and the highly variable permeability of the lavas themselves generally means that multiple and variable water bearing horizons will be encountered. It also means that drilling often has to proceed a substantial distance below sea level to achieve the desired yield (Tom Nance Water Resource Engineering, 2011).

However, four wells have been developed directly to the west of the Park site. The wells (State Nos. 1324-01, 1324-02, 1324-04 and 1324-05) are closely grouped and have water levels standing from 40 to 216 feet above sea level. These wells have capacities of 15 to 60 gallons per minute (gpm), and all produce fresh water (Tom Nance Water Resource Engineering, 2011).

Three wells have been developed to the east of the project site across Kīlauea Stream. These wells (State Nos. 1223-01, 1223-02, and 1223-03) are also closely grouped, have water levels between 11 feet and 258 feet above sea level, have capacities of 50 to 200 gpm, and produce fresh water (Tom Nance Water Resource Engineering, 2011).

Potential Effects and Mitigation

Because of the unpredictable and highly variable characteristics of the Kōloa volcanic series, development of a reliable supply of water with onsite wells is not assured. Well development early in the project's development should be undertaken to prove the viability of the proposed irrigation system. To minimize the initial investment, pump tests are proposed in the pilot boreholes to establish supply capacity before the entire cost of a well's construction and testing is expended (Tom Nance Water Resource Engineering, 2011).

3.5 Drainage

Natural drainage flows into the parcel generally from the northwest. Runoff sheet flows across the property to the southeast corner of the property. As the property is overgrown and unmaintained, there are no existing on-site drainage improvements.

Potential Effects and Mitigation

Short Term

Drainage effects related to construction activities will be of short duration and will cease upon completion of the project. Planned improvements will require excavation and grading to install infrastructure and achieve proper elevations and grades.

During construction, project activities will be conducted in compliance with HAR 11-54 Water Quality Standards; and HAR 11-55 Water Pollution Control. Because planned improvements will result in more than one acre of ground disturbance during construction, project activities will be subject to a NPDES Notice of Intent (NOI) Form C for Storm Water Discharges Associated with Construction Activity from DOH, Clean Water Branch (CWB). A NOI Form F, Hydrotesting Waters permit application may also be required if hydrostatic testing of water lines is required. These permits require implementation of BMPs, including site management measures and physical controls (e.g. diversion berms, silt fences, detention ponds) to reduce pollutants in construction storm water runoff and ensure that the project complies with State water quality standards. As feasible, any discharges of treated, dechlorinated effluent will be reused for dust control, or offered as irrigation water to area farmers.

General BMPs for urban-type development areas will include the following:

General Best Management Practices (BMPs)

- Construction will be limited near drainageways to avoid the potential for release of sediments into stormwater.

Before Construction

- Existing ground cover will not be destroyed, removed or disturbed more than 20 calendar days prior to start of construction.
- Erosion and sediment control measures will be in place and functional before earthwork may begin, and will be maintained throughout the construction period. Temporary measures may be removed at the beginning of the work day, but shall be replaced at the end of the work day.

During Construction

- Clearing shall be held to the minimum necessary for grading, equipment operation, and site work.
- Construction shall be sequenced to minimize the exposure time of cleared surface areas. Areas of one phase shall be stabilized before another phase can be initiated. Stabilization shall be accomplished by protecting areas of disturbed soils from rainfall and runoff by use of structural controls such as PVC sheets, geotextile filter fabric, berms or sediment basins, or vegetative controls such as grass seedling or hydromulch.
- Temporary soil stabilization with appropriate vegetation shall be applied on areas that remain unfinished for more than 30 calendar days, and permanent soil stabilization using vegetative controls shall be applied as soon as practicable after final grading.

- All control measures shall be checked and repaired as necessary, e.g., weekly in dry periods and within 24 hours after any heavy rainfall event. During periods of prolonged rainfall, daily checking shall be conducted.

During Adverse Weather Conditions

- The contractor shall listen to weather reports daily while conducting work. If an emergency weather warning is issued, work shall cease. All equipment and materials shall be secured against wind, rainfall and flooding, and the work area cleared of construction debris to the extent practicable. Work shall not resume until conditions improve and weather warnings are rescinded.
- Prior to recommencement of work activities following an event, the Contractor shall inspect all BMPs, including silt fence, sandbag barriers, and stabilized construction entrance, to ensure that they are not damaged, and that all BMP's are properly installed and functioning.
- Construction materials and debris that is dispersed due to wind or rainfall shall be collected by the Contractor and reused or disposed of in compliance with State and County regulations.

Long-Term

A conservation plan will be prepared in coordination with the Natural Resources Conservation Service (NRCS). It is intended to be a tool to assist farmers to decide on the best methods to help improve productivity, sustainability and profitability of a farming operation as well as enhance soil conservation and erosion control. Long-term effects to drainage will be positive.

3.6 Flora and Fauna

A study entitled *Natural Resource Surveys for the Proposed Kīlauea Agriculture Park, Kīlauea, Kaua'i (TMK:5-2-04:099)* was undertaken by AECOS Consultants, Inc. dated March 2011 and covered botanical, avian and mammalian resources on the subject property (see **Appendix C**). The following summarizes the findings and recommendations of the study.

Botanical Resources

The result of the botanical field survey revealed a total of two species of fern/fern ally and 79 species of flowering plants on the site. The only truly native plant recorded was moa (*Psilotum nudum*). Three species attributed to early introductions (Polynesian, before 1793): 'ulu or breadfruit (*Artocarpus altilis*), noni (*Morinda citrifolia*), and niu or coconut (*Cocos nucifera*) were observed growing on the property. Given the fact that nearly all of the site was in agricultural use up until some 30 years ago, it is not surprising that the plants now characteristic

of the property are common, non-native species typical of lowland, windward Kauaʻi (AECOS Consultants, Inc., 2011).

The dominant grass in open areas on the property is Guinea grass (*Urochloa maxima*), with some areas having an abundance of California or para grass (*U. mutica*). These are both large grasses that tend to prevent other herbaceous species from establishing or persisting. Thus, many of the smaller, herbaceous species recorded are limited in distribution to more open forest areas or the roadway shoulders, maintained by mowing (AECOS Consultants, Inc., 2011).

The dominant tree in forested areas is Christmas berry (*Schinus terebinthefolius*), with common guava (*Psidium guajava*) abundant. Where the canopy is dense, the understory is rather sparse. However, the property includes extensive interfaces between forest patches and open grassland, where various vines and shrubs grow profusely. In the gulch area, Java plum (*Syzygium cumini*) is the dominant tree. The gulch vegetation is also unique compared with the majority of the site in as much as there is considerable evidence of informal farming occurring along the bottom and lower margins of the gulch (AECOS Consultants, Inc., 2011).

The past history of this site entailed removal of the original vegetation for agricultural activities. On lowland Kauaʻi, as is the case generally in the Hawaiian Islands, reversion to a secondary forest following cessation of agricultural uses seldom involves any significant inclusion of native species. With the exception of the gulch, all of the trees on the site appear to have come in over the last couple dozen years and have no significance botanically. The trees in the gulch may be somewhat older, but again have no particular tie to the Hawaiian Islands or its culture (AECOS Consultants, Inc., 2011).

Avifauna

A total of 361 individual birds of 23 species, representing 17 separate families, were recorded during station counts by the AECOS study. An additional species, Black crowned Night-Heron (*Nycticorax nycticorax hoactli*), was recorded as an incidental observation while transiting the site between count stations. Four of the species detected, Hawaiian Goose or, Nēnē (*Branta sandvicensis*), Great Frigatebird (*Fregata minor*), Pacific Golden-Plover (*Pluvialis fulva*), and Black-crowned Night-Heron are native to the Hawaiian Islands. Nēnē are listed as endangered species under both federal and state endangered species statutes. The Black-crowned Night-Heron is an indigenous resident breeding species. Pacific Golden-Plover is an indigenous migratory shorebird species, and Great Frigatebird is an indigenous seabird. The remaining 18 species recorded are all considered to be alien to the Hawaiian Islands (AECOS Consultants, Inc., 2011).

Avian diversity and densities were in keeping with the habitat present on the site, and its location in the lowlands of the Island of Kauaʻi. Three species, Japanese White-eye (*Zosterops japonicus*), Red Junglefowl (*Gallus gallus*), and House Finch (*Carpodacus mexicanus*), accounted for slightly less than 48% of the total number of individual birds recorded during station counts. The most commonly recorded species was Japanese White-eye, which accounted for slightly more than 21% of the total number of birds recorded (AECOS Consultants, Inc., 2011).

The findings of the avian survey are consistent with the location of the property, and the habitat present on the site. Four of the 24 avian species detected during the course of this survey: Nēnē, Great Frigatebird, Pacific Golden-Plover, and Black-crowned Night-Heron are native to the Hawaiian Islands. Nēnē, is listed as endangered species under both state and federal endangered species statutes. A total of 25 individual Nēnē were recorded over-flying the project site. The Nēnē population on Kaua‘i is increasing at a fairly rapid pace and if this increase continues, human/Nēnē interactions will increase on the Island over time (AECOS Consultants, Inc., 2011).

A relatively large number of Great Frigatebird were seen soaring over the site and the adjacent Seacliff Plantation Subdivision. Great Frigatebird is an indigenous seabird species which nests in the Leeward Islands, and is relatively common in and around the Kīlauea Point National Wildlife Refuge. One Pacific Golden-Plover was seen flying over the site during station counts. This species is an indigenous migratory shorebird that nests in the high Arctic during the late spring and summer months, returning to Hawai‘i and the tropical Pacific to spend the fall and winter months each year. The species usually leaves Hawai‘i for the trip back to the Arctic in late April or the very early part of May each year (AECOS Consultants, Inc., 2011).

One Black-crowned Night-Heron was flushed from within the thickly vegetated gulch on the site. The Night heron is an indigenous resident breeding waterbird species commonly found in association with just about any form of standing or running fresh water on the Island, although the gulch in this case lacks a stream. The remaining 18 avian species detected during this survey are all considered to be alien to the Hawaiian Islands (AECOS Consultants, Inc., 2011).

Waterbirds – Presently, there is no suitable wetland habitat on the subject property that would attract any of the five endangered waterbird species found in the lowlands of Kaua‘i. Following development of the agricultural park, it is probable that Nēnē will be attracted onto the property by leafy vegetables. The development of an open irrigation reservoir may also be expected to attract Hawaiian Duck (*Anas wyvilliana*), Common Moorhen (*Gallinula chloropus sandvicensis*), Hawaiian Coot (*Fulica alai*), and possibly Black-necked Stilt (*Himantopus mexicanus knudseni*) onto the site. All of these species are listed as endangered under both federal and state endangered species statutes (AECOS Consultants, Inc., 2011).

Seabirds - Two other species not detected during this survey—Hawaiian Petrel (*Pterodroma sandwichensis*) and the threatened endemic sub-species of the Newell’s Shearwater (*Puffinus auricularis newelli*) have been recorded overflying the project site between April and the end of November each year (David, 1995; Morgan, et al., 2003, 2004; David and Planning Solutions, 2008). Additionally, the Save Our Shearwaters Program has recovered both species from the general area on an annual basis over the past three decades (Morgan, et al., 2003, 2004; David and Planning Solutions, 2008; DOFAW, 2009). The petrel is listed as endangered, and the shearwater as threatened under both federal and state endangered species statutes. The primary cause of mortality in both Hawaiian Petrel and Newell’s Shearwater is thought to be predation by alien mammalian species at the nesting colonies (USFWS, 1983; Simons and Hodges, 1998; Ainley, et al., 2001). Collision with man-made structures is considered to be the second most significant cause of mortality of these seabird species in Hawai‘i. Nocturnally flying seabirds, especially fledglings on their way to sea in the summer and fall, can become disoriented by

exterior lighting. When disoriented, seabirds often collide with manmade structures, and if they are not killed outright, the dazed or injured birds are easy targets of opportunity for feral mammals (Hadley, 1961; Telfer, 1979; Sincock, 1981; Reed, et al., 1985; Telfer, et al., 1987; Cooper and Day, 1994; Podolsky, et al., 1998; Ainley, et al., 2001) (AECOS Consultants, Inc., 2011).

There are no nesting colonies nor appropriate nesting habitat for either of these listed seabird species within the current study site. There are nesting Newell's Shearwaters within the Kīlauea Point National Wildlife Refuge, with the next closest colonies located at the back of Limahuli, Wainiha, Lumaha'i, and probably Hanalei valleys (David, et al., 2002; DOFAW, 2009). Currently the closest Hawaiian Petrel nesting colonies are also located at the back of Limahuli, Wainiha, Lumaha'i, and probably Hanalei valleys (AECOS Consultants, Inc., 2011).

In addition to the two listed seabird species discussed above, a number of indigenous seabird species protected under the federal Migratory Bird Treaty Act utilize resources of one type or another along the north coastline of Kaua'i. Several of these nest within the refuge and at locations along the coastline in the general project area. These include the Laysan Albatross (*Phoebastria immutabilis*), Bulwer's Petrel (*Bulweria bulwerii*), Wedge-tailed Shearwater (*Puffinus pacificus*), White-tailed Tropicbird (*Phaethon lepturus*), Red-tailed Tropicbird (*Phaethon rubricauda*), Brown Booby (*Sula leucogaster*), and Red-footed Booby (*Sula sula*). None is believed to utilize the project site (AECOS Consultants, Inc., 2011).

Mammals

Three mammalian species were noted. Tracks, sign and cast of items of humans (*Homo s. sapiens*) were encountered throughout the site. There were numerous dogs (*Canis f. familiaris*) barking from residences to the west of the study site. Additionally, dog tracks and sign were encountered in numerous locations within the site. Pig (*Sus s. scrofa*) tracks, sign, and scat were encountered on the property, especially within the thickly vegetated gulch, which runs along the southwest side of the site; two pigs were seen in the gulch (AECOS Consultants, Inc., 2011).

The findings of the mammalian survey are consistent with the location of the property and the habitats present on the site. All three mammalian species detected during the course of the survey are alien to the Hawaiian Islands. Although no Hawaiian hoary bats were detected during the survey, bats have been recorded on a regular basis foraging for insects within the general project area (David, 2010). The Hawaiian hoary bat is widely distributed in lowland areas on the Island of Kaua'i, and has been documented in and around almost all areas that still have some dense vegetation (Tomich, 1986; USFWS, 1998; David, 2010) (AECOS Consultants, Inc., 2011).

Although no rodents were detected during the course of the survey, it is likely that the four established alien Muridae found on Kaua'i—roof rat (*Rattus r. rattus*), Norway rat (*Rattus norvegicus*), European house mouse (*Mus musculus domesticus*), and Polynesian rat (*Rattus exulans hawaiiensis*) use various resources found within the general project area. All of these introduced rodents are deleterious to native ecosystems and native species dependent on them. No mammalian species protected or proposed for protection under either the federal or state

endangered species programs were detected during the course of this survey (DLNR, 1998, USFWS, 2005a, 2005b, 2010) (AECOS Consultants, Inc., 2011).

Potential Effects and Mitigation

Botanical Resources

No plants currently listed, or proposed for listing under either the federal or state endangered species programs (DLNR, 1998; USFWS, 2005, 2010) were noted during the course of the botanical survey (AECOS Consultants, Inc., 2011). Therefore, no impacts are anticipated or expected.

Avifaunal Resources

Nēnē

The potential impacts that development and operation of an agricultural park poses to Nēnē are those which could arise when these birds are attracted onto the site by agricultural crops. These birds would then be at risk of harm from farming activities, vehicular traffic, etc. Nēnē have become a nuisance on many farms on Kaua‘i over the past five or six years (AECOS Consultants, Inc., 2011).

Other Listed Waterbird Species

The development and operation of an irrigation reservoir may attract Hawaiian Duck, Common Moorhen, Hawaiian Coot and Black-necked Stilts onto the site. These birds may also be placed at risk by farming activities, vehicular traffic, etc. (AECOS Consultants, Inc., 2011).

Hawaiian Petrel, Newell’s Shearwater and Migratory Bird Treaty Act Protected Seabird Species

The principal potential impact that the development of the site poses to Hawaiian Petrels, Newell’s Shearwaters and Migratory Bird Treaty Act Protected Seabird species is the increased threat that birds will be downed after becoming disoriented by outdoor lighting associated with night-time construction activity and, following build-out, with exterior lighting associated with structures and appurtenances built on the property (AECOS Consultants, Inc., 2011).

Hawaiian Hoary Bat

The principal potential impact that the proposed development poses to Hawaiian hoary bats would occur during the clearing and grubbing phase. Areas that currently support dense trees are likely used to some degree by roosting bats. Normally it is not thought that availability of roosting habitat is a limiting factor in this species’ survival (Bonaccorso, 2009). The threat that clearing potential roosting habitat poses to the

species occurs mostly between May and July when female bats may be carrying pups and may not be able to flee clearing activity quickly enough to avoid harm (Bonaccorso, 2005, 2007, 2009). Following build-out of the project, lighting associated with the agricultural lots and plantings of fruiting trees will attract volant insects to the site, which in turn will provide bats with additional foraging opportunity (AECOS Consultants, Inc., 2011).

Critical Habitat

There is no federally delineated Critical Habitat encompassing this project site or areas adjacent. Thus the development of the site will not result in impacts to federally designated Critical Habitat. There is no equivalent statute under state law (AECOS Consultants, Inc., 2011).

Recommendations

The following recommendations from the AECOS study will be utilized at the project site to address the potential for adverse effects.

- If nighttime work is required in conjunction with development of the project, it is recommended that lights be shielded to reduce adverse interactions of nocturnally flying Hawaiian Petrels, Newell's Shearwaters, and seabirds protected under the MBTA with external lights and man-made structures (Reed, et al. 1985; Telfer, et al., 1987) (AECOS Consultants, Inc., 2011).
- If there is exterior lighting associated with the operation of the agricultural park, these lights must be shielded to reduce adverse interactions of nocturnally flying seabirds with external lights and man-made structures (Reed, et al., 1985; Telfer, et al., 1987) (AECOS Consultants, Inc., 2011).
- It is recommended that woody vegetation taller than 15 ft in height not be cleared during initial grubbing of the site if scheduled between May 15 and July 15, when bats may be carrying young and potentially put at risk by tree clearing (AECOS Consultants, Inc., 2011).
- If following development of the farm lots and associated irrigation features any of the five endangered waterbird species present in the lowlands of Kaua'i are attracted to the site, consultation with the State Division of Forestry and Wildlife should be initiated. Management options and plans should be formulated to ensure that ongoing operations do not result in adverse impacts to any of these species (AECOS Consultants, Inc., 2011).

3.7 Scenic and Visual Resources

The Kīlauea area is characterized by its open space and rural character. The area immediately surrounding the Kīlauea Agricultural Park is classified Agricultural. As part of the County of Kaua‘i General Plan, the North Shore Planning District recognizes this area as an Open Space, Parks, Agriculture and Conservation heritage resource.

Potential Effects and Mitigation

The project will support open space by restoring agricultural use on the site. Since the site is relatively windy, there will be a need for wind breaks along the north and east boundary of the project. However, no adverse impacts to visual resources are expected.

3.8 Air Quality

Air quality in the Kīlauea area is generally good, as it is through the entire State. The State Department of Health has noted that, “Criteria pollutant levels remain below state and federal ambient air quality standards at all State and Local Air Monitoring Stations.” (DOH, 2010).

Potential Effects and Mitigation

Short Term

Short-term effects on air quality will occur either directly or indirectly as a consequence of project construction activities. The operation of vehicles, heavy equipment, and generators at the project site will generate some fugitive dust and pollution emissions. Adjacent areas will be temporarily affected during the period of construction by dust and pollution, however, these effects will be temporary and will cease when construction is completed.

State air pollution control regulations require that there be no visible fugitive dust emissions at the construction site boundary. Therefore, an effective dust control plan will be implemented by the project contractor to ensure compliance with HAR, Chapter 11-59 and 60. Fugitive dust emissions can be controlled to a large extent by watering of active work areas, using wind screens, keeping adjacent paved roads clean, and by covering open-bodied trucks.

Dust control measures will include, but not be limited to, the following:

- Planning phases of construction to minimize dust generating activities;
- Minimizing the use of dust generating materials and centralizing material transfer points and on-site vehicle travel ways;
- Locating dusty equipment in areas of least effect;
- Providing an adequate water source at the site prior to start-up of construction activities;
- Landscaping bare areas, including slopes, starting from the initial grading phase;

- Providing adequate dust control measures during weekends, after hours, and prior to daily start-up of construction; and
- Construction-related exhaust emissions will be mitigated by ensuring that project contractors properly maintain their internal combustion engines and comply with HAR Chapters 11-59 and 11-60, regarding Air Pollution Control.

Long Term

No long-term negative consequences related to air quality are expected as a result of the project. Plowing and other dust-generating activities will continue to be practiced to minimize the loss of topsoil. The measures to reduce loss of soils include: erection of dust screens, planting of trees, and use of water trucks, as applicable.

Application of pesticides and herbicides on the property will be dictated by wind conditions and application techniques to minimize impacts on air quality within the agricultural park and within surrounding areas.

3.9 Noise

Ambient noise in the proposed project area is generated from natural and man-made sources. Kīlauea Town is located approximately 1,100 feet to the southwest of the project site. The Kaua‘i Christian Academy is located right across Kīlauea Lighthouse Road. Other portions of the project border the residential/agricultural lots of the Seacliff Plantation.

Construction activities will generate noise which could affect nearby areas. Noise levels of diesel powered construction equipment typically range from 80 to 90 dBA at 50 feet distance. The actual noise levels produced are dependent on the construction methods employed during the construction process. Earth moving equipment, including diesel engine powered bulldozers, trucks, backhoes, front-end loaders, graders, etc. will probably be the noisiest equipment used during construction.

Potential Effects and Mitigation

Short Term

Construction noise will be temporary and will cease when construction is complete. Adverse effects from construction noise are not expected to pose a hazard to public health and welfare due to the temporary nature of the work, the absence of sensitive land uses in the surrounding area, and the application of mitigation measures that will be employed to minimize noise effects.

All project activities will comply with HAR Chapter 11-46, Community Noise Control. Excessive noise levels generated by construction activities will require that a noise permit be filed with the DOH, Noise, Radiation and Indoor Air Quality Branch. The provisions of the noise permit will require that contractors use mufflers on all combustion powered

construction vehicles and machinery, and maintain all noise attenuation equipment in good operating condition. Faulty equipment will be repaired or replaced. Additionally, trucks and other construction vehicles will be routed to avoid residential communities whenever possible.

Under current permit procedures, noisy construction activities are normally restricted to the hours between 7:00 AM and 6:00 PM, Monday through Friday, and between 9:00 AM and 6:00 PM on Saturday. Construction activities and use of heavy equipment will be scheduled as much as possible during daylight hours to avoid disturbing area residents during the evening. If work during the nighttime hours is required, a variance from the existing state noise regulations will be requested from the DOH. Construction activities will be suspended on Sundays and during holidays.

Long Term

The noise generated by farming will likely include use of combustion powered farm equipment such as trucks and tractors. However, use of equipment would be intermittent and would be limited to daylight hours.

3.10 Flood Hazards

The entire project area is characterized by the Federal Emergency Management Agency, Digital Flood Insurance Rate Map (FEMA-FIRM) as Zone X. This zone corresponds to areas outside the 1 percent chance of sheet flow flooding where average depths are less than 1 foot. See **Figure 3-4**.

Potential Effects and Mitigation

The project is not expected to exacerbate flood conditions or be adversely affected by flooding.

3.11 Other Hazards

In addition to flooding, other natural hazards include volcanic seismic activity, hurricanes, and tsunami.

3.11.1 Hurricanes

The Hawaiian Islands are seasonally affected by Pacific hurricanes from the late summer to early winter months. Kaua‘i has been affected twice since 1982 by hurricanes, ‘Iwa in 1982 and ‘Iniki in 1992. It is difficult to predict these natural occurrences, but it is reasonable to assume that future events will occur. The project site is, however, no more or less vulnerable than the rest of the island to the destructive winds and torrential rains associated with hurricanes. If a hurricane should affect Kaua‘i, damage would be expected to be to crops in various stages of growth as

Figures

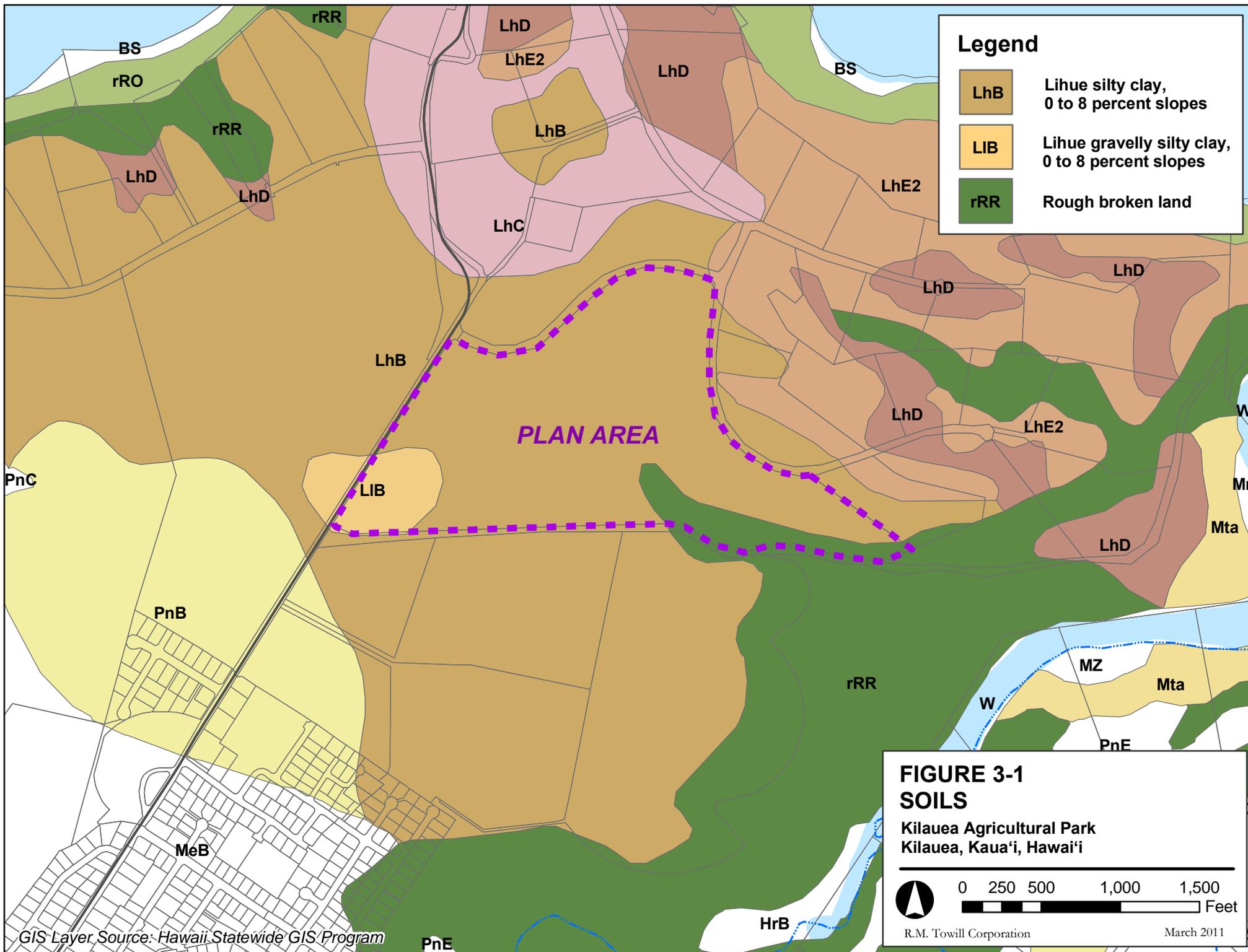
Section 3 –Natural Environment

Figure 3-1
Soils

Figure 3-2
ALISH

Figure 3-3
Land Study Bureau

Figure 3-4
Flood Hazard Map



Legend

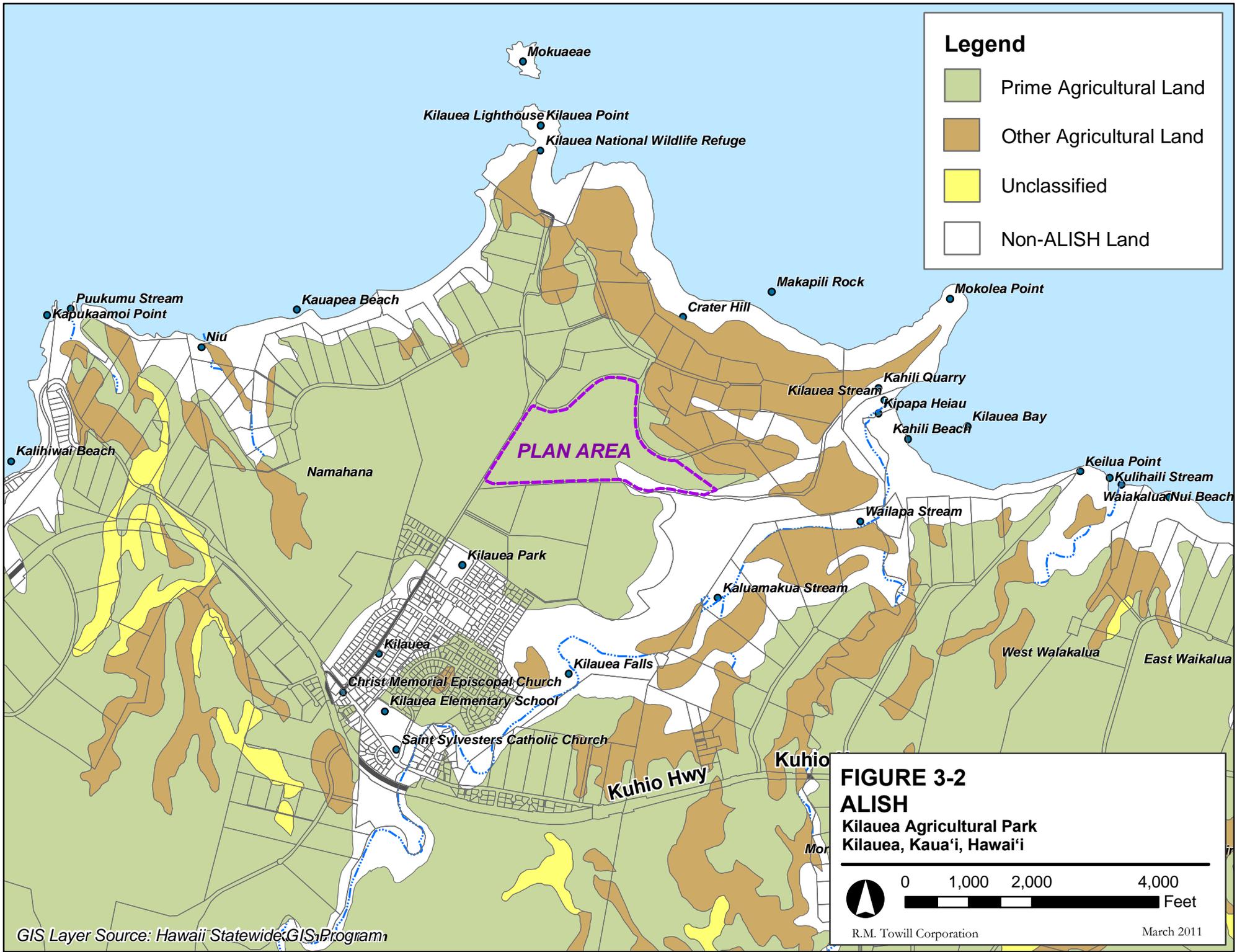
	LhB Lihue silty clay, 0 to 8 percent slopes
	LIB Lihue gravelly silty clay, 0 to 8 percent slopes
	rRR Rough broken land

FIGURE 3-1 SOILS

Kilauea Agricultural Park
Kilauea, Kaua'i, Hawai'i

0 250 500 1,000 1,500 Feet

R.M. Towill Corporation March 2011

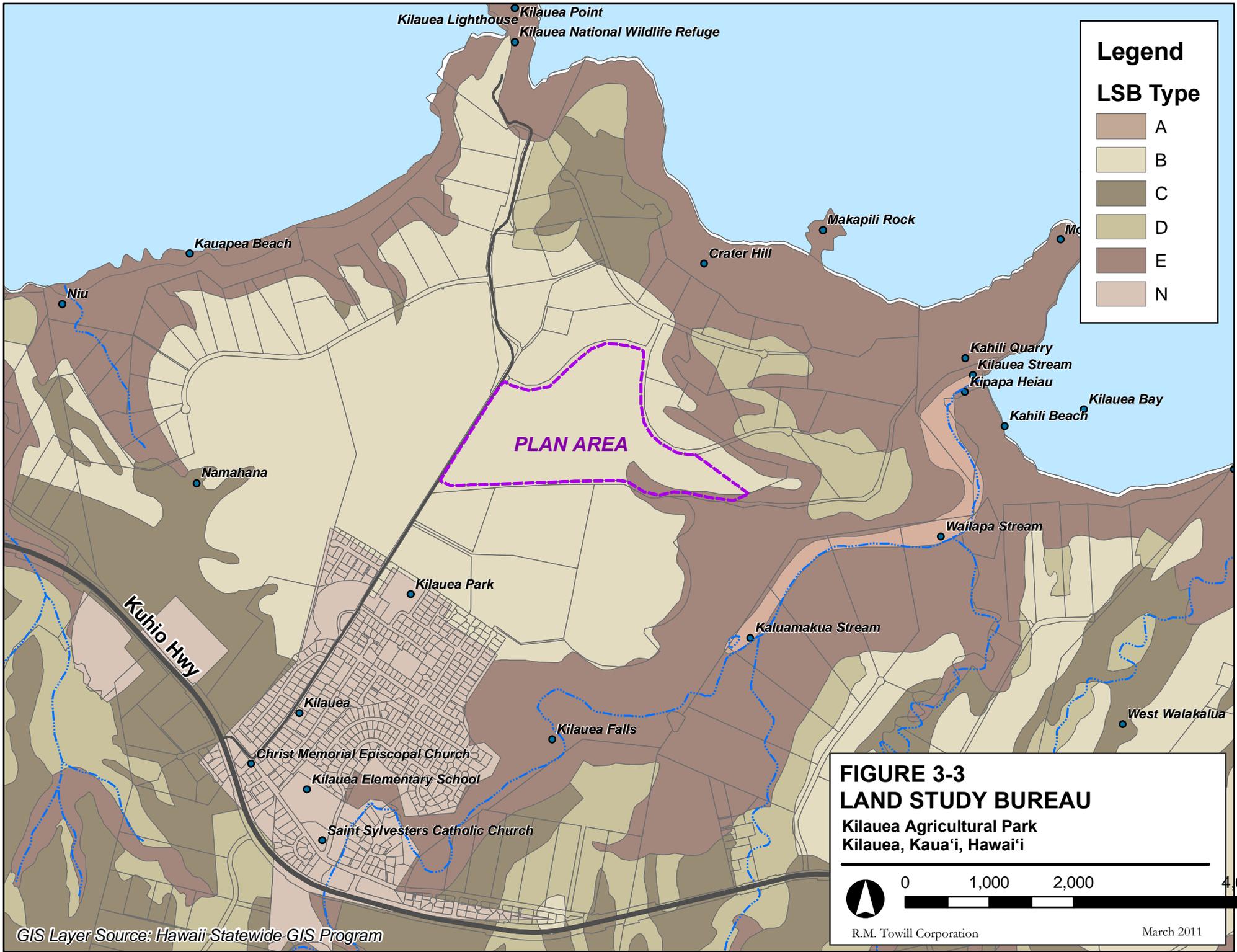


PLAN AREA

FIGURE 3-2
ALISH
 Kilauea Agricultural Park
 Kilauea, Kaua'i, Hawai'i

0 1,000 2,000 4,000 Feet

R.M. Towill Corporation March 2011



Legend

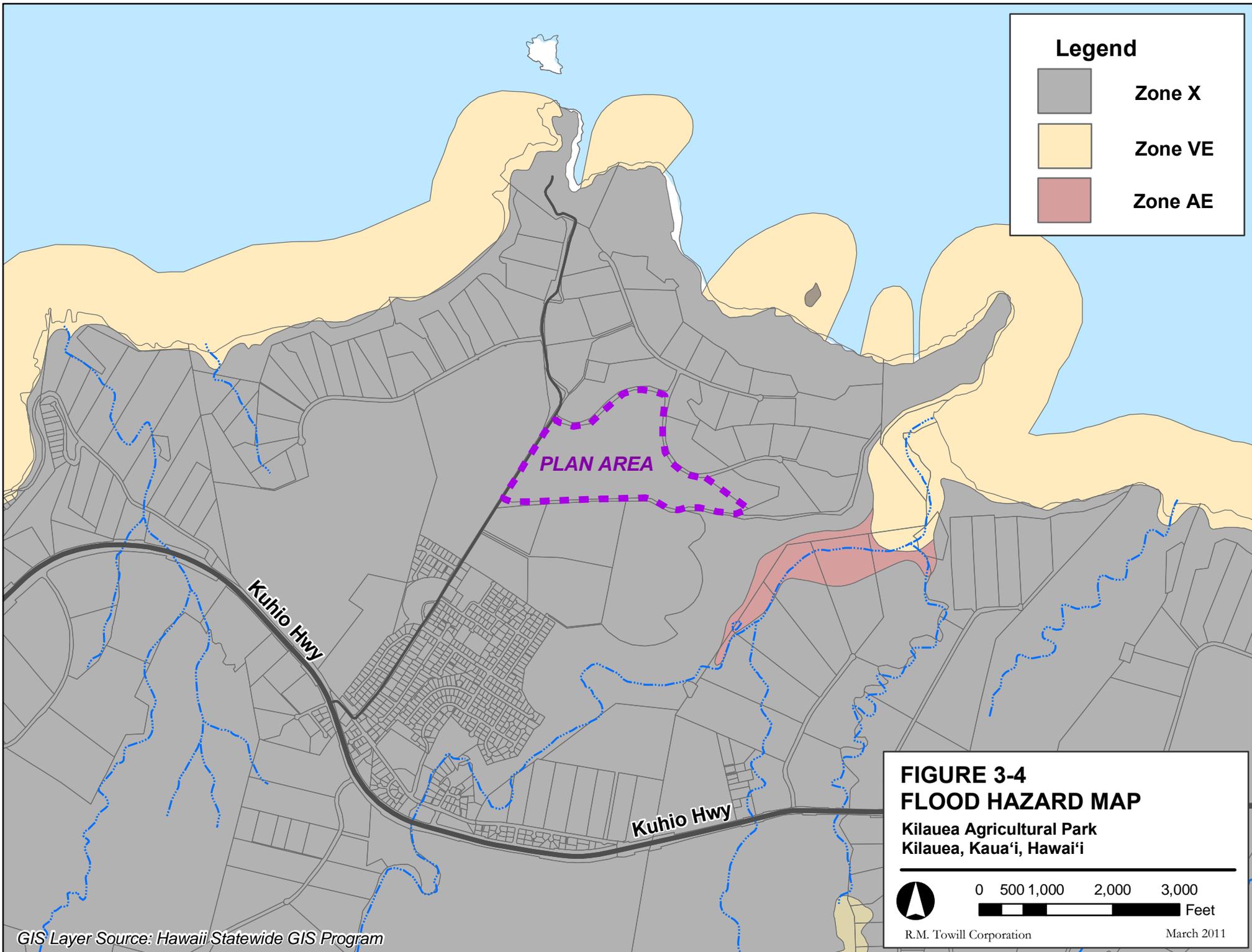
LSB Type

- A
- B
- C
- D
- E
- N

FIGURE 3-3
LAND STUDY BUREAU
 Kilauea Agricultural Park
 Kilauea, Kaua'i, Hawai'i

0 1,000 2,000 4,000 Feet

R.M. Towill Corporation March 2011



Section 4 – Public Services

4.1 Traffic and Roadways

A Traffic Assessment for the Kīlauea Agricultural Park was completed by Julian Ng Inc., in 2011 (see **Appendix D**). The following summarizes the Traffic Assessment.

The project site is located on Kīlauea Lighthouse Road, a two lane County roadway that extends from Kolo Road through Kīlauea Town to the Kīlauea Lighthouse. Kolo Road is a two lane County road that parallels Kuhio Highway for about one mile and provides access to properties and other local streets in Kīlauea. Kolo Road turns to connect to Kuhio Highway at its west end. In this vicinity, there are two other roads (Hookui Road and Pili Road) which extend between Kolo Road and Kuhio Highway. A separate left turn lane is provided for eastbound traffic on Kuhio Highway turning onto Kolo Road. However, there are no left turn lanes at the other two intersections.

Vehicle counts in the year 2008 for the vicinity of Kuhio Highway were derived from the Department of Transportation, Highways Division data. The average weekday total volume along Kuhio Highway is 13,314 vehicles per day. The highest peak hour volumes are 1,200 vehicles in both directions. While no count data from county roads in the vicinity were obtained, the highest volumes are estimated to be no more than 25% of the volumes on Kuhio Highway. Daily volumes would thus be less than 3,500 vehicles per day. Peak hour volumes would be about 300 vehicles per hour in both directions (Julian Ng Inc., 2011).

The Traffic Assessment applied trip rates for the farm lots and community gardens. The typical project traffic impact would be minimal. The highest hourly impact is less than 35 vehicles per hour. This is significantly less than 100 vehicles per hour which the Institute of Transportation Engineers utilizes as a threshold to define a significant traffic impact (Julian Ng Inc., 2011).

The traffic impacts relating to the Sunshine Market were also reviewed. Since this is an existing use that is relocating from Kīlauea Town, this use will have negligible effects on traffic conditions on Kuhio Highway. The project impacts could occur at the intersection of the Sunshine Market driveway and Kīlauea Lighthouse Road. The site includes a 0.7 acre lot for parking that will accommodate 75 cars. Assuming 20% of the cars belong to vendors, 80% would be available for shoppers. If peak hour traffic based on full occupancy of the parking lot and a half-hour average stay by shoppers are assumed, a volume of 120 vehicles per hour in each direction would be generated (Julian Ng Inc., 2011).

The traffic volumes generated by the Sunshine Market, the remainder of the agricultural park, and existing volumes within Kīlauea Town can be as high as 600 vehicles per hour. This is rated as Level of Service C conditions for left turns out of the Sunshine Market driveway (Julian Ng Inc., 2011).

Possible Effects and Mitigation

The Traffic Assessment found that the project traffic impacts will not be significant. The largest traffic volumes due to the project would occur during the hours that the Sunshine Market would be in operation. Traffic volumes on Kīlauea Road will increase noticeably, but conditions will remain at acceptable levels (Julian Ng Inc., 2011).

Since the site provided within the project will provide a permanent venue for the market that currently operates in Kīlauea Town, traffic impacts of that operation on conditions on Kuhio Highway will be minimal (Julian Ng Inc., 2011).

4.2 Parks and Recreational Resources

There are no recreational resources in the project area. The majority of the project area is comprised of former sugar cane land previously cultivated by Kīlauea Sugar Company. Since the closure of the company, the land has remained undeveloped. At the southeastern portion of the project site, a natural drainage gulch has been utilized for the growing of peanuts, bananas and avocados. It is also an informal vehicle dump. The surrounding area is primarily rural, dominated by agricultural and large house lot development.

The nearest park facility is the Kīlauea Neighborhood Center and Park which is located approximately 1,000 feet to the southwest of the project site. The Sunshine Market currently operates in the parking lot of the Kīlauea Neighborhood Center. While the existing location is central and convenient, there are a number of drawbacks. The parking is cramped on market days with vendors occupying a number of stalls and both market customers and users of the neighborhood center and gym competing for the remaining stalls.

Potential Effects and Mitigation:

With the relocation of the Sunshine Market to the Kīlauea Agricultural Park site, this should alleviate congestion issues at the Kīlauea Neighborhood Center and Park. This aspect of the project should be considered as beneficial. Other proposed uses of the project such as the farm lots, community gardens, compost/recycle/storage facility, energy farm, and irrigation reservoir should have no adverse effects on parks and recreational resources.

4.3 Fire, Police and Medical Services

The closest fire station to the project site is the Hanalei Fire Station which provides fire control services to the area. The Hanalei Fire Station has an engine company equipped with a mini-pumper. Back up protection is provided by the Kaiakea Fire Station.

Police protection is provided to the project area by the Hanalei District Patrol, which serves the North Shore, including Kīlauea (E-mail Communication from Kaua‘i Police Department, 2011).

Medical service providers on Kaua‘i include the Wilcox Memorial Hospital in Lihue, Samuel Mahelona Medical Center in Kapaa, and the Kaua‘i Veterans Memorial Hospital in Waimea. Emergency ambulance service is provided by American Medical Response.

Potential Effects and Mitigation:

As the proposed agricultural park is a low-intensity land use with regard to population, the project is not expected to have adverse effects on fire, police or emergency services. Police and emergency medical service providers can respond to emergency calls for service from agricultural park lessees. The project is not expected to result in a significant increase in calls for services.

4.4 Water

A Technical Memorandum relating to *Irrigation Supply for the Proposed 54-Acre Agricultural Park in Kīlauea, Kaua‘i* was undertaken by Tom Nance Water Resource Engineering (see **Appendix D**). The following summarizes the findings of the Technical Memorandum relating to water.

A basic premise of the Technical Memorandum is that all of the park’s irrigation supply will need to be provided by new wells developed for that purpose. Existing surface water sources are a significant distance inland and are not available for the project and potential supply from the Kaua‘i Department of Water is negligible (Tom Nance Water Resource Engineering, 2011).

The capacity of the new wells should match, in a 24 hour pumping day, the maximum irrigation requirement in the driest and hottest months. The Technical Memorandum estimates that the irrigation supply should have the capacity to provide the equivalent of 6,600 gallons per day/acre for 54 acres. Roughly, this amounts to 360,000 gallons per day or 250 gpm as a 24 hours a day pumping capacity (Tom Nance Water Resource Engineering, 2011).

Potential Effects and Mitigation

Three irrigation wells are proposed to be drilled near the mauka boundary of the site. The Technical Memorandum notes that wells should be located along the Park’s inland property line to maximize their distance inland. Wells are also recommended to be spaced at least 300 feet apart along the property line to avoid interference effects and drilled to sufficient depth and possibly to 100 feet below sea level to achieve the desired yield (Tom Nance Water Resource Engineering, 2011).

The combined capacity of the irrigation wells is anticipated to be at least 250 gpm. The wells can be completed with 12-inch casing. Depending on actual capacity, they might be downsized to 10- or even 8-inch casing. It is estimated that wells should be drilled to an

average of 370-foot depth, about 65 feet below sea level (Tom Nance Water Resource Engineering, 2011).

The Technical Memorandum notes that the topography of the site does not provide a reservoir site of sufficient elevation for gravity elevation. As such, a storage reservoir is proposed in close proximity to the wells and an automated, multiple pump station drawing from this reservoir will be needed to provide necessary delivery pressures throughout the Park. A reservoir storage volume of 0.30 million gallons is recommended. Average delivery by the pump station over an assumed 8-hour irrigation period per day would be 750 gpm. To deal with varying use in this 8-hour period, a 1,000 gpm pump station capacity is recommended. This would provide 100 pounds per square inch outlet pressure (Tom Nance Water Resource Engineering, 2011).

4.5 Wastewater

The project site is not served by the County sewer system. There are no other existing wastewater facilities on the property.

Potential Effects and Mitigation

Portions of the project site may utilize individual septic systems to handle wastewater. This may include the Sunshine Market, community gardens, and energy farm. If individual wastewater systems are utilized, then applicable Department of Health regulations will be followed. However, portable restroom facilities are also an option.

4.6 Solid Waste

During the initial clearing of the property for infrastructure development and the grading of the farm lots, clearing of vegetation will need to be accommodated by existing composting operations on the island. The composting/recycle site within the project site is intended to be handled as a separate operation. As this site is intended to primarily service the farm lots and community gardens within the project, startup will occur after the farm lots are in operation.

Potential Effects and Mitigation

The composting/recycle area within the project site is intended to reuse the green waste from agricultural park operations for the further benefit of the farming operations.

There are no toxic, hazardous, or radioactive substances which will be utilized or produced by the proposed project facilities and primary beneficiaries. It is noted that the farm equipment storage area does not include storage of petroleum products, used/waste oil storage or reclamation units or chemical storage. The Applicant Certification Clause acknowledges the absence of hazardous materials or waste on the site (see **Appendix E**).

4.7 Drainage

An overall drainage plan has been prepared which generally retains existing drainage patterns. Most of the project site is generally flat with a gradual decline in elevation to the southeast corner of the site. From that point, the gulch at the southeast corner of the site conveys runoff to the Kīlauea River.

A detention basin will be established near the southeast corner of the site to aid in capturing silt and sediment from the site.

Potential Effects and Mitigation

Requisite permits which involve drainage will be obtained. These include the Special Management Area permit and the National Pollutant Discharge Elimination System permit. Best Management Practices will also be implemented. In addition, a Soil Conservation Plan will be formulated in conjunction with the Natural Resources Conservation Service should be addressing soil conservation and erosion control during construction and during farming operations as well.

4.8 Electrical Demand

A preliminary assessment of electrical system locations and cost was undertaken by Insynergy Engineering, Inc. dated March 2011 (see **Appendix F**). The following summarizes the assessment.

Overhead electric distribution service (12,460 volt, 3 phase, 60 hertz) is presently provided along the alignment of Kīlauea Lighthouse Road by the Kaua‘i Island Utility Cooperative.

The 3 well sites and water storage tank along Quarry Road will require electrical power which can be provided through a pole extension along Quarry Road from its intersection with Kīlauea Lighthouse Road.

Street lighting will be provided initially at the project’s driveway intersection at Kīlauea Lighthouse Road and the secondary driveway intersection at Quarry Road. At the main access, a 250 watt street light on a 14 inch arm is proposed. At the Quarry Road intersection, a 150 watt street light on a 6 inch arm is proposed. High efficiency lighting will be utilized at other locations within the park, as needed. All street lighting will either have a cut off lens or will be shielded to orient lighting towards the ground.

The energy farm is intended to operated as a separate operation. Because seabirds such as the Hawaiian petrel (*Pterodroma sandwichensis*) and Newell’s Shearwater (*Puffinus auricularis newelli*) have been recorded overflying the site, the use of wind as a renewable energy resource will not be utilized in order to avoid the potential of harm to these endangered and threatened

species. However, concentrating solar power or photovoltaic technology will be considered for development. At this time, the County is evaluating the following:

- Photovoltaic system to supplement energy demand from street lighting and the irrigations system. Any surplus energy will be shared with the KIUC grid.
- Photovoltaic system to be shared with the KIUC grid. Any energy credits would be used to offset the electrical requirements of the agricultural park.

It is expected that the County's evaluation would be completed following the issuance of the project's Final Environmental Assessment. However, any further information that is obtained prior to the completion of the Final EA will be included in that document.

Section 5 – Socio-Economic and Cultural Environment

5.1 Socio-Economic Characteristics

Resident population on the island of Kaua‘i has increased from 58,463 in the year 2000 to 64,529 in the year 2009. Census data for the year 2000 showed the town of Kīlauea had a population of 2,092 (DBEDT, 2010). However, the subject project is not expected to materially change the socio-economic characteristics of Kīlauea or its immediate vicinity. This is largely because the agricultural park intends to provide a limited number of farm lots and other agriculture related uses to benefit existing residents of Kaua‘i. No residential use is being proposed as part of the development.

Potential Effects and Mitigation

No adverse effects to population are expected as a result of the project. Short-term economic benefits include expenditure of funds and creation of jobs during construction. Long-term, the project is expected to provide farm-related jobs and crop revenues.

5.2 Archaeological and Historical Resources

An Archaeological Inventory Survey (AIS) was conducted as part of this environmental assessment by Cultural Surveys Hawai‘i, Inc., dated December 2010 (see **Appendix G**). The following is a summary of the survey.

Fieldwork for the AIS was conducted between the periods of October 14- November 12, 2010 by Cultural Surveys Hawai‘i. Fieldwork consisted of a 100% coverage pedestrian inspection of the project area and limited subsurface testing at selected archaeological sites. Four historic properties, comprised of five archaeological features, were discovered. All four historic properties were located within the tributary gulch of the Kīlauea Stream Valley in the southeastern portion of the project site (Cultural Surveys Hawai‘i, Inc., 2010).

SIHP # 50-30-04-2123 is a historic habitation terrace. It consists of a stacked cobble and boulder terrace (1-4 courses) comprised of stone construction on two corners connected by a linear ledge of soil. The terrace was oriented NW-SE and measured 4.8 meters long by 0.6 meters wide and 0.56 meters high. It is in generally poor condition (Cultural Surveys Hawai‘i, Inc., 2010).

SIHP # 50-30-04-2124 is a historic, likely plantation era concrete wall and concrete foundation structure. It consists of two concrete wall structures, including one linear form and one U-shaped form with concrete flooring. Feature A is a poured concrete wall, measuring 2.05 meters long by 0.16 meters wide by 0.82 meters high. Feature A was observed to be in poor condition. Feature B is the U-shaped wall with a soil covered concrete floor within the interior. The structure measured 3.61 meters long by 3.19 meters wide with an exterior height of 0.46 meters and an interior height of 0.05 meters. Wall thickness measured 0.12 meters. Feature B is in good condition (Cultural Surveys Hawai‘i, Inc., 2010).

SIHP # 50-30-04-2125 is a pre-contact agricultural terrace. This is a stacked cobble and boulder terrace (1-4 courses) retaining soil oriented NW-SE. It measures 5.45 meters long by 0.38 meters wide with a maximum height of 0.41 meters. This site was observed in good condition (Cultural Surveys Hawai‘i, Inc., 2010).

SIHP # 50-30-04-2126 is a historic drainage ditch. This is an excavated ditch with soil berm. The site measured 109.75 meters long by 1.75 meters wide at the base and 7.0 meters wide at the top (Cultural Surveys Hawai‘i, Inc., 2010).

Potential Effects and Mitigation

All four historic properties which were discovered during the AIS were located within the southeastern portion of the project area. No historic properties were discovered within the remaining project area which was utilized for sugar cane cultivation in the past (Cultural Surveys Hawai‘i, Inc., 2010).

All four historic properties have been evaluated for significance according to criteria established for the Hawai‘i Register of Historic Places. Each of the sites have been assessed under Criterion D (have yielded, or is likely to yield information important for research on prehistory or history) (Cultural Surveys Hawai‘i, Inc., 2010).

Three historic properties were likely associated with the plantation era: SIHP # 50-30-04-2123, SIHP # 50-30-04-2124, and SIHP # 50-30-04-2126. Sufficient information regarding the location, function, age, and construction methods of the historic properties have been generated by the inventory survey to mitigate any adverse effect caused by proposed development activities (Cultural Surveys Hawai‘i, Inc., 2010).

SIHP # 50-30-04-2125, a pre-contact agricultural terrace, was likely associated with or an outlier of SIHP # 50-30-04-580, a large cluster of agricultural terraces located downslope of the gulch and previously recommended for preservation. As an outlier that lacks distinctive characteristics and which has been tested for subsurface deposits and artifacts during the inventory survey, it is not recommended that any further preservation work be pursued (Cultural Surveys Hawai‘i, Inc., 2010).

5.3 Cultural Resources and Practices

A Cultural Impact Assessment (CIA) was undertaken by Cultural Surveys Hawai‘i, Inc. dated March 2011 for the Kīlauea Agricultural Park project (see **Appendix H**). The following summarizes the findings and recommendations of the study.

A total of 38 community members, government agency and community organization representatives were contacted for the CIA. Six individuals responded and two participated in interviews. The community consultation indicates:

1. The Project area and environs has a history of use by Kanaka Maoli (Native Hawaiians) and other *kama'āina* groups for a variety of past and present cultural activities and gathering practices. Community participant Mr. Jack Gushiken discusses natural and cultural resources including the Kīlauea Stream abundant with 'o'opu, wi, and shrimp; the catching and enjoyment of fish like *kala*, *imanui*, *ulu*, *pāpio* and gathering of limu; the presence of aloe and gathering of *noni* and fruits like avocados. Community participant Mr. Gary Smith describes the presence of *lo'i* (irrigated terrace) in the upper areas of the valley near the Project Area and the nesting of 500 *nēnē* and presence of 90 *mōlī* (Laysan albatross nests) as well as wedgetailed shearwater birds that traditionally have been found in the area and which are now protected in nearby Kīlauea Point National Wildlife Refuge. Both participants recall Kīlauea town's sugar plantation past, with Mr. Gushiken noting the self-sufficiency of the town where most everybody grew their own vegetables to be shared with neighbors, while Mr. Smith expressed the wide interaction among different ethnicities which encouraged the growth of pidgin and the learning of diverse cultural backgrounds (Cultural Surveys Hawai'i, Inc., 2011).
2. Mr. Smith shares several *mo'olelo* (stories, legends) about the places in the area, including the Hawaiian name of Kīlauea Point as Cape Wowoni, due to the feeling one gets when standing at the point where the waves roar and bellow and one feels it at the core; the origin of the name Nīhoku (known as Crater Hill), where the profile of the hill is like a standing or upright tooth and hence the meaning of the name; the name of a nearby hill, beach and wind called "Kauapea," which he interprets as the "sail filling rain." (Cultural Surveys Hawai'i, Inc., 2011).
3. According to Mr. Smith, the Project area was used as cattle grazing ground before being planted with sugar. After the end of sugar in 1971, sorghum, corn, prawns and guavas were attempted to be grown in the plantation (Cultural Surveys Hawai'i, Inc., 2011).
4. Mr. Smith points to the valley portion of the Project area, formerly considered as *'opala* (trash) lands, as being known by the name of "Pākē Man Place" and where such crops as peanuts, bananas and avocados were cultivated. Some of the crops are still gathered today (Cultural Surveys Hawai'i, Inc., 2011).
5. The Kīlauea Sugar Company once sprawled over nine *ahupua'a*, including Kīlauea. The nine *ahupua'a* were once part of the *moku* (district) of Ko'olau before Kīlauea was put in the Hanalei district (Cultural Surveys Hawai'i, Inc., 2011).
6. The Office of Hawaiian Affairs suggests consideration of traditional land use concepts which emphasize land stewardship and also requests clarification on past and present land use of the Project area (Cultural Surveys Hawai'i, Inc., 2011).
7. The State Historic Preservation Division (SHPD) voices concern with any ground disturbance work, which may uncover burials or burial sites as there is a cemetery north of the Project area. SHPD also calls for the continued access to cultural resources by the Hawaiian community and recreational users (Cultural Surveys Hawai'i, Inc., 2011).

8. Both Mr. Smith and Mr. Gushiken voice their concerns about water for the agricultural park and for maintenance of the park once built. Mr. Smith recommends leasing the land, and not selling it, in order to ensure the perpetuity of the agricultural park (Cultural Surveys Hawai‘i, Inc., 2011).

Potential Impacts and Mitigation

The CIA does not foresee potential impacts of the proposed Project on Native Hawaiian or other ethnic groups' cultural practices customarily and traditionally exercised for subsistence, cultural or religious purposes. However, the Assessment does foresee two potential impacts on cultural, historic, and natural resources. The following recommendations from the CIA will be utilized to address the potential for adverse effects.

Land-disturbing activities may uncover burials or other cultural resources. Mr. Smith notes there are no known burials, but if there were any, it would most likely be in the valley portion of the Project area. Should historic, cultural or burial sites or artifacts be identified during ground disturbance, the construction contractor should immediately cease all work and the appropriate agencies (State Historic Preservation Division, Department of Land and Natural Resources at phone no. 808-692-8015) notified pursuant to applicable law (Cultural Surveys Hawai‘i, Inc., 2011).

Although the Project area is outside the vicinity of Kīlauea Point National Wildlife Refuge, its proximity to the refuge may mean that occasional endangered birds may be found in or around the Project area. Care must be taken to ensure that these birds such as the *nēnē*, shearwaters and Laysan albatross or *mōlī* be unharmed and returned to the refuge (Cultural Surveys Hawai‘i, Inc., 2011).

Section 6 – Relationship to County, State and Federal Land Use Plans, Policies and Controls

6.1 Federal

6.1.1 Environmental Justice

Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations and policies. The goal of the Environmental Protection Agency (EPA), which administers these provisions, is to provide an environment where all people enjoy the same degree of protection from environmental and health hazards and equal access to the decision making process to maintain a healthy environment in which to live, learn and work.

On February 11, 1994, President Bill Clinton signed Executive Order 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations”, to focus Federal attention on the environmental and human health conditions of minority and low-income populations with the goal of achieving environmental protection for all communities.

Discussion:

This environmental assessment is part of a process to engage broad and meaningful input from a wide range of the community to provide input to the project. The initial step in the planning for this project involved the formulation of a Kīlauea Agricultural Park Master Plan done by Kimura International, Inc. This process was inclusionary in that it involved two planning meetings with members of the community to gather input into what should be included in the plan.

The environmental assessment process has involved the necessary analysis with the intent to implement the master plan concept. Initial consultations were done with interested organizations, groups and individuals. A public comment period will also be provided prior to doing the final environmental assessment. After conclusion of the environmental assessment process, the Use Permit will provide opportunity for input through the public hearing process before the Kaua‘i Planning Commission. If a major Special Management Area Permit is required, this will also require a public hearing before the Kaua‘i Planning Commission.

The proposed project also complies with the ‘fair treatment’ clause of environmental justice. The project intends to provide job opportunities for farmers who are interested in providing products for the Kaua‘i market which is intended to enhance sustainability efforts on the island. The project includes 14 lots which are fairly small in size ranging from 1.0 acre to 6.93 acres. Since the Kaua‘i market is also rather limited, a range of agricultural products are intended to be grown as part of the project in order to enhance the success and profitability of all the farmers. The project will comply with all applicable environmental regulations during construction and operations.

6.1.2 Clean Water Act

The EPA is responsible for administering the Clean Water Act. States can use their water quality standards in Section 401 certifications to review and approve, condition, or deny all federal permits or licenses that might result in a discharge to State waters, including wetlands. States and Tribes make their decisions to deny, certify, or condition permits or licenses primarily by ensuring the activity will comply with State water quality standards. In addition, States and Tribes look at whether the activity will violate effluent limitations, new source performance standards, toxic pollutants, and other water resource requirements of State/Tribal law or regulation.

National Pollutant Discharge Elimination System (NPDES) permits are regulated under Section 402 of the Clean Water Act. In Hawai‘i, the approval and enforcement of such permits are the responsibility of the State of Hawai‘i, Department of Health, Clean Water Branch (DOH-CWB).

The DOH-CWB Guidelines for Notice of Intent, Form C, differentiate between land to be disturbed “for the sole purpose of growing crops” and land to be used for construction of “buildings and roads of agricultural or agriculture-related operations”.

1. Construction Site Area

b. Disturbance Area is the area of the project that is expected to undergo any disturbance, including, but not limited to excavation, grading, clearing, demolition, uprooting of vegetation, equipment staging, and storage areas. Clarification of disturbed areas is as follows...

vii. Areas which are cleared, graded, and/or excavated for the sole purpose of growing crops are considered to be agricultural and are therefore not included in the disturbed area quantity. This exemption does not extend to the construction of buildings and roads of agricultural or agriculture-related operations that disturb one (1) acre or more.

Discussion:

A NPDES permit application will be filed with the DOH-CWB to address stormwater runoff associated with construction of roadways, infrastructure and utilities. However, ground disturbances on the agricultural lots, where only cultivation will occur, will be exempt from coverage under the NOI Form C stormwater permit per the Guidelines for Notice of Intent, Form C, stated above.

6.1.3 Conservation Plan

The conservation plan falls under the jurisdiction of the Natural Resources Conservation Service (NRCS). It is intended to be a tool to assist farmers to decide on the best methods to help improve productivity, sustainability and profitability of a farming operation. Through the planning process, the farmer formulates a conservation plan, or a written record of the management decisions and the conservation practices that are in use or are planned for the

operation. A conservation plan combines the farming skills of the operator with the technical resources and knowledge of the NRCS.

The combination of different treatments that work together to address the overall natural resource needs of a farm is the conservation system, or a resource management system. Conservation systems are sets of land treatment that, when properly planned and applied, work in tandem to provide the greatest overall conservation and production benefits.

The NRCS has provided numerous “Field Office Technical Guides” which provide useful information to farmers in considering practices which could enhance conservation systems, improve operations, and protect natural resources. The NRCS works with farmers in the formulation of the plan and continues to provide consultation and technical assistance to farmers during operations to enhance the probability of continued success.

6.2 State of Hawai‘i

6.2.1 State of Hawai‘i Constitution

The development of the Kīlauea Agricultural Park is consistent with provisions of the State of Hawai‘i Constitution related to agricultural policy under “Conservation, Control and Development of Resources.”

Article XI – Conservation, Control and Development of Resources

Agricultural Lands (emphasis added)

Section 3. The State shall conserve and protect agricultural lands, promote diversified agriculture, increase agricultural self-sufficiency and assure the availability of agriculturally suitable lands. The legislature shall provide standards and criteria to accomplish the foregoing.

Lands identified by the State as important agricultural lands needed to fulfill the purposes above shall not be reclassified by the State or rezoned by its political subdivisions without meeting the standards and criteria established by the legislature and approved by a two-thirds vote of the body responsible for the reclassification or rezoning action.

Discussion:

The subject agricultural parcel is identified as important agricultural lands and thus receives protection under the State of Hawai‘i Constitution. This project is also consistent with Article XI, Section 3 (above) because it promotes diversified agriculture and assures the availability of agriculturally suitable lands.

6.2.2 Hawai‘i State Plan

The Hawai‘i State Plan, Chapter 226, HRS, was adopted in 1978 and revised in 1988. The Plan serves as a guide for the future long range development of the State by identifying goals, objectives, policies, and priorities. The purpose of the Hawai‘i state planning process, as defined in HRS, Chapter 226, is to:

- *Guide the future long-range development of the State;*
- *Identify the goals, objectives, policies, and priorities for the State;*
- *Provide a basis for determining priorities and allocating limited resources;*
- *Improve coordination of federal, state, and county plans, policies, programs, projects, and regulatory activities; and*
- *Establish a system for plan formulation and program coordination to integrate major state, and county activities.*

With regard to the State’s role in promoting the agricultural industry, the Hawai‘i State Plan provides the following legislative intent.

§226 7 Objectives and policies for the economy--agriculture.

(a) Planning for the State's economy with regard to agriculture shall be directed towards achievement of the following objectives:

- (2) Growth and development of diversified agriculture throughout the State*
- (3) An agriculture industry that continues to constitute a dynamic and essential component of Hawai‘i's strategic, economic, and social well-being.*

(b) To achieve the agriculture objectives, it shall be the policy of this State to:

- (9) Enhance agricultural growth by providing public incentives and encouraging private initiatives.*
- (10) Assure the availability of agriculturally suitable lands with adequate water to accommodate present and future needs.*
- (12) Expand Hawai‘i's agricultural base by promoting growth and development of flowers, tropical fruits and plants, livestock, feed grains, forestry, food crops, aquaculture, and other potential enterprises.*

§226-103 Economic priority guidelines.

(d) Priority guidelines to promote the growth and development of diversified agriculture and aquaculture.

- (3) Assist small independent farmers in securing land and loans.*
- (9) Continue the development of agricultural parks.*

Discussion:

In conformance with Hawai‘i State Plan policies, the proposed Kīlauea Agricultural Park will provide land and agricultural water for small independent farmers on prime agricultural lands. The development of the park will “assure the availability of agriculturally suitable lands with adequate water to accommodate present and future needs,” promote diversified agriculture, and continue the development of agricultural parks in the State.

6.2.3 State Land Use District Classification

State-level land use control is enabled by Chapter 205, HRS, Land Use Commission, adopted in 1961. Also known as the “State Land Use Law,” Chapter 205 is meant to preserve and protect Hawai‘i lands and encourage the uses to which the lands are best suited. All lands in Hawai‘i are classified as Urban, Rural, Agriculture or Conservation. The proposed Kīlauea Agricultural Park is within the state agriculture district. See **Figure 6-1**. Intended uses, focusing on cultivation of crops within a new agricultural park are all consistent with the following provisions of the Chapter 205 (with emphasis added in **bold**):

§205-4.5 Permissible uses within the agricultural districts.

(a) Within the agricultural district, all lands with soil classified by the land study bureau's detailed land classification as overall (master) productivity rating class A or B shall be restricted to the following permitted uses:

(1) Cultivation of crops, including crops for bioenergy, flowers, vegetables, foliage, fruits, forage, and timber;

(7) Public, private, and quasi-public utility lines and roadways, transformer stations, communications equipment buildings, solid waste transfer stations, major water storage tanks, and appurtenant small buildings such as booster pumping stations, but not including offices or yards for equipment, material, vehicle storage, repair or maintenance, treatment plants, corporation yards, or other similar structures;

(11) Agricultural parks;

(16) Agricultural-energy facilities, including appurtenances necessary for an agricultural-energy enterprise; provided that the primary activity of the agricultural-energy enterprise is agricultural activity. To be considered the primary activity of an agricultural activity-enterprise, the total acreage devoted to agricultural activity shall be not less than ninety percent of the total acreage of the agricultural-energy enterprise. The agricultural-energy facility shall be limited to lands owned, leased, licensed, or operated by the entity conducting the agricultural activity.

[§205-42] Important agricultural lands; definition and objectives.

(a) As used in this part, unless the context otherwise requires, "important agricultural lands" means those lands, identified pursuant to this part, that:

(1) Are capable of producing sustained high agricultural yields when treated and managed according to accepted farming methods and technology; (2) Contribute to the State's economic base and produce agricultural commodities for export or local

consumption; or (3) Are needed to promote the expansion of agricultural activities and income for the future, even if currently not in production.

Discussion:

The proposed Kīlauea Agricultural Park will contain only allowed uses within the state agriculture district. Most of the project site is classified as Prime Agricultural Lands under the Agricultural Lands of Importance to the State of Hawai‘i, or ALISH, rating system. This system was established in 1977 in a collaborative effort spearheaded by the State Department of Agriculture, U.S. Department of Agriculture and U.S. Department of the Interior Soil Conservation Service [now the Natural Resources Conservation Service]. The gulch portion near the southeast corner of the project site was not included in the ALISH study.

The Land Study Bureau classifies most of the project site as “B” with the gulch portion being classified as “E”. This system classifies land between “A” and “E” with “A” being the highest classification.

6.2.4 Coastal Zone Management

HRS, Chapter 205A, sets forth the state’s Coastal Zone Management Program. This project will be consistent with the objectives identified under Section 205A-2. Chapter 205A policies relevant to the project are discussed below.

Section 205A-2(c)

(1) Recreational resources;

(B) Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:

(vi) Adopting water quality standards and regulating point and nonpoint sources of pollution to protect, and where feasible, restore the recreational value of coastal waters;

Discussion:

Planned drainage improvements will be designed to control runoff, where feasible, and thus comply with policies protecting the recreational value of coastal waters.

Section 205A-2(c) - continued

(2) Historic resources;

(A) Identify and analyze significant archaeological resources;

(B) Maximize information retention through preservation of remains and artifacts or salvage operations;

(C) Support State goals for protection, restoration, interpretation, and display of historic resources.

Discussion:

The project will comply with policies regarding historic resources. Four historic properties were found during the archaeological inventory survey conducted as part of this environmental assessment. For three of the sites, adequate documentation has been compiled to mitigate any adverse effect. The remaining site was associated with or is an outlier of a nearby site recommended for preservation. Since the outlier lacks distinctive characteristics and has been tested for subsurface deposits, no further preservation work is being recommended. The project will have no adverse effect on historic or cultural resources.

Section 205A-2(c) - continued

(3) Scenic and open space resources

(A) Identify valued scenic resources in the coastal zone management area;

(B) Insure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;

(D) Encourage those developments that are not coast-dependent to locate in inland areas.

Discussion:

The project will comply with policies on scenic and open space resources. The proposed project provides 14 farm lots for small scale farming purposes. There may be minor structures such as temporary tents and portable restrooms as part of the Sunshine Market use. However, these are erected on an event-based schedule. Scenic and open space values in the region are not expected to be adversely affected.

Section 205A-2(c)

(4) Coastal ecosystems;

(B) Preserve valuable coastal ecosystems of significant biological or economic importance;

(C) Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs;

(D) Promote water quantity and quality planning and management practices which reflect tolerance of fresh water and marine ecosystems and prohibit land and water uses which violate state water quality standards.

Discussion:

The project will comply with coastal ecosystem policies since there are none present on the site or in its immediate vicinity. Drainage improvements will be designed to control runoff, and help preserve valuable coastal ecosystems.

Section 205A-2(c) - continued

(5) Economic uses;

(C) Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long-term growth at such areas, and permit coastal development outside of presently designated areas when:

- (i) Utilization of presently designated locations is not feasible;*
- (ii) Adverse environmental effects are minimized; and*
- (iii) Important to the State's economy.*

Discussion:

The project will not conflict with policies regarding economic use because it is not a coastally-dependent development and is located inland. Further, the development of a new agricultural park supports the continuation of production on specifically-identified important agricultural lands.

Section 205A-2(c) - continued

(6) Coastal hazards;

(B) Control development in areas subject to storm wave, tsunami, flood, erosion, and subsidence hazard;

(C) Ensure that developments comply with requirements of the Federal Flood Insurance Rate Program; and

(D) Prevent coastal flooding from inland projects.

Discussion:

The project will comply with coastal hazard policies because it will not be located in flood designated areas nor be subject to hazards along the coastline. Drainage and other infrastructure improvements will not have an effect on coastal flooding issues.

Section 205A-2(c) - continued

(7) Managing development;

(C) Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life-cycle and in terms understandable to the general public to facilitate public participation in the planning and review process.

Discussion:

This Environmental Assessment has been prepared under the procedural provisions of the National Environmental Policy Act (40 CFR Parts 1500-1508) and Chapter 343, HRS, and Title 11, Chapter 200 of DOH Hawai'i Administrative Rules which allow for public review and participation. Consequently, the preparation of this Environmental Assessment, and disclosure of anticipated effects of the project, comply with the policy on managing development.

6.3 County of Kaua'i

6.3.1 General Plan

The General Plan of the County of Kaua'i states the County's 20-year vision for Kaua'i and sets policies for achieving that vision. It represents an opportunity to look at the entire island and think about the future, and make early decisions about issues and opportunities.

The policies of the General Plan are intended to guide County decision making by mapping the direction of future development by describing what kind of future development is desirable, and by setting priorities for public improvements. The policies will guide the County in making revisions to land development regulations, in deciding zone changes and development permits, and in setting strategies for capital improvements. The General Plan also establishes a framework and priorities for future community level planning and long range planning for public facilities. The General Plan took effect on November 30, 2000.

According to the General Plan, the project site is designated Agriculture in the North Shore Planning District Land Use Map. See **Figure 6-2**. The Kīlauea Agricultural Park is consistent with this designation. The proposed project is supported by the following policies and visions of the General Plan:

4.3 Agriculture

4.3.7 Policy

- (e) Recognizing the need to furnish and coordinate a wide variety of direct assistance programs and appropriate land use, water use, environmental and tax policies, the County shall actively collaborate with federal, state and private farm organizations to expand and diversify agricultural enterprise on Kaua‘i.*

4.3.8 Implementing Actions

- (c) Through the Office of Economic Development, the County shall operate an agriculture development and support program, leveraging County resources and policy tools by working collaboratively with state and federal agencies, and private business and farm organizations.*
- (d) The County shall support the Sunshine Markets and other means of marketing Kaua‘i agricultural and food products to Kaua‘i residents, businesses and visitors.*

6.3.2 Kaua‘i County Code

The Kaua‘i County Code 2006 (KCC) regulates land development in accordance with adopted land use policies set forth in the Kaua‘i General Plan. The Code embodies legal and administrative instruments related to the use, development, and allocation of land and water resources.

Zoning

According to the Kaua‘i Planning Department, the project site is zoned Agriculture. Farming activities would be considered permitted uses in the Agriculture District. However, other proposed uses not expressly permitted in the Agriculture District would require a Use Permit. This would include uses such as the energy farm, Sunshine Market, and compost/recycle/co-op facility. The purpose of a Use Permit is to assure the proper integration of uses within the community. Certain uses which require a Use Permit may be suitable only in specific locations in a district, or only under certain conditions, or only if the uses are designed, arranged or conducted in a certain manner (Telephone Communication with Kaua‘i Planning Department, 2011).

6.3.3 Special Management Area

The southeastern portion of the project site is within the Special Management Area. This is the gulch area of the project site. See **Figure 6-3**. Discussion of the project’s relevance to the Coastal Zone Management Program of the State of Hawai‘i is discussed in Section 6.2.4, Coastal Zone Management.

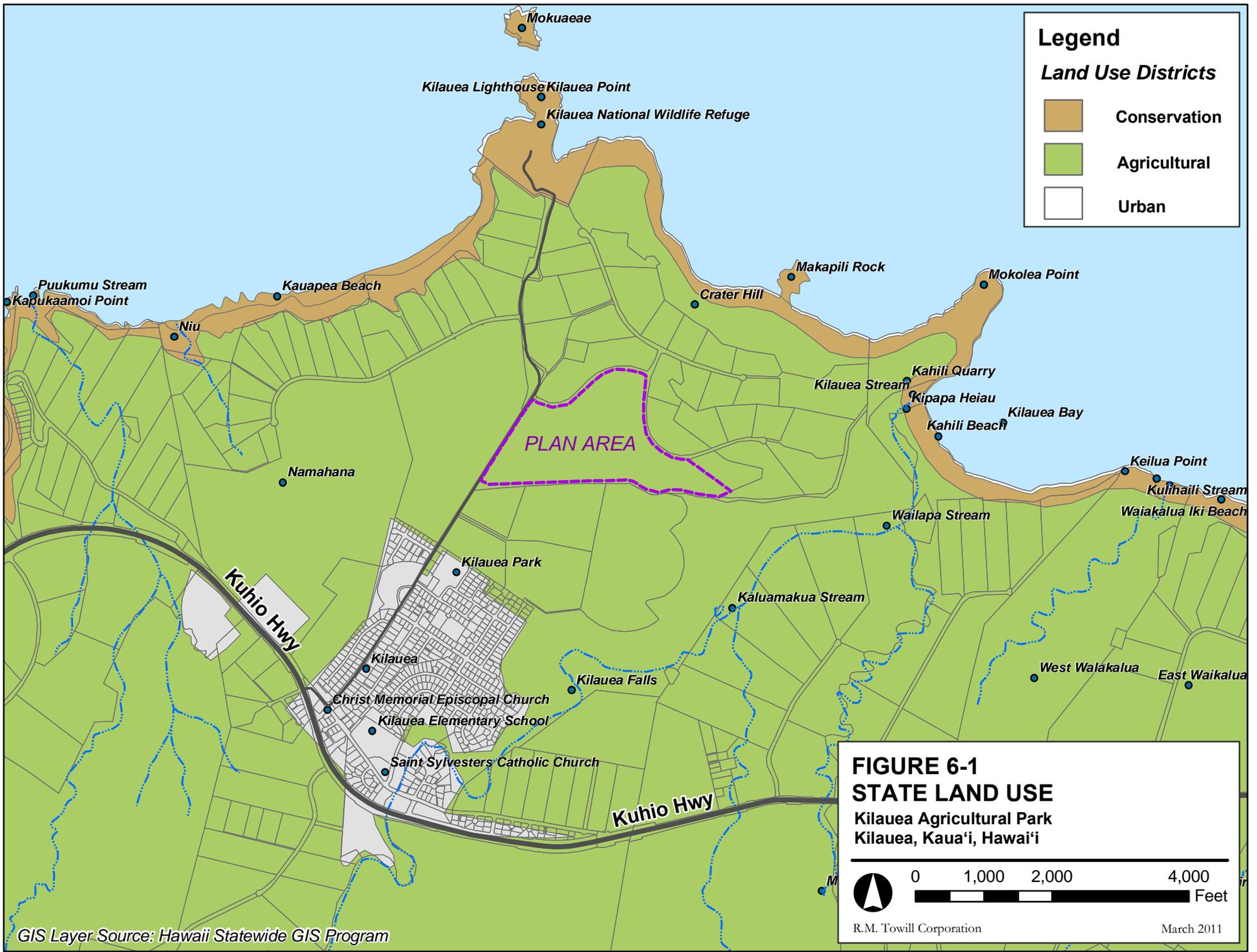
Figures

Section 6 –Relationship to State, County and Federal Land Use Plans, Policies and Controls

Figure 6-1
State Land Use

Figure 6-2
Kaua‘i General Plan

Figure 6-3
Special Management Area



Legend

Land Use Districts

- Conservation
- Agricultural
- Urban

FIGURE 6-1
STATE LAND USE
 Kilauea Agricultural Park
 Kilauea, Kaua'i, Hawai'i

0 1,000 2,000 4,000
 Feet

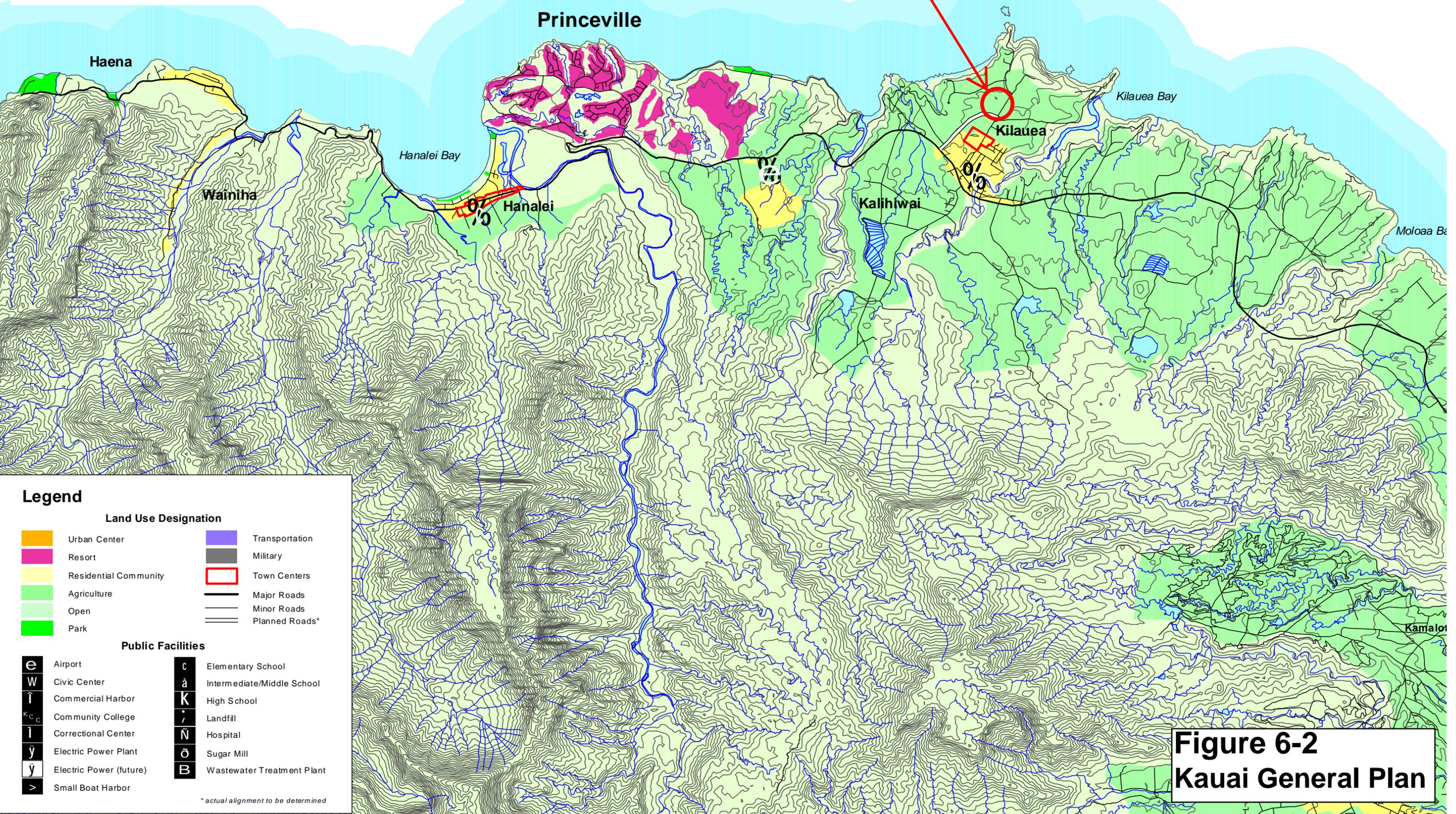
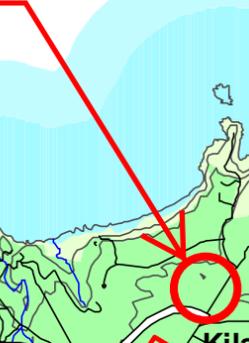
R.M. Towill Corporation March 2011

North Shore Planning District Land Use Map

Source: County of Kauai Planning Department



General Location of
Kilauea Agricultural Park



Legend

Land Use Designation

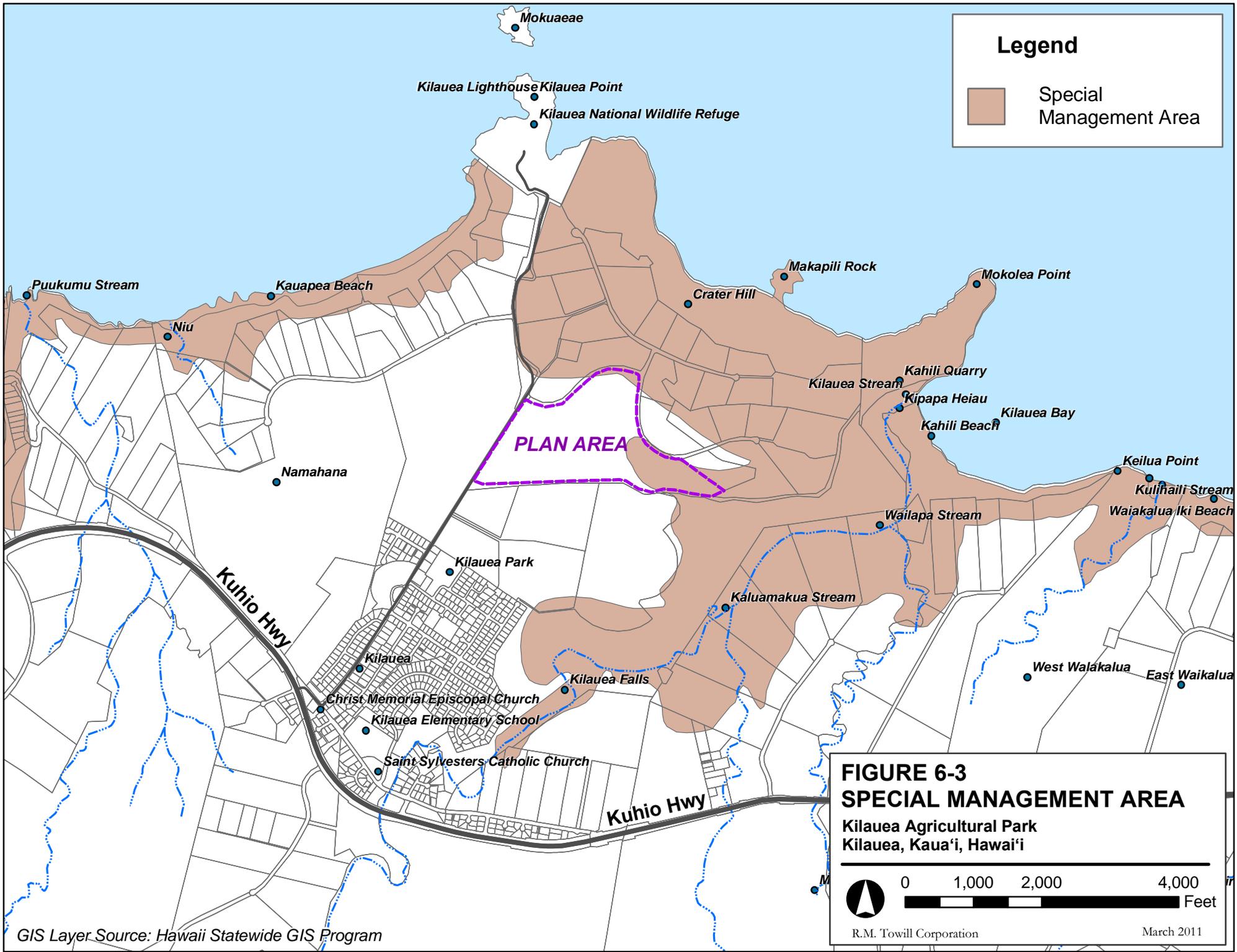
Urban Center	Transportation
Resort	Military
Residential Community	Town Centers
Agriculture	Major Roads
Open	Minor Roads
Park	Planned Roads*

Public Facilities

Airport	Elementary School
Civic Center	Intermediate/Middle School
Commercial Harbor	High School
Community College	Landfill
Correctional Center	Hospital
Electric Power Plant	Sugar Mill
Electric Power (future)	Wastewater Treatment Plant
Small Boat Harbor	

* actual alignment to be determined

**Figure 6-2
Kauai General Plan**



Legend

Special Management Area

FIGURE 6-3
SPECIAL MANAGEMENT AREA
 Kilauea Agricultural Park
 Kilauea, Kaua'i, Hawai'i

0 1,000 2,000 4,000 Feet

R.M. Towill Corporation March 2011

GIS Layer Source: Hawaii Statewide GIS Program

Section 7 – Necessary Permits and Approvals

7.1 Federal

7.1.1 Conservation Plan

A conservation plan will be prepared and implemented in coordination with the NRCS in order to ensure conservation practices and enhance farming operations.

It should be emphasized that an actively pursued conservation plan acceptable to the applicable soil and water conservation district may be exempted from County grading permit provisions by the County of Kaua‘i County Engineer. However, all other applicable permits and requirements of other agencies would still apply.

7.2 State of Hawai‘i

7.2.1 Community Noise Control

A Noise Permit is required from the DOH for construction activities that exceed noise levels established by the Community Noise Code; and will be required for construction.

7.2.2 National Pollutant Discharge Elimination System

NPDES permits will be filed as required by the State Department of Health for the management and control of construction stormwater and hydrotesting discharges. The DOH-CWB Guidelines for Notice of Intent, Form C, Section 1-b-vii, states, “Areas which are cleared, graded, and/or excavated for the sole purpose of growing crops are considered to be agricultural and are therefore not included in the disturbed area quantity. This exemption does not extend to the construction of buildings and roads of agricultural or agriculture-related operations that disturb one (1) acre or more.”

7.3 County of Kaua‘i

7.3.1 Use Permit

A Use Permit would be required for those proposed uses not expressly permitted by County Agriculture District zoning. The Kaua‘i Planning Commission is the decision making body for the Use Permit.

7.3.2 Special Management Area

The southeast portion of the project site is within the Special Management Area. If proposed work within the Special Management Area has a construction value less than \$125,000 and has

no substantial adverse effects relative to Coastal Zone Management objectives and policies, a minor permit may be issued administratively. If, however, the proposed work within the SMA has a construction value more than \$125,000, or which may have significant adverse and/or cumulative impacts relative to the Coastal Zone Management objectives and policies, an SMA major permit must be obtained. A public hearing is required and the decision making body for the major permit is the Kaua‘i Planning Commission.

7.3.3 Roadway Access

Presently, direct access to the site from Kīlauea Lighthouse Road is not permitted. Obtaining access from Kīlauea Lighthouse Road will require approval by the Department of Public Works.

7.3.4 Ministerial Permits

Building, plumbing and/or electrical permits may be required depending on the specific construction plans. This may include minor structures for the Sunshine Market, accessory structure for the well, energy farm, fencing, plumbing and electrical work within the park.

As noted in an earlier section, the County of Kaua‘i County Engineer may exempt agricultural operations from grading permit provisions if an actively pursued comprehensive conservation plan has been approved by the applicable soil and water conservation district. In accord with Section 22-7.6(e) of the Kaua‘i County Code, the County Engineer must find that the conservation plan meets certain conditions in order to grant the exemption, such as no alteration of the drainage pattern and inclusion of best agricultural management practices.

Section 8 – Agencies, Organizations and Individuals Consulted

8.1 Federal Government

U. S. Army Corps of Engineers
U. S. Department of Commerce Economic Development Administration
U. S. Fish and Wildlife Service
Kaua‘i National Wildlife Refuge Complex

8.2 State of Hawai‘i

Department of Land and Natural Resources - Kaua‘i Land Division
Department of Land and Natural Resources - State Historic Preservation Division
Kaua‘i/Ni‘ihau Island Burial Council
Kīlauea Elementary School
Office of Hawaiian Affairs

8.3 County of Kaua‘i

Department of Public Works
Fire Department
Kaua‘i Historic Preservation Review Commission
Planning Department
Police Department

8.4 Private Organizations and Individuals

Aha Pūnana Leo o Kaua‘i	Smith, Gary
Akana, Kaipo	Takamine, Vicky Holt
Ako, Uncle Valentine	Trugillo, William
Gushiken, Jack	
Hui Mālama I Na Kupuna ‘O Hawai‘i Nei	
Hui O Laka	
Ka‘ie‘ie Foundation/Kaua‘i Heritage Center	
Kaua‘i Island Hawaiian Civic Club	
Kaua‘i Museum	
Kīlauea Neighborhood Association	
Kīlauea Point Natural History Association	
Mālama Kaua‘i	
Muraoka, Auntie Beverly	
Oi, Tommy	
Reeves, Hannah	

Section 9 – Alternatives to the Proposed Action

An alternatives analysis is being considered as part of the environmental assessment in order to evaluate all reasonable alternatives to the proposed project. It is noted that the County master plan for the development of the site discussed several alternatives (Kimura International, Inc., 2009). The following analysis attempts to build on the prior work.

There were three alternative plans which were formulated as part of the master planning process. Several aspects were common to all three alternatives.

There is a windbreak along the northern and eastern boundary of the project site. This is intended to provide some protection from the prevailing northeast tradewinds. All interior roads were planned for County agricultural standards: 20 feet wide, gravel covered (no asphalt pavement), and grassy shoulders for surface drainage. An irrigation reservoir was included near the southeast corner of the project site. A recycle/compost area, community gardens and energy farm are included in all three alternatives although the locations and acreages vary in each alternative (Kimura International, Inc., 2009).

The alternatives are discussed as follows.

Alternative 1

Alternative 1 was based on a minimalist concept with limited public improvements, thereby minimizing public cost and implementation time. See **Figure 9-1**. This alternative was divided into 6 relatively large lots which ranged from 7.8 to 11.6 acres. There were no designated sectors for conventional farming or organic farming. The community gardens were located on a 1.4 acre narrow strip of land along Quarry Road. This allowed for a sense of safety afforded by visibility from the roadway. Gardeners could also park along the road shoulders adjacent to their plot (Kimura International, Inc., 2009).

Discussion

This alternative does not differentiate between the conventional farm lots and the organic farm lots. Since organic farming generally excludes all synthetic chemicals, antibiotics and hormones in crop and livestock production, the random location of conventional and organic lots may result in contamination through pesticide drift. Generally, organic fields must be buffered from conventional fields. This alternative does not specifically address this concern.

While the lots are larger in size, it does benefit a smaller number of farmers. If the intent is to increase sustainability on the island, there needs to be consideration to ensure that specific crops grown within each lot can be readily purchased by Kaua‘i consumers. Larger lots tend to increase risk that harvested supply from larger lots may exceed island demand.

This alternative allows for relatively minimal public investment but does provide concerns pertaining to contamination between conventional and organic farming, higher potential for market saturation, and fewer number of lots made available.

Alternative 2

Alternative 2 created distinct farming sectors and called for a higher level of public improvements. See **Figure 9-2**. There are four sectors of crop production. Organic farms are located in the northeast portion of the site. Conventional farms are located in the southern portion of the site, and incubator farms were in the northwest. There were 20 farm lots. Organic lots ranged in size from 3.0 to 6.2 acres and are located upwind of the conventional lots. There were 7 conventional lots ranging in size from 2.4 to 9.2 acres. There were 8 incubator farm lots, ranging from 1.0 to 1.9 acres. Community gardens occupy 3.7 acres along Quarry Road. Also, there are access points along Kīlauea Lighthouse Road and Quarry Road (Kimura International, Inc., 2009).

Discussion

Alternative 2 does provide a segregation between organic farm lots and conventional farm lots. This may not be sufficient to totally avoid drift issues. Farm lots are smaller in size which enables more farmers to participate. This alternative does provide for incubator farms which are intended for a start up farmer. The community gardens are located along a strip of property along Quarry Road which allows gardeners the convenience of parking their car alongside Quarry Road close to their garden plot. This also allows a sense of safety since it is visible from the roadway.

Alternative 3

Alternative 3 included the relocation of the Sunshine Market within the project site. See **Figure 9-3**. There were a total of 15 farm lots separated into three sectors. There were 6 conventional farm lots, ranging in size from 2.3 acres to 9.2 acres. There were 4 organic farming lots in the northeast portion of the site ranging in size from 3.0 acre to 6.2 acres. Four incubator farm lots were located in the northwest section ranging in size from 1.9 acres to 3.6 acres. The Sunshine Market was located on 1.7 acres along Kīlauea Lighthouse Road. This is adjacent to the 4.6 acre community gardens area. Parking for the Sunshine Market and community gardens can be shared within a single lot. This alternative provides two access points. The main access to the project is from Kīlauea Lighthouse Road with secondary access from Quarry Road (Kimura International, Inc., 2009).

Discussion

The location of the Sunshine Market site does offer excellent visibility and convenient access from Kīlauea Lighthouse Road. Like Alternative 2, this alternative provides for segregation between the organic and conventional farm lots. The farm lots are also smaller than Alternative 1

which allows more farmers the opportunity to participate. Incubator farm lots are also included. This alternative also provides for the greatest number of potential community garden plots. The layout of the community gardens are also a narrow strip on Quarry Road which provides for site visibility. Alternative 3 is more beneficial than either Alternative 1 or 2.

Alternative 4

Alternative 4 can be considered the ‘No Action’ alternative. The 75 acre parcel is overgrown with vegetation and is otherwise unmaintained. Most of the parcel was utilized for sugar cane cultivation but this ended in 1971. In the southeastern portion of the project area, the natural drainage ditch has been utilized for growing of peanuts, bananas and avocados. It is also an informal vehicle dump. If the project is not implemented, it is anticipated that existing conditions will persist.

Discussion

The ‘No Action’ alternative would allow the waste of a land resource under the control of the County of Kaua‘i which could be put to productive farming use. The property is designated as Agriculture by the State Land Use Commission, Kaua‘i General Plan, and County zoning. Thus, State and County policy dictates that the site is intended to be used for agricultural purposes. This alternative is not a prudent selection for use of the land.

Alternative 5- Preferred Alternative

Alternative 5 is very similar to Alternative 3. See **Figure 2-1**. However, the energy farm has been relocated to property abutting Kīlauea Lighthouse Road. Incubator farm lots have been placed in the area near the eastern boundary. On-site wells as well as a 300,000 gallon water tank have been included to provide irrigation water. A detention basin for drainage purposes has been included near the southeastern boundary of the site.

Discussion

Alternative 5 provides additional advantages over Alternative 3. The energy farm site has been relocated along Kīlauea Lighthouse Road in order to take advantage of the close proximity to existing power lines and the on-site wells. This would minimize cost and provide added convenience for the energy farm. The on-site wells can provide a predictable water source for the farm lots and community gardens. The existing five 5/8 inch County water meters are also available to service the site, as needed. This alternative includes a detention basin for drainage purposes rather than an irrigation reservoir. The detention basin can help to minimize the extent to drainage impacts to downstream properties. An irrigation reservoir would receive runoff from the conventional, organic and incubator farm lots as well as off-site sources. In addition to receiving pollutants, the reuse of the water for irrigation purposes can contaminate the organic farms.

Alternative 5, the preferred alternative, takes the best advantage of the site's opportunities and constraints.

Figures

Section 9 – Alternatives to the Proposed Action

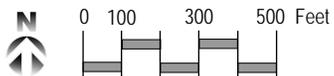
Figure 9-1
Alternative 1 – Kīlauea
Agricultural Park

Figure 9-2
Alternative 2 – Kīlauea
Agricultural Park

Figure 9-3
Alternative 3 – Kīlauea
Agricultural Park

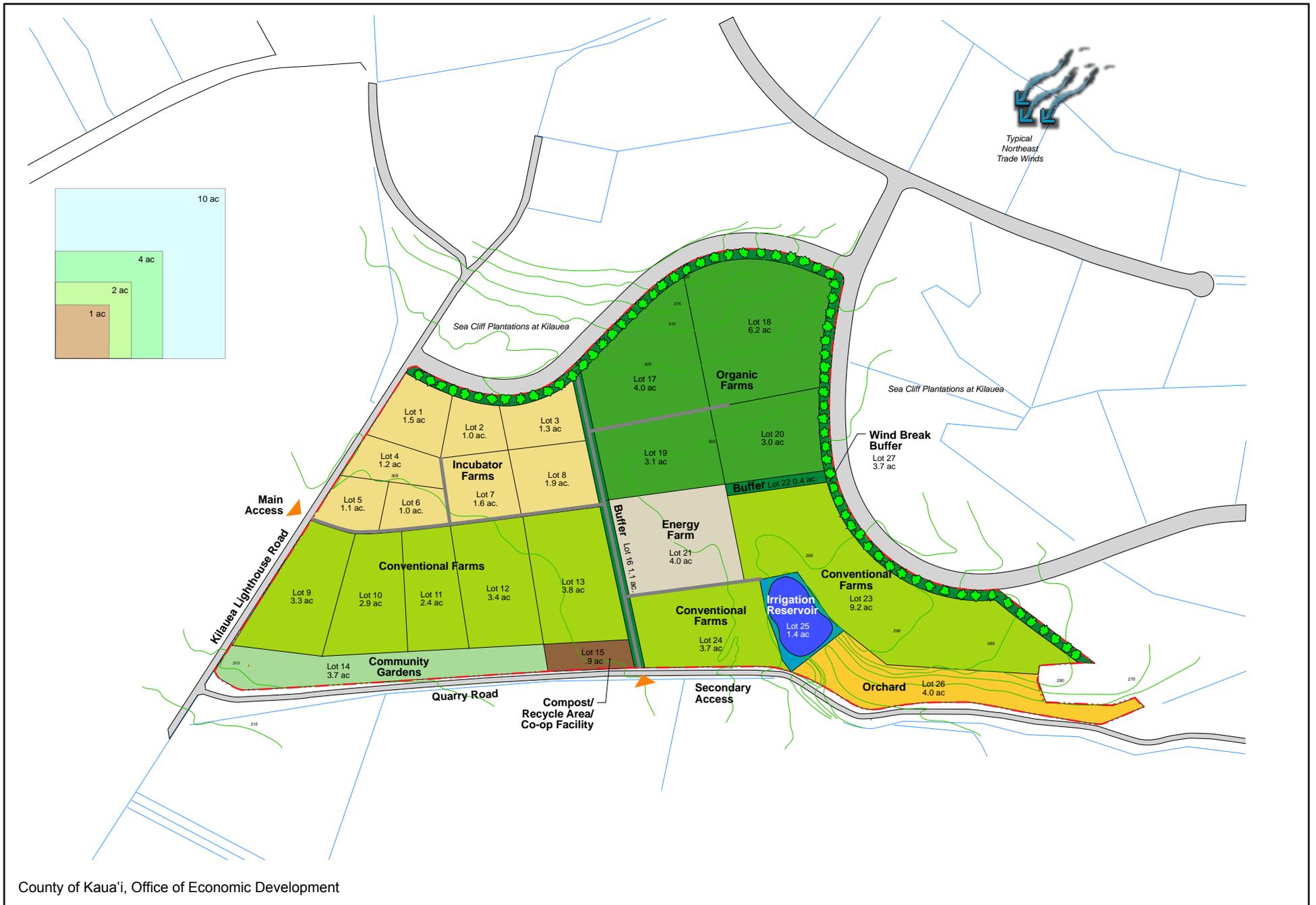


County of Kauai, Office of Economic Development

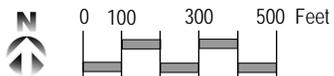


Source: Kimura International, Inc.

Figure 9-1
Alternative 1 - Kilauea Agricultural Park

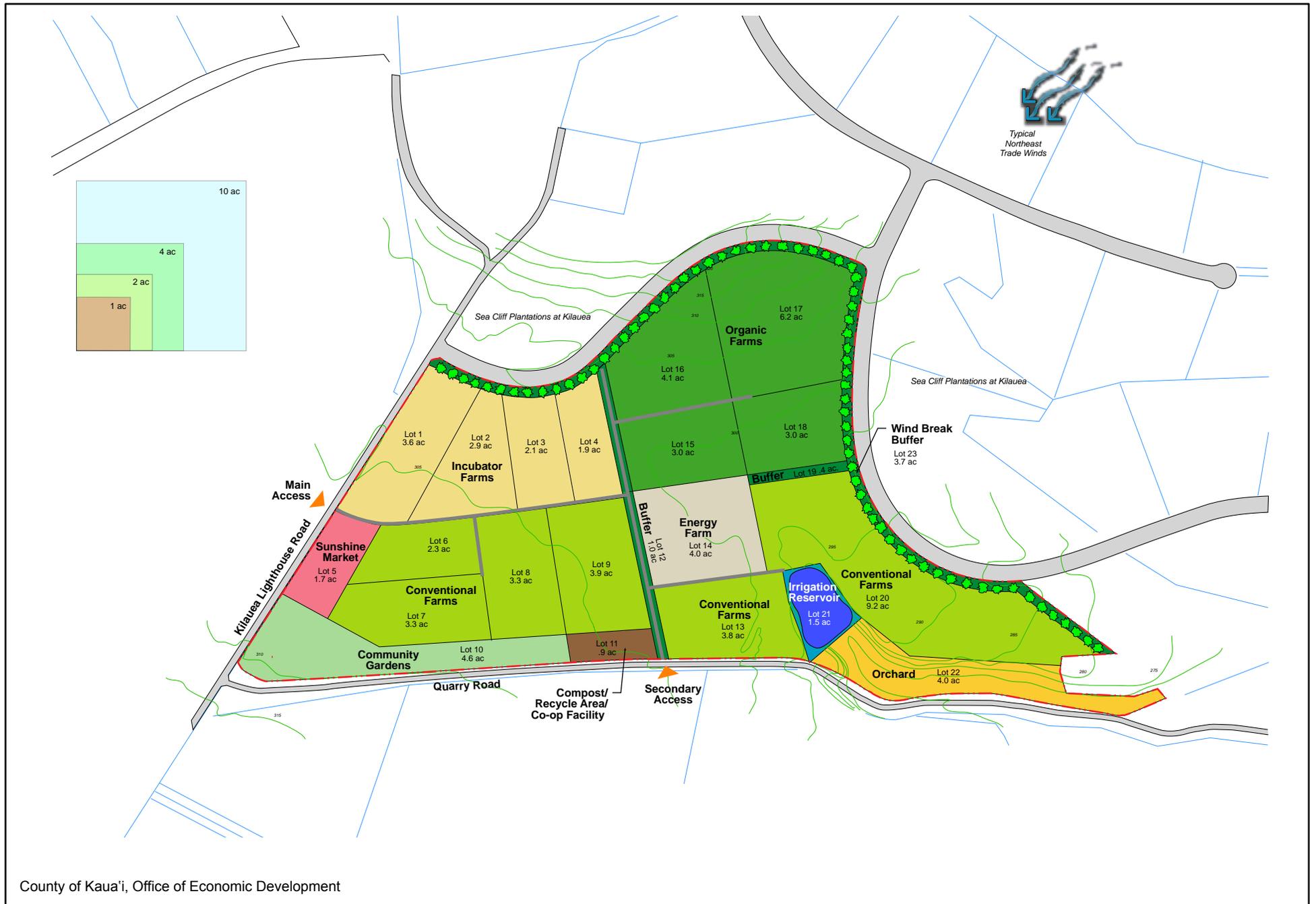


County of Kaua'i, Office of Economic Development

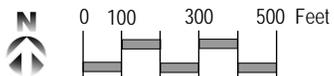


Source: Kimura International, Inc.

Figure 9-2
Alternative 2 - Kilauea Agricultural Park



County of Kauai, Office of Economic Development



Source: Kimura International, Inc.

Figure 9-3
Alternative 3 - Kilauea Agricultural Park

Section 10 – Significance Determination

According to the Department of Health’s HAR, 11-200-12) (Rules), an applicant or agency must determine whether an action may have a significant impact on the environment, including all phases of the project, its expected consequences, both primary and secondary, its cumulative impact with other projects, and its short and long term effects. In making the determination, the Rules establish “Significance Criteria” to be applied as a basis for identifying whether significant impact environmental impact will occur. According to the Rules, an action shall be determined to have a significant impact on the environment if it meets any one of the following criteria.

Pursuant to 40 CFR Section 1508.7, cumulative effects of the proposed action must be assessed. This involves the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency or person undertakes such actions. This assessment is also included within the following discussion.

The proposed project:

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

The proposed project will not cause any irrevocable loss of natural or cultural resources. The agricultural park is re-introducing farming uses to the site. The site was formerly in pineapple cultivation. It has been in an undeveloped and unmaintained state for the past 40 years. There are no endangered botanical resources in the project area. Nēnē may be attracted to the site by agricultural crops. The birds may be at risk of harm from farming activities. Similarly, the irrigation reservoir may also attract the Hawaiian Duck, Common Moorhen, Hawaiian Coot, and Black-necked Stilts onto the site. Care needs to be exercised by users of the agricultural park to not harm these birds. Outdoor lighting at the project site will be shielded to reduce any adverse interactions of nocturnally flying Hawaiian Petrels, Newell’s Shearwaters and other species protected by the Migratory Bird Treaty Act. Woody vegetation taller than 15 feet in height also will not be cleared during May 15 and July 15 when Hawaiian hoary bats may be carrying young and may be put at risk by tree clearing. View corridors will be preserved as a result of the predominantly open-space land use.

As previously noted, no adverse effects to archaeological or historical sites will result from planned improvements. Four historic properties were discovered on the site. However, sufficient information has been collected on three of the sites to mitigate any adverse effect caused by proposed development. The remaining site is a pre-contact agricultural terrace which is likely an outlier of a nearby large cluster of agricultural terraces. Since the recently discovered terrace lacks distinctive characteristics and has been tested for subsurface deposits and artifacts, it is not recommended for preservation. Should any archaeologically or historically significant artifacts, or other indicators of previous on-site activity be uncovered during the construction phase, their treatment will be conducted in strict compliance with the requirements of the Department of Land and Natural Resources.

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

The proposed Kīlauea Agricultural Park will result in the implementation of beneficial uses of the environment. Benefits include preservation of important agricultural lands for diversified agricultural use and preservation of open space and viewplanes. Other positive beneficial uses include production of renewable energy and implementation of sustainable practices such as composting and community gardening.

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

The proposed Kīlauea Agricultural Park is consistent with the Environmental Policies established in HRS, Chapter 344, and the National Environmental Policy Act (NEPA).

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

The proposed project will provide short term employment opportunities during construction and increase the supply of public agricultural lots available to small-scale farmers. The project also increases the food sustainability of the island of Kaua‘i. The project supports State and County policies to preserve important agricultural lands and support diversified agriculture.

5. Substantially affects public health;

During construction, there will be minor impacts to air quality and noise levels. After completion of the construction work, there will be no long term negative consequences relating to air quality and noise. The positive aspects of the proposed project in the areas of economic and social benefits of the community are greater than the “No Action” alternative.

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

Impacts on public facilities will not be an issue and the project will not significantly change the area’s population or demographic make-up.

7. Involves a substantial degradation of environmental quality;

The proposed Kīlauea Agricultural Park will not substantially degrade the environment either by its construction or by its use.

8. Is individually limited but cumulatively has considerable effect on the environment, or involves a commitment for larger action;

The Kīlauea Agricultural Park does not commit resources or energy for a larger action. There are no future phases of development. There is no further commitment to a larger action. Specific tropical, vegetable and organic crops may change within the project over time. Farming operations will be overseen through the Conservation Plan coordinated with the NRCS. It is intended that a growers association will govern overall operations of the park, such as community relations, grower relations, interaction with government officials, overseeing the water system, compliance with permit requirements, road maintenance, and security. The land use is consistent with State land use, general plan and zoning. There are no other effects on ecosystem resources and human communities from a cumulative effects perspective.

9. Substantially effects any rare, threatened or endangered species or it's habitat;

No rare, threatened or endangered plant or animal species or their habitat will be affected by the project.

10. Detrimentially affects air or water quality or ambient noise levels;

All measures will be taken during construction to prevent runoff from entering the ocean or streams. Application of pesticides and herbicides on diversified agricultural crops will be restricted based on wind conditions.

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

The project is not in an environmentally sensitive area such as a tsunami zone, beach or erosion-prone area, geologically hazardous land, estuary, freshwater or coastal area. Potential effects related to erosion will be mitigated by the implementation of construction BMPs in compliance with HAR 11-54 Water Quality Standards and HAR, 11-55 Water Pollution Control. General Best Management Practices (BMPs) are described in Section 3.5 – Drainage. Long-term impacts related to coastal areas will be mitigated by adherence to the Soil Conservation Plan within the project.

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

The views into or out of the project will not be adversely affected. The site has been overgrown with trees and vegetation for 40 years. Open space will be maintained through the predominant land use of diversified agriculture. County and State plans designate the site for agricultural use.

13. Requires substantial energy consumption;

The construction of the Kīlauea Agricultural Park will not require substantial consumption of energy or resources. Agricultural operations following construction will likely require energy for lighting, irrigation systems, equipment, and communication. Demand for electrical energy will not be substantial.

Section 11 – Anticipated Findings

In accordance with the provisions set forth in 40 CFR Parts 1500-1508; HRS, Chapter 343, and the significance criteria in HAR, 11-200-12, this assessment has preliminarily determined that the project will have no significant adverse impact to water quality, air quality, existing utilities, noise levels, social welfare, archaeological sites, or wildlife habitat. Anticipated effects will be temporary and will not adversely impact the environmental quality of the area. Impacts that have been identified will be mitigated. Based on analysis and review of the above factors, it has been preliminarily determined that an Environmental Impact Statement (EIS) will not be required, and that a Finding of No Significant Impact (FONSI) should be issued for this project.

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Appendix A

Preliminary Agricultural Assessment
Kīlauea Agricultural Park, Kīlauea, Kaua‘i, Hawai‘i
North Shore Pineapple Company and
Development Strategies LLC, December 2010

DRAFT

Preliminary Agricultural Assessment

Kilauea Agricultural Park

Kilauea, Kauai, Hawaii

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Executive Summary

The Office of Economic Development (OED) of the County of Kauai is in the initial phase of planning the development of a 75 acre parcel of land located in Kilauea, Kauai, Hawaii (TMK: (4) 5-2-04.99) as an agricultural park for small scale cultivation of crops intended primarily for consumption on the island. Based on meetings with various segments of the community, a conceptual Master Plan (Kimura International, April 2009) was prepared for the OED.

The Master Plan describes three conceptual layouts for the site, each incorporating approximately 54 acres of land for conventional and organic crop production along with areas for ag related activities and other suggested functions for the KAP. The Preliminary Agricultural Assessment (Assessment) identified, screened, and selected tropical fruit and vegetable crops that have potential for cultivation on the 54 net acres for commercial production. The preliminary screening criteria used in the crop selection process included: 1) suitability for cultivation under the climatic and growing conditions at the KAP; 2) potential for replacement of intra-state and Mainland imports to Kauai; 3) revenue potential per acre per year; and 4) other benefits/considerations (i.e. export potential, reduction in water demand, potential synergies with existing growers on the island, etc.).

The preliminary crop list includes 25 acres of pineapple/papaya and 29 acres of vegetable and root crops. Weather conditions at the site are generally acceptable for the cultivation of tropical crops. However, the climate during the wet winter months is not ideal for vegetable crops. The Assessment recommended limiting vegetable crop production to the drier months from April to October in order to mitigate plant disease risks during periods of high rainfall.

The Preliminary Pan Evaporation Projections indicated that average daily, peak daily, and peak daily without rain water demands are 0.13, 0.22, and 0.33 inch per day, respectively. The Crop Water Requirements based on the Pan Evaporation Projections and the preliminary crop list for sprinkler irrigation methods indicated average daily, peak daily, and peak daily without rain crop water requirements are 257,000, 436,000, and 654,000 gallons per day (gpd), respectively, for the 54 acres to be cultivated. The irrigation flow rate required to meet peak daily without rain crop water requirements for 8 to 24 hour pumping day ranges from 453 to 1360 gallons per minute (gpm).

Due to potential limitations of the Koloa basal aquifer in the Kilauea area, an alternate case scenario was considered in the event that the proposed groundwater supply well is unable to consistently meet irrigation water requirements. Given the rainfall in Kilauea, pineapple and papaya can be grown without irrigation. The alternate case scenario which considers sprinkler irrigation of 29 acres of vegetable crops only indicated average daily, peak daily, and peak daily without rain crop water requirements are 163,000, 275,000, and 413,000 gpd, respectively. The irrigation flow rate required to meet peak daily without rain crop water requirements for 8 to 24 hour pumping day ranges from 287 to 860 gpm.

The Assessment presented Agricultural Considerations and Recommendations to increase efficiency, productivity, and profitability of the small farms at the KAP. The small farms must be efficient, productive, and profitable to be sustainable in the long term. The Assessment provided suggestions on infrastructure requirements that may be needed to operate and maintain the small farms. The Assessment also provided general guidelines for development of Production Guides and Plans required to prepare Grower Proposals. Grower Proposals will be used to evaluate the viability of specific agricultural proposals from individual grower as project planning activities transition from concept into implementation.

During the course of preparing the Assessment, several issues of potential concern were identified that may affect the long term viability of small farms at the KAP. The issues of potential concern included: 1) Development of sales and marketing plans based on all potential market channels; 2) Potential residential exposure to pesticides; 3) Development of a reliable source of irrigation water with acceptable chloride content; 4) Potential impacts on endangered species; and 5) Storm water discharges into the Shoreline Management Area.

There is no question that tropical fruit crops can be grown at the KAP. Vegetable crop production has higher risks requiring good management practices. In the next phases of project planning, individual growers will need to determine if the production costs are acceptable and if all of the crops produced can be sold at prices that lead to profitable small farms. Development of the KAP will take patience, cooperation, compromise, careful planning, effective plan execution, and Community support. Hopefully, the Assessment provides useful information required for rational decision making as the planning process continues.

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1. Introduction

The Office of Economic Development (OED) of the County of Kauai is in the initial phase of planning the development of a 75 acre parcel of land located in Kilauea, Kauai, Hawaii (TMK : (4) 5-2-04.99) as an agricultural park for the small scale cultivation of crops intended primarily for consumption on the Island. Based on meetings with various segments of the community, a conceptual Master Plan (Kimura International, April 2009) was prepared for OED. The Master Plan report illustrates a preliminary layout for the project site, with alternative allocations of the land area for fields and other related land uses.

The intent of the Kilauea Agricultural Park (KAP) is to provide agricultural lots that would be affordable to small farmers (growers) for production of fresh, wholesome locally grown produce to reduce the import of fruit and vegetables to the Island. In order to achieve this objective, agricultural operations must be efficient and profitable in order to assure sustainability. Criteria for evaluating the viability of specific agricultural proposals from individual growers will be established as project planning activities transition from concept into implementation.

1. Purpose and Scope

The Purpose and Scope of the Preliminary Agricultural Assessment (Assessment) is to:

- Evaluate pertinent characteristics of the project site and the surrounding Kilauea area to determine the suitability of the KAP for small scale cultivation of crops;
- Identify tropical fruits, vegetables, and other crops that may be suitable for the growing conditions at the KAP;
- Provide crop selection screening criteria for crops that may be grown at the KAP based on crop characteristics, advantages and disadvantages, and the potential local consumption on Kauai;
- Provide reasonable case crop management practices based on site conditions and crop specific requirements that should be considered in later phases of the planning process; and
- Generate a preliminary recommendation on the crops that may be cultivated at the KAP to facilitate future planning activities;

In order to guide continued development of the KAP, the Assessment will also identify Considerations and Recommendations which must be addressed during subsequent phases of project planning to enhance the successful, long-term viability of the agricultural park. The implementation of cooperative programs, particularly activities involving small scale growers must be economically and technically feasible. It must be anticipated that these will require the use of a phased and integrated approach

predicated upon practical experience, prudent decision making, mutual cooperation, and community support.

2. Site Description

The site consists of approximately 75 gross acres located adjacent to Kilauea Lighthouse Road and approximately one thousand (1000) feet North of Kilauea town. The Kauai Christian Academy is located adjacent to the Western boundary of the site. The Sea Cliff Plantation is located near to the Northern boundary of the site. The Kilauea Lighthouse Preserve is located approximately three quarter (3/4) mile from the Northern tip of the site. The Southeast portion of the site is located in a Special Management Area (SMA) near a drainage pathway to Kilauea River Basin. The close proximity of the site to residential areas and a SMA presents potential challenges that must be effectively addressed prior to the start of any crop production at the site.

The Master Plan describes a conceptual plan that includes approximately 54 acres for conventional and organic crop production, four (4) one acre incubator farms, community gardens, a Farmer's Market called the Sunshine Market, tree crops in the SMA, Energy Farm, and Composting Area. The conceptual plan also includes a groundwater supply well, an irrigation reservoir, roads, and irrigation supply lines.

The final field layout, tropical and vegetable crop mix, and site elements must be based on facilitating implementation of economically and technically feasible grower proposals to ensure that all activities contribute to the sustainability of the KAP.

3.1 Climate

Monthly average air temperatures and average monthly rainfall for the Kilauea Station 1134 between 1999 to 2008 are provided in Table 1. A summary of the average monthly air temperatures and average monthly rainfall for the 10 year period (Weather Warehouse, October 2010) is provided in Table 2 and 2A (Appendix A). The weather data set has data gaps, however, it is sufficient for use in the Assessment.

Table 1. Monthly Average Air Temperatures and Rainfall (Kilauea 1134, 1999-2008)

Month	Average Air (deg. F)	Average Rainfall (inches)
January	70.5	4.77
February	70.3	6.93
March	71.0	8.66
April	72.5	4.16
May	74.5	4.55
June	76.5	3.71
July	77.0	3.60
August	77.5	4.13

September	77.3	3.51
October	76.4	5.13
November	74.6	6.32
December	71.7	6.53
Avg. Temp./		
Total Rainfall	74.2	62.0

The 10-Year average annual rainfall at the site is approximately 62 inches per year. The annual rainfall for 1999 to 2008 ranged from 52.61 (Year 2007) to 87.46 (Year 2004). The wettest month during the 10 year period was March with average of 8.66 inches of rainfall. The driest month during the 10 year period is September with average of 3.51 inches of rainfall.

The highest monthly rainfall total was March 2006 at 36.44 inches. The lowest monthly rainfall total was May 2000 at 0.71 inch. The occurrence of high rainfall during storm events will require installation of a surface drainage system at the KAP.

The 10-Year annual average air temperature at the site is 74.2 degrees Fahrenheit. Monthly average air temperatures for the April to October growing season ranges from 72.5 to 77.5 degrees Fahrenheit. Monthly average air temperatures during the extended March to November growing season range from 71.0 to 77.5 degrees Fahrenheit. In addition to reducing plant disease risks, limiting vegetable production to the April to October growing season will provide better air temperatures for crop growth.

Prevailing wind direction is east-northeast with average wind speed of 10 to 20 miles per hour. The windy conditions at the site will increase evapotranspiration thus increasing crop water requirements. Wind sensitive vegetable crops may require installation of wind breaks within the field areas. Typical in-field wind breaks consist of non-seed bearing sudex grass planted in wind rows laterally against the wind direction. Papaya and banana may require more extensive wind breaks to prevent 'blow down' during major storm events.

The climatic conditions at the site are suitable for tropical fruit crops such as papaya, pineapples, and banana. Pineapple may be grown without irrigation at the site. Papaya may be grown without irrigation at the site, however, irrigation will reduce disruptions in production or 'skips' that will be caused by occasional dry periods. Banana will require irrigation to attain economic yields and achieve quality standards.

The climatic conditions at the site are wetter than desired for vegetable crop production. The relatively high monthly rainfall between November to March will require seasonal planting and production to mitigate plant and fruit diseases in vegetable crops. Despite fairly even distribution of rainfall, all vegetable crops will require irrigation to meet crop water requirements.

Tropical crops can be grown year round at the site. The recommended vegetable growing season is April to October. During dry years, it may be possible to increase the length of the growing season to March to November. The number of growing days in the April to October and March to November growing seasons are 213 and 274 days, respectively.

3.2 Soils and Topography

The soils at the site consist of the Lihue series, a silty clay soil. The Lihue soils series consists of well, drained fairly deep soils that are suitable for mechanized land preparation. With proper fertilization, silty clay soils are suitable for tropical and vegetable crops.

The site is relatively flat with surface elevation ranging from 281 to 325 feet above mean sea level. The site slopes naturally toward the southeast corner of the property. The southeast corner of the site is located within a Shoreline Management Area leading to a drainage pathway to the Kilauea River Basin.

The surface layer of the Lihue series is dusky red silty clay about 12 inches thick. The subsoil is a dark red to dark reddish brown silty clay about 48 inches thick. The substratum is soft, highly weathered basalts called saprolite.

3.3 Hydrogeology

The site is underlain by the Lihue Aquifer Sector (201) and the Kilauea Aquifer System (20105). Most of the Kilauea Aquifer System is a platform of the Koloa volcanic series. The aquifer under the site is basal in the Koloa series. The volcanic rock series and formations are relevant in the preliminary assessment of the location and potential productivity of the proposed groundwater supply well at the site.

In most geologic aspects, Kauai is the most complex of the main Hawaiian Islands. It is the oldest of the main islands and was eroded before being covered by later volcanic eruptions. The original volcano is located in the high interior of the island. The primary basaltic rocks from the original volcano are named the Waimea Canyon series. The innumerable lava flows from the original volcano is divided into three major geologic formations; the Napali formation, the Olokele formation, and the Makaweli formation. The Napali formation of the Waimea Canyon series are the most permeable rocks or water bearing rocks in the island.

After almost complete erosion to the island's current shape, the Koloa volcanic series covered the eastern part of the island. The Koloa series are less permeable than the Napali formation of the Waimea Canyon series. The Koloa series were deposited in relatively flat layers in contrast to the moderately dipping layers of the Napali lavas. The Olokele and Makaweli formations of the Waimea Canyon series are also relatively flat lying but they are more permeable than the Koloa series.

Near the Coast, the Kilauea system aquifers in the Koloa series are basal or groundwater in contact with sea water. Basal aquifers are the most productive sources of groundwater. About 1.5 miles from the Coast, the Koloa aquifers are characterized by poorly permeable perched aquifers or shallow groundwater trapped in highly weathered, impermeable layers. Perched aquifers are rarely used as a water source due to very low sustainable yields. In the Interior, the Napali formation contains productive high level, diked impounded aquifers. Dike impounded aquifers are also productive and may be exploited for irrigation and/or drinking water.

The less permeable Koloa series is usually ignored as a groundwater source in favor of more permeable Waimea Canyon series. No producing wells have been drilled in the Kilauea Aquifer System. Therefore, basal groundwater levels in the Koloa series in the Kilauea Aquifer System have not been measured. Groundwater levels are used to measure the sustainability of pumping of basal aquifers. When groundwater levels decline significantly from baseline levels from droughts or pumping of wells, restrictions are enforced to prevent sea water from increasing the salt or chloride content of the water.

The principal surface drainage system is the Kilauea River which is moderate in size. Other smaller, shorter streams also reach the Coast. The basal groundwater flows to the Northeast exiting in springs into the Kilauea River.

The basal aquifers in the Koloa series may have limits to pumping rates and total quantity of groundwater that can be pumped before pumping has to be stopped to prevent salt water intrusion. The lack of data on the aquifer characteristics of the Kilauea Aquifer System raises some uncertainty on the sustainable pumping rate of the proposed groundwater supply well before groundwater levels decline to levels that will trigger water use restrictions. Excessive pumping may increase chloride content of the water to levels that may injure or damage irrigated crops.

The preliminary evaluation of hydrogeology at the site indicates it may not be possible to meet 100 percent of the crop water requirements for all acreage of tropical fruit and vegetable crops from the proposed groundwater supply well. The suggested approaches to estimate sustainable pumping rates and associated water quality of the proposed well are discussed in Section 5.8.1. Suggested approaches to manage irrigation requirements to allow lower pumping rates are discussed in Section 5.8.2.

3. Crop Selection Screening Criteria

The purpose of the Crop Selection Screening Criteria is to identify strengths and weaknesses of tropical fruit, vegetable, and organic crops that may be adapted to the growing conditions at the site. The information was used to develop a preliminary list of potential crops and their respective annual acreage to estimate irrigation water requirements. The potential crops were selected using standard level of professional care based on:

- Suitability for cultivation under climatic and growing conditions;
- Potential for replacement of intra-state and Mainland imports to Kauai;
- Theoretical Kauai market potential, potential Kauai acres to meet market demand, and good revenue per acre per year;
- Crop specific agricultural considerations; and
- Other benefits (Avoidance of competition with large Oahu growers, Export potential, Availability of local knowledge, Potential synergies in equipment, labor, and marketing with existing growers, etc.)

Ultimately, the decision on what crops to grow and the crop management practices to use will be the growers' decision. In later phases of planning, growers will need to submit grower proposals to determine if their respective plans may contribute to the overall objectives of the KAP. Commonly accepted agriculture practices and suggested phases and components of the planning and execution of the development of small farms are discussed in Section 5.

Hawaii Agricultural Statistics and US Census Statistics

Annual Hawaii crop production data is provided in National Agricultural Statistics Service (NASS reports at <http://www.nass.usda.gov/hi.com>. NASS data does not provide Kauai County production and consumption data essential for preparing grower proposals directed at complementing existing crop production. However, the NASS data does provide general information required to prepare estimates for the Assessment.

The 2009 US Census statistics indicated Kauai County has approximately 64,500 residents with weekly visitor count of about 10,000 visitors (4 day stay). The Hawaii State population was reported as approximately 1.295 million residents with about 44,230 visitors per week.

For purposes of the crop selection criteria, the most recent NASS reports for State wide production and consumption were extrapolated against the Kauai population level to estimate weekly production and consumption for specific crops in the Kauai market. The Kauai market may represent approximately 6 percent of State wide consumption.

Theoretical Production and Market Data-Tropical Crops

The number of farms, bearing acres, production, farm value, and potential revenue per acre per year for potential tropical crops are presented in Table 3. Table 4 presents estimated weekly consumption of tropical crops for the island of Kauai (including visitors) relative to State wide consumption. The annual production and market data is

based on the most recent NASS reports. Use of data for one year provides a 'snapshot' of the production and market for Hawaii crops, but must be considered as suggestive rather than conclusive.

Similar estimates were calculated for vegetable crops in Section 4.2. Inadequate production and market data was available to provide weekly consumption estimates for organic crops in Section 4.3. Sweet potato is considered a tropical root crop but was included in the vegetable crops in Section 4.2.

Table 3. Number of Farms, Acres, Production, Value of Sales, and Revenue per Acre (Tropical Crops-State of Hawaii)

Crop	No. Farms	Acres (acres)	Production (lbs.x1000)	Sales (\$.x1000)	Revenue/ Acre/Yr
Pineapple	30	NA	23,400	9,360	\$13,140
Papaya	174	1,430	30,555	13,750	\$9,615
Banana	230	1,100	17,400	8,004	\$6,615
Ginger Root	NA	0.06	1,800	2,880	\$48,000
Taro, Chinese	NA	0.02	NA	NA	NA

Table 4. Annual Consumption, Weekly Consumption, Average Yield, and Potential Acres (Tropical Crops-Kauai County)

Crop	Annual (lbs.X1000)	Weekly (lbs.x1000)	Yield/Acre (lbs.x1000)	Potential Acres
Pineapple	1,404	27	66	21
Papaya	1,008	19	21	48
Banana	1,044	20	15.8	66
Ginger Root	43	NA	30	1.4
Taro, Chinese	NA	NA	NA	NA

The crop specific sections provide rationale for crop selection and agricultural considerations for future planning activities. This information is not intended to encourage or discourage growers to select specific crops. It provides some basic guidelines to consider in preparation of grower proposals that will be required at later phases of planning. Small scale growers cannot afford to make costly mistakes. Hopefully, some of this information will prove to be useful to growers in making rationale decisions as they evaluate short term and long term viability of their farms.

Initially, growers at the site should concentrate on 'import' replacement for tropical fruit and vegetable crops from intra-state and Mainland sources. If yields, quality, and costs are acceptable, the Kauai grower will enjoy an advantage of freight savings over

Mainland and intra-state imports. The freight savings can provide additional gross revenue per acre to improve on profitability and thus sustainability of the small, family farms.

Most of the produce grown by Kauai growers are sold in Farmers' Markets. The 54 acres of new crops at the KAP represents a significant increase in the total production volume. In order for small farms at the KAP to be successful, it will be necessary to sell part of the production to local produce distributors for retail sales.

In a later phase of the planning process, a Kauai specific production and market survey should be conducted to identify crops with the greatest potential to complement existing production for retail sale. The small size of individual farms may make it difficult to produce enough volume to consistently meet the Island's requirements. In addition, small scale growers will want to avoid producing more produce than can be consumed on the Island on a weekly basis. Oversupply may result in lower pricing or direct losses if the produce cannot be sold. It may be necessary to have access to refrigerated storage facilities to spread sales over longer periods of time.

4.1 Tropical Crops

Tropical crops are well suited to the climatic and growing conditions at the site. The most important limiting factor influencing crop selection is high rainfall and the periodic occurrence of storm events during the winter months. Tropical crops planted in fields with adequate surface and internal drainage can be grown year round under the most extreme conditions that may occur at the site.

Pineapple may represent the 'best case' crop for intra-state import replacement. Under Hawaii State Law, Pineapple cannot be imported into the State from foreign growing areas. Production on Oahu and Maui are the primary sources of pineapple consumed in the State. A percentage of the current production is shipped to the Mainland making the relatively small Kauai market less important to sales and marketing plans for current pineapple growers.

Pineapple has been grown successfully without irrigation under similar climatic and soil conditions in Haiku, Maui for more than 50 years. Pineapple does not require planting of extensive wind breaks. In the past, Smooth Cayenne pineapples were also grown on Kauai for cannery production. Fresh pineapple production already exists on Kauai and consumption may be increased by conversion to new Extra Sweet Gold Pineapple varieties.

Papaya is the most likely crop of choice for production at the site. Kauai growers have extensive experience in growing papaya. All of the papaya grown on Kauai is consumed on the island. If the Kauai market is already saturated, it may not be practical for new growers to compete with existing production for the local market. Currently, there is no papaya packing plant on the Island that is operational. Papaya

grown at the KAP cannot be exported to Mainland markets until the papaya packing facility is re-activated.

Banana has been previously grown at the site. Banana has a high water requirement and is impacted by pests and diseases that are difficult to control. Banana can be imported into the State making it more difficult for small growers to successfully compete for the local market.

Dry land taro for luau leaf may also a good candidate for both conventional and organic production. However, it makes little practical sense to grow dry land taro when the best wetland taro growing area is located a few miles down the road. Dry land taro leaf was eliminated from further consideration in this Assessment.

Ginger root can be grown with good drainage in wet, windy growing environments. The high revenue per acre per year and ability to export excess production makes ginger root a good candidate for growers at the KAP.

Crop specific information on tropical crops that may be grown at the site is presented in the following sub-sections.

4.1.1 Extra Sweet Gold Pineapple

Pineapple is a very efficient water user and can be grown without irrigation. Unirrigated pineapple culture provides both capital and operating cost savings potentially increasing profitability. Pineapple will reduce total crop water requirements that may be required if the proposed well cannot meet 100 % of the water demand. Pineapple is adapted to a wide range of growing conditions. Pineapple has unique pests and diseases thus reducing pest and disease pressures in adjacent farms growing other tropical and vegetable crops.

Ag Statistics and Potential Acres

Annual pineapple consumption in the State of Hawaii is estimated at approximately 900 thousand 26 lb. boxes per year (Oda, October 2010). The pineapple consumption on Kauai is estimated at approximately 54,000 boxes per year or 1038 boxes per week (equivalent to approximately 27,000 lbs./week).

Pineapple produces an average of 45 tons per acre per crop with approximately 73 percent saleable product recovery per acre (Oda, October 2010). Two crops are normally harvested from a single planting. It takes approximately four years to complete the two crop cycle.

Existing local production was not considered in the estimated potential acres. If Kauai growers decide to meet the theoretical market demand, it may be feasible to plant up to about 10 to 11 acres per year at the KAP. It may require up to 22 total bearing acres to

meet the Kauai market demand. When growing and fallow acres are also considered, pineapple growers on Kauai may need approximately 88 acres to meet requirements of the production plan.

Assuming average price of \$0.40 per lb. and yields/recovery listed above, the estimated revenue per acre per crop is \$26,280. For the four year crop cycle, revenue per acre per year is estimated at \$13,140 per acre per year. Pineapple rates are second to ginger root in potential revenue per acre per year. There is a possibility of increasing revenue by utilizing rejects for salsa or Smoothies that could be sold at the Sunshine market.

Agricultural Considerations

The initial investment to enter into the pineapple business is relatively high. The largest initial investment is seed development or planting material production. Planting material for new varieties are grown in nurseries approximately one year before commercial planting.

Pineapple may require soil fumigation to control nematodes. Soil fumigation requires specialized bedding equipment and use of agricultural mulches. Soil fumigation and mulching is a significant cost component in the budget. Soil fumigation equipment may be used for pineapple and ginger root production.

Pineapple requires approximately 18 months prior to the first harvest. Growers will not be able to realize a return on investment until the crop is harvested and sold. New growers may have a difficult time in paying loans if they do not have additional revenue.

Small growers may attain lower yields and recovery due to inability to implement required agricultural practices reducing the revenue potential per acre. If the reasonable case yield and recovery assumptions cannot be attained, it may not be feasible to sustain small scale pineapple farms.

The small size of the individual farms will make it necessary to coordinate planting and fruit deliveries with other growers. Coordination and cooperation can be beneficial in sharing of equipment, labor, and other resources. However, it can also become an unmanageable situation if the working relationship breaks down.

Pineapple production on the scale listed above will require Island wide distribution and securing resort accounts to sell all of the weekly volume. Use of distributors will increase costs and reduce profit margins.

Pineapple may require specialized equipment requiring high capital expenditures, if equipment is not available. Pineapple cultivation, harvesting, and packing can be very

labor intensive. Growing costs may be high thus requiring a careful business analysis to determine if it is economically feasible for small growers to enter the business.

4.1.2 Papaya

Sunrise Solo papaya has been grown for many years on Kauai. There is significant local expertise easily making papaya as the first crop of choice for growers. Existing growers will be able to take advantage of synergies (equipment, hot water dip treatment, marketing channels, etc.), if they are selected as growers at the KAP.

Ag Statistics and Potential Acres

In June 2009 (NASS, October 2009), the Hawaii agricultural statistics indicated that approximately 2,075 acres of papaya were grown in the State of Hawaii. Approximately 1,900 acres were grown on the Big Island with about 175 acres grown on Oahu/Kauai/Maui.

The number of farms on Oahu/Kauai/Maui in 2009 was 54 farms. Two farms on Oahu are fairly large. Therefore, the average size of papaya farms outside of Hawaii County may be significantly smaller than 3.2 acres derived by dividing acres by number of farms.

Monthly consumption in the State in July 2009 was reported as 1,530,000 pounds produced on 1,430 bearing acres. The estimated annual, monthly, and weekly papaya consumption on Kauai are 1.008 million pounds, 84,026 lbs., and about 23,000 lbs., respectively.

Assuming an average price of \$0.45 per lb. and average yield of 21,367 pounds of papaya per acre per year, one acre of papaya may generate \$28,846 in gross revenue in a three year production period. Revenue per acre per year for the 3 year production cycles is estimate at \$9,615 per acre per year.

Estimated annual consumption on Kauai may be met with approximately 48 bearing acres per year. When non-bearing acres are included, the total potential acres of papaya on Kauai may be about 64 acres.

About 45 percent of the Hawaii papaya production is exported to Mainland markets. A small percentage of the annual Hawaii production may be sold in Japan. Re-activating the papaya packing plant located near the Lihue Airport will provide the option of shipping excess production to Mainland markets.

Agricultural Considerations

Papaya requires about a year from planting to first harvests. The papaya fruit is borne in the leaf axils as the tree grows. Papaya is harvested on a weekly basis until the trees

become too tall and unproductive to harvest. It usually takes about two to three years before the orchard reaches maturity requiring knockdown and re-planting.

After the crop cycle, the fields are normally left in fallow for three years to manage root diseases. If papaya is grown at the KAP, it may be necessary to grow other crops during the fallow period.

Papaya is a host to the four fruit fly species found in Hawaii. In compliance with Federal quarantine laws, papaya cannot be shipped out of the State without treatment with an approved quarantine treatment. Quarantine treatments add significant costs requiring attainment of higher pricing to be competitive in export markets.

Papaya is susceptible to ringspot virus that nearly decimated production on the Big Island. Currently, ringspot virus is not a major limiting factor in the expansion of papaya production on Kauai. The ringspot virus resistant varieties like Rainbow are not generally accepted by Kauai growers. Therefore, growers at the KAP will need to weigh the risks-benefits of growing ringspot virus resistant varieties if it is necessary to mitigate risks in the future.

Papaya is very susceptible to plant and fruit diseases. Postharvest fruit diseases like anthracnose, stem end rots, and Rhizopus fruit rots can decimate export shipments if diseases are not controlled in the fields. It is not practical to assume that papaya can be exported to Mainland or even to other local markets with adequate pre-harvest and postharvest disease control. Fruit disease control programs require spraying fungicides at 7 to 14 day intervals throughout the fruit development and harvesting stages.

Papaya requires hot water treatment to control postharvest diseases. Hot water treatments require installation of dip tanks, boilers/heaters, and hot and cool water drench treatments increasing capital and operating expenses for first time growers. Existing growers may not use postharvest treatments for disease control potentially making it necessary to invest in hot water treatment systems to allow shipment to other Islands.

Papaya tends to drop its flowers during times of drought resulting disruptions in production or skips. Skips or low production periods may last for one to three months. Papaya grown at the KAP may require irrigation to prevent skips that can significantly reduce total yields and revenue per acre over the life of the orchard.

If root health is poor, papaya can be subject to blow down if wind breaks are not well established. Blow down results in loss of trees per acre reducing yields and revenue per acre.

4.1.3 Banana

Banana is usually grown in deep, friable loam or clay loam soils with good drainage and aeration. The silty clay soils at the site are not ideal for banana cultivation, however, banana can be grown if properly irrigated and fertilized. Banana has a very high water requirement, therefore, it was not included in the Preliminary Crop List in Section 5.5 while the pumping rate of the well is determined.

Ag Statistics and Acres

In 2008, approximately 1,300 acres of banana were cultivated on 230 farms in the State of Hawaii. Fresh market consumption in 2008 was 17.4 million pounds, representing a 32 percent reduction in consumption when compared to 25.6 million pounds in 2007. Hawaii's banana producers received an average of \$0.45 per pound in 2008. The value of sales in 2008 was about \$8 million (NASS, June 2009).

The Kauai consumption is estimated at about 1.04 million pounds of fresh bananas per year or approximately 20,000 lbs. per week.

According to the NASS report, average annual yield of fresh banana per acre may be approximately 13,385 lbs. per acre per year or 6.7 tons per acre per year. At this theoretical yield, the market demand for fresh banana on the Island may be met by growing a total of about 80 acres.

The US imported approximately 4.0 million metric tons of banana from foreign sources in 2008. Due to low banana prices in West Coast markets, it is economically feasible to import foreign banana into Hawaii. The availability of cheap foreign imports tends to decrease price per pound for local banana.

Agricultural Considerations

Similar to papaya, there is extensive local expertise in banana cultivation. It is an obvious crop of choice for consideration of cultivation at the KAP. Banana production has been on a slow but steady decline in recent years. Increasing costs of raw material such as potassium fertilizers has reduced profitability.

Banana is susceptible to bunchy top and Sigatoka diseases. The plant diseases of bananas are difficult to control due to the high, thick leaf canopy. Banana is normally cultivated in large, continuous fields conducive to aerial application of pesticides. Small scale farms will be vulnerable to plant disease risks since it is more difficult to control pests and diseases with ground application methods.

Similar to pineapple and papaya, banana has a relatively long growing period before first harvest. Growers will need to have some financial reserves to survive periods when there is no revenue. Well managed banana orchards can remain productive for at least 10 years before re-planting is required.

Banana production is labor intensive. Harvesting of heavy Cavendish varieties that can weigh up to 150 lbs. per bunch is back breaking work. After harvest, each mat of bananas needs to be pruned by hand to leave one producing and one growing sucker in the mat.

Brazilian or Apple Banana may be preferred by local consumers. Apple banana have significantly lower yields than Cavendish varieties. The lower yield potential of apple banana may not be offset by higher price per pound.

Developing banana bunches are covered with insecticide impregnated bags to control insects and accelerate fruit development. Small farmers may not use banana bags resulting in greater fruit losses.

Banana orchards may harbor rodents due to the heavy ground cover and high canopy. Rodents can damage other crops in neighboring farms.

4.1.4 Ginger root

Ginger root can be grown with good drainage in wet growing environments, but may benefit from irrigation during dry periods. Ginger root requires 300 to 365 growing days from planting to harvests.

Ag Statistics and Potential Acres

Hawaii's ginger root growers located primarily on the island of Hawaii harvested approximately 1.8 million pounds from about 60 acres in 2007/2008. Production was down by 36 percent from the 2006/2007 season, the lowest production since the 1979/1980 harvests (NASS, September 2008).

The average price per pound was \$1.60 during the 2007/2008 season, up from \$0.85 per pound during the 2006/2007 season. Total farm value of the 2007/2008 ginger root production was estimated at \$2.9 million. Ginger root provides excellent revenue per acre per year estimated at \$48,333 when the price/lb was high. The price per pound varies significantly from year to year. Therefore, the fluctuation in price is an important consideration in preparation of the grower proposals.

Ginger root consumption on the island is estimated at 43,000 pounds per year. Average ginger root yield is reported at 30,000 pounds per acre. The Kauai demand may be met with about 1.4 acres.

Agricultural Considerations

Ginger root production in Hawaii has been declining for many years due to cheap foreign imports into Hawaii's export markets. Planted acreage may be on the increase resulting in recent decreases in price per pound.

Ginger root has long growing cycle. Ginger root is normally planted late in the year to take advantage of the rainy season and is harvested late in the following year.

If root diseases can be managed, it may be a good candidate for consideration in organic farming.

Ginger root cultivation may require soil fumigation to minimize losses to soil borne pests and diseases. In general, ginger root is relatively tolerant to insect pests and leaf diseases.

Ginger root can be grown without irrigation. However, ginger root may benefit from irrigation during dry periods.

Ginger root is grown from its root or tuber like potato. Root cuttings for planting material may be very expensive making it necessary for growers to specialize in ginger root for several years before rotating crops.

Ginger root requires specialized washing equipment to allow export to Mainland markets. The small farm size may not justify the investment in equipment, packing, and storage area required to successfully grow and export ginger root.

4.1.5 Dry Land (or Chinese) Taro

Kauai is the major producer of poi (or Lehua) taro in the State of Hawaii. Approximately 225 of the 360 poi taro acres cultivated in 2006 were grown on Kauai. The extensive taro growing expertise on Kauai could support dry land taro production.

Dry land taro is an excellent crop in buffer areas and possibly for organic production since pesticide use in taro production is very limited. It may not be a hardship to eliminate all pesticide use in dry land taro as long as adequate labor resources are available. It is good buffer crop in fields near the Kauai Christian Academy and Sea Cliff Plantation.

Dry land taro can be grown with drip or overhead irrigation systems. Irrigation will be required mostly during the drier summer months.

Agricultural Considerations

Only 20 acres of dry land taro were grown in the State of Hawaii in 2006. Kauai did not grow a single acre of dry land taro in 2006. The best taro growing area in the State is located a few miles North of the KAP. It does not make practical sense to include dry land taro as a potential crop for consideration at this time. Dry land taro was eliminated from further consideration in this Assessment.

4.2 Vegetable Crops

Vegetable crops are more sensitive to climatic and growing conditions than tropical fruit crops. Vegetable crops are normally grown in hot, dry growing environments with irrigation to facilitate rapid plant growth and minimize losses from plant and fruit diseases.

As discussed in Section 3, the climatic conditions during the wet winter months at the KAP are not ideal for cultivation of vegetable crops. Monthly rainfall is fairly well distributed throughout the year. However, the winter months are too wet to grow vegetable crops even with good drainage. Although storm events are more frequent during the winter months, they may also occur during the spring and fall. Storm events can cause catastrophic losses when crops die in water logged soils. Excessively wet, growing conditions requires very frequent pesticide applications to control plant diseases. However, it is often physically impossible to drive tractors in wet, fields without causing serious damage to crops.

Due to the high initial investment, marketing challenges, and higher growing risks, it is possible that growers may not try to grow vegetable crops at the KAP. Since import replacement is one of the primary objectives of the KAP, vegetable crops must be a major component of the Assessment.

Growing Season

Based on the evaluation of the weather data, the recommended vegetable growing season at the KAP is April to October. During dry years, it may be possible to extend the vegetable growing season to March to November. The number of growing days in the April to October and March to November growing seasons are 213 and 274 days, respectively.

Growing Cycles

The number of growing days required from planting to harvests is one of the primary crop characteristics that must be considered in any Production Plan. Growing crops or varieties within a crop category with shorter growing cycles may reduce crop water and fertilizer requirements, reduce pest and disease pressures, and decrease risks of crop failure due to poor weather.

The approximate number of growing days from planting to harvest for vegetable crops is presented below in Table 5. The number of growing days is dependent on the type of crop and may vary significantly among different varieties within the same crop. It is advantageous to select varieties that are resistant to diseases. Quality can vary significantly among different varieties and should be one of the primary criteria used in varietal selection.

Table 5. Approximate Length of Growth Cycles (Days)

Crop	Growing Days
Bean, Snap	90
Broccoli	150
Cabbage, Chinese	90
Cabbage, Head	90
Carrots	120
Cauliflower	90-120
Celery	120
Cucumber	120
Eggplant	150
Ginger root	300-365
Lettuce, Leafy	50-60
Lettuce, Head	90
Muskmelon	120
Onion, bulb	120
Onion, green	60-75
Pepper, Bell	150
Potato	120
Squash (summer/winter)	80-180
Strawberry	365
Sweet Corn	90
Sweet Potato	150
Tomato	120
Watermelon	120

For vegetable crops, it is critical to maintain rapid and vigorous growth with good growing site selection and effective field maintenance (fertilization, irrigation, and pest and disease control) to grow and harvest crops at the estimated growing days within the growing season. Extending the growing cycles of vegetables may lead to severe disease outbreaks and crop failure.

Due to the relatively short vegetable growing season, it may be practical to grow and harvest only one vegetable crop per acre per season. Weather permitting the length of the growing season may increase to allow cultivation of two short growing cycle vegetable crops per acre per season. In this Assessment, one crop per acre per season will be considered as the standard practice since it mitigates risks.

Potential Vegetable Crops

Vegetable crops that may be adapted to climatic and growing conditions at the KAP with acceptable growing cycles includes green bean, bittermelon, chinese cabbage, mustard cabbage, sweet corn, cucumber, eggplant, lettuce, green pepper, pumpkin, squash, sweet potato, tomato, and watermelon.

The list of potential vegetable crops shown above was preliminarily screened against potential competitive advantage for Kauai production and potential revenue per acre per year. Vegetable production by large growers on Oahu makes it difficult to compete for Kauai market share for specific crops. Inter-island freight savings probably do not offset the competitive advantages that the Oahu growers have for watermelon, green pepper, tomato, head cabbage, and melons.

High revenue per acre per year was also considered to provide greater flexibility in budget development in later phases of the planning. Low revenue crops like sweet corn were included in the Preliminary Crop List for crop rotation purposes.

The vegetable crops selected for evaluation in this Assessment includes green onion, sweet potato, cucumber, eggplant, tomato, and sweet corn. The crops that were selected represent the logical first step for growers and is not intended to discourage evaluating and growing different crops at the KAP. The crops that are ultimately selected and acres grown should be based on the viability of the Grower Proposals.

Estimated Kauai Consumption and Potential Acres

For any agricultural business, planning always starts with production and market analysis to develop planting and delivery schedules to meet the market demand. The Kauai market represents approximately six (6) percent of the State market. Therefore, it is prudent not to overplant crops that cannot be shipped to secondary markets.

The number of farms, bearing acres, production, value of sales, and revenue per acre per year for selected vegetable crops in the State of Hawaii is presented in Table 6. The estimated annual and weekly consumption, average yield per acre, and potential acres for Kauai County is presented in Table 7. As stated in Section 4, this information derived from NASS reports should be considered as suggestive rather than conclusive.

Table 6. Number of Farms, Bearing Acres, Production, Value of Sales, Revenue/Acre (Fruit and Vegetable Crops-State of Hawaii)

Crop	No. Farms	Acres (Acres)	Production (lbs.X1000)	Sales (\$X1000)	Revenue/ Acre
Green Onions	NA	130	1,500	1,500	\$11,538
Sweet Potato	NA	360	6,000	4,440	\$12,333
Cucumber	NA	330	5,400	2,700	\$8,182
Eggplant	NA	70	1,000	840	\$12,000
Tomatoes	NA	700	14,700	11,319	\$16,170
Sweet Corn	NA	350	1,800	1,188	\$3,394

Table 7 . Annual Consumption, Weekly Consumption, Average Yields, and Potential Acres (Fruit and Vegetable Crops-Kauai County)

Crop	Annual (lbs.X1000)	Weekly (lbs.X1000)	Yield/ (lbs.X1000)	Acres
Green Onions	90	1.7	11	8
Sweet Potato	360	6.9	18	20
Cucumber	324	6.2	16.4	20
Eggplant	60	1.2	14.3	4
Tomato	882	17	21	42
Sweet Corn	108	2.1	5.1	21

In 2006, Kauai County produced 497,000 pounds of vegetables and melons, down 49 percent from 2005. Major crops on Kauai were sweet corn, eggplant, tomato, and watermelon.

Farm value for all vegetables and melons was \$805,000 in 2006, down 30 percent from 2005. Harvested acreage totaled 66 acres, down 66 percent from 2005. Reductions in sweet corn and watermelon accounted for the decrease in acreage in 2006.

The acres at the KAP represent a major increase in fruit and vegetable production on Kauai. Therefore, common sense dictates that the crops, planting and delivery schedules, and sales even for small farms need to be carefully planned and well executed.

Vegetable crops with potential for cultivation during the April to October growing season are presented in the following sub-sections.

4.2.1 Green Onion

Onions are cool season, biennial plants that are commercially grown as annual crops. Green onion has short growing cycles ranging from 60 to 75 days. It may be a good rotational crop for cucumber, tomato, and eggplant.

Ag Statistics and Potential Acres

In 2006, approximately 130 acres produced about 1.5 million pounds of green onions in the State of Hawaii. The farm value of the 2006 green onion crop was \$1.5 million. Estimated revenue per acre per year is estimated at \$11,538 (NASS, November 2007).

The estimated annual, monthly, and weekly consumption of green onions on Kauai are 90,000 pounds, 7,500 lbs, and 1,875 pounds, respectively. The average yield from the NASS reports is about 11,500 pounds per acre. The weekly consumption on the island may be satisfied with approximately 0.15 acre of green onion. A total of 8 acres may be grown on Kauai before production exceeds the Island's demand.

Approximately 20 weekly plantings of 0.15 acre of green onion may be grown during the April to October growing season. The maximum potential acres of green onion that may be grown at the KAP is estimated at about 3 acres per year.

Agricultural Considerations

Green onion should be grown on raised beds. The number of rows per bed varies with bed spacing. Normally, 60 to 70 seeds per foot are planted on a 30 inch bed.

Green onion may be grown from seeds or transplants. The onion seeds are very small requiring very good seed bed preparation and weed management. Green onion will require herbicide applications since hand weeding can damage root systems.

Green onion will require specialized planting equipment. Standard vegetable seed planters can be used if the seed orifice plate and row spacing can be adjusted.

Green onion is not subject to infection by a wide host of plant diseases. Major diseases of green onion include pink root, white rot, and Fusarium basal rot. Insects like leafminers will need to be controlled to meet quality standards.

Green onion is harvested by hand making it a labor intensive crop. Green onion is very perishable with shelf life of 7 to 10 days.

4.2.2 Sweet Potato

Sweet potato requires approximately 150 days from planting to harvests. Sweet potato is a root crop native to the tropics and requires warm days and nights for optimum growth and root development.

Ag Statistics and Potential Acres

In 2006, approximately 360 acres producing about 6 million pounds of sweet potatoes were grown in the State of Hawaii. The farm value for the 2006 sweet potato crop was \$4.44 million. Average yield per acre reported in the NASS reports is estimated at about 16,700 pounds or about 8.3 tons per acre. Estimated revenue per acre per year is \$12,333 (NASS, November 2007).

Estimated weekly consumption of sweet potato on Kauai is about 6,900 pounds. The Kauai demand may be met by growing about 0.41 acre per week or about 22 acres per year.

Approximately 9 weekly plantings of 0.41 acre of sweet potato or about 4 acres may be grown during the April to October growing season. If good surface and internal drainage can be maintained, it may be possible to grow sweet potato during the

extended March to November growing season. Approximately 18 weekly plantings of 0.41 acre of sweet potato or about 7.3 acres may be grown during this period.

Sweet potato can be stored for long periods of time under refrigerated storage. Therefore, it may be possible to grow more acres of sweet potato than the potential acres shown above if refrigerated storage facilities are available. The optimum storage temperature for sweet potato is 50 to 56 degrees Fahrenheit.

Agricultural Considerations

Sweet potato is not recommended for a grower that does not plan to grow the crop for several years. Sweet potato production is very labor intensive. Sweet potato is normally harvested mechanically. However, the small scale of the farms may not justify investment in mechanical harvesters and other production technologies increasing labor requirements.

Sweet potato planting is expensive since it is grown from cuttings and planted by hand. Therefore, similarly to pineapple and banana growers, the sweet potato grower will not want to change crops once adequate planting material is generated by the farm. Sweet potato should be rotated with other crops once every three to five years.

Sweet potato should be grown on raised beds at least 4 inches in height. Bed spacing is 36 to 42 inches between rows with 12 inches between plants. The low canopy makes it resistant to wind damage.

Common sweet potato diseases include stem rot, nematode damage, black rot, and soft rots. Many of the sweet potato diseases can be controlled by use of good root stock.

Sweet potato is very attractive to wild pigs. If wild pigs are common in the Kilauea area, it will necessary to implement a trapping program.

4.1.3 Cucumber

Cucumber requires approximately 120 days from planting to harvests. Cucumber need well drained soils to reduce the risk of Phytophthora blight. A good crop rotation program is essential to improve soil quality and manage carry-over pest populations. Cucumber, eggplant, and tomato are impacted by similar pests and diseases, therefore they should not be used in the crop rotation program. Cucumber, eggplant, and tomato may be rotated with sweet corn in alternating growing seasons.

Ag Statistics and Potential Acres

In 2006, approximately 5.4 million pounds of cucumber were produced on 330 acres in the State of Hawaii. Value of sales was estimated at \$2.7 million or revenue of \$8,183 per acre per year. The average price per lb. for cucumber in 2006 was \$0.50 per lb. (NASS, October 2007).

Estimated annual, monthly, and weekly consumption in Kauai County are estimated at 324000, 27000, and 6750 pounds, respectively. The average yield per acre reported in the NASS reports is 16,364 pounds per acre. Potential acres of cucumber that may be required to meet annual consumption on the island is about 20 acres or approximately 0.41 acre per week.

Approximately 13 weekly plantings of 0.41 acre may be planted at the KAP during the April to October growing season. The potential acres of cucumber that may be grown at the KAP is estimated at 5.3 acres.

Agricultural Considerations

A good pest and disease management plan based on crop rotation is a prerequisite for cucumber, eggplant, and tomato production.

Cucumber, eggplant, and tomato require good air circulation to promote leaf drying for disease management. Use of micro-sprinkler irrigation will improve irrigation efficiency, reduce crop water requirements, and support better disease management.

Cucumber, eggplant, and tomato should be grown from transplants. Use of transplants reduces the number of growing days from transplanting to harvests. Transplanting increases the uniformity of the plants resulting in more efficient field maintenance and harvesting.

Agricultural mulches increase soil temperatures promoting more rapid growth and should be considered as part of the Production Guidelines for cucumber, eggplant, and tomato. Cucumber, eggplant, and tomato are self pollinated and do not require honey bees for pollination.

Cucumber and tomato require trellises to support the vines during fruit set and maturation. Installing trellises in the fields requires a significant investment in labor and materials.

Cucumber is hand harvested and is a labor intensive crop.

4.2.4 Eggplant

Eggplant is one of the major vegetable crops grown on Kauai. Eggplant requires approximately 150 days from planting from seed to harvests. Eggplant grown from transplants requires approximately 80 days from transplanting to harvests.

Ag Statistics and Potential Acres

In 2006, approximately 1.0 million pounds of eggplant were produced on 70 acres in the State of Hawaii. The value of sales was reported at \$840,000 or estimated revenue of \$12,000 per acre per year (NASS, October 2007).

Annual, monthly, and weekly consumption in the County of Kauai are estimated at 60000, 5000, and 1,200 pounds, respectively. The average yield per acre reported in the NASS reports is 14,300 pounds per acre. Potential Kauai acres to satisfy the annual consumption is estimated at about 4 acres per year or about 0.1 acre per week.

About 2.0 acres of eggplant may be grown during the April to October growing season at the KAP. The production and market survey may support an increased production level if actual consumption is higher than estimated consumption.

Agricultural Considerations

Eggplant is a warm season crop that grows well in a wide variety of soil types. The optimum soil pH for eggplant is 5.5 to 6.5.

Eggplant is grown on raised beds to promote better drainage. Agricultural mulches may be used to increase soil temperature, conserve soil moisture, and control weeds.

Spider mites, aphids, flea beetles, and wireworms are common insect pests of eggplant. Plant and fruit diseases of eggplant includes Phomopsis leaf spot and fruit rots, early blight, anthracnose, Verticillium wilt, and Tobacco Ringspot virus.

Fruits are harvested when they reach market size and the skin is glossy. Eggplant do not have a long shelf life usually fewer than 14 days when stored at 50 degrees Fahrenheit.

4.2.5 Tomato

Tomato is one of the major vegetable crops on Kauai. Tomato requires approximately 120 growing days from planting to harvests. The decline in tomato and watermelon production on Kauai may be due loss of market share to lower cost imports from Oahu.

Ag Statistics and Potential Acres

In 2006, approximately 14.7 million pounds of tomato were produced on about 700 acres in the State of Hawaii. The value of sales was reported as \$11.319 million or about \$16,170 per acre per year (NASS, October 2007).

Estimated annual, monthly, and weekly consumption of tomato in the County of Kauai is estimated at 882000, 73500, and 17,000 pounds, respectively. The average yields was reported at about 21,000 pounds per acre. Potential acres required to satisfy the annual Kauai consumption is about 42 acres or about 0.8 acre per week.

Approximately 13 weekly plantings of 0.8 acre of tomato may be possible during the April to October growing season at the KAP. The maximum potential acres of tomato that may be grown at the KAP is estimated at 10.4 acres per year.

Ag Considerations

Tomato production in the State has increased dramatically due to the surge in green tomato production on Oahu. If Kauai growers decide to grow tomato at the KAP, they should focus on larger, vine ripe varieties to differentiate their product from the Oahu production. Vine ripe tomato is usually grown hydroponically in greenhouses.

Tomato and cucumber are hosts to a wide spectrum of insects, fungal diseases, and viruses. Effective pest and disease management is critical to successful tomato, eggplant, and cucumber production.

Proper fertilization of tomato is required to attain yields and quality. Tomato may need foliar calcium nitrate applications to prevent blossom end rot.

Sweet corn

Sweet corn requires approximately 90 growing days from planting to harvests. Sweet corn provides low revenue per acre per year but is a key crop in the proposed crop rotation program. Conventional crop production will benefit from but may not require crop rotation. Organic crop production must be based on a good crop rotation program including the planting of cover crops during fallow periods to improve soil fertility.

Ag Statistics and Potential Acres

In 2006, approximately 1,800,000 pounds of sweet corn were produced on 350 acres in the State of Hawaii. The value of sales was reported as \$1,188 million or \$3,394 per acre per year (NASS, October 2007).

Estimated annual, monthly, and weekly consumption of sweet corn for the County of Kauai are estimated at 108000, 9000, and 2080 pounds, respectively. Average yield per acre was reported at 5,100 pounds per acre. Potential acres of sweet corn per year to satisfy the estimated Kauai consumption is about 21 acres per year or about 0.4 acres per week.

The short growing cycles may allow up to 18 weekly plantings during the April to October growing season. The maximum potential acres of sweet corn that may be grown at the KAP is approximately 7.2 acres.

Agricultural Considerations

Sweet corn is grown from seeds. Sweet corn may require specialized vegetable seed planters.

Sweet corn may require high clearance tractors for spraying. It may be necessary to install infield roads and limit block widths if regular tractors and spray equipment is used.

Sweet corn can be severely damaged by numerous insect pests. Important soil insects of sweet corn include rootworms, wireworms, and cutworms. Important foliar insects of sweet corn include corn earworms, armyworms, aphids, stem borers, and other foliar insects. The crop rotation program with cucumber, eggplant, and tomato may be effective in reducing plant disease risks. However, crop rotation with sweet corn will not be effective for reduction in insect population densities at the KAP.

Sweet corn can be severely damaged by seedling diseases, stalk and root rots, leaf diseases, and ear and kernel rots. An Integrated Pest Management Program for insect and diseases is essential for sweet corn production. Corn requires an intensive foliar spray application program that will significantly increase inputs and production costs.

Birds will be attracted to the seeds after planting and may eat the entire planting if they cannot be scared away. On Oahu, blanks fired from shotguns to scare birds away from the new seed plantings after they become accustomed to conventional tactics. A bird management plan is essential for sweet corn and other vegetable crops grown from seeds.

Sweet corn is highly perishable. Sweet corn should be cooled rapidly after harvest and stored at 32 degrees Fahrenheit to increase shelf life.

4.3 Organic Crop Production

Organic crop production requires better growing site selection and planning than conventional crop production. The climatic conditions at the site will increase pest and disease risks in organic crops. Plant nutrition is more difficult due to limitations on the types and quantities of fertilizers that can be used. Cover crops are required to improve soil health and soil nutrient content before planting of organic crops. Irrigation management has to be more precise than conventional crops to minimize plant stresses that accelerate the spread of diseases. Weed control is very difficult in wet, windy growing conditions due to heavy weed pressure from wind blown weed seeds.

The site may be suitable for organic tropical fruit production. It is important to recognize that organic tropical fruit production will produce lower yields with less control over fruit delivery schedules when compared to conventional tropical fruit crops.

There are successful organic growers on the North shore of Kauai. However, it will be difficult to grow large acreage of organic crops due to higher raw material and labor costs.

Although organic crop production does not use a wide range of pesticides, it may present odor nuisances from use of manures, fish meals, and composts that may not be acceptable to the Community. Similarly to conventional crop production, organic growers should prepare grower proposals to evaluate the efficiency, productivity, sustainability, and profitability of small scale organic farms.

Organic crop production should focus primarily on growing the tropical crops like pineapple, papaya, and banana while conducting small scale studies to determine if organic vegetables can be grown economically. Use of composts is an essential component of organic crop production. However, fertilization with composts is not the 'silver bullet' needed to consistently produce economically viable organic crops.

There is very little available data on organic production and sales in the State of Hawaii. Most of the organic vegetables are imported from the Mainland. Large organic farms in California have very large conventional farms as buffers. The conventional farms control insects in up wind areas reducing insect and disease pressures in the the organic growing areas.

Organic crops that may have potential for cultivation at the site are presented in the following sub-sections.

4.3.1 Extra Sweet Gold Pineapple

Organic pineapple has been grown on Maui for many years. The cost of organic pineapple production is significantly higher than conventional pineapple. Organic pineapple crop yields may be less than 50 percent of conventional pineapple yields.

Estimated revenue per acre per year for organic pineapple is estimated at \$10,125. Needless to say, the risks may outweigh the benefits. It is suggested to conduct small scale field trials before expanding into full organic pineapple production.

Organic pineapple cannot be produced year round. Pineapple flowers naturally during periods with short day length and cold night temperatures. Organic pineapple production peaks in July-August. Natural flowering may be reduced by multiple applications of an organically certified fermentation product called aminovinyglycine (AVG). AVG is very expensive and is not 100 percent effective for natural flowering control.

Pineapple is a very efficient water user. However, it may be necessary to grow organic pineapples with irrigation. Any delays in plant growth will increase natural flowering resulting in the production of small, undesirable fruit during the summer.

Pineapple has low pest and disease pressures. In addition, there are some products with insecticidal and nematicidal activity that are approved for organic pineapple production.

Two of the most important limiting factors in organic pineapple production include:

- Pineapple requires relatively high nitrogen fertilization to attain yields. The organic nitrogen fertilizers are produced from bird guano and fish meals. Most of the nitrogen applied is from fish meals. Fish meals are very expensive and is one of the primary factors why organic pineapple production may not be economical.
- When land preparation is poor, weed control can become a serious issue. Weeds may be controlled with acetic acid (vinegar), burning, green mulches, or hand weeding. In windy, wet growing environments, weed seed blows into the fields in the prevailing wind direction from outside areas often resulting in unmanageable weed problems.

4.3.2 Papaya

Papaya may be the best initial crop for organic production due to the wealth of experience in papaya production on Kauai. Potential issues that may need to be address include:

- It is very difficult and expensive to meet nitrogen requirements in papaya. The organic papaya grower needs to have a very good soil nutrient and fertilization program. Papaya nutrition is almost like an art form. Plant nutrients need to be balanced to promote good root systems, thick trunks, rapid but not excessively rapid growth to properly size the fruit, and slow down tree growth to prolong the working life of the orchard. Balanced plant nutrition is more difficult to accomplish when obtaining varying percentages of nutrients from soils, composts, manures, and other organic sources.
- Without in-field disease control and postharvest fungicide treatment, the organic papaya will be extremely susceptible to losses to postharvest diseases. Frequent occurrence of unacceptable postharvest diseases will reduce customer confidence in the product.
- Good drainage alone may not be effective for control of root diseases. Phytophthora stem canker can devastate unprotected orchards after high rainfall. Heavy rains during storm events may result in loss of trees seriously reducing yields.
- Weed control will be difficult. Organic papaya orchards may need to use green mulches in the inter-space for weed control.

The production and market study will need to evaluate if additional costs for organic papaya production will be offset by higher pricing. In the case of organic pineapple on Maui, costs always exceeded revenue.

4.3.3 Banana

Organic growing protocols are available for banana. Organic banana production requirements will increase production costs and lower yields. It may be better to grow Apple banana organically than Cavendish varieties. Apple banana are more flavorful, has less intra-state and foreign competition, and may command better pricing.

Fertilization, nematode control, and plant disease control are the primary issues to address. Banana can be infested with the burrowing nematode which is very hard to control. The inability to control leaf diseases in banana can result in crop failure.

The market study should evaluate if additional costs for organic banana production will be offset by higher pricing.

4.3.4 Asparagus and Herbs

Asparagus is grown organically on Maui. The spears are smaller in size than available in stores. Organic asparagus may be a good product for resort sales.

Herbs like basil require little inputs and can be grown organically. The Kauai consumption of herbs may be relatively small. Organic herbs like basil and cilantro may be good products for resort sales.

4.4 Tree and Nursery Crops

Tree crops like mango, limes, and rambutan are adapted to the climatic and growing conditions at the site. Tree crops are easy to fertilize. Harvesting and pruning can be labor intensive and dangerous activities.

Nursery crops (palms and coconut trees) for landscaping in resorts or home garden sales also has potential for production at the KAP. Palms and coconut trees can be grown in wet and dry conditions.

A specialty crop that may make some sense due to low inputs is Palmeto or Heart of Palms. It grows slowly but produces on a year round basis once the orchard matures. It has high value in resorts for Heart of Palm salads and could be a signature item for the site at resorts.

The gulch area at the southeast corner of the site is located within a SMA leading to a drainage pathway to the Kilauea River basin. It is recommended that soil erosion control and storm water discharge requirements be identified and addressed prior to further consideration of the gulch area for agricultural uses. It may be appropriate to use the gulch area to construct a sediment basin and spill way to manage storm water discharges from the site.

The number of arable acres of land at the KAP is limited. Tree and nursery crops were not included in the Preliminary Crop List and Crop Water Requirement Projections in Section 5.8 due to potential limitations in irrigation water availability. Growers interested in growing tree, landscape and nursery crops may submit grower proposals at later phases of planning activities.

4. Planning Considerations and Recommendations

The purpose of this section is to identify issues of potential concern and to provide recommendations to be considered during the subsequent, more detailed phases of the planning process for the agricultural park. The conceptual layout in the Master Plan report provides a preliminary land plan and allocation of land uses for the project site. These should be considered initial proposals to be refined as development of the KAP moves forward. Based upon the findings of various assessments and studies of the site and the ag park layout, the initial layout and allocation of uses will need to evolve into a firm implementation plan and budget for the initial development and on-going operation of the agricultural park.

The foregoing will be essential to generate a basis for evaluating grower proposals submitted by interested individual growers. The ultimate objective being to assure the long term sustainability and profitability of the small farms to be located at the KAP, as this has a direct bearing on the viability of the entire agricultural park.

5.1 Issues of Potential Concern

Issues of potential concern as described below must be addressed in the later phases of the planning process. It may be difficult to effectively execute grower proposals at the KAP if the issues of potential concern are not or cannot be addressed satisfactorily.

5.1.1 Development of Comprehensive, Viable Sales and Marketing Plans

The growers should develop viable sales and marketing plans based on retail, resort, and Farmers' Markets to sell all of the production at the KAP on an Island wide basis. The 54 acres of additional crops represents a significant increase in production on Kauai. Due to the lack of required infrastructure, it is not possible to ship excess production to alternative Hawaii and Mainland markets.

Almost all of the fruit and vegetable crops produced on Kauai are consumed on the Island. There are no large growers on Kauai with consistent production volumes that may be required to sell in retail channels. The primary sales channel for small growers are Farmers' Markets potentially limiting the number of acres of crops that can be grown at the KAP.

Three local produce distributors dominate the produce supply chain for retail and resort sales. There may be a need to foster a cooperative agreement between Kauai

growers and local produce distributors to 'Buy Local First' if volume and quality requirements for retail sales can be attained for specific crops.

5.1.2 Potential Residential Exposure to Pesticides

Urban encroachment into agricultural areas is a major issue in Hawaiian Agriculture. Ag and urban areas can co-exist, but it will require compromise by both sides.

The close proximity of the site to Kilauea town, the Kauai Christian Academy, and the Sea Clift Plantation will require careful management of pesticide applications and other agricultural activities. Organic crop production cannot be considered as the solution since there is uncertainty if large acreage of organic crops can be grown due to higher pest and disease risks at the site.

On Maui, pineapple has been farmed adjacent to public schools and residential properties in Haiku, Kula, Makawao, Honolua, Kapalua, and Honokawai for decades. However, sudden changes in wind direction and wind speed have resulted in complaints. The Maui Community is still heavily involved in agriculture and may be more tolerant to nuisances associated with agriculture. When the frequency of complaints becomes intolerable to the Community and the grower, the agricultural lands are abandoned in favor of alternative areas that are easier to farm.

To minimize potential future problems, the County should ask a qualified expert to conduct a review of the crop management practices for approved grower proposals to minimize potential complaints. Emulsifiable concentrate formulations like Malathion EC that contain petroleum distillates as carriers are the primary cause of complaints. Growers will need to use pesticide formulations with less odor or alternative pesticides that do not result in odor nuisances.

Spray applications and other activities will need to be restricted during high wind and low wind events depending on the wind direction. It may be necessary to make spray applications at night due to lower wind conditions. The field edges of the KAP should be bermed and planted with cane grass to reduce potential pesticide drift. Use of low drift spray nozzles and spray boom shrouds, and lower operating pressure can also reduce spray drift.

Growers will need to be aware of additional restrictions and be willing to voluntarily comply with appropriate restrictions.

5.1.3 Development of a Reliable Source of Irrigation Water

The Master Plan includes drilling and installation of a groundwater supply well to provide irrigation water for the KAP.

The site is hydrogeologically located over the Kilauea Aquifer System. Most of the Kilauea Aquifer System is a platform of the Koloa rock series. The Koloa series aquifers are not as productive as the older Waimea Canyon series aquifers.

No producing wells have been drilled in the Kilauea Aquifer System. The proposed groundwater supply well at the KAP will be located in the Kilauea basal aquifer. Wells in other aquifers drilled in the Koloa series are affected by pumping or exhibit measurable declines in groundwater levels by pumping. High pumping rate at the proposed groundwater supply well or excessive water usage at the KAP may cause salt water intrusion into the basal aquifer. High chloride content in the irrigation water can injure or damage chloride sensitive crops.

Restrictions on the pumping rate of the well and total water allocation will be established by the State Water Commission to prevent increases in chloride levels in the basal groundwater. Due to the lack of specific information on the Kilauea basal aquifer, there is uncertainty on the sustainable pumping rate and water allocation for the well. The potential limitations in availability of irrigation water may increase grower risks at the KAP.

In order to mitigate grower risks, alternative crop water requirement scenarios are considered in this Section 5.8. A detailed Irrigation Management Plan should be developed in later phases of planning activities.

5.1.4 Potential Impacts on Endangered Species

The close proximity of the Kilauea Lighthouse Preserve and Hanalei River raises some concerns about the potential impacts of agricultural activities on endangered native bird species at the site. Nene goose, shearwaters, and albatross may be attracted to the site after land clearing. Installation of the irrigation reservoir may also attract endangered bird species to the site. Later phases of the planning process will need to evaluate potential impacts of agricultural activities on endangered species.

5.1.5 Special Management Area/Storm Water Discharges

The southeast corner of the site is located within a Special Management Area (SMA) leading to a drainage pathway to the greater Kilauea River Basin. Storm water discharges to the greater Kilauea River Basin may require a National Pollutant Discharge Elimination System permit. The Clean Water Branch at the Hawaii Department of Health should be consulted to determine if agricultural use of the site will trigger storm water discharge permit requirements.

5.2 Infrastructure Considerations

In order to increase the likelihood of meeting the objectives of the KAP, it is suggested that the development costs focus primarily on meeting crop production requirements.

The small size of the lots and small acreage per crop makes it difficult for growers to invest individually or collectively in infrastructure requirements.

5.2.1 Composting Operation at KAP

Use of composts to meet a percentage of the crop nutrient requirements is a critical component of organic crop production.

A cost-benefit analysis on composting should be conducted when feasible. Organic crop production guidelines typically require up to 40 tons of compost per acre. Chipping equipment that can handle the volume of material is very expensive. Backhoes or a front end loader will also be required to load the green wastes into the chipping equipment. Hauling and spreading the compost also adds to the organic crop production costs.

The composting area may need to be evaluated as a separate business entity due to high capital expenditures and O&M costs. It may be more cost effective to produce compost at the existing compost operation located near the KAP.

5.2.2 Energy Farm

A cost-benefits analysis on energy farm should be conducted. Capital investment and O&M costs may outweigh the benefits. Obviously, the energy farm justification will need to determine demand before evaluating feasibility of the energy farm. Storage of the electricity generated during non-peak demand hours and providing an alternative power source when solar or wind energy cannot be generated should also be considered.

If the energy farm can be justified, it may be better to locate the energy farm next to the Kilauea Lighthouse Road to allow cost effective connection into the Kauai Electric Company power grid.

5.2.3 Drainage System

Due to the frequent occurrence of high rainfall events within 24 hour periods, it will not be practical to farm the KAP without installation of a good drainage system to direct storm water run-off out of the fields. Without a drainage system, growers may lose their crops to flooding and/or severe disease outbreaks.

All tropical fruit and vegetable crops will require good surface and internal drainage to be grown at the KAP. Typical surface water drainage consists grading or excavation of primary drainage ditches with 1 to 2 percent slope to take storm water out of the fields. The primary drainage ditches are planted with non-seeding grasses like Kikuyu grass to minimize soil erosion and slow down storm water flow.

The preliminary design for the drainage system will follow the existing slopes and elevation of the site. The drainage system will need to be directed to the southeast corner of the site that leads to the drainage pathway to the greater Kilauea River Basin. The drainage system should be designed using a CAD program. One primary ditch may transect the site from northwest to southeast. Secondary ditches will be required to remove storm water from the southwest and northeast corners of the site. The ditches and drains within the fields themselves will depend on final field layout and drainage needs of the specific crops.

5.2.4 Sediment Basin/Spill Way

The installation of the drainage system may require construction of a sediment basin and spill way in the existing gully to reduce sediments in storm water discharges to the greater Kilauea River Basin. Sediment basin/spill ways constructed in drainage pathways to the Ocean have proven to be very effective in minimizing sediment run-off to sensitive areas.

The Soil Conservation Service should be consulted to provide guidelines on specifications for the sediment basin and spill way. The sediment basin and spill way may be an essential component of the soil conservation plan for the KAP.

As previously stated, if storm water discharges reach the Kilauea River, it may be necessary to manage storm water discharges under a NPDES permit. If the NPDES permit is required for storm water discharges from the site, it will be very important to assign responsibilities for monitoring and reporting to a responsible party in the KAP Grower Association.

5.2.5 Groundwater Supply Well/Irrigation Reservoir

The preliminary conceptual plan described in the Master Plan included construction of an irrigation reservoir at the southeast corner of the site adjacent to the proposed Energy Farm. The proposed location of the irrigation reservoir is in the drainage pathway to the Kilauea River Basin and at the end of the drainage system for the KAP.

The irrigation reservoir must comply with State dam safety requirements. Considering potential liabilities and the need to install the drainage system, it may be necessary to re-locate the well and irrigation reservoir to an alternative location outside of the SMA.

The suggested alternative location for the proposed groundwater supply well and irrigation reservoir is near the mid-point of the northern boundary of the main body of the property. The suggested location increases the likelihood of drilling the well into the Koloa basal aquifer. Locating the well nearer to the Coast may also increase the risks of salt water intrusion into the basal aquifer.

The irrigation reservoir would store excess irrigation water when all the water cannot be used. Installing the well and reservoir at the highest elevation of the site will allow for

efficient design of the irrigation system. The main irrigation supply lines should be installed to deliver water from the well or irrigation reservoir in the north to south direction. Sub-mains with risers can be installed at intervals to reduce distances to connect to main irrigation supply line. The submersible pump for the groundwater supply well can be connected to Kauai Electric power lines, if necessary.

5.2.6 Roads

The conceptual Master Plan suggests allocating a large portion of the development costs to interior road construction. Under normal circumstances, growers do not install permanent or semi-permanent roads on agricultural lands because the roads hinder land preparation activities and reduce flexibility in changing field layouts.

It is suggested that earthen roads be installed along the perimeter of agricultural areas of the KAP. The earthen roads can be graded after heavy rains and stabilized with gravel. The earthen roads along the edges of the fields can be used as the 'turn around' area for tractors and trucks and are required to prevent crop damage.

Once the field layouts are finalized, an earthen center road can be graded to improve access to the individual farm lots. The roads will need to be maintained requiring a road grader to be leased occasionally.

The installation of in-field roads and ditches may reduce arable acres by 10 to 15 percent. If it is important to maximize arable acres, it may be necessary to include the lands proposed for the incubator farms in the commercial field layout.

5.2.7 Packing Plant/Baseyard

There are no functional Papaya Packing Facilities with refrigerated storage capacity on Kauai. The KAP growers may need a Packing Plant to wash, grade, pack, and store raw materials and fresh produce. The County of Kauai is taking steps to re-activate the Papaya Packing Plant that is located near the Lihue Airport. The re-activated Papaya Packing Plant may support expansion of tropical fruit crop production for export to high end niche markets. A small inexpensive packing facility and base yard may add great value to the KAP.

The Packing Plant could be limited to stainless steel water tanks for washing and sorting/packing tables that can be sanitized. Matson containers could serve as cold storage areas until investment in more sophisticated refrigerated storage systems can be justified. The refrigerated storage capability is critical to spread sales over the shelf life of the specific crop and increase availability of the locally grown produce.

At a minimum, a fenced base yard with locked storage areas may be essential for efficient operation of the small farms at the KAP. It may not be practical to drive farm equipment to the KAP unless the grower lives in Kilauea town. Grower proposals may be heavily weighted to the greater Kilauea Community, however, the requests for

grower proposals should be open to the island of Kauai and not restricted to any specific geographic location.

It is suggested to re-allocate some of the development funds for interior roads for a fenced base yard.

5.2.8 Greenhouse/Transplant Production

A small, inexpensive greenhouse will be required to produce transplants if cucumber, eggplant, and tomato are grown at the KAP. Existing growers may have greenhouses for transplant production. Transplant production is essential for vegetable crop production and should be considered as a component of the development costs, if vegetable crops are selected and existing greenhouses are inadequate.

5.2.9 Water Tank/Stand pipe

A 5,000 to 10,000 gallon water tank and stand pipe should be installed to provide water for spray applications. Pineapple is fertilized with foliar sprays at 50 gallons of water per acre at 7 to 14 day intervals. Conventional and Organic pesticide applications will require water for foliar spray applications. The amount of water required per day will depend on acres treated and gallonage used per tank mix. In general, foliar fertilizers are applied at low gallonage. Insecticides, fungicides, herbicides, and plant growth regulators are applied at high gallonage.

The water tank and stand pipe should be included as part of the development costs.

5.3 Soil Nutrient Surveys

In general, soil surveys are completed for the crop and site selection process. Soil nutrient surveys are critical for preparation of the soil amendment and fertilization programs for specific crops. This task should be completed after land clearing and knockdown.

The site should be divided into five 10 acre sections. Approximately 16 soil cores at 0 to 12 and 12 to 18 inch soil depth should be collected randomly in each section. The soil cores are composited then dried prior to submittal the Agriculture Diagnostic Laboratory at the University of Hawaii.

The soil samples should be analyzed for pH, potassium, phosphorous, calcium, magnesium, and percent organic matter. Normally, soil nitrogen is not required because of the naturally low levels of nitrogen in Hawaiian soils. Micro-nutrient analysis may also be conducted but is not necessary for the initial recommendations on soil amendments.

Each crop will have critical and threshold levels for major and minor elements where yield gains can be expected if fertilizer is applied. Growers may adjust fertilization programs based on the soil nutrient critical levels and plant tissue analysis.

The field layout for crops grown at the KAP will need to be organized by soil pH levels. The optimum soil pH range for pineapple is 5.0 to 5.5. The optimum soil pH range for papaya and vegetable crops ranges from 5.5 to 7.0. In general, crops with different soil pH are not rotated since it is not practical to change pH levels between crop cycles.

Soil amendments may include lime to adjust soil pH and rock phosphate to increase soil-phosphorous levels. Manure (cow or chicken) if available can be applied at 10 tons per acre to increase organic matter and soil nutrients. Gay and Robinson may have a truck or tractor mounted spreader to apply soil amendments.

5.4 Production and Marketing Survey

Normally, the first step before crop and site selection is to conduct a production and marketing survey to determine production and consumption levels of various commodities for the targeted market. Kauai has a relatively small population level, therefore, weekly consumption of specific crops on Kauai can be met with a small number of bearing acres per week.

As described in Section 4, the best approach for the crop production at the site is to focus on 'import' replacement to increase food production independence on Kauai. Import replacement improves profitability through freight savings thus improving sustainability of the small scale farms. As previously stated, it is not practical to compete with large vegetable growers on Oahu on watermelon, green tomato, and peppers.

In order for import replacement to become viable, the growers on Kauai will need to develop an adequate production base to become consistent suppliers of high quality fruit and vegetable crops. The weekly production targets should be based on potential consumption for the entire island of Kauai. Farmers markets are very valuable to the Community but cannot be expected to be the sole channel to sell produce grown at the KAP. The fresh produce must also be sold in the population center of Lihue to attain target pricing and sell all of the production.

Growers should develop sales and marketing plans to sell all of the production in retail, resort, internet, and Farmers' Market channels. Development of alternative sales channels is an essential business practice to avoid oversupply in the limited market.

Re-activation of the Papaya Packing Facility located near the Lihue Airport will be beneficial by allowing excess tropical fruit production to be shipped to alternative markets. The packing plant may be essential to meet food safety guidelines that are mandatory for sale to retail channels.

For large or small growers, it makes no practical sense to grow crops that cannot be sold. Local produce distributors will need to support expansion of agriculture on Kauai by providing fair and equitable retail sales opportunities to growers that meet their basic requirements. Development of viable sales and marketing plans for the increased crop production from the KAP is a critical issue that has to be addressed in the grower proposals in subsequent phases of the planning process.

5.5 Preliminary Crop List

The Preliminary Crop List shown below in Table 8 was based on the crop selection screening evaluation described in Section 4 of this Assessment. In later phases of the planning process, the actual crop list and subsequent field layout should be based on the viability of grower proposals and amount of irrigation water that is available.

Table 8. Preliminary Crop List

Crop	Acres
Pineapple	10
Papaya	15
Gr. Onion	3
Sweet Potato	6
Cucumber	4
Eggplant	2
Tomato	3
Ginger root	5
Sweet Corn	6
Total Acres	54

5.6 Land Clearing and Land Preparation

The site is currently covered with large Christmas Berry trees, lantana, vines, and weeds. Land clearing, knockdown, removal of vegetative trash, and soil preparation will take one to two years to complete properly. It is imperative not to take short cuts on land preparation to avoid a host of subsequent problems.

Initial land clearing and land preparation should be managed by the County of Kauai and included as part of the development costs. D-8 tractors, knockdown harrows, plows, and finish harrows will be required to complete land clearing and initial land preparation. Most small farmers will not have the equipment resources to complete this critical task.

The land clearing can be completed in phases. The Christmas Berry trees along the edges of the site can serve as temporary wind breaks and buffers during initial phases of grower proposal implementation. The large trees may need to be hauled off-site to

an existing compost operation located near the KAP. Plant material that can be cleared and chopped with harrows should be incorporated into the fields. The cost of hauling, chipping, and composting of the large trees should be included in the development costs.

The high rainfall at the site will accelerate decomposition of the green wastes after knockdown and plowing. It will be necessary to allow the lands to go through at least one rainy season to allow for complete breakdown of the green wastes. The high ridges from plowing will minimize soil erosion during the fallow period.

Gay and Robinson may have the equipment and operators required to complete land clearing and initial land preparation. Land clearing can be contracted to farm services companies like Kahuku Farms (if equipment is no longer available on Kauai).

It may be appropriate to secure an agricultural burning permit. One time burning of the fields may be justifiable to accelerate the return of lands to productive agriculture. Burning will need to be in very small increments to prevent smoke and dust nuisances to neighboring areas.

After green waste decomposition, it will be necessary to allow time for weed seed germination to occur. When weeds start to grow, they must be controlled by harrowing (or Round-up applications in conventional fields). It may take at least three rounds of harrowing before the lands are ready for final land preparation.

The close proximity of the site to shoreline areas will require development of Soil Conservation Plan (SCP). The Soil Conservation Service should be consulted to assist in development of the SCP, when appropriate. Operation and maintenance of the SCP should be a responsibility of the KAP Grower Association.

5.7 Production Guides and Production Plans

Small growers may not want to prepare Production Guides and Production Plans that are specific to their farms. However, Production Guides and related Production Plans are necessary to mitigate growing risks, attain yield and quality goals, and meet delivery schedules. It is also impossible to prepare budgets without valid production guides and plans. In addition, it is critical to have valid crop management plans to prevent outbreaks of pests and diseases that can jeopardize not only the individual grower's crops but also his neighbor's crops too.

There is a tremendous amount of useful information on production guides for tropical fruit and vegetable crops on the internet. Rather than providing a specific website, it will be more appropriate for growers to conduct their own research and adapt applicable practices to the climatic and growing conditions at the KAP. The internet search is simple. Type the Crop Name followed by Production Hawaii to review Hawaii specific Crop Production Guides.

Other sources of information include the Kauai Extension Agent, the Hawaii Department of Agriculture, and the University of Hawaii.

There is no substitute to actual farming experience with the crops of interest under the climatic and growing conditions at the KAP. However, it is important for growers to strive for continuous improvements by evaluating new information and adapt and adjust new programs, if appropriate.

Suggestions and recommendations that may be useful in later phases of the planning process are provided below.

5.7.1 Basic Requirements

All tropical and vegetable crops will require good surface and internal drainage to be grown at the KAP. All crops should be grown on raised beds of varying height and widths. Suggested drainage system requirements were discussed in Section 5.3.

Row to row distances for tropical fruit and vegetable crops varies from 30 to 72 inches. Selection of crops with similar bed to bed distances will increase equipment efficiencies by reducing the need to change the tractor tire and spray nozzle spacing during bedding and spray activities.

The irrigation system design will dictate field layouts and individual block widths at the KAP. The type of irrigation method and irrigation system design will determine water flow rates, irrigation times and irrigation capacities.

Block width for row crops should be standardized to allow to allow standardization of spray boom lengths and sprinkler irrigation swaths. It is suggested to standardize block widths at 90 feet. In-field roads between blocks may be necessary to set up irrigation pipes and sprinklers without damaging the crop. Micro-sprinklers may be used in cucumber, tomato, and eggplant to promote more rapid leaf drying between irrigation rounds for disease control. For pineapple, it will be necessary to install in-field roads between individual blocks for field maintenance and harvesting.

5.7.2 Varietal Selection

Varieties for tropical fruit crops are well established. If it is economical to grow pineapple at the KAP, it is suggested to grow PRI variety number 73-50 (aka Maui Gold) due to better flavor, higher brix levels, and lower total acid levels than other commercially grown varieties. Papaya growers on Kauai traditionally grow the Sunrise Solo variety. Sunrise and Waimanalo varieties are adapted to a wider range of climatic and growing conditions than Kapoho Solo.

Varietal selection of vegetable crops is critical to optimize yields and quality during the growing season. Different varieties may have shorter or longer growing day requirements greatly influencing production schedules. Crops and varieties with shorter

growing intervals will reduce fertilizer and pesticide use in conventional crops. Shorter growing cycles are also essential to minimize pest and disease problems. Varieties that are tolerant or resistant to viruses and diseases should be used to mitigate growing risks.

No new variety should be grown commercially without evaluation in small plots. Small plot studies to evaluate crops and identify problems may need to be installed prior to full scale production.

5.7.3 Pest and Disease Management

Integrated Pest Management programs based on pest and disease surveys and preventative pest and disease control practices should be used by growers at the KAP. Guidance on development of IPM programs are readily available from many different sources on the internet.

Conventional and organic vegetable crop production should be based on crop rotation to minimize pest and diseases risks, to reduce pesticide use and/or optimize productivity. The crop rotation program based on sweet corn, cucumber, tomato, and/or eggplant is not ideal but may be adequate for conventional vegetable crop production. Crop rotation including use of cover crops will be extremely important for organic crop production. Organic crops rely heavily on use of legumes to increase soil nitrogen content during fallow periods.

The Organic growing area may serve as a reservoir for insects like white fly and aphids. White fly and aphids transmit viruses that can decimate vegetable crops. The conventional growing areas will provide a buffer where insects can be controlled. Organic and conventional growers must understand that they need to work together to ensure sustainability of the KAP.

5.7.4 Regulatory Requirements

The crop protection programs for conventional and organic production should be reviewed by a qualified expert to ensure compliance with applicable laws and guidelines.

All tropical and vegetable crops may harbor pathogenic microorganisms. Therefore, Good Agricultural Practices to ensure compliance with microbiological safety guidelines for fresh fruits and vegetables must be followed at the KAP.

5.8 Crop Water Requirements and Irrigation Management

The evaluation, screening, and selection of tropical fruit and vegetable crops that have potential for cultivation on the 54 net acres proposed for commercial cultivation is presented in Section 4.1 to 4.4 of this Assessment. The preliminary crop list and potential acres for cultivation is presented in Section 5.4 of this Assessment.

Appendix B presents the Preliminary Pan Evaporation Projections for water requirements per acre (inch/day) for average daily, peak daily, and peak daily without rainfall demands. The average daily water requirement is 0.13 inch per day, peak daily water requirement is 0.22 inch per day, and peak daily water requirement without rain is 0.33 inch per day.

Appendix C estimates the average daily crop water requirement, average peak daily crop water requirement, and average peak daily crop water requirement without rainfall for the preliminary crop list and their respective potential acreage using the Preliminary Pan Evaporation Projections for the site. As discussed in greater detail below, consideration will need to be given to the sustainable yield of the groundwater source without salt water intrusion which may impact the pumping rate and the extent of crop irrigation.

Irrigation by sprinklers was assumed in calculating the crop water requirements since small farmers rarely use drip irrigation methods due to high capital investment and raw material costs. Sprinkler irrigation has relatively low irrigation efficiency (70%) due to water loss from evaporation, less accurate application, and wind drift. The lower irrigation efficiency increases crop water requirements which could be reduced through use of drip irrigation systems (efficiency of 85 to 90 %). For purposes of Appendix C, mid-crop growth figures ('Crop Factors') were used in the analysis which also has the effect on increasing crop water requirements.

Base Case Scenario

The Base Case Scenario consists of 25 acres of pineapple/papaya and 29 acres of vegetable and root crops. For the Base Case Scenario, pineapple and papaya are assumed to be irrigated along with vegetable crops which present conservative projections of water demand for the 54 net acres in cultivation. The Base Case projections provide the flexibility to replace vegetable crops from the initial crop mix with more pineapple, papaya, or other tropical crops.

For the 25 acres of pineapple/papaya and 29 acres of vegetable crops, the average daily water requirement, the peak daily water requirement, and the peak daily water requirement without rain are 257,247, 436,238, and 653,859 gpd, respectively. The irrigation flow rates required to meet the peak daily water requirement without rain for 8 to 24 hour pumping day ranges from 453 to 1,360 gallons per minute (gpm).

Alternate Case Scenario

The fairly even distribution of rainfall in the Kilauea area will allow pineapple to be grown without irrigation. Papaya may be also be grown without irrigation but may benefit from irrigation during dry periods. Accordingly, Appendix C includes an Alternate Case Scenario for crop water requirements without irrigation of pineapple/papaya. The Alternate Case Scenario can be considered if the pumping rate of the groundwater

supply well is limited due to water allocation restrictions. For irrigation of 29 acres of vegetable crops, the average daily water requirement, peak daily water requirement, and peak daily water requirement without rainfall are 162,693, 275,224, and 412,837 gpd, respectively. The irrigation flow rates required to meet the peak daily water requirement without rainfall for 8 to 24 hour pumping day ranges from 287 to 860 gpm.

At this point in time, the sustainable yield of the Koloa series basal aquifer in the Kilauea area is unknown. This has ramifications relative to the pumping rate and water allocation of the groundwater supply well. Due to the potential limitations of the Koloa basal aquifer, it may not be possible to attain the peak water flow rates required for practical irrigation management without incurring excessive capital costs and/or risking potential salt water intrusion.

It is difficult to physically operate a well and irrigation system on a 24 hour pumping day/7 days per week-particularly when a number of small farmers are involved. It is suggested that consideration be given for water flow rates based on 18 hour pumping day for six days per week.

For the Base Case Scenario, the irrigation flow rates required to meet average daily water requirement and peak daily water requirement without rain for the 18/6 pumping schedule ranges from 278 to 706 gpm. For the Alternate Case Scenario, the irrigation flow rates required to meet average daily water requirement and peak daily requirement without rain ranges from 175 to 455 gpm.

5.8.1 Irrigation Water Quality

All wells drilled into the Koloa series in other aquifer systems are affected by pumping. Pumping results in decreases in basal groundwater levels potentially increasing the chloride content of the water. Groundwater supply wells of interest completed in the Koloa series include: 1) Anahola Well (Local No. 2-0818-03); 2) Hanapepe Town Well (Local No. 2-5534-03); 3) Kilohana Well (Local No. 2-5426-03); 4) Koloa Well (Local No.2-5426-03); and 5) Wainiha Well (Local No. 2-1232-01).

The groundwater level measurements, pumping rates, water allocations, and chloride concentrations of the Koloa series wells of interest listed above should be reviewed by a trained hydrogeologist. This information will provide useful data for development of well specifications for the proposed groundwater supply well.

The gradation of groundwater from fresh to seawater is a feature of all basal aquifers in Hawaii. Chloride content is the class definer because it is routinely reported in Hawaii literature. The salinity class limits consist of:

1. Fresh (<250mg/l): The upper limit of the standard for drinking water is 250 mg/l chloride.
2. Low (250-1000 mg/l): Salt tolerant crops like sugarcane can be irrigated with water containing up to 1000 mg/l chloride.

3. Moderate (1000-5000 mg/l): Brackish water of this salinity class may serve as feed water for desalinization in the future.
4. High (5000-15,000 mg/l): The high salinity class, not yet seawater, is arbitrarily designated for water that is between potentially economically valuable water and seawater.
5. Seawater: The seawater has a chloride content of 18,980 mg/l.

The chloride content of the Kilauea basal aquifer as influenced by decreases in groundwater levels by pumping will be a key operating parameter for pumping regimes (pumping rate and duration). High chloride concentrations can cause severe leaf injury reducing yields and/or crop failure of sensitive crops. High chloride concentrations cause more problems when applied by sprinkler irrigation. Drip irrigation can reduce foliar injury by application of irrigation water to soils in the root zone.

The chloride classification of irrigation water is shown below.

Chloride (ppm)	Effect on Crops	Crops
<70	Generally safe for all plants	
70-140	Sensitive plants show injury	Tomato, cucumber
141-350	Moderately tolerant plants show injury	Corn, potato
>350	Can cause severe problems	Pineapple

If the well water has high chloride concentrations, it may be necessary to use drip irrigation methods to minimize foliar injury to chloride sensitive crops. Drip irrigation will reduce crop water requirements but will increase capital and material costs.

5.8.2 Preliminary Irrigation Management Plan

The preliminary review of the well specifications for the Koloa series wells of interest indicates that the well at the KAP may have the following specifications.

Well Depth:	425 feet
Land surface altitude:	325 feet above sea level
Well casing diameter:	10 inches
Borehole diameter:	14 inches
Pump Type and Capacity:	350 gpm submersible pump

If the Kilauea basal aquifer characteristics allows the theoretical pumping rate of 350 gpm, the 18/6 pumping schedule may produce 378,000 gallons of water per operating day. In times of drought, the well could be operated on 24/7 pumping schedule which may produce 504,000 gallons per operating day.

The suggested location of the well, irrigation reservoir, and irrigation supply lines were described in Section 5.2. The main irrigation supply line should be connected directly to

the well. If the irrigation flow rate is lower than the pumping rate of the well, the overflow can be diverted into the irrigation reservoir.

The minimum size of the farm lots should be five acres to secure the commercial ag designation for agricultural loans. However, it may be necessary to increase the size of the lots to attain efficiency and productivity required for the creation of sustainable small farms.

It will be important to standardize sprinkler irrigation system flow rates to allow for efficient operation of the irrigation system. The size of one irrigation set should be roughly 5 acres with the goal to irrigate two irrigation sets per day.

If the actual crop mix includes more acres of tropical fruit crops, it may be beneficial to consider installation of drip irrigation systems at the KAP. Drip irrigation will reduce irrigation water and labor costs. If irrigation water costs are relatively high, it may be more cost effective to use drip irrigation methods instead of sprinkler irrigation on crops with long growing cycles.

There are five 5/8 inch County Water meters designated for the property. The County water may serve as an alternative source of irrigation water. However, it is uncertain how much water and when the water can be drawn without impacting water service to residential properties adjacent to the KAP. The amount of water that can be made available without disruption of domestic water service to Kilauea residents should be determined.

The operation of the well and opening and closing of valves should be assigned to a trained water system operator. If the well goes down without an alternative water source, it will result in crop failure of vegetable crops. The trained water system operator could perform other agricultural park tasks like road maintenance, tractor operation for land preparation, and other activities.

5.9 Preparation of Grower Proposals

After Production Guides and Production Plans are developed, the interested growers will need to prepare grower proposals to allow evaluation of the technical and economic feasibility of the proposed small farm. It is important for growers to be profitable since percentages of the operation and maintenance costs for the KAP should be allocated to the KAP Growers Association based on a mutually acceptable formula. All farm lots at the KAP will need to be productive in order to contribute to shared operating costs.

The Request for Grower Proposals should be open to all interested parties residing in the County of Kauai. However, due to its close proximity to the site the North Shore growers will be the most interested and will likely be selected as growers if they are qualified.

A standard format for the Grower Proposal may include Summary, Introduction, objectives and approach, grower qualifications, crops and acres, production guides, raw materials price list, equipment list, labor plan, 5 year production plan, 5 year budget, cash flow, and sales plan. Properly prepared grower proposals may also be used in agricultural loan applications. Proof of Financial Responsibility may be required at this stage of the process or it can be provided at the next phase of the process.

The Grower Proposals are very detailed and time consuming to prepare. To streamline the grower selection process, the County of Kauai may require submittal of Grower Pre-Proposals. The Pre-Proposals will allow pre-qualification of potential growers who will be invited to submit full Grower Proposals at a later date.

It is important to use reasonable case not best case assumptions in the grower proposals to provide contingencies in the event of occurrence of unforeseen events. The growers will need to conduct their own due diligence on the long term feasibility of operating a small farm.

The individual grower will need to establish crop specific gross margin targets. The margins will probably be thin. Materials and supplies, fuel, and other direct costs will increase over time. Therefore, growers should consider how their small farms will evolve (better yields, higher quality, more efficient with equipment use, better pricing, etc.) to sustain their farms.

All of the crops that have potential for cultivation at the KAP are labor intensive. Growers should consider how they will meet labor requirements in the short and long term. Pooling labor resources for common tasks like harvesting and packing may increase efficiencies and decrease individual growers head count.

The small size of the farm lots is not conducive to major investments in equipment. However, it is unrealistic to expect the growers at the KAP to be successful without the basic equipment for land preparation, field maintenance, harvesting, and packing. The KAP Growers Association may be able to provide farm services at affordable rates, if farm equipment is available.

Lease rent is usually a small component of the budgets. However, it is important for the interested growers to include lease rent costs in budget estimates. In the initial stages of development, the lease rent should be low in consideration of the grower investments required to start the farms. At steady state, lease rents should be based on lease rent for comparable lands with irrigation water in Kauai County.

Water costs and quantity of irrigation water is unknown at this time. Irrigation costs will be a major component of budgets making it necessary to provide an estimated cost per thousand to growers.

The County of Kauai should have standard Lease Agreements that can be revised to cover specific agricultural considerations. The term of the lease agreement for growers

at the KAP may need to be 10 to 15 years to match the term of agricultural loans. Growers should expect standard lessor and lessee conditions in the Lease Agreement. Agricultural leases usually require the lessee to provide proof of insurance, disclosure of uses of the property, no sub-leases without written consent of lessor, responsibility for current and future environmental liabilities, responsibility for personal injury, accidental death and dismemberment, responsibility for property damage, and provisions for the duty to defend and indemnification in any litigation or regulatory action.

Individual growers may not be able to accept standard lease conditions. The KAP Grower Association may be reluctant to be responsible for all parties. The relevant lease issues should be addressed in next stage of the planning to provide the growers with a clear understanding of their responsibilities and potential liabilities.

5.10 Grower Proposal Review and Approval

Grower proposals should be reviewed by an independent committee to ensure fair and equitable selection of growers. A numerical rating system based on generally accepted screening criteria should be developed or adopted for the review and approval process.

A suggested numerical rating system for grower proposals is shown below.

1. Basic Requirements (20 points)

- Grower qualifications (education, work experience, etc.)
- Willing to lease at least one 5 acre lot
- Equipment List
- Labor Plan

2. Meets objectives and key results (30 points)

- Proposal based on minimum of one crop/acre/year
- Production supports Import Replacement
- Proposal based on valid sales and marketing plan with sales channel analysis
- Benefits the Kauai Community
- Efficient, productive, and profitable small farm

3. Economic feasibility (20 points)

- Business Pro-forma based on acceptable Cost, Revenue, and Margin
- Reasonable level of capital investments required for start-up
- Qualified for agricultural loan
- 5 Year Business Plan includes cost escalators and indicates positive cash flow

4. Technical Feasibility (20 points)

- Selected crop adapted to climatic and growing conditions

- Valid Production Guide and Plan
- Pest and Disease Risk Management Plan
- Proposal includes crop improvement program to manage costs or increase revenue

5. Community Acceptance (10 points)

- Agricultural activities are generally accepted by Kilauea Community
- Preserves green, open space
- Environmentally responsible

The selected growers should make a short presentation to the Committee followed by questions and answers. The Committee may vote to approve or disapprove of the grower proposal at the presentation. The review and approval process is typical of government sector funding. However, the grower proposal review process for the KAP is different because the grower will be held fully accountable and is expected to operate an efficient and profitable small farm.

5.11 Community Outreach

The Kilauea Community will be an integral part of the entire planning process for the KAP. After the grower proposals are selected, the growers should meet with the Kilauea Community to discuss the final field layout and the related agricultural activities.

It will be important to develop a Community Relations Plan that initially shares information on additional steps taken to minimize noise, dust, and other nuisances. It may be necessary to provide verbal notice of pesticide applications that allows residents to temporarily leave their residences, if they choose to do so.

5.12 Growers Association

The formation of a KAP Growers Association will be essential to administration of shared KAP responsibilities. The responsibilities of the Association may include community relations, KAP grower relations, interaction with government officials, operation and maintenance of the well and irrigation system, compliance with permit requirements, coordination of planting sequences, road maintenance, and security.

The KAP should develop and adopt By-Laws for the Association. After all of the responsibilities are identified and associated cost estimates are developed, it will be appropriate to develop access Association fees by acres leased (or some other measurable, non-confidential information). The small number of acres will not support collection of high Association fees. Therefore, the growers will need to decide what services should be provided by the Association and services that will be assigned to individual growers.

The growers should elect a voluntary Board of Directors to address Association business. The Board requires three to five directors to ensure fair voting on issues.

Most importantly, all growers must be willing to work together using a Teamwork approach. Many small growers with flexible boundaries due to the irrigation sets relying on one irrigation water source can lead to internal conflicts. Growers who do not manage their fields properly will adversely affect their neighbors. All growers must be good neighbors to fellow growers and to the Kilauea Community.

5.13 Grower Proposal Implementation

The next two sections will need to be changed based on the potential changes in infrastructure, the crops, acres, and crop management practices in approved grower proposals, and the final field layout of the KAP.

Potential Kauai County Schedule and Milestones

A preliminary schedule of potential Kauai County activities to facilitate implementation of grower proposals is presented in Appendix D. A temporary project manager may be required to manage installation of approved infrastructure and expenditure of development funds.

Potential Grower Tasks and Milestones

Each grower should develop a project schedule with milestones for cost and schedule controls. A preliminary schedule outlining potential grower tasks is provided in Appendix E.

5.14 5 Year Review

The purpose of the 5 Year Review is to evaluate progress towards meeting the objectives and key results for the KAP. Although the overall goals of the County and growers are similar, the key results for each party will be focused on more specific measurements.

The broad objective of the County of Kauai is to provide affordable agricultural lots dedicated to efficient, sustainable, and profitable small scale farms. Key results for the County that are measurable include:

- No illegal activities allowed or tolerated on the KAP
- Limited liability for County
- Must grow at least one crop per acre per year
- Consistently meets profitability expectations of growers
- Produces a measurable reduction in intra-state and Mainland imports to Kauai
- No 'land banking' allowed
- No sub-leasing

- No new major capital expenditures from County after plan is implemented
- Benefits to greater Kauai Community
- Self sustaining, limited oversight
- Manageable nuisances
- Cooperative, teamwork atmosphere
- Community Acceptance

The broad objective of growers is to manage profitable small farms providing a sustainable source of safe, wholesome produce to Kauai County. Key results for the growers that are measurable include:

- Validate growth curves and the number of growing days from planting to harvest
- Manage weeds and pest and diseases to prevent crop failure within budget
- Attain yield, saleable product recovery, and quality targets
- Achieve weekly delivery schedules
- Consistently attain weekly sales goals
- Well is confirmed as a reliable water source
- Manage KAP Grower Association costs
- Acceptable joint and several liabilities at the KAP
- Attain required cost, revenue, and gross margin targets
- Adequate equipment resources are available
- Secure short term and long term labor requirements
- Capital investments are reasonable for size of the farm
- Return on investments are within generally accepted standards
- No incidents of serious personal injury and property damage
- Theft and vandalism is manageable
- Security Program is cost effective
- Individual growers are efficient, productive, and profitable
- Collectively, all growers contribute to the sustainability of the KAP
- All growers are able to work together to share water and other resources
- Work schedule is manageable
- Growers and growers' families are happy
- Community Acceptance

5.15 Next Steps

The purpose of this Section is to provide a realistic objective view of potential outcomes and changes in the next five years not to raise unfounded doubts about the viability of small farms at the KAP. The growers at the KAP will probably consist mostly of existing growers from the greater Kilauea area. The small farms at the KAP will be operated as separate business entities to protect their other assets. The small, stand alone farm will be more fragile because it is hard to justify investments and losses in the small footprint.

The success or failure of agriculture should not be judged by performance in the first 5 years. It is critical to continue to implement the plan if it is efficient, profitable and has

the ability to adapt to changes. However, the sense of urgency will be intense for small growers if unforeseen problems occur or if they are unable to consistently meet their respective performance targets.

The KAP growers should not expect the County or KAP Growers Association to bail them out if financial difficulties occur. Preparing a risk assessment and risk mitigation plan prior to entering into the lease agreement or applying for loans is prudent but by no means will guarantee success.

Hopefully, all growers at the KAP are successful. However, in the unfortunate event that a grower or growers encounter unforeseen problems, it may be necessary to revise the Plans and objectives and key results for the KAP. It will be important to have a strong base of crops and growers to weather the ups and downs of agriculture.

APPENDIX A

Weather Data Summary

Appendix A. Weather Data Summary

Table 2A. Average Monthly Air Temperatures (degrees Farenheit)

Kilauea Station 1134 (1999-2008)

Month	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
January	N	N	N	68.4	68.9	71.1	N	72.4	72.1	70.1
February	N	N	N	69.7	69.8	72.2	70.4	69.3	69.8	70.7
March	N	N	N	70.3	71.9	70.9	68.7	70.9	71.9	72.7
April	N	N	N	73.1	72.8	72.2	72.7	71.7	71.9	72.8
May	N	N	N	77.5	74.6	71.8	75.3	72.6	74.9	74.7
June	N	N	N	76.5	76.5	78.4	76.4	75.8	76.2	75.8
July	N	N	N	76.7	77.8	77.4	77.2	76.4	76.9	76.6
August	N	N	N	77.3	78.1	78.8	77.1	77.1	77.6	77.6
September	N	N	N	77.1	77.8	78.2	77.7	77.1	77.1	76.2
October	N	N	N	76.5	77.5	77.1	75.8	75.9	76.2	75.5
November	N	N	74.3	73.8	78.2	74.4	73.9	75.1	73.9	73.3
December	N	N	72.9	67.4	72.6	72.1	71.5	72.2	72.7	72.2
Average	N/A	N/A	N/A	73.7	74.7	74.5	N/A	73.9	74.3	73.9

APPENDIX B

Preliminary Pan Evaporation Projections
(Table 1 – Weather Data)

Kilauea Agricultural Park
Preliminary Pan Evaporation Projection
Pan Evaporation Data-Lihue Airport 1020.1
Weather Data-Kilauea Station 1134 (1998-2008)

Table 1. Weather Data

Month	Evaporation Mean (inches)	Rainfall Avg. Mo. (inches)	Evaporation Less Rainfall (Inches)	Daily Avg. Net Evaporation (inches)	Avg. Daily Evaporation Only (inches)
January	5.6	4.77	0.83	0.03	0.18
February	6.19	6.93	0	0	0.22
March	7.63	8.66	0	0	0.25
April	8.2	4.16	4.04	0.13	0.26
May	9.18	4.55	4.63	0.15	0.3
June	9.87	3.74	6.13	0.2	0.33
July	10.37	3.6	6.77	0.22	0.33
August	10.14	4.13	6.01	0.19	0.33
September	9.17	3.51	5.66	0.19	0.31
October	8.04	5.13	2.91	0.09	0.26
November	6.27	6.32	0	0	0.21
December	5.65	6.53	0	0	0.18
Annual Total	96.36	62			
Peak Daily Water Requirement				0.22	0.33
Daily Average For The Year				0.13	0.24

APPENDIX C

Preliminary Pan Evaporation Projections
(Table 2 – Crop Water Requirements)

Kilauea Agricultural Park
 Peak Daily Water Requirement w/no rain: 0.33
 Peak Daily Water Requirement: 0.22
 Daily Average For The Year: 0.13

Table 2. Crop Water Requirements

Crop	Area (Acres)	Crop Factor (Kc)	Form of Irrigation	Irrigation Efficiency	Avg. Daily Water Req. (gpd)	Peak Water Req. (gpd)	Peak Req. W/No Rain (gpd)
Pineapple	10	0.3	Sprinkler	70%	15129	25602	38404
Papaya	15	1.05	Sprinkler	70%	79425	134412	201618
Green Onions	3	1.05	Sprinkler	70%	15885	26882	40324
Sweet Potato	6	1.15	Sprinkler	70%	34796	58885	88328
Cucumbers	4	1.05	Sprinkler	70%	21180	35843	53765
Eggplant	2	1.05	Sprinkler	70%	10590	17922	26882
Tomato	3	1.15	Sprinkler	70%	17398	29443	44164
Sweet Corn	6	1.2	Sprinkler	70%	36369	61445	92168
Ginger Root	5	1.05	Sprinkler	70%	26475	44804	67206
Totals - Base Case	54				257247	435238	652859
Totals - Alternate Case (W/O Pineapple and Papaya)					162693	275224	412837

Flow Rate Required For 8 Hour Pumping Day: 1360
 Flow Rate Required For 12 Hour Pumping Day: 907
 Flow Rate Required For 16 Hour Pumping Day: 680
 Flow Rate Required For 24 Hour Pumping Day: 453

APPENDIX D

Preliminary Kauai County Task List
and
Schedule

Appendix D. Preliminary Kauai County Task List and Schedule

Year 1

- Review and Approval of Grower Proposals
- Establish final field layout based on crops and acres for approved grower proposals
- Complete Basis of Design and Engineering Design Report for Well, Reservoir, and Irrigation Water Supply Lines
- Apply for permit for well drilling and pump installation
- Drill test borehole and complete aquifer testing
- Complete Basis of Design and Engineering Report for Sediment Basin/Spillway (if necessary)
- Land clearing, knockdown, and burn (during dry season)
- Incorporate green waste and allow decomposition (during wet season)
- Install infield roads along field edges
- Plant windbreaks (if appropriate)
- Maintain clean fallow
- Install drainage and sediment basin/spill way (if necessary)

Year 2

- Maintain clean fallow by harrowing
- Install Irrigation supply lines
- Install Well and irrigation reservoir
- Install Water Storage Tank and Standpipe
- Install Greenhouse (if appropriate)
- Install baseyard (if appropriate)
- Apply and incorporate soil amendments

Year. 3

- Monitor progress towards grower proposal implementation
- Monitor compliance with applicable permit requirements

Year. 4

- Monitor progress towards grower proposal implementation

Year. 5

- Conduct 5 Year Review

APPENDIX E

Preliminary KAP Grower Task List and Schedule

Appendix E. Preliminary KAP Grower Task List and Schedule

Year 1

- Prepare Grower Proposals to qualify for farm lot
- Develop Soil Conservation Plan in collaboration with Kauai Chapter of the Soil Conservation Service
- Develop Irrigation Management Plan for KAP
- Form KAP Growers Association
- Participate in review of Engineering Design Reports for Well/Reservoir and Sediment Basin/Spillway
- Enter into lease agreements with County of Kauai
- Apply for permits (Storm water Discharge Permit)
- Apply for agricultural loans (if appropriate and necessary)
- Develop sales and marketing plan based on appropriate marketing channels (produce distributors, retail and resort accounts, farmers markets, processors)
- Start seed development for pineapple (if appropriate)
- Start Community Outreach

Year 2

- Start land preparation
- Plant cover crops for organic crops (if appropriate)
- Start composting operation (if cost effective)
- Start late year planting of pineapple and papaya if weed pressure is manageable
- Provide training for water system operator certification
- Test irrigation system
- Implement soil conservation plan
- Maintain sediment basin/spillway and complete permit reporting requirements (if appropriate)
- Maintain in-field roads
- Implement security plan
- Install weather station at KAP

Year 3

- Plant vegetable and organic crops (if appropriate)
- Continue to plant pineapple, papaya, and other tropical crops
- Monitor effectiveness of Production Guidelines
- Monitor cost and schedule controls for Production Plan
- Evaluate yields, saleable product recovery, and quality of harvested crops
- Monitor groundwater levels and water quality of irrigation well

- Monitor volume of groundwater pumped and report to Commission on Water Resources Management
- Conduct KAP Growers Association business as required

Year 4

- Same as year 3
- Start crop rotation program for vegetable and organic crops (if appropriate)
- Conduct Cost and Budget Reviews (Expenditures, Revenue, and Margins)
- Evaluate attainment of yield and saleable product recovery targets
- Identify problems, develop and implement corrective actions, and follow-up

Year 5

- Same as years 3 and 4
- Participate in 5 Year Review

Appendix B

Letter Report on Irrigation Supply
Proposed 54-Acre Agricultural Park in Kīlauea, Kauaʻi
Tom Nance Water Resource Engineering, March 28, 2011.



Tom Nance Water
Resource Engineering

No. of pages: 7
Email: mikeo@rmtowill.com

Original will will not
be mailed to you.

March 28, 2011
11-087 | 11-16

MEMORANDUM

To: Michael Okamoto - RM Towill Corporation
From: Tom Nance
Subject: Irrigation Supply for the Proposed 54-Acre Agricultural Park in Kilauea, Kauai

Introduction

This memo and its attachments provide infrastructure sizing and cost estimates to develop an irrigation supply for the proposed Kilauea Agricultural Park to be developed by the County of Kauai. The location of the agricultural park site on the east side of Kilauea Lighthouse Road is shown on Figure 1.

Irrigation Supply Requirement

A basic premise of this study is that all of the Park's irrigation supply will need to be provided by new wells developed for that purpose. Existing surface water sources are at a far distance inland and are not available for this project and the potential supply from the Kauai Department of Water is negligible.

The capacity of these new wells should match, in a 24-hour pumping day, the maximum irrigation requirement in the driest and hottest months. At the Park site, this is typically in the July-August period. To quantify this maximum irrigation rate, the following assumptions are made:

- Maximum summertime pan evaporation, based on the available record for Moloaa Station 1146, is 8.5 inches in a 30-day period or 0.283 inches per day.
- Rainfall during this same 30-day period, using the minimum monthly amounts for Kilauea Station 1134, is 1.8 inches. The effective portion of this rainfall for plant use is 70 percent or 1.26 inches. This is equivalent to an average of 0.04 inches/day.
- The overall average crop factor is 1.0 times pan evaporation less effective rainfall. This sets the maximum plant uptake requirement at 0.243 inches per day, equivalent to 6600 GPD/acre.
- The irrigation efficiency, depending on equipment used, is likely to be in the range of 70 to 80 percent. An offsetting factor is that the total planted area requiring irrigation is likely to be in the range of 70 to 80 percent of the Park's gross area.

For the series of assumptions and calculations above, the irrigation supply should have the capacity to provide the equivalent of 6600 GPD/acre for 54 acres. In round numbers, this amounts to 360,000 GPD or 250 GPM as a 24 hours a day pumping capacity.

Hydro-Geologic Circumstances for New Well Development

The Park site and all of the surrounding area sit on the Koloa volcanic formation. This is the island's later-stage volcanic series which overlies the island's older and shield-building Waimea series volcanics. Due to characteristics of the Koloa volcanics, successful well development for the Park's irrigation faces the following prospects:

- The Koloa volcanics are typically of low to moderate permeability and highly variable over short distances.
- In the Kilauea area, the Koloa lava flows are typically interbedded with soil horizons which have been weathered to clay. This and the highly variable permeability of the lavas themselves generally means that multiple and variable water bearing horizons will be encountered. It also means that drilling often has to proceed a substantial distance below sea level to achieve the desired yield.
- Four wells have been developed directly to the west of the Park site along Kaupea Road (wells of the following State Nos. 1324-01, 1324-02, 1324-04, and 1324-05). These closely grouped wells have water levels standing from 40 to 216 feet above sea level and have capacities of 15 to 60 GPM. All produce fresh water.
- Three wells have developed to the east of the project site and on the other side of Kilauea Stream (State Nos. 1223-01, -02, and -03). These closely grouped wells have water levels between 11 and 258 feet above sea level, have capacities from 50 to 200 GPM, and all also produce fresh water.

Based on the foregoing and the probable subsurface structures associated with the nearby puu (Crater Hill) directly to the north of the Park site, wells developed for the Park should be:

- Located along the Park's inland property line to maximize their distance inland;
- Spaced at least 300 feet apart along the property line to avoid interference effects; and
- Drilled to sufficient depth and possibly to 100 feet below sea to achieve the desired yield.

Other Elements of the Irrigation System Infrastructure

Topography across the site does not provide a reservoir site of sufficient elevation for gravity irrigation. As such, the storage reservoir should be in the near proximity of the well and an automated,

multiple-pump station drawing from this reservoir will be needed to provide necessary delivery pressures throughout the Park. Reservoir storage and pump station capacity are sized as follows:

- The dry-period maximum irrigation amount of 360,000 GPD is applied in an eight-hour irrigation period;
- 10 percent of reservoir storage is drawn from the reservoir for irrigation before the well pumps are started by water level sensors in the reservoir;
- Maximum drawdown in the reservoir at the end of the eight-hour irrigation period should leave at least 10 percent of the storage volume in the reservoir as a buffer; and
- The combined capacity of the irrigation wells will be (at least) 250 GPM.

Based on the foregoing, the required reservoir storage volume is 0.30 million gallons (MG). Average delivery by the pump station over the eight-hour period would be 750 GPM. To deal with varying use in this eight-hour period, a 1000 GPM pump station capacity is recommended.

Facilities Layout and Cost Estimates

Figure 2 shows the recommended locations of three wells (at 300-foot spacing), the 0.30 MG storage tank, and the 1000 GPM pump station. Cost estimates for these improvements are compiled in Exhibit 1. These cost estimates assume:

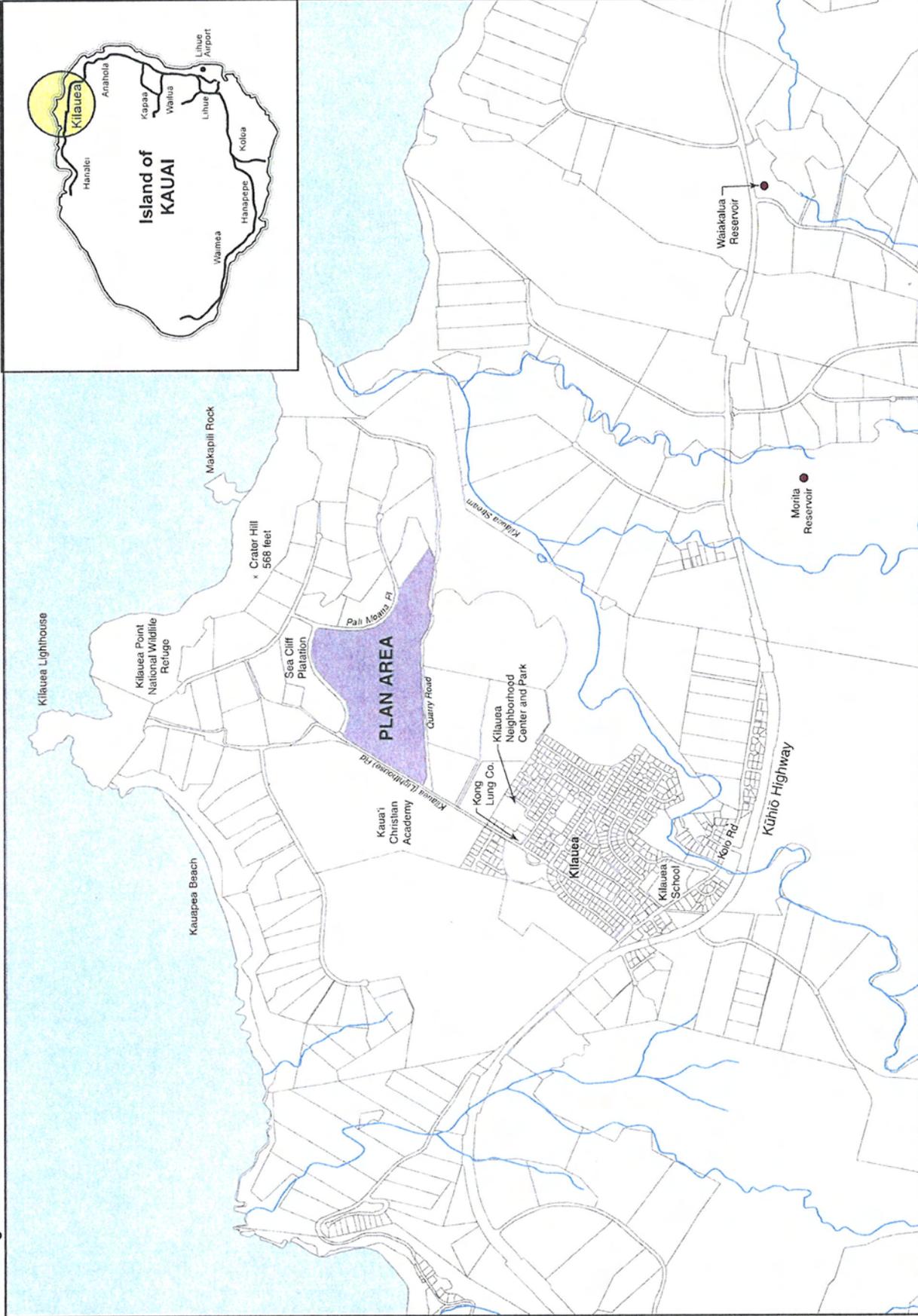
- Three wells will be needed to provide at least 250 GPM combined capacity costs are based on three wells, each of 100 GPM capacity;
- Wells will be completed with 12-inch casing. Depending on actual capacity, they might be downsized to 10- or even 8-inch casing.
- Wells will be drilled to an average of 370-foot depth, about 65 feet below sea level;
- Reservoir storage will be in a lined and bolted steel tank with passive cathodic protection (hanging zinc anodes); and
- The automated pump station with 1000 GPM capacity will provide 100 psi outlet pressure.

Final Comments

Given the unpredictable and highly variable characteristics of the Koloa volcanics, developing a reliable 250 GPM supply capacity with onsite wells is not assured. Well development early in the project's development should be undertaken to prove the viability of the irrigation supply presented herein. To minimize the initial investment, pump tests can be done in the pilot boreholes to establish supply capacity before the entire cost of a well's construction and testing is expended.

Attachments

MASTER PLAN



Kilauea Agricultural Park

m_11-087

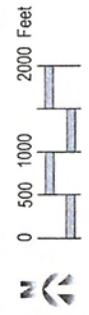
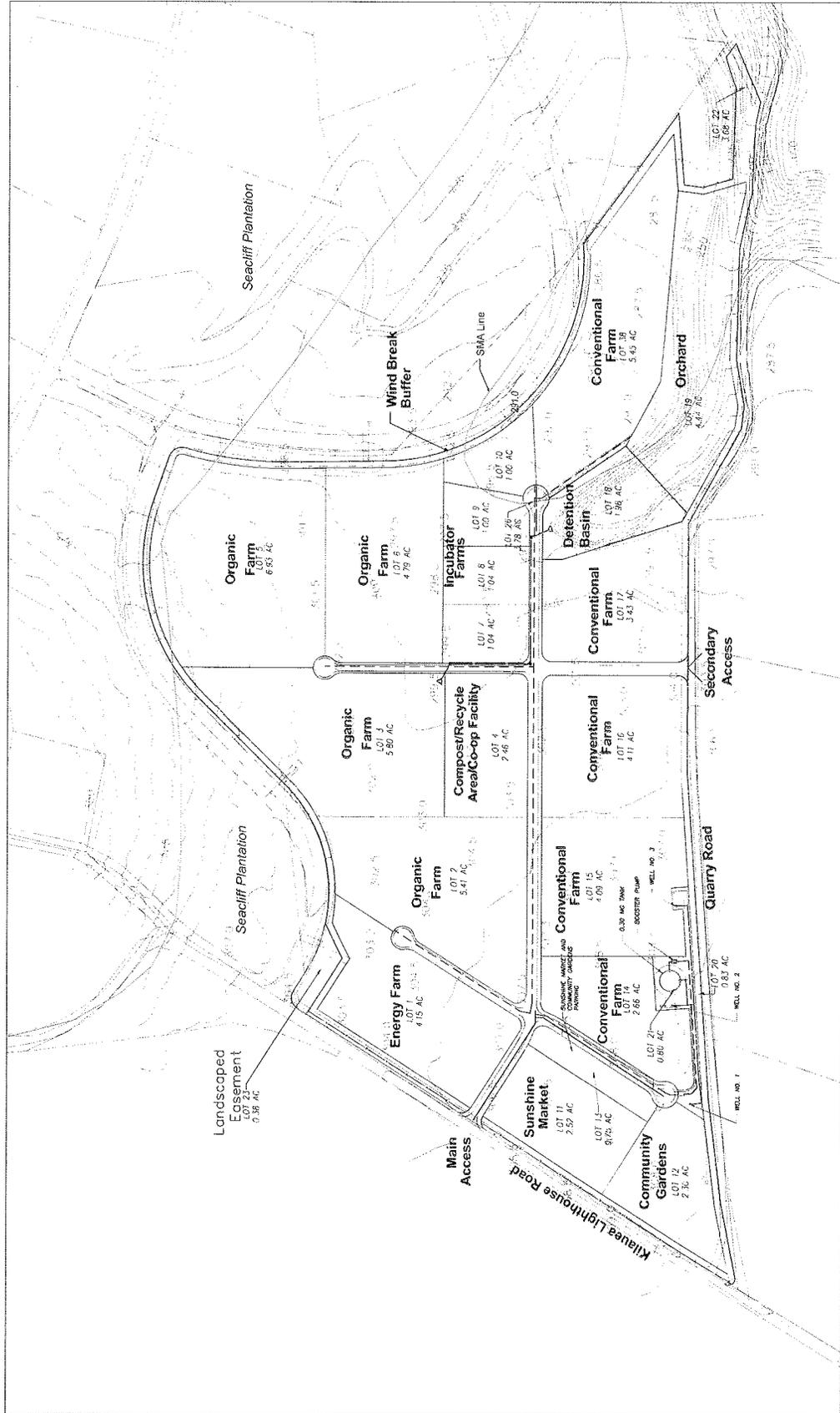


Figure 1
Location Map



m_11-087

Figure 2
Proposed Irrigation Wells, Storage Tank, and Pump Station

Exhibit 1

**Cost Estimate for the
Kilauea Agricultural Park Irrigation System**

Item Description	Quantity	Unit	Unit Price	Amount	Total
Drill, Case, and Pump Test Well No. 1					
Mobilization		LS		10,000	
Drill 12-Inch Pilot Hole	370	LF	170	62,900	
Video Log Pilot Hole	1	EA	2,500	2,500	
Test Pump Pilot Hole	1	EA	12,000	12,000	
Ream Pilot Hole to 21 Inches	370	LF	210	77,700	
12" Solid Casing	310	LF	100	31,000	
12" Perforated Casing	60	LF	150	9,000	
Furnishing and Installing grout	300	LF	60	18,000	
Plumbness and Alignment Test	1	EA	2,500	2,500	
Furnishing and Installing Test Pump	1	EA	15,000	15,000	
Development and Test Pumping	60	HRS	250	15,000	
Demobilization		LS		7,500	
	Total				\$263,100
Drill, Case, and Pump Test Well No. 2					
					\$263,100
Drill, Case, and Pump Test Well No. 3					
					\$263,100
Outfit Well No. 1					
Well Site Earthwork	200	CY	40	8,000	
Site AC Paving w/ BC	100	SY	100	10,000	
Gravel Fill	290	SY	50	14,500	
Site Fencing	230	LF	50	11,500	
Site Gate	1	EA	3,000	3,000	
4" DI Pipe, Class 52	50	LF	60	3,000	
Pipe Valves and Fittings		LS		2,000	
Testing		LS		3,000	
Submersible Pump (100 GPM, 15 HP)	1	EA	60,000	60,000	
Pump Pad, Discharge Unit & Piping	1	EA	10,000	10,000	
Erosion and Dust Control		LS		5,000	
Construction Survey		LS		1,500	
Pump Controls, Isolation Switch, and Ducts	1	EA	20,000	20,000	
	Total				\$151,500
Outfit Well No. 3					
					\$151,500

Exhibit 1

**Cost Estimate for the
Kilauea Agricultural Park Irrigation System**

Item Description	Quantity	Unit	Unit Price	Amount	Total
Outfit Well No. 2 and Other Facilities at the Well 2 Site					
4" DI Pipe, Class 52	50	LF	60	3,000	
Pipe Valves and Fittings		LS		2,000	
Testing		LS		3,000	
Submersible Pump (100 GPM, 15 HP)	1	EA	60,000	60,000	
Pump Pad, Discharge Unit and Piping	1	EA	20,000	20,000	
Erosion and Dust Control		LS		5,000	
Construction Survey		LS		1,500	
Pump Controls, Isolation Switch and Ducts	1	EA	20,000	20,000	
Transformer Pad and Ducts	1	EA	15,000	25,000	
Metering, Motor Control Center for 3 Wells and Booster		LS		300,000	
MECO Facility Charge for Well Connection		LS		15,000	
Total					\$454,500
0.3 MG Tank and Booster Station at the Well 2 Site					
Tank Site Earthwork	1,500	CY	40	60,000	
Site AC Paving w/ BC	680	SY	75	51,000	
Site Fencing	510	LF	50	25,500	
Site Gate	1	EA	3,000	3,000	
Site and Tank Drainage System		LS		30,000	
8" DI Pipe, Class 52	100	LF	120	12,000	
6" DI Pipe, Class 52	50	LF	80	4,000	
Pipe Valves and Fittings		LS		15,000	
0.30 MG Steel Tank With Concrete Floor		LS		600,000	
Pipe and Tank Testing		LS		15,000	
Package Booster Station (1000 GPM)	1	EA	110,000	110,000	
Station Pad and Tank Connection Piping		LS		15,000	
Power Ducts and Cable from MCC	130	LF	120	15,600	
Erosion and Dust Control		LS		10,000	
Construction Survey		LS		2,000	
Total					\$968,100
Connecting Well Pipelines, Power and Control Ducts (From Tank to Wells)					
6" DI Pipe, Class 52	100	LF	80	8,000	
4" DI Pipe, Class 52	525	LF	60	31,500	
6" BFV w/VB	2	EA	1,500	3,000	
4" BFV w/VB	3	EA	1,000	3,000	
6" DI Fittings	6	EA	800	4,800	
UG Power Ducts and Cables	750	LF	150	112,500	
Pipe Testing		LS		3,000	
Erosion and Dust Control		LS		3,000	
Construction Survey		LS		1,500	
Total					\$170,300
Total for Construction					\$2,685,200
Engineering Design (8%)					215,000
Construction Management (3%)					81,000
Contingency (~10%)					266,800
Total Cost					\$3,248,000

Appendix C

Natural Resources Surveys
Proposed Kīlauea Agriculture Park, Kīlauea, Kauaʻi
AECOS Consultants, February 22, 2011

Natural resources surveys for the proposed Kilauea Agriculture Park, Kilauea, Kaua'i (TMK: 5-2-04: 099)

February 22, 2011

DRAFT

AECOS Consultants No. AC101

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Introduction

The County of Kaua'i is proposing to develop an agricultural park on a 75-ac parcel (Tax Map Key [TMK] 5-2-04: 099) at Kilauea on north coast of Kaua'i (Fig. 1). The agricultural park is intended to provide affordable land for new and established farmers, to promote farming generally, to increase production of fresh produce on the Island, and to develop sustainable agricultural practices among other goals (Kimura International, Inc., 2009).

This report describes the methods and results of natural resource reconnaissance surveys undertaken by biologists covering botanical, avian, and mammalian resources on the subject property. These surveys were conducted for R. M. Towill Corporation (RMT)² as part of the environmental disclosure process. The primary purpose of the surveys was to determine if there are any sensitive biological resources, including but not limited to species listed or proposed for listing under either federal or state endangered species statutes within or adjacent to the project site. The federal and state listed species are those species identified in the following referenced documents: Department of Land and Natural Resources (DLNR), 1998 and U. S. Fish & Wildlife Service (USFWS), 2005a, 2005b, and 2010.

¹ Rana Biological Consultants, Inc., Kailua-Kona, Hawai'i

² Prepared for R. M. Towill Corporation., Honolulu, Hawai'i for use in permitting for the Kilauea Agriculture Park project. This document will become part of the public record.

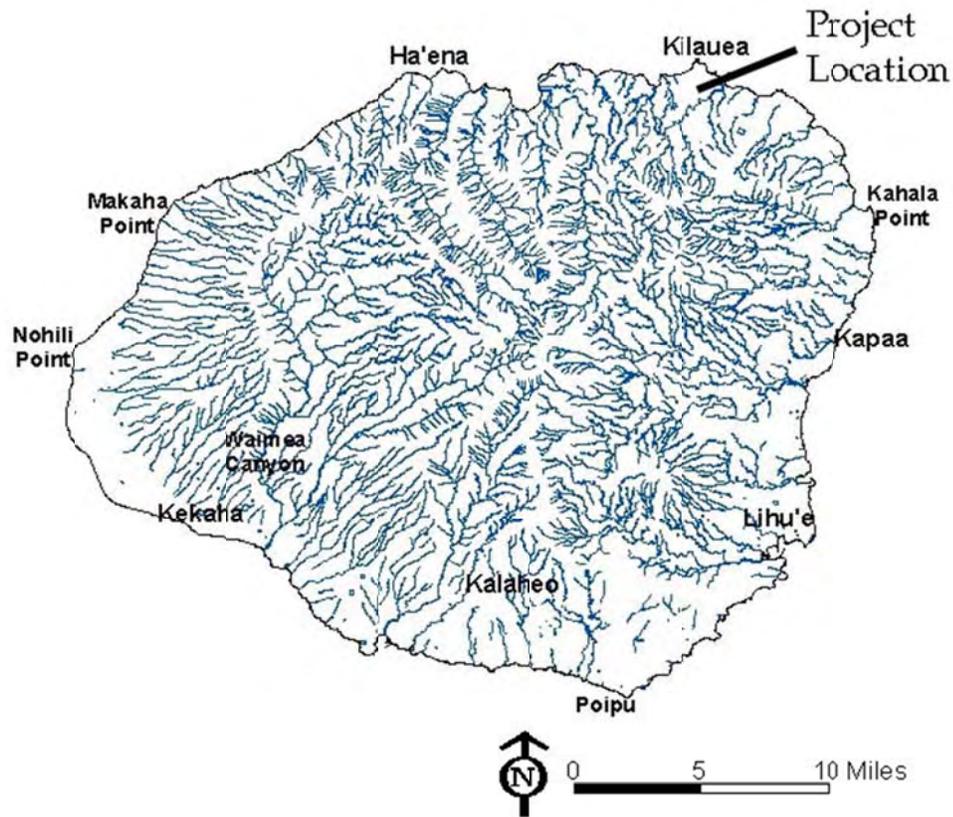


Figure 1. Kilauea Agriculture Park ("Project") location on the Island of Kaua'i.

General Site Description

The Project site borders Kilauea (Lighthouse) Road on the west and Quarry Road on the south. The Sea Cliff Plantation development abuts the property on the north and east. The project site is nearly flat to very gently sloping land with a narrow, steep-sided gulch at the far southeast end. An unimproved vehicle track enters from Quarry Road and winds inward a short distance. The parcel, with the exception of the southeast gulch, was managed by the Kilauea Sugar Co. for cane sugar cultivation up until the 1970s (Kimura International, Inc. 2009). Today, vegetation on the site is a mixture of closed or nearly closed canopy forest, scrub, and open grassland; these have grown up since agricultural activities ceased (Fig. 2).



Figure 2. Interior of site showing grassland in foreground and open forest in background.

Methods

Botanical Survey

A wandering transect approach was used to survey botanical resources on the project parcel on October 21, 2010. A GPS unit (Trimble GeoXT) recorded progress of the survey, providing a record of areas traversed and allowing for real time adjustments in course to ensure a reasonably complete coverage of the entire site. Conditions (rainfall received, etc.) in October 2010 were generally favorable for observing the flora on this windward Kauaʻi property. Plant names used here follow *Manual of the Flowering Plants of Hawaiʻi* (Wagner *et al.*, 1990, 1999) for native and naturalized flowering plants. Place names follow *Place Names of Hawaii* (Pukui *et al.*, 1974).

Avian Survey

Eight avian count stations spaced approximately equidistant from each other were sited within the study site. Eight-minute point counts were made at each station. Stations were each counted once. Field observations were made with the aid of Leica 10 X 42 binoculars and by listening for vocalizations. Counts were concentrated during the early morning hours, the peak of daily bird activity. Time not spent at counting stations was used to search the site for species and avian habitats not detected during count sessions.

Avian phylogenetic order and nomenclature presented in this report follows *The American Ornithologists' Union Check-list of North American Birds 7th Edition* (American Ornithologists' Union 1998), and the 42nd through the 51st supplements to *Check-list of North American Birds* (American Ornithologists' Union 2000; Banks et al., 2002, 2003, 2004, 2005, 2006, 2007, 2008; Chesser et al., 2009, 2010).

Mammalian Survey

With the exception of the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), or 'ōpe'ape'a as it is known locally, all terrestrial mammals currently found on the Island of Kaua'i are alien species, and most are ubiquitous. The survey of mammals was limited to visual and auditory detection, coupled with visual observation of scat, tracks, and other animal sign. A running tally was kept of all vertebrate species observed and heard within the project area.

Results

Flora

The result of the botanical field survey is a flora listing (Table 1). This list provides the name of all ferns and flowering plants observed, as well as their status (native or non-native) and relative abundance. A total of two species of fern/fern ally and 79 species of flowering plants were recorded from the site. The only truly native plant recorded was *moa* (*Psilotum nudum*). Three species attributed to early introductions (Polynesian, before 1793): 'ulu or breadfruit (*Artocarpus altilis*), noni (*Morinda citrifolia*), and niu or coconut (*Cocos nucifera*) were observed growing on the property. Given the fact that nearly all of the site was in agricultural use up until some 30 years ago, it is not surprising that the plants now characteristic of the property are common, non-native species typical of lowland, windward Kaua'i.

Table 1. Checklist of plants found at the Kīlauea Agricultural Park property.

Family	Species	Common name	Status	Abundance	Notes
<i>PTERIDOPHYTES ~ FERNS & FERN ALLIES</i>					
NEPHROLEPIDACEAE					
	<i>Nephrolepis multiflora</i> (Roxb.) F.M. Jarrett ex C. Morton	swordfern	Nat	U	<2>
PSILOTACEAE					
	<i>Psilotum nudum</i> (L.) P. Beauv.	<i>moa</i>	Ind	R1	
<i>FLOWERING PLANTS</i>					
DICOTYLEDONS					
ACANTHACEAE					
	<i>Asystasia gangetica</i> (L.) T. Anderson	Chinese violet	Nat	U1	<2>
	<i>Dicliptera chinensis</i> (L.) Juss.	---	Nat	R	<2>
	<i>Thunbergia fragrans</i> Roxb.	sweet clockvine	Nat	C	
ANACARDIACEAE					
	<i>Mangifera indica</i> L.	mango	Nat	U	<2>
	<i>Schinus terebinthifolius</i> Raddi	Christmas berry	Nat	AA	
ARALIACEAE					
	<i>Schefflera actinophylla</i> (Endl.) Harms	octopus tree	Nat	U	
ASTERACEAE (COMPOSITAE)					
	<i>Ageratum conyzoides</i> L.	<i>maile hohono</i>	Nat	R	<2>
	<i>Bidens pilosa</i> L.	beggartick, <i>ki</i>	Nat	U	<1>
	<i>Calyptracarpus vialis</i> Less.	---	Nat	O	<1>
	<i>Desmodium incanum</i> DC	Spanish clover	Nat	U	<1>
	<i>Elephantopus mollis</i> Kunth	elephant's foot	Nat	R2	<3>
	<i>Parthenium hysterophorus</i> L.	false ragweed	Nat	U	<1>
	<i>Pluchea carolinensis</i> (Jacq.) G. Don	sourbush	Nat	R	
	<i>Sphagneticola triloba</i> (L.) Pruski	wedelia	Nat	U	
BIGNONIACEAE					
	<i>Spathodea campanulata</i> P. Beauv.	African-tulip tree	Nat	C	
CARICACEAE					
	<i>Carica papaya</i> L.	papaya	Nat	O	
CASUARINACEAE					
	<i>Casuarina equisetifolia</i> L.	common ironwood	Nat	R1	
CECROPIACEAE					
	<i>Cecropia obtusifolia</i> Bertol.	guarumo	Nat	O	<2>
CUCURBITACEAE					
	<i>Benincasa hispida</i> (Thunb.) Cogn..	winter melon	Orn	R	<2>

Table 1 (Continued).

Family	Species	Common name	Status	Abundance	Notes
EUPHORBIACEAE					
	<i>Chamaesyce hirta</i> (L.) Millsp.	garden spurge	Nat	R	<1>
	<i>Chamaesyce prostrata</i> (Aiton) Small	prostrate spurge	Nat	U	<1>
	<i>Manihot esculenta</i> Crantz	cassava, manioc	Orn	U	<2>
	<i>Ricinis communis</i> L.	castor bean	Nat	O	
FABACEAE					
	<i>Caesalpinia decapetala</i> (Roth) Alston	wait-a-bit	Nat	U2	
	<i>Canavalia cathartica</i> Thours	<i>maunaloa</i>	Nat	U	
	<i>Chamaecrista nictitans</i> (L.) Moench	partridge pea	Nat	U	
	<i>Crotalaria incana</i> L.	fuzzy rattlepod	Nat	R	
	<i>Desmodium incanum</i> DC	Spanish clover	Nat	O	<1>
	<i>Falcataria moluccana</i> (Miq.) Barneby & Grimes	albizia	Nat	R	
	<i>Indigophora hendecaphylla</i> Jacq.	prostrate indigo	Nat	U	<1>
	<i>Indigofera suffruticosa</i> Mill.	indigo	Nat	R	
	<i>Leucaena leucocephala</i> (Lam.) deWit	<i>koa haole</i>	Nat	A	
	<i>Mimosa pudica</i> L.	sensitive plant	Nat	U	
	<i>Neonotonia wightii</i> (Wight & Arnott) Lackey	glycine vine	Nat	AA	
LAURACEAE					
	<i>Persea americana</i> Mill.	avocado	Nat	U	<2>
MALVACEAE					
	<i>Abutilon grandifolium</i> (Willd.) Sweet	hairy abutilon	Nat	R	
	<i>Sida rhombifolia</i> L.	Cuba jute	Nat	R	
MORACEAE					
	<i>Artocarpus altilis</i> (Z) Fosberg	'ulu; breadfruit	Pol	U	<2>
MYRSINACEAE					
	<i>Ardisia elliptica</i> Thunb.	shoebuttan ardisia	Nat	U	
MYRTACEAE					
	<i>Psidium guajava</i> L.	common guava	Nat	A	
	<i>Syzygium cuminii</i> (L.) Skeels	Java plum	Nat	AA	<2>
PASSIFLORACEAE					
	<i>Passiflora</i> cf. <i>laurifolia</i> L.	yellow grandilla	Nat	U	<2,3>
PHYTOLACCACEAE					
	<i>Rivina humilis</i> L.	coral berry	Nat	U3	
PLANTAGINACEAE					
	<i>Plantago major</i> L.	brd-lvd plantain	Nat	U	<1>

Table 1 (Continued).

Family	Species	Common name	Status	Abundance	Notes
ROSACEAE					
	<i>Rubus ellipticum</i> Sm.	Himalayan raspberry	Nat	R	
RUBIACEAE					
	<i>Morinda citrifolia</i> L.	<i>noni</i>	Pol	U	
	<i>Spermacoce assurgens</i> Ruiz. & Pav.	buttonweed	Nat	U	<1>
RUTACEAE					
	<i>Citrus maxima</i> (J. Burm.) Merr.	pummelo	Orn	R	<2>
SAPOTACEAE					
	<i>Chrysophyllum oliviforme</i> L.	satin leaf	Nat	O2	
SOLANACEAE					
	<i>Solanum seforthianum</i> Andr.	---	Nat	O	
STERCULIACEAE					
	<i>Lantana camara</i> L.	lantana	Nat	O1	
ULMACEAE					
	<i>Trema orientalis</i> (L.) Blume	gunpowder tree	Nat	R	<2>
VERBENACEAE					
	<i>Lantana camara</i> L.	lantana	Nat	O	
	<i>Stachytarpheta australis</i> Moldenke	---	Nat	O	
	<i>Stachytarpheta cayennensis</i> (Rich.) Vahl	---	Nat	R	
MONOCOTYLEDONES					
AGAVACEAE					
	<i>Cordyline fruticosa</i> (L.) A. Chev.	ti cultivars	Orn	U	<2>
ARACEAE					
	<i>Epipremnum pinnatum</i> ‘Aureum’ J. Linden & André	pothos vine	Nat	R	
	<i>Syngonium</i> sp.	nephthytis	Nat	R	
	<i>Xanthosoma roseum</i> Schott	‘ape	Nat	U	
ARECACEAE					
	<i>Cocos nucifera</i> L.	coconut	Pol	R	
	<i>Veitchia merrilli</i> H.E. Moore	Manila palm	Orn	R1	<2>
LILIACEAE					
	<i>Asparagus densiflorus</i> (Kunth) Jessop	asparagus fern	Nat	R	
MUSICACEA					
	<i>Musa</i> hybrid	banana	Pol	A	<2>
COMMELINACEAE					
	<i>Commelina diffusa</i>	dayflower	Nat	U	

Table 1 (Continued).

Family	Species	Common name	Status	Abundance	
					Notes
POACEAE (GRAMINEAE)					
	<i>Cenchrus echinatus</i> L.	common sandbur	Nat	R	<1>
	<i>Cynodon dactylon</i> (L.) Pers.	Bermuda grass	Nat	C	<1>
	<i>Digiteria</i> sp.	---	Nat	U	<1>
	<i>Eleusine indica</i> (L.) Gaertn.	wiregrass	Nat	O	<1>
	<i>Eragrostis pectinacea</i> (Michx.) Nees	Carolina lovegrass	Nat	C	<1>
	<i>Oplismenus hirtellus</i> (L.) P. Beauv.	basketgrass	Nat	U2	
	<i>Paspalum conjugatum</i> Bergius	Hilo grass	Nat	C	
	<i>Paspalum dilatatum</i> Poir.	Dallis grass	Nat	U	<1>
	<i>Paspalum fimbriatum</i> Kunth	Panama grass	Nat	R	<1>
	<i>Paspalum</i> sp.	---	Nat	R	<1>
	<i>Pennisetum purpureum</i> Schumach.	elephant grass	Nat	U2	
	<i>Setaria palmifolia</i> (J. König) Stapf	palmgrass	Nat	R	<2>
	<i>Sporobolus</i> cf. <i>africanus</i> (Poir.) Robyns & Tournay	smutgrass	Nat	U	<1>
	<i>Urochloa maxima</i> (Jacq.) Webster	Guinea grass	Nat	AA	
	<i>Urochloa mutica</i> (Forssk.) Nguyen	California grass	Nat	A	

Legend to Table 1

Status = distributional status

- end.** = endemic; native to Hawaii and found naturally nowhere else.
ind. = indigenous; native to Hawaii, but not unique to the Hawaiian Islands.
nat. = naturalized, exotic, plant introduced to the Hawaiian Islands since the arrival of Cook Expedition in 1778, and well-established outside of cultivation.
orn. = exotic, ornamental or cultivated; plant not naturalized (not well-established outside of cultivation).
pol. = Polynesian introduction before 1778.

Abundance = occurrence ratings for plants in survey area.

- R - Rare - only one, two, or three plants seen.
 U - Uncommon - several to a dozen plants observed.
 O - Occasional - found regularly around the site.
 C - Common - considered an important part of the vegetation and observed numerous times.
 A - Abundant - found in large numbers; may be locally dominant.
 AA - Abundant - abundant and dominant in some areas surveyed, defining vegetation in those areas.

Notes:

- <1> plant mostly or only found in roadway verge areas; relative abundance given for verge.
 <2> Plant mostly associated with southeast gulch; relative abundance given for gulch area.
 <3> plant lacking flowers or fruit; identification somewhat uncertain.

Vegetation

The dominant grass in open areas on the property is Guinea grass (*Urochloa maxima*), with some areas having an abundance of California or para grass (*U. mutica*). These are both large grasses that tend to prevent other herbaceous species from establishing or persisting. Thus, many of the smaller, herbaceous species recorded are limited in distribution to more open forest areas or the roadway verges, maintained by mowing. Nearly one-quarter of the plants listed in Table 1 were seen almost exclusively in the roadway verge areas, and not on the site itself.

The dominant tree in forested areas is Christmas berry (*Schinus terebinthefolius*), with common guava (*Psidium guajava*) abundant. Where the canopy is dense, the understory is rather sparse; however, the property includes extensive interfaces between forest patches and open grassland, where various vines and shrubs grow profusely. In the gulch area, Java plum (*Syzygium cumini*) is the dominant tree. The vegetation here is also unique compared with the majority of the site in as much as there is considerable evidence of informal farming occurring along the bottom and lower margins of the gulch. Many of the species listed as “ornamental” in Table 1. are, in fact, cultivated food plants. Several others grown here are food plants as well, but have become naturalized in Hawai‘i.

Avifauna

A total of 361 individual birds of 23 species, representing 17 separate families, were recorded during station counts (Table 2). An additional species, Black-crowned Night-Heron (*Nycticorax nycticorax hoactli*), was recorded as an incidental observation while transiting the site between count stations. Four of the species detected, Hawaiian Goose or, Nēnē (*Branta sandvicensis*), Great Frigatebird (*Fregata minor*), Pacific Golden-Plover (*Pluvialis fulva*), and Black-crowned Night-Heron are native to the Hawaiian Islands.

Nēnē are listed as endangered species under both federal and state endangered species statutes. The Black-crowned Night-Heron is an indigenous resident breeding species. Pacific Golden-Plover is an indigenous migratory shorebird species, and Great Frigatebird is an indigenous seabird. The remaining 18 species recorded are all considered to be alien to the Hawaiian Islands.

Avian diversity and densities were in keeping with the habitat present on the site, and it’s location in the lowlands of the Island of Kaua‘i. Three species, Japanese White-eye (*Zosterops japonicus*), Red Junglefowl (*Gallus gallus*), and House Finch (*Carpodacus mexicanus*), accounted for slightly less than 48% of the total number of individual birds recorded during station counts. The most commonly recorded species was Japanese

White-eye, which accounted for slightly more than 21% of the total number of individual birds recorded. An average of 45 birds were detected per station count.

Table 2. Avian species detected at the Kīlauea Agricultural Park property.

Common Name	Scientific Name	ST	RA
ANSERIFORMES			
ANATIDAE - Ducks, Geese & Swans			
Anserinae - Geese & Swans			
Hawaiian Goose (<i>Nēnē</i>)	<i>Branta sandvicensis</i>	EE	3.13
GALLIFORMES			
PHASIANIDAE - Pheasants & Partridges			
Phasianinae - Pheasants & Allies			
Grey Francolin	<i>Francolinus pondicerinaus</i>	A	1.50
Red Junglefowl	<i>Gallus gallus</i>	A	6.50
Phasianinae (continued)			
Kalij Pheasant	<i>Lophura leucomelanos</i>	A	0.50
Ring-necked Pheasant	<i>Phasianus colchicus</i>	A	0.13
SULIFORMES			
FREGATIDAE - Frigatebirds			
Great Frigatebird	<i>Fregata minor</i>	IS	1.50
CICONIIFORMES			
ARDEIDAE - Herons, Bitterns & Allies			
Cattle Egret	<i>Bubulcus ibis</i>	A	0.25
Black-crowned Night-Heron	<i>Nycticorax nycticorax hoactli</i>	IR	I-1
CHARADRIIFORMES			
CHARADRIIDAE - Lapwings & Plovers			
Charadriinae - Plovers			
Pacific Golden-Plover	<i>Pluvialis fulva</i>	IM	0.13
COLUMBIFORMES			
COLUMBIDAE – Pigeons & Doves			
Spotted Dove	<i>Streptopelia chinensis</i>	A	0.50
Zebra Dove	<i>Geopelia striata</i>	A	1.75

Table 2 (continued).

Common Name	Scientific Name	ST	RA
PASSERIFORMES			
CETTIIDAE - Cettia Warblers & Allies			
Japanese Bush-Warbler	<i>Cettia diphone</i>	A	1.88
ZOSTEROPIDAE - White-eyes			
Japanese White-eye	<i>Zosterops japonicus</i>	A	9.50
TIMALIIDAE – Babblers			
Hwamei	<i>Garrulax canorus</i>	A	1.00
Red-billed Leiothrix	<i>Leiothrix lutea</i>	A	1.88
TURDIDAE - Thrushes			
White-rumped Shama	<i>Copsychus malabaricus</i>	A	1.38
MIMIDAE - Mockingbirds & Thrashers			
Northern Mockingbird	<i>Mimus polyglottos</i>	A	0.38
STURNIDAE – Starlings			
Common Myna	<i>Acridotheres tristis</i>	A	3.25
EMBERIZIDAE – Emberizids			
Red-crested Cardinal	<i>Paroaria coronata</i>	A	0.25
CARDINALIDAE – Cardinals Saltators & Allies			
Northern Cardinal	<i>Cardinalis cardinalis</i>	A	1.25
ICTERIDAE - Blackbirds			
Western Meadowlark	<i>Sturnella neglecta</i>	A	3.13
FRINGILLIDAE – Fringilline And Cardueline Finches & Allies			
Carduelinae – Carduline Finches			
House Finch	<i>Carpodacus mexicanus</i>	A	5.50
ESTRILDIDAE – Estrildid Finches			
Estrildinae – Estrildine Finches			
Nutmeg Mannikin	<i>Lonchura punctulata</i>	A	1.13
Java Sparrow	<i>Padda oryzivora</i>	A	0.25

Key to Table 2.

- ST** Status
- EE** Endangered Endemic species – Endangered native and unique to Hawai‘i species
- A** Alien species – Introduced to Hawai‘i by humans, and have become established in the wild
- IR** Indigenous Resident – Native breeding species also found elsewhere naturally
- IS** Indigenous Seabird – Native seabird species also found elsewhere naturally
- IM** Indigenous Migratory species – native migratory species does not breed in Hawai‘i
- RA** Relative Abundance: Number of birds detected divided by the number of count stations (8)
- I-** Incidental Observation – a species recorded while transiting the site, and not recorded during station counts followed by the number recorded

Mammals

Three mammalian species were detected during the course of this survey. Tracks, sign and cast of items of humans (*Homo s. sapiens*) were encountered throughout the site. We heard numerous dogs (*Canis f. familiaris*) barking from residences to the west of the study site; additionally, dog tracks and sign were encountered in numerous locations within the site. Pig (*Sus s. scrofa*) tracks, sign, and scat were encountered on the property, especially within the thickly vegetated gulch, which runs along the southwest side of the site; two pigs were seen in the gulch.

Discussion

Botanical Resources

The past history of this site entailed removal of the original vegetation for agricultural activities. On lowland Kauai—as is the case generally in the Hawaiian Islands—reversion to a secondary forest following cessation of agricultural uses seldom involves any significant inclusion of native species. With the exception of the gulch, all of the trees on the site appear to have come in over the last couple dozen years and have no significance botanically. The trees in the gulch may be somewhat older, but again have no particular tie to the Hawaiian Islands or its culture.

Avian Resources

The findings of the avian survey are consistent with the location of the property, and the habitat present on the site. Four of the 24 avian species detected during the course of this survey: *Nēnē*, Great Frigatebird, Pacific Golden-Plover, and Black-crowned Night-Heron are native to the Hawaiian Islands. *Nēnē*, is listed as endangered species under both state and federal endangered species statutes. We recorded a total of 25 individual *Nēnē* over-flying the site. The *Nēnē* population on Kaua‘i is increasing at a fairly rapid pace and if this increase continues, human/*Nēnē* interactions will increase on the Island over time.

A relatively large number of Great Frigatebird were seen soaring over the site and the adjacent Sea Cliff Plantation Subdivision. Great Frigatebird is an indigenous seabird species which nests in the Leeward Islands, and is relatively common in and around the Kīlauea Point National Wildlife Refuge. We recorded one Pacific Golden-Plover flying over the site during station counts; this species is an indigenous migratory shorebird that nests in the high Arctic during the late spring and summer months, returning to Hawai‘i and the tropical Pacific to

spend the fall and winter months each year. The species usually leaves Hawaiʻi for the trip back to the Arctic in late April or the very early part of May each year.

One Black-crowned Night-Heron was flushed from within the thickly vegetated gulch on the site. Night heron is an indigenous resident breeding waterbird species commonly found in association with just about any form of standing or running fresh water on the Island, although the gulch in this case lacks a stream. The remaining 18 avian species detected during this survey are all considered to be alien to the Hawaiian Islands.

Waterbirds – Presently, there is no suitable wetland habitat on the subject property that would attract any of the five endangered waterbird species found in the lowlands of Kauaʻi. Following development of the agricultural park, it is probable that *Nēnē* will be attracted onto the property by leafy vegetables. The development of an open irrigation reservoir may also be expected to attract Hawaiian Duck (*Anas wyvilliana*), Common Moorhen (*Gallinula chloropus sandvicensis*), Hawaiian Coot (*Fulica alai*), and possibly Black-necked Stilt (*Himantopus mexicanus knudseni*) onto the site. All of these species are listed as endangered under both federal and state endangered species statutes.

Seabirds - Two other species not detected during this survey—Hawaiian Petrel (*Pterodroma sandwichensis*) and the threatened endemic sub-species of the Newell’s Shearwater (*Puffinus auricularis newelli*)—have been recorded over-flying the project site between April and the end of November each year (David, 1995; Morgan, et al., 2003, 2004; David and Planning Solutions, 2008). Additionally, the Save Our Shearwaters Program has recovered both species from the general area on an annual basis over the past three decades (Morgan, et al., 2003, 2004; David and Planning Solutions, 2008; DOFAW, 2009).

The petrel is listed as endangered, and the shearwater as threatened under both federal and state endangered species statutes. The primary cause of mortality in both Hawaiian Petrel and Newell’s Shearwater is thought to be predation by alien mammalian species at the nesting colonies (USFWS, 1983; Simons and Hodges, 1998; Ainley, et al., 2001). Collision with man-made structures is considered to be the second most significant cause of mortality of these seabird species in Hawaiʻi. Nocturnally flying seabirds, especially fledglings on their way to sea in the summer and fall, can become disoriented by exterior lighting. When disoriented, seabirds often collide with manmade structures, and if they are not killed outright, the dazed or injured birds are easy targets of opportunity for feral mammals (Hadley, 1961; Telfer, 1979; Sincock, 1981; Reed, et al., 1985; Telfer, et al., 1987; Cooper and Day, 1994; Podolsky, et al., 1998; Ainley, et al., 2001).

There are no nesting colonies nor appropriate nesting habitat for either of these listed seabird species within the current study site. There are nesting Newell’s Shearwaters within the Kīlauea Point National Wildlife Refuge, with the next closest colonies located at the back of Limahuli, Wainiha, Lumaha‘i, and probably Hanalei valleys (David, et al., 2002; DOFAW, 2009). Currently the closest Hawaiian Petrel nesting colonies are also located at the back of Limahuli, Wainiha, Lumaha‘i, and probably Hanalei valleys.

In addition to the two listed seabird species discussed above, a number of indigenous seabird species protected under the federal Migratory Bird Treaty Act utilize resources of one type or another along the north coastline of Kaua‘i. Several of these, including the seven species listed in Table 3, nest within the refuge and at locations along the coastline in the general project area. None is believed to utilize the project site.

Table 3. MBTA Protected seabirds nesting in the general project area.

Common Name	Taxonomy
	PROCELLARIIFORMES
	DIOMEDEIDAE – Albatrosses
Laysan Albatross	<i>Phoebastria immutabilis</i>
	PROCELLARIIDAE - Shearwaters & Petrels
Bulwer’s Petrel	<i>Bulweria bulwerii</i>
Wedge-tailed Shearwater	<i>Puffinus pacificus</i>
	PHAETHONIFORMES
	PHAETHONTIDAE – Tropicbirds
White-tailed Tropicbird	<i>Phaethon lepturus</i>
Red-tailed Tropicbird	<i>Phaethon rubricauda</i>
	SULIFORMES
	SULIDAE – Boobies
Brown Booby	<i>Sula leucogaster</i>
Red-footed Booby	<i>Sula sula</i>

Mammalian Resources

The findings of the mammalian survey are consistent with the location of the property and the habitats present on the site. All three mammalian species detected during the course of this survey are alien to the Hawaiian Islands. Although no Hawaiian hoary bats were detected during the survey, bats have been recorded on a regular basis foraging for insects within the general project

area (David, 2010). Hawaiian hoary bat is widely distributed in lowland areas on the Island of Kauaʻi, and has been documented in and around almost all areas that still have some dense vegetation (Tomich, 1986; USFWS, 1998; David, 2010).

Although no rodents were detected during the course of this survey, it is likely that the four established alien Muridae found on Kauaʻi—roof rat (*Rattus r. rattus*), Norway rat (*Rattus norvegicus*), European house mouse (*Mus musculus domesticus*), and Polynesian rat (*Rattus exulans hawaiiensis*)—use various resources found within the general project area. All of these introduced rodents are deleterious to native ecosystems and native species dependent on them. No mammalian species protected or proposed for protection under either the federal or state endangered species programs were detected during the course of this survey (DLNR, 1998, USFWS, 2005a, 2005b, 2010).

Potential Impacts to Protected Species

Botanical Resources

No plants currently listed, or proposed for listing under either the federal or state endangered species programs (DLNR, 1998; USFWS, 2005, 2010) were noted during the course of the botanical survey.

Nēnē

The potential impacts that development and operation of an agricultural park poses to *Nēnē* are those which could arise when these birds are attracted onto the site by agricultural crops. These birds would then be at risk of harm from farming activities, vehicular traffic, etc. *Nēnē* have become a nuisance on many farms on Kauaʻi over the past five or six years.

Other Listed Waterbird Species

The development and operation of an in-ground irrigation reservoir may attract Hawaiian Duck, Common Moorhen, Hawaiian Coot and Black-necked Stilts onto the site. These birds may also be placed at risk by farming activities, vehicular traffic, etc.

Hawaiian Petrel and Newell's Shearwater

The principal potential impact that the development of the site poses to Hawaiian Petrels and Newell's Shearwaters is the increased threat that birds will be downed after becoming disoriented by outdoor lighting associated with

night-time construction activity and, following build-out, with exterior lighting associated with structures and appurtenances built on the property.

MBTA Protected Seabird Species

Potential impacts to MBTA protected seabird species posed by the project are the same as those posed to the two listed seabird species discussed in the preceding paragraph.

Hawaiian Hoary Bat

The principal potential impact that the proposed development poses to Hawaiian hoary bats would occur during the clearing and grubbing phase. Areas that currently support dense trees are likely used to some degree by roosting bats. Normally it is not thought that availability of roosting habitat is a limiting factor in this species' survival (Bonaccorso, 2009). The threat that clearing potential roosting habitat poses to the species occurs mostly between May and July when female bats may be carrying pups and may not be able to flee clearing activity quickly enough to avoid harm (Bonaccorso, 2005, 2007, 2009). Following build-out of the project, lighting associated with the agricultural lots and plantings of fruiting trees will attract volant insects to the site, which in turn will provide bats with additional foraging opportunity.

Critical Habitat

There is no federally delineated Critical Habitat encompassing this project site or areas adjacent. Thus the development of the site will not result in impacts to federally designated Critical Habitat. There is no equivalent statute under state law.

Recommendations

- If nighttime work is required in conjunction with development of the project, it is recommended that lights be shielded to reduce adverse interactions of nocturnally flying Hawaiian Petrels, Newell's Shearwaters, and seabirds protected under the MBTA with external lights and man-made structures (Reed, et al. 1985; Telfer, et al., 1987).
- If there is exterior lighting associated with the operation of the agricultural park, these lights must be shielded to reduce adverse interactions of nocturnally flying seabirds with external lights and man-made structures (Reed, et al., 1985; Telfer, et al., 1987).

- It is recommended that woody vegetation taller than 15 ft in height not be cleared during initial grubbing of the site if scheduled between May 15 and July 15, when bats may be carrying young and potentially put at risk by tree clearing.
- If following development of the farm lots and associated irrigation features any of the five endangered waterbird species present in the lowlands of Kauaʻi are attracted to the site, consultation with the State Division of Forestry and Wildlife should be initiated; the goal to be development of management options and plans to ensure that ongoing operations do not result in adverse impacts to any of these species.

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Appendix D

Traffic Assessment of the Proposed Kīlauea Agricultural Park
Kīlauea, Kaua‘i, Hawai‘i
Julian Ng, Inc., March 4, 2011

**Traffic Assessment of the Proposed
Kilauea Agricultural Park
Kilauea, Kauai, Hawaii**

March 4, 2011

Prepared for:

R. M. Towill Corporation



THIS WORK WAS PREPARED BY
ME OR UNDER MY SUPERVISION


Signature

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**Traffic Assessment of the Proposed
Kilauea Agricultural Park
Kilauea, Kauai, Hawaii**

March 4, 2011

Summary

A master plan has been developed for an agricultural park at Kilauea on the south shore of Kauai (Figure 1). The plan will subdivide a vacant parcel of land for agricultural use. The master plan will be in use almost immediately upon approvals, but will be developed over a period of up to 15 years.

A traffic assessment was conducted to identify the potential impact due to the proposed agricultural park. The assessment has found that the project traffic impacts will not be significant. The largest traffic volumes due to the project would occur during the hours a proposed farmers' market on a portion of the site is in operation. Traffic volumes on Kilauea Road will increase noticeably, but conditions will remain at acceptable levels.

Since the site provided within the project will provide a permanent venue for the market that currently operates elsewhere in Kilauea, traffic impacts of that operation on conditions on Kuhio Highway will be minimal.

Vehicular Access and Existing Traffic Conditions

Figure 2 shows the immediate vicinity of the project site. The project is located east of Kilauea Road, a two-lane County roadway that runs from Kolo Road through the village of Kilauea to the Kilauea Lighthouse. Kolo Road is a two-lane County road that parallels Kuhio Highway for about one mile and provides access to properties and other local streets in Kilauea. Kolo Road turns to connect to the highway at its west end; two other roads (Hookui Road and Pili Road) also link Kolo Road and the highway. A separate left turn lane is provided for eastbound traffic on the highway turning into Kolo Road; however, left turn lanes are not provided at the other two intersections.

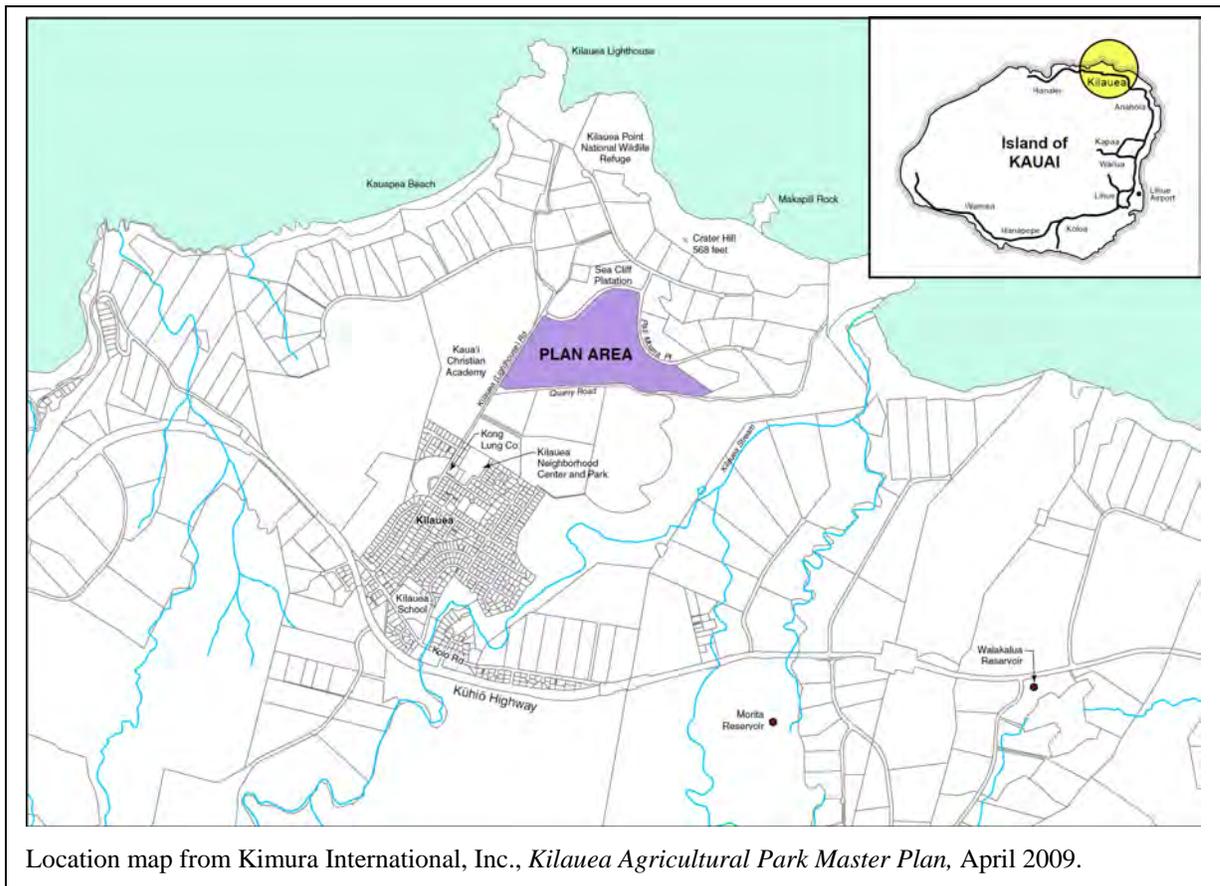


Figure 1 – Project Location

Machine counts are taken as part of a regular counting program for the State Highways Division; the reports for year 2008 include counts taken at two locations on Kuhio Highway near Kilauea. A continuous counting station is located 800 feet northwest of Kolo Road, and a two-day count was taken on April 22-23, 2008 between the Kolo Road and Hookui Road intersections. Table 1 shows the averages (to the nearest 5 vehicles) of the data from the counts taken in 2008 at latter location. The continuous count station recorded data from mid-March to the end of the year, with an average weekday total volume of 13,314 vehicles per day.

Table 1 – Traffic Count Data from State Highways Division

	24-hour total, (vehicles per day)	AM Peak Hour (vehicles per hour)	PM Peak Hour (vehicles per hour)
Kuhio Highway, between Hookui Road & Kuawa Road (April 22, 2008)			
Westbound	6,601	522	444
Eastbound	6,642	431	756
Total two-way	13,243	953	1,200
Kuhio Highway, between Hookui Road & Kuawa Road (April 23, 2008)			
Southbound	6,626	546	441
Northbound	6,573	412	707
Total two-way	13,199	958	1,148
Source: State of Hawaii, Department of Transportation, Highways Division. <i>Hawaii DOT Traffic Station Maps 2008 (CD)</i> .			

While no count data from county roads were obtained, highest volumes are estimated to be no more than 25% of the volumes on the highway. Daily volumes would be less than 3,500 vehicles per day and peak hour volumes would be about 300 vehicles per hour (total in two directions).

Traffic Impact of Proposed Project

The proposed project will provide new properties for agricultural use as shown in Figure 2.

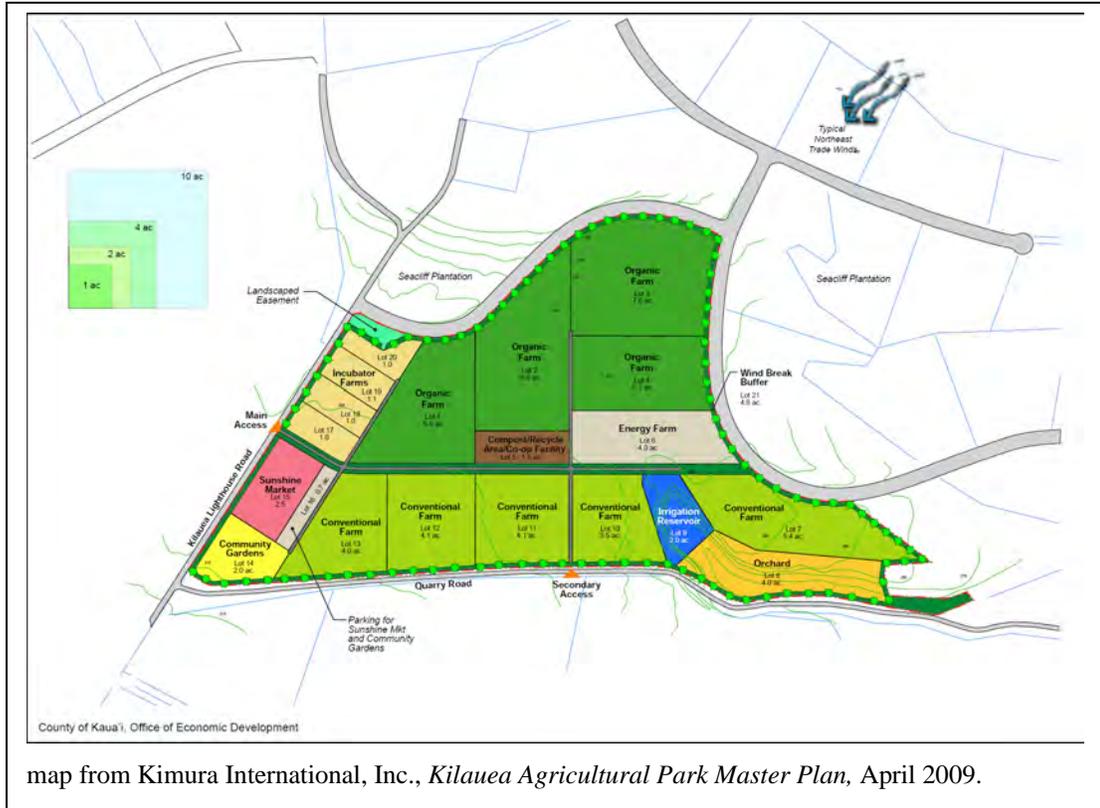


Figure 2 – Proposed Site Plan

The everyday traffic due to this new use is estimated using trip rates compiled by the Institute of Transportation Engineers and published in the *Trip Generation* manual. Rates from this manual are commonly used in traffic studies. While there are various land use categories available, none are clearly applicable for the proposed use. However, the published trip rates for “Wholesale Nursery” from *Trip Generation* was considered to be the best available. Rates were applied to the acreage for the farm lots and community gardens (total 56.3 acres) and trip estimates based on those rates are shown in Table 2.

The typical day project traffic impact would be minimal. The highest hourly impact is less than 35 vehicles per hour in the both directions, considerably less than a published criterion* of 100 vehicles per hour for a significant traffic impact.

* – Institute of Transportation Engineers, *Transportation Impact Analyses for Site Development*. Washington, D.C., 2005

Table 2 – Trip Generation Estimate

	Trip rates * (per acre)		For 56.3 acres	
	Trip rate	% entering	enter	exit
Average Weekday	19.50	50%	550	550
AM Peak Hour of adjacent street	0.26	n.a.	15	
AM Peak Hour of generator	0.34	43%	8	11
PM Peak Hour of adjacent street	0.45	n.a.	25	
PM Peak Hour of generator	0.53	n.a.	30	
Saturday	3.11	50%	90	90
Peak Hour	0.58	n.a.	33	
Sunday	2.20	50%	60	60
Peak Hour	0.50	n.a.	28	
* Source: Institute of Transportation Engineers. <i>Trip Generation, 8th Edition.</i> n.a. = not available				

The project also includes a 2.5-acre site for the Sunshine Market, a farmers’ market that currently operates in Kilauea. While this use will have a negligible effect on traffic conditions on the highway, since it is an existing use relocated from elsewhere within Kilauea, there could be localized impacts at the intersection of the site access road and Kilauea Road. The site includes a 0.7-acre lot for parking that will accommodate approximately 75 cars. Assuming 20% of the cars belong to vendors, 80% would be available for shoppers. Peak hour traffic based on full occupancy of the parking lot and a half-hour average stay by shoppers, a volume of 120 vehicles per hour in each direction would be generated.

A capacity analysis of the intersection of the site access road and Kilauea Road was done using the procedure described in the *Highway Capacity Manual*, which determines capacities, average delays, and levels of service for each controlled movement at an unsignalized intersection. The “level of service” is a qualitative description of traffic conditions used by traffic engineers, and are based average delay:

Average Delay (seconds per vehicle)	General Description of Delay	Level of Service (LOS)
≤ 10	Little or no delay	A
> 10 and ≤ 15	Short traffic delays	B
> 15 and ≤ 25	Average traffic delays	C
> 25 and ≤ 35	Long traffic delays	D
> 35 and ≤ 50	Very long traffic delays	E
>50	Very long traffic delays	F

Peak hour Level of Service (LOS) C is considered desirable and LOS D is acceptable. For a peak hour with 140 vehicles (120 for the market and 20 for the remainder of the park) arriving and a similar number leaving the project site, non-site traffic volumes can be as high as 600 vehicles per hour on Kilauea Road with LOS C conditions for the left turns out of the project roadway (LOS D for up to 750 vehicles per hour of non-site traffic). These volumes are considerably higher than the maximum 300 vehicles per hour estimated on the local roadways in Kilauea.

Conclusions

The proposed agricultural park will not have any significant impacts to traffic conditions in Kilauea or on Kuhio Highway. While traffic volumes on Kilauea Road will increase when the Sunshine Market moves from its current location within Kilauea to the new site in the agricultural park, estimates of the traffic volumes indicate that a simple unsignalized intersection with Kilauea Road would be adequate to serve peak hour volumes at acceptable levels of service.

Appendix E

Applicant Certification Clause

k. Industrial or manufacturing operation?

If any of the above operations ever occurred at the site, and if appropriate cleanup or other mitigation actions were performed in accordance with the local, State, and federal laws, please attach documentation of these actions.

2. Do wells draw water from an underlying aquifer to provide the local domestic water supply?

Yes No

3. Has a federal, State, or local regulatory authority ever conducted an environmental assessment, environmental impact statement, or a preliminary assessment/site inspection, or similar environmental surveyor inspection report at the site? If yes, please attach copies of these reports or results.

Yes No

4. Have any environmental or OSHA citations or notices of violation been issued to a facility at the site? If yes, please attach copies.

Yes No

5. Have any unauthorized releases of hazardous substances occurred at any facility at the site which resulted in notification of the EDA's National Response Center?

Yes No

6. Is any material containing asbestos located at the site? If yes, please attach information concerning State and federal regulatory compliance.

Yes No

7. Is there any equipment (electrical transformers, etc.) containing polychlorinated biphenyls (PCB) on the site? If yes, please attach a description of the equipment.

Yes No

8. Are there underground storage tanks on the site? If yes, please attach a detailed description, including the number of underground storage tanks on the site, whether the tanks have been inspected (or removed) and the results of such inspections.

Yes No

9. Has the site been tested for radon? If yes, please attach results.

Yes No

10. Have there been or are there now any environmental investigations by federal, State or local government agencies that could affect the site in question? If yes, please attach available information.

___ Yes

___ No

The applicant acknowledges that this certification regarding hazardous substances and/or waste is a material representation of fact upon which EDA relies when making and executing an award. EDA reserves the right to terminate any award made in conjunction with the representations contained herein if, at any time during the useful life of the project, EDA becomes aware of the presence of hazardous materials or waste at the site, or that hazardous materials or waste have been inappropriately handled thereon.

Further, if it is determined at any time that the presence of hazardous materials or waste, or handling thereof, has been misrepresented, EDA may pursue other available legal remedies against the applicant.

Applicant Name _____

Name and title of applicant's authorized representative _____

Signature of applicant's authorized representative _____

Date signed _____

Appendix F

Energy Park Concept Plan
Insynergy Engineering, Inc., 2011

Appendix G

Archaeological Inventory Survey
Kīlauea Agricultural Park Project
Kīlauea Ahupua‘a, Hanalei District, Kaua‘i
Cultural Surveys Hawai‘i, Inc., 2011

**Archaeological Inventory Survey for the
75-Acre Kīlauea Agricultural Park Project,
Kīlauea Ahupua‘a, Hanalei District, Kaua‘i Island
TMK: [4] 5-2-004:099**

**Prepared for
R. M. Towill Corporation**

**Prepared by
Ena Sroat, B.A.,
David W. Shideler, M.A.,
and
Hallett H. Hammatt, Ph.D.**

**Cultural Surveys Hawai‘i, Inc.
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(Job Code: KILAUEA 3)**

December 2010

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Management Summary

Reference	Archaeological Inventory Survey for the 75-Acre Kīlauea Agricultural Park Project, Kīlauea Ahupua'a, Hanalei District, Kaua'i Island, TMK: [4] 5-2-004:099
Date	December 2010
Project Number (s)	Cultural Surveys Hawai'i, Inc. (CSH) Job Code: KILAUEA 3
Investigation Permit Number	The fieldwork component of the archaeological inventory survey was carried out under archaeological permit number 10-10 issued by the Hawai'i State Historic Preservation Division/Department of Land and Natural Resources (SHPD/DLNR), per Hawai'i Administrative Rules (HAR) Chapter 13-282.
Project Location	The Kīlauea Agricultural Park Project is located at the juncture of Kīlauea Lighthouse Road and Quarry Road, approximately 1100 ft northeast of Kīlauea Town and 1200 ft southeast of Crater Hill. The project area consists of a 75-acre parcel of predominantly level tableland with a natural drainage gulch in the southeastern corner. The project area is depicted on the U.S. Geological Survey 7.5-Minute Series Topographic Map, Anahola Quadrangle (1996).
Land Jurisdiction	County of Kaua'i
Agencies	State Historic Preservation Division / Department of Land and Natural Resources (SHPD/DLNR)
Project Description	Proposed development within the project area includes: grading and grubbing for the creation of agricultural lots, a composting and recycling area, energy farm, and community gardens and market; development of a 4,000 linear foot network of unpaved gravel roads and parallel drainage system; development of a 0.7-acre public parking lot comprised of 74 stalls; construction of windbreaks along the project area perimeter; and the construction of an irrigation reservoir located within the upper portion of the gulch.
Project Acreage	75 acres
Area of Potential Effect (APE) and Survey Acreage	Based on the conceptual plan map provided by the County of Kaua'i, the area of potential effect (APE) is considered to be the entire 75-acre project area.
Historic Preservation Regulatory Context	This document was prepared to support the proposed project's historic preservation review under Hawai'i Revised Statutes (HRS) Chapter 6E-8 and Hawai'i Administrative Rules (HAR) Chapter 13-13-275. In consultation with the Hawai'i State Historic Preservation Division (SHPD), the archaeological inventory survey investigation was designed to fulfill the State requirements for an archaeological inventory survey per HAR Chapter 13-13-276.

Archaeological Inventory Survey for the Kilauea Agricultural Park Project, Kīlauea Ahupua'a, Hanalei District, Kaua'i

Fieldwork Effort	The fieldwork component of the archaeological inventory survey was conducted between October 14 - November 12, 2010 by two CSH archaeologists, Gerald Ida, B.A. and Missy Kamai, B.A., under the general supervision of Hallett H. Hammatt, PhD. The fieldwork required approximately 22 person-days, or 178 hours, to complete.
Number of Historic Properties Identified	Four historic properties, comprised of five archaeological features, were documented within the project area.
Historic Properties Recommended Eligible to the Hawai‘i Register of Historic Places (Hawai‘i Register)	<p>SIHP # 50-30-04-2123, a historic habitation terrace, recommended Hawai‘i Register-eligible under Criterion D.</p> <p>SIHP # 50-30-04-2124, a historic, likely plantation-era concrete wall and concrete foundation structure, recommended Hawai‘i Register-eligible under Criterion D.</p> <p>SIHP # 50-30-04-2125, a pre-contact agricultural terrace, recommended Hawai‘i Register-eligible under Criterion D.</p> <p>SIHP # 50-30-04-2126, a historic drainage ditch, recommended Hawai‘i Register-eligible under Criterion D.</p>
Historic Properties Recommended Ineligible to the Hawai‘i Register	None
Effect Recommendation	<p>The archaeological inventory survey investigation identified four historic properties within the southeastern gulch of the project area. No historic properties were identified within the tableland portion of the project area previously utilized for sugarcane production. The four historic properties within the gulch will likely, or potentially, be affected by the proposed orchard lot and irrigation reservoir.</p> <p>CSH’s project-specific effect recommendation is “effect, with proposed mitigation commitments.”</p>

Mitigation Recommendation	<p>Each of the four historic properties identified in the gulch portion of the project area was documented with detailed written descriptions, photographs, and accurately located with GPS survey equipment. Scale drawings were made of all historic properties, and limited subsurface testing was conducted at SIHP # 50-30-04-2123, -2124 and -2125. Sufficient information regarding the location, function, age, and construction methods of the four historic properties has been generated by the current inventory survey investigation to mitigate any adverse effect caused by proposed development activities. No further work is recommended for SIHP #s 50-30-04-2123, -2124, -2125, and -2126. If, in the unlikely event, that intact cultural resources and/or human skeletal remains are encountered during the course of development activities, all work in the immediate area should stop and the on-call archaeological monitoring firm promptly notified.</p>
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 Claimant Name: A-14

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Section 1 Introduction

1.1 Project Background

At the request of R. M. Towill Corporation, Cultural Surveys Hawai'i, Inc. (CSH) completed an archaeological inventory survey for the planned 75-acre Kīlauea Agricultural Park Project, Kīlauea Ahupua'a, Hanalei District, Kaua'i Island (TMK [4] 5-2-004:099). The 75-acre land parcel was conveyed to the County of Kaua'i in 2006 by the developer of the Seacliff Plantation subdivision as a condition of development. The project area is located at the juncture of Kīlauea Lighthouse Road and Quarry Road, approximately 1100 ft northeast of Kīlauea Town and 1200 ft southeast of Crater Hill (Figure 1, Figure 2, Figure 3).

The Kīlauea Agricultural Park is a County resource to be developed for the purpose of sustaining and supporting agricultural production in perpetuity for the citizens of Kaua'i. Present plans call for farm lots to occupy a total of 54.3 acres or 72.4% of the entire agricultural park. Present plans anticipate four organic farm lots of between 5.1 and 7.6 acres, five conventional farm lots ranging in size from 3.5 to 5.4, four incubator lots, approximately 1-acre each, for start-up farmers, and an orchard within the gulch area in the southeast corner of the project lands, in the location of a remnant banana farm. Additionally, the plan provides for an energy farm, irrigation reservoir, composting and recycling area, community gardens, and market area (Figure 4). Infrastructure will include a network of interior roads, a public parking lot and perimeter windbreak/buffers. The extreme northern and eastern portions of the project area lie within the boundary of the Special Management Area (SMA). The SMA is that portion of the coastal zone designated for more intensive land use management pursuant to Section 205A-2, HRS. Because portions of the agricultural park are located within the SMA boundary, an SMA permit is required. The Planning Commission is the approving authority in the County of Kaua'i.

This document was prepared to support the proposed project's historic preservation review under Hawai'i Revised Statutes (HRS) Chapter 6E-42 and Hawai'i Administrative Rules (HAR) Chapter 13-284. In consultation with the Hawai'i State Historic Preservation Division (SHPD), the archaeological inventory survey investigation was designed to fulfill the State requirements for an archaeological inventory survey per HAR Chapter 13-13-276.

1.2 Scope of Work

The archaeological inventory survey and its accompanying report documented all historic properties within the project area. The following scope of work satisfies State and County requirements for an archaeological inventory survey [per HAR 13-13-276]:

1. Consultation with knowledgeable community members as part of the inventory survey process. This consultation required contacting knowledgeable members of the community and requesting information on historic and cultural issues related to the property.
2. A complete ground survey of the project area for the purpose of historic property identification and documentation. Historic properties were located, described, and mapped with evaluation of function, interrelationships, and significance. Documentation

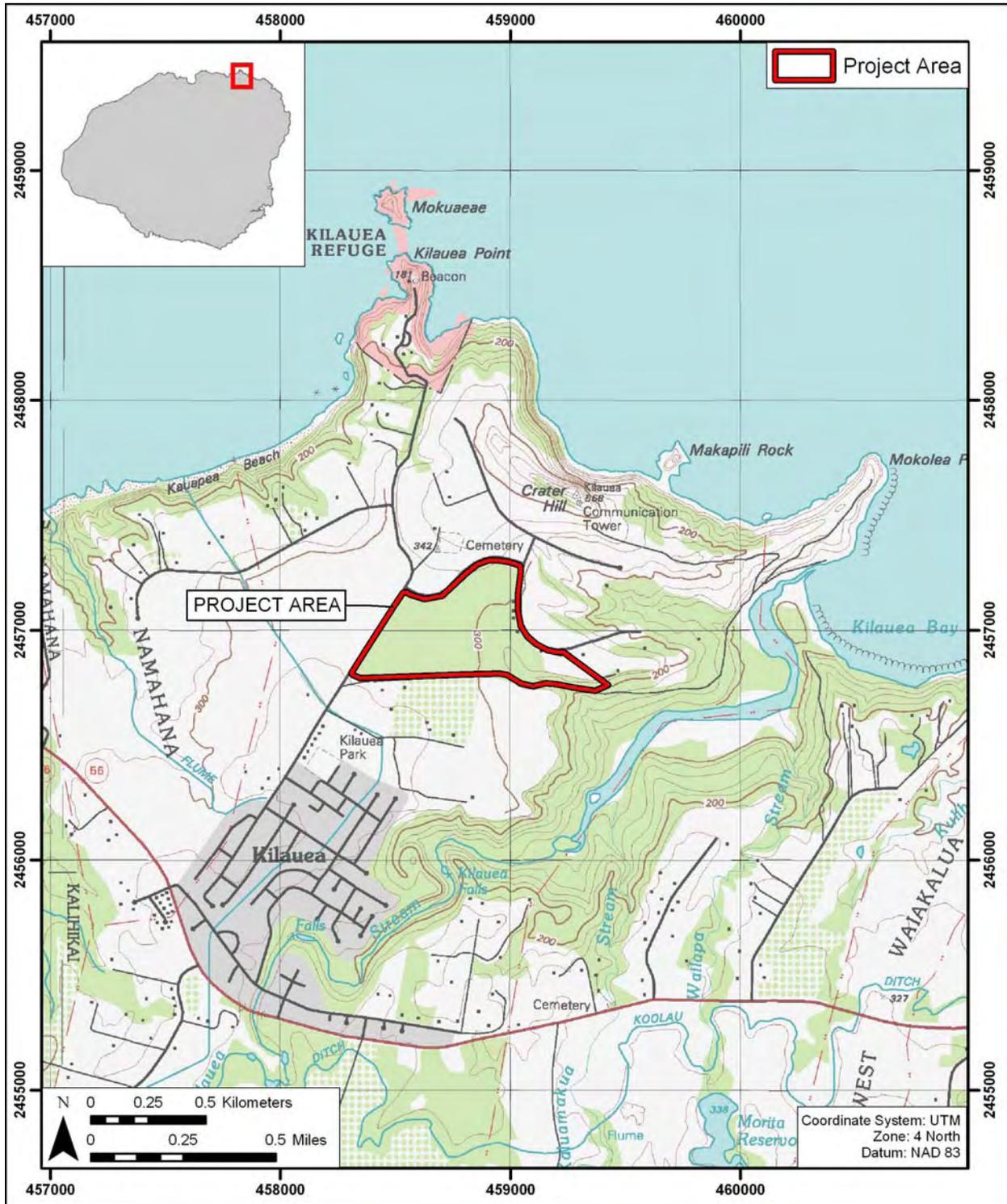


Figure 1. U.S. Geological Survey 7.5 Minute Series Topographic Map, Anahola Quadrangle (1996), showing the location of the project area

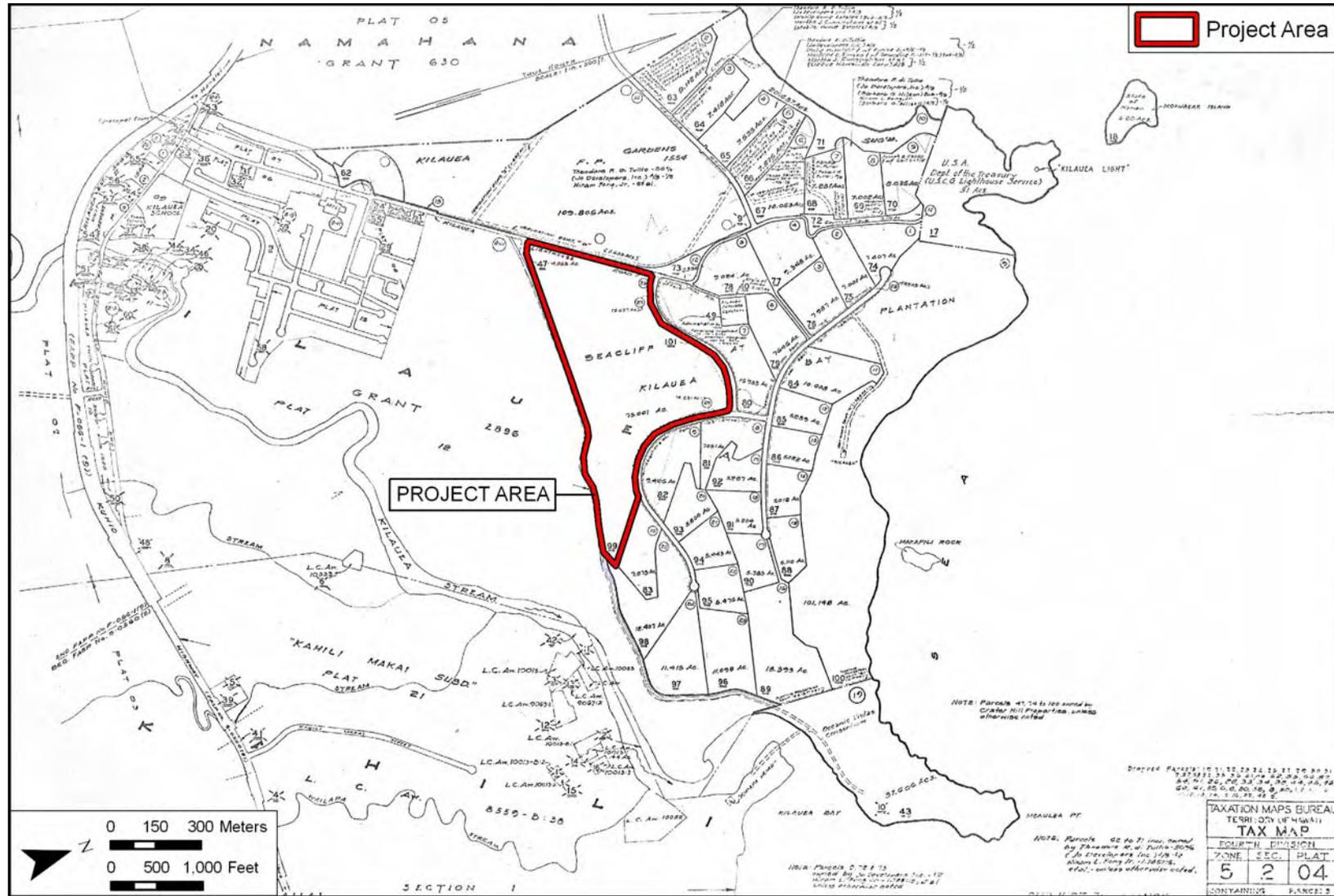


Figure 2. Tax Map Key (TMK) 5-2-014, showing the location of the project area

Archaeological Inventory Survey for the Kilauea Agricultural Park Project, Kilauea Ahupua'a, Hanalei District, Kaua'i

TMK: [4] 5-2-004:099



Figure 3. Aerial photograph (source: Google Earth 2010) showing the location of the project area

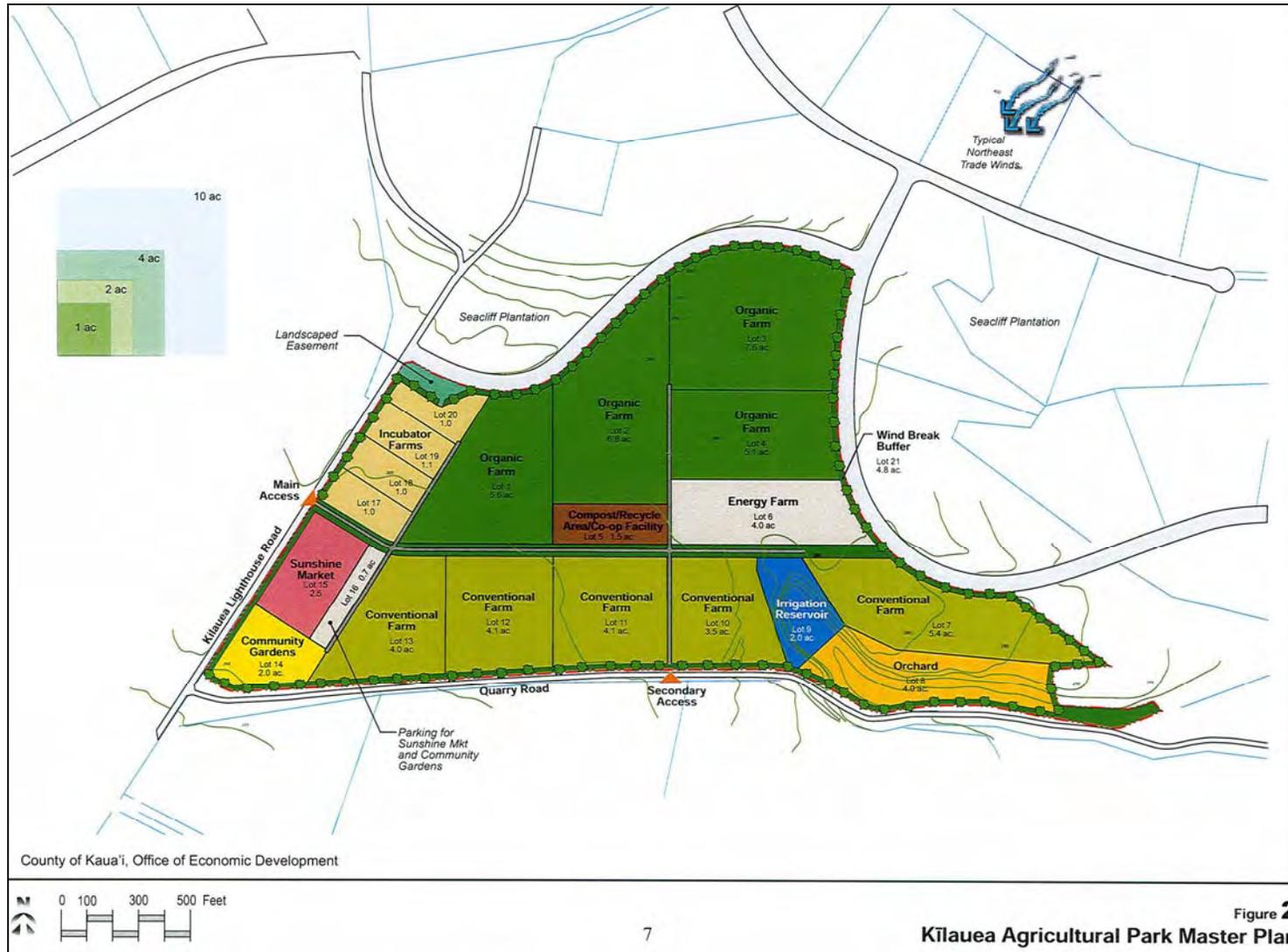


Figure 4. Kīlauea Agricultural Park Master Plan

included photographs and scale drawings of selected historic properties. All historic properties were assigned State Inventory of Historic Properties (SIHP) numbers. All historic properties were also located with GPS survey equipment.

3. Limited subsurface testing to determine if subsurface deposits were located in archaeological sites within the project area, and, if so, evaluate their significance. Samples from these excavations may be analyzed for chronological information.
4. Research on historic and archaeological background, including search of historic maps, written records, and Land Commission Award documents. This research focused on the project area with general background on the *ahupua'a* and district, and emphasizes settlement patterns.
5. Preparation of this inventory survey report including the following:
 - a. A topographic map of the survey area showing the locations of all historic properties;
 - b. Results of consultation with knowledgeable community members about the property and its historical and cultural issues;
 - c. Description of all historic properties with selected photographs, scale drawings, and discussions of function;
 - d. Historical and archaeological background sections summarizing pre-contact and historic land use as they relate to the project area's historic properties;
 - e. A summary of historic property categories and their significance in an archaeological and historic context;
 - f. Recommendations based on all information generated that will specify what steps should be taken to mitigate impact of development on the project area's significant historic properties. These recommendations were developed in consultation with the client and the State agencies.

This scope of work also includes full coordination with the State Historic Preservation Division (SHPD), and the County of Kaua'i relating to archaeological matters. This coordination takes place after consent of the landowner or representatives.

1.3 Environmental Setting

1.3.1 Natural Environment

The project area includes mostly relatively flat tableland at about 300 ft. elevation (varying from about 308 ft. to 281 ft. AMSL but the east portion of the south side is a tributary gulch of the Kīlauea Stream Valley dropping down to approximately 200 ft. AMSL. Soils within the tributary gulch are primarily of Rough Broken Land (rRR) (Figure 5). Rough Broken Land is described as:

very steep land broken by numerous intermittent drainage channels. In most places it is not stony...Runoff is rapid and geologic erosion is active. These soils are variable. They are 20 to more than 60 inches deep over soft, weathered rock.

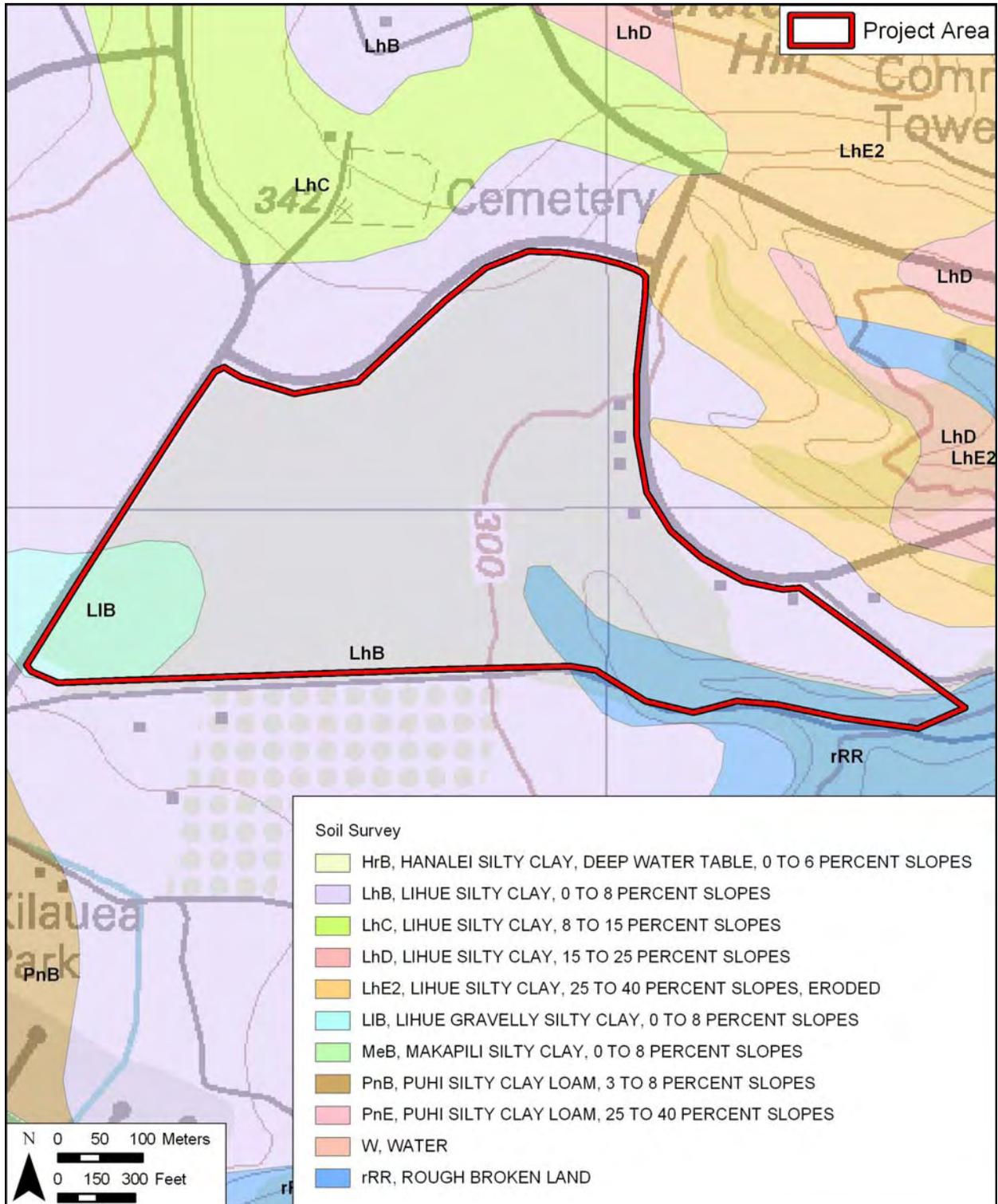


Figure 5. Overlay of Soil Survey of the State of Hawai'i (Foote et al. 1972), indicating soil types within the project area

In most places some weathered rock fragments are mixed with the soil material. Small areas of rock outcrop, stones, and soil slips are common. [Foote et al. 1972]

The vast majority of the project area, however, is Lihue Silty Clay (LhD) with a small pocket of Lihue Gravelly Silty Clay (LIB) in the southwest corner. Soils of the Lihue Series are described as “well-drained soils on uplands...developed in material weathered from basic igneous rock” (Foote et al. 1972).

The project area is indicated to receive approximately 1500-1800 mm (60-70 in.) of annual rainfall, with increased rainfall at higher elevations (Giambelluca et al. 1986). This is more than sufficient for most non-irrigated agriculture, and supports luxuriant and diverse vegetation. The vegetation within the project area is almost entirely exotic. In the tributary gulch are extensive areas of exotic grasses, *hau* (*Hibiscus tiliatus*), ironwood (*Cassuarina equisetifolia*), Christmas berry (*Schinus terebinthifolius*), false *kamani* (*Terminalia catappa*) and Java plum (*Syzygium cumini*). Vegetation in the upper plateau includes Java plum, extensive areas of *hau*, *hala* (*Pandanus* sp.), ironwood, bamboo, Christmas berry, lantana (*Lantana* sp.), banana (*Musa* sp.), African tulip (*Spathodea campanulata*), mango (*Mangifera indica*), and ti (*Cordyline fruticosa*). There are also extensive areas of thorny exotic vegetation including cat's claw (*Caesalpinia decapetala*) and other quite thorny plants. The only native plant observed was *hala*.

The 203-acre Kīlauea National Wildlife Refuge is located along the Kīlauea shoreline, to the north of the project area, and was created largely as a preserve for various seabird species. A popular guidebook notes:

Along the backshore, the lower reaches of Kīlauea Stream form one of the most pristine estuaries in the state. In former times it supported an important mullet fishery. Mullet and other fish are still found there, but are not fished commercially. [Clark 1990:22]

1.3.2 Built Environment

The majority of the project area is comprised of former sugarcane land previously cultivated by Kīlauea Sugar Company from 1880-1971. Since the closure of Kīlauea Sugar Company the land has remained undeveloped (Figure 6 & Figure 7). In the southeastern portion of the project area a natural drainage gulch has been utilized as a banana farm and an informal vehicle dump (Figure 8 & Figure 9). The surrounding area is primarily rural, dominated by agricultural and luxury house lot development.



Figure 6. Photograph of project area, view from Quarry Road to northeast



Figure 7. Photograph of eastern portion of project area, view to east



Figure 8. Photograph of gulch in southeastern portion of project area, showing remnant banana farm, view to east



Figure 9. Photograph of gulch in southeastern portion of project area, showing abandoned cars, view to west

Section 2 Methods

2.1 Field Methods

The fieldwork component of the archaeological inventory survey was conducted intermittently between October 14 – November 12, 2010 by CSH archaeologists, Gerald Ida, B.A. and Missy Kamai, B.A., under the general supervision of Hallett H. Hammatt, Ph.D. The fieldwork required approximately 22 person-days, or 178 hours, to complete. Fieldwork consisted of a 100% coverage pedestrian inspection of the project area and limited subsurface testing at select archaeological sites. The pedestrian inspection of the study area was accomplished through systematic sweeps. The interval between the archaeologists was generally 5-10 m. Historic properties encountered were recorded and documented with a written field description, scale drawings, photographs, and each feature was located using Garmin GPS 60 CSx GPS survey technology (accuracy 3-5 m).

Subsurface testing consisted of the partial excavation, by hand, of selected surface archaeological features located during the pedestrian survey. The purpose of the subsurface testing was to aid in determining the function of located surface sites, as well as to possibly obtain datable materials for later radiocarbon dating. All excavated material was sifted through a 1/8 in. wire mesh screen to separate out the soil matrix, then all cultural material was collected for analysis in the lab. Each test excavation was documented with a scale section profile, photographs, and sediment descriptions. Sediment descriptions included characterizations of Munsell color designations, compactness, texture, structure, inclusions, cultural material present, and boundary distinctness and topography.

2.2 Document Review

Historic and archival research included information obtained from the UH Hamilton Library, the State Historic Preservation Division Library, the Hawai'i State Archives, the State Land Survey Division, and the Archives of the Bishop Museum. Previous archaeological reports for the area were reviewed, as were historic maps and primary and secondary historical sources. Information on Land Commission Awards was accessed through Waihona Aina Corporation's Māhele Data Base (www.waihona.com).

2.3 Consultation

A consultation effort was undertaken as a component of the companion cultural impact assessment investigation. The individuals contacted are summarized in Table 1 (below). To date there have been no substantive responses.

In the absence of the identification of any historic properties with significance under criterion "E" the present approach to cultural consultation for the project is deemed sufficient.

Table 1. Community Contact List

Name/Affiliation
Aha Punana Leo o Kauai
Ako, Uncle Valentine
Aipoalani, Clisson (Kunane), Chairman Kauai-Niihau Island Burial Council
Akana, Kaipo
Kauai Island Hawaiian Civic Club
Ayau, Halealoha, Hui Mālama I Na Kupuna 'O Hawai'i Nei
Cataluna, Don, OHA Trustee, Kauai/Ni'ihau
Cayan, Coochie, SHPD History & Culture Branch Chief
Erickson, Marsha, Executive Director, Hui o Laka (Koke'e Ecological Education Group, Waimea Valley Association)
Ka'ie'ie Foundation, Kauai Heritage Center
Kealoha, Keone Executive Director, Malama Kaua'i
McMahon, Nancy, SHPD- Deputy State Historic Preservation Officer
Muraoka, Auntie Beverly
Nāmu'o, Clyde, Administrator, Office of Hawaiian Affairs
Oi, Tommy
Reeves, Hannah Reeves
Takamine, Vicky, Kumu Hula (also a lecturer of Hawaiian culture and chant)
Trugillo, William

Section 3 Background Research

3.1 Traditional and Historical Background

3.1.1 The Land of Kīlauea

The project area lies on the *makai* (seaward) central portion of the traditional Hawaiian land division of Kīlauea Ahupua'a. The name "Kīlauea" is understood as meaning "Spewing, much spreading" (Pukui et al. 1974:111). In the case of the best known "Kīlauea" at Ka'ū District, Hawai'i Island (Hawaii Volcanoes National Park) the name is typically understood as referring to volcanic steam clouds or aerial fountains of volcanic eruptions. Wichman (1998:102) explains the name as referring to "spewing many vapors" and traces it rather generically to the streams of Kīlauea that flow between the Makaleha Mountains and the Kamo'okoa Ridge. The name may have originally been in reference to Kīlauea Falls itself. The relatively large volume of water, flowing over a relatively wide and high drop, flowing against the prevailing trade winds blowing approximately straight up the lower stretch of the valley can create a large volume of diffuse mist that may have inspired the name of the land. We see some support for this theory in that the portion of Kīlauea Stream that lies within Kāhili Ahupua'a (that does not include Kīlauea Falls) was evidently universally called Kāhili Stream by Hawaiians resident in that area. The name could however be in reference to the seaspray at Kīlauea Point and the Crater Hill cliff or it could be in reference to all of the above.

3.1.2 Mythological and Traditional Accounts

An exhaustive search of Hawaiian legends and myths in print produced only four mythological references.

Dole (1892) relates a somewhat vague account that at Kīlauea there were the remains of three, long, ancient, parallel irrigation ditches attributed by the Hawaiians to the claw marks of a *mo'o*. "The lizard had been ordered by [the famous ruling chief] Mano-ka-lani-pō to open Kīlauea's upper regions for agriculture" (Wichman 1998:102). In context the *mo'o* is associated with the "brave lizard" Ka-mo'o-koa after whom a ridge of the Makaleha Mountains is named.

Wichman (1998:102) relates an account, (that may have originated in a 1939 story contest - Juliette Ferreira's "Pele the Goddess of Fire" for the Martha W. Beckwith prize, Kamehameha School for Girls), that near the top of a volcanic cone open to the ocean:

...once stood three huge stones that have since been moved, with great difficulty, to make room for sugarcane. These three stone sisters of great beauty, were a warning that Pele, the volcano goddess, was not to be trifled with....Pele [seeking to establish a home for herself and her Kaua'i lover Lohiau] caused an eruption here, but it was soon extinguished when the sea goddess [Nā-maka-o-kaha'i] broke down the walls of the crater, drowning the fire with the ocean. The laughter of the three beautiful sisters enraged Pele. They had seen Pele defeated and shamed. Their scorn was not to be endured. "What are your names?" Pele asked. And one replied "I am Kalama, this is Pua, and this is Lāhela." Pele repeated their names, touching them with her staff as

she did so, turning them to stone. They were a mute and visible warning not to laugh at or ridicule Pele. (Wichman 1998:103)

In a slight variant of the story Pele is motivated by jealousy of the three girls' beauty and fear they will make Lohiau fall in love with them and thus she turns them to stone to protect her love interest.

A third mythological account of Kīlauea related by Rice (1923:38, see also Wichman 1998:104) concerns the creation of a swath of awash boulders lying between the islet of Moku'ae'ae and Kīlauea crater:

Traveling on the Menehune moved a big stone to Kahili, below Kilauea, which they used to dive from. At Moku'ae'ae, the island off the present Kilauea lighthouse, they began to fill in the channel between the island and the mainland. They were just able to touch the bottom with a paddle when morning dawned, and their task was left unfinished.

In the Story of Lonomakahiki (Fornander 1917: Vol IV, Part II: 358-359) is a passing reference to the ruling chief Lonoikamakahiki traveling with a companion at Kīlauea and Kalihi (Kalihiwai, Kalihikai) Kaua'i. The account makes reference to "days of hunger" in which their hunger was appeased by eating the ripe flowers (or possibly fruit) of pandanus trees (*hele aku a ai i ka pua pala o ka hala, hala ia la poloi o ka ua ilaila, e ka hoa, he hoa i ka nahele lauhala loloa, mai Kilauea a Kalihi la*). The account emphasizes the great *lauhala* tracts and "...the heavy and wind-blown rain, the ceaseless and general rain..." The "ae-kai" is said to be the name of a wind specific to the vicinity of Moku'ae'ae Island and "the Wai-mio is the wind of Kilauea" (Aikin 1988:7). The wind name for the Ko'olau District of Kaua'i between Moloa'a and Kalihikai was the "Kiukainui" (Nakuina 1990:54).

3.1.3 Population

Our best data on the population of north Kaua'i comes from a census there in the spring of 1847 (Table 2). For the purposes of the census, Kīlauea was lumped with adjacent Kāhili Ahupua'a. Even given this conflation of the two it may be noted that the recorded population of 240 is relatively large, larger than the combined populations of Kalihiwai and Kalihikai to the west and larger than the combined populations of Waiakalua, Pāpa'a, Waipāke, and Lepeuli to the southeast. The population is larger than that of the huge valleys of Kalalau or Wainiha. The population density of Kīlauea/Kāhili thus would appear to have been relatively high for the Ko'olau District in 1847. Most likely this pattern of being relatively well-populated would have continued back well into pre-contact times.

Table 2 Population of Northern Kaua'i (1847) (from Schmitt 1969:229), indicating a relatively large population (and high population density at "Kilauea and Kahili")

TABLE I. POPULATION OF NORTHERN KAUAI, BY AHUPUAA: SPRING 1847						
<i>Ahupuaa</i> *						<i>Population</i>
Total	-	-	-	-	-	2,698
Kalalau	-	-	-	-	-	190
Haena	-	-	-	-	-	162
Wainiha	-	-	-	-	-	154
Lumahai	-	-	-	-	-	123
Waikoko	-	-	-	-	-	5
Waipa	-	-	-	-	-	66
Waioli	-	-	-	-	-	159
Hanalei	-	-	-	-	-	637
Kalihikai	-	-	-	-	-	87
Kalihiwai	-	-	-	-	-	78
Kilauea and Kahili	-	-	-	-	-	240
Waiakalua	-	-	-	-	-	43
Papaa	-	-	-	-	-	22
Pilaa	-	-	-	-	-	51
Waipake	-	-	-	-	-	60
Lepeuli	-	-	-	-	-	23
Moloaa	-	-	-	-	-	104
Papaa	-	-	-	-	-	23
Anahola	-	-	-	-	-	280
Hoomaikawaa	-	-	-	-	-	32
Kumukumu	-	-	-	-	-	21
Kealia	-	-	-	-	-	143

* Listed from west to east. Two different areas are named "Papaa". See text and footnote 3 for further comment.

3.1.4 Early Historic Records

We have identified few early narratives of the vicinity of the project area. In 1849, William DeWitt Alexander wrote the following passing account:

...A little farther on we entered groves of hala, through which we continued to ride for the rest of our journey. We turned from the road to see the falls of the Kahili River. Though not large they are beautiful. Here the river falls in a jet of foam over a precipice of about 40 feet into a broad clear basin below...
(Alexander 1991:124)

3.1.5 Māhele Records

In the great land division or Māhele of 1848, Kīlauea Ahupua‘a was retained as Government Lands. In the records for Land Commission Awards, there are no entries for commoner land claims associated with Kīlauea Ahupua‘a.

While no commoner Land Commission Awards (LCAs) are listed in Kīlauea Ahupua‘a, eleven awards are clustered along the south side of Kīlauea Stream in adjacent Kāhili Ahupua‘a. Most of these commoner Land Commission Awards lie in a low, wide terrace next to the stream - evidently well-watered and well-suited for maintenance of taro *lo‘i*.

It is unknown why there were no commoner *kuleana* land holdings within Kīlauea Ahupua‘a at the time of the Māhele (1848) and the following Kuleana Act. There was however a pattern at the time of the division of lands in which the land overseers (*konohiki*) often tried to present their overlord *ali‘i* with undivided tracts of land believing that to be in the best interests of their masters. Thus it could be that there was a systematic pattern to discourage commoner land claims in Kīlauea Ahupua‘a. It certainly seems odd that there was not a single claim in what should have been a well-populated *ahupua‘a*.

The land claims just south across Kīlauea Stream (universally referred to as “Kāhili Stream” in the land records of claims within Kāhili Ahupua‘a) are given in full in Appendix A of this study and are summarized below in Table 3. While these are all outside the project area (indeed outside of Kīlauea Ahupua‘a), they offer insight into such Hawaiian occupation as may have existed within Kīlauea Ahupua‘a and gone unrecorded in the Māhele-era land documents. Virtually all claims involve a house-lot (understood as a permanent residence) and a few irrigated ponded fields for taro cultivation (*lo‘i*). Several claims mention “*kula*” which in this context probably refers both to pasturage and areas of dry land cultivation (with *wauke* specifically mentioned as a *kula* crop). Other specific cultigens mentioned are the bark-cloth plant *wauke*, *noni*, and orange trees.

Table 3. Commoner Land Commission Awards within Kāhili Ahupua'a

LCA #	Awardee	Place name	Area	Land Use
9067	Keo	Kāhili, Ulehulehu Kanaele given as place name of 5 <i>lo'i</i> & <i>kula</i> ; Uleulehu given as place name of 2 <i>lo'i</i> ; Reference to <i>loko</i> "Kanaio"	2.25 acres	' <i>Āpana</i> 1, 2 & 3 were quite close together; claims 7 <i>lo'i</i> , 2 <i>māla</i> of <i>wauke</i> & "a house lot in Kilauea"; Reference to at least two <i>loko</i> "Kanaio" and one owned by Luakini also "Konohiki's pond"
10013	Leimanu	Kāhili (Kāhililalo), Kaukahiwai & Kaiaakahiuunu named as place of house lot, <i>lo'i</i> and <i>kula</i> ; Kaukahinu (Kaukahināu) named as place of 2 <i>lo'i</i> ; Nanohala named as place of <i>kula</i>	1 acre	' <i>Āpana</i> 1,2 & 3 were quite close together; claims 5 <i>lo'i</i> , <i>kula</i> for planting <i>wauke</i> & a house lot
10013B	Mokuhali'i	Kāhili, 5 <i>lo'i</i> in Ho'opala (Hapala); <i>kula</i> , house lot & orange tree in Kapunahoa	1 acre	' <i>Āpana</i> 1 & 2 were quite close together; claims 5 <i>lo'i</i> , <i>kula</i> , a house lot & an orange tree
10015	Luakini	Kāhili [in one account all holdings also said to be "in one area in Kilauea"]	2 acres	Claims 2 <i>lo'i</i> , <i>kula</i> , a house lot "in Kilauea" & 2 orange trees
10082	Mamao	Kāhili, Makaihiwa'a (var. Makaihuwa'a & Makaihuāāā) 'Ili; claims 2 <i>lo'i</i> in 'ili of Kapuka; reference to <i>pali</i> of Makaihuwa'a	5.5 acres	Claims 6 <i>lo'i</i> , & a house lot
10083	Mamuakalono	Kāhili	33 rods	Claims 1 <i>lo'i</i> , 1 <i>māla</i> of <i>wauke</i> , 1 <i>māla</i> of <i>noni</i> & a house lot
10333	Naaimaneo	Kāhili, Kupe; holdings said to be in 'ili of Upa (var. Kupa); brook named "Kilauea"	0.75 acre	Claims a field of <i>kalo</i> embracing a number of small <i>lo'i</i> & <i>kula</i>

3.1.6 Late 1800s

The History of Kilauea Plantation

In January 1863, a former American whaler named Charles Titcomb purchased the entire *ahupua'a* of Kīlauea amounting to approximately 3,016 acres from Kamehameha IV for \$2,500 (Grant 2896) (Figure 10, Figure 11). This land grant included the present project area. By this time, Charles Titcomb was already a veteran of several enterprises at Kōloa, Hanalei, and Kīlauea, Kaua'i, including efforts to cultivate silkworms, coffee, tobacco, sugarcane and cattle. He expanded his holdings to the west through further purchases within the next couple of years. The Kilauea Plantation, begun in 1863 by Mr. Titcomb, became a sugar estate in 1877 when Captain John Ross and E. P. Adams, in partnership with Titcomb, purchased much of the land and leased another substantial tract (Aikin 1988:19). Titcomb and his family continued to be involved in the plantation. He, his Hawaiian wife and two of his eight children are buried in a family plot near his former home behind the Kīlauea Elementary School.

The Kilauea Plantation “was one of the smallest plantations in the Hawaiian Islands operating its own sugar mill” (Condé and Best 1974:159). In 1881, a railway was begun and Princess Lydia Kamakaeha (Lili'uokalani) drove in the first spikes for the railroad bed. The plantation infrastructure grew over the next twenty years:

Transportation system consists of 12 and a half miles of permanent track, five miles of portable track, 200 cane cars, six sugar cars and four locomotives. Kilauea is situated three miles from the landing at Kahili, with which it is connected by the railway system. Sugar is delivered to the steamers by means of a cable device at the rate of from 600 to 800 bags an hour. Mr. J. R. Meyers was the plantation manager. (*San Francisco Chronicle*, July 18, 1910, in Condé and Best 1974:152)

The plantation employed Chinese and Portuguese workers. In the 1880s, Kilauea Sugar Company began major modification of water resources in the uplands with dams, reservoirs, ditches and flumes (Joesting 1984). This may have had a major damaging effect on *lo'i kalo* downstream and possibly signaled the end of large-scale native agricultural practices in Kīlauea and vicinity.

The Kilauea Plantation Company started to be managed by C. Brewer and Company in 1910 and C. Brewer took over the controlling interest in 1948. The Kilauea Plantation Company continued to operate until 1971.

The Monsarrat map of “Kaua'i Between the Kalihiwai and Moloaa Streams” (1898) shows the plantation infrastructure in place at that time (Figure 12). Overlays indicate that the “Government Road” lies at approximately the same elevation as the older “Hanalei Road” and the present Kūhiō Highway - well *mauka* of the project area. The railroad, begun in 1881, and the Ko'olau Ditch are shown running from the mill at Kīlauea as far as the east side of East Waiakalua, terminating near the Government Road well *mauka* of the present project area.

Part of this Kilauea Plantation Company rail system passed by Kahili Quarry on the way to an off-loading station at Mokolea Point, where raw sugar was cabled down to transport ships

ROYAL PATENT.

KAMEHAMEHA IV., By the grace of God, King of the Hawaiian Islands, by this His Royal Patent, makes known unto all men, that he has, for himself and his successors in office, this day granted and given, absolutely, in Fee Simple, unto *Charles Titcomb* his faithful and loyal subject, for the consideration of *Two thousand five hundred dollars* paid into the Royal Exchequer, all that piece of Land situated at *Keolu* and known as the *Ahupua'a Kilauea* in the Island of *Hawaii* and described as follows:

*Commencing at a stake on the Cliff overlooking the sea, near the Mouth of Kilauea River from which the Mt. Peak (Kaliou) bears S. 15 1/2° W., and Mt. Peak, Keki. bears S. 55° W. running N. 79° W. 30. 20 Chains along the edge of the Cliff bounding the sea to the high promontory or Cliff called *Nihouka*, from thence North 42° W. 27. 60 Ch. along the ^{to the Cliff called Kairapala from thence S. 42° 39' 71 Ch.} Sea to a Point of Land or Cape called *Urowani*, from thence S. 43° W. 10 Ch. along the Sea to a Cliff from thence S. 6° W. 20 Ch. along the Sea to a pile of rocks upon the land from thence S. 66° W. 25 Ch. more or less to the boundary*

Figure 10. Portion of Royal Patent Granting “the Ahupua’a Kilauea” to Charles Titcomb (from Aikin 1988:17)

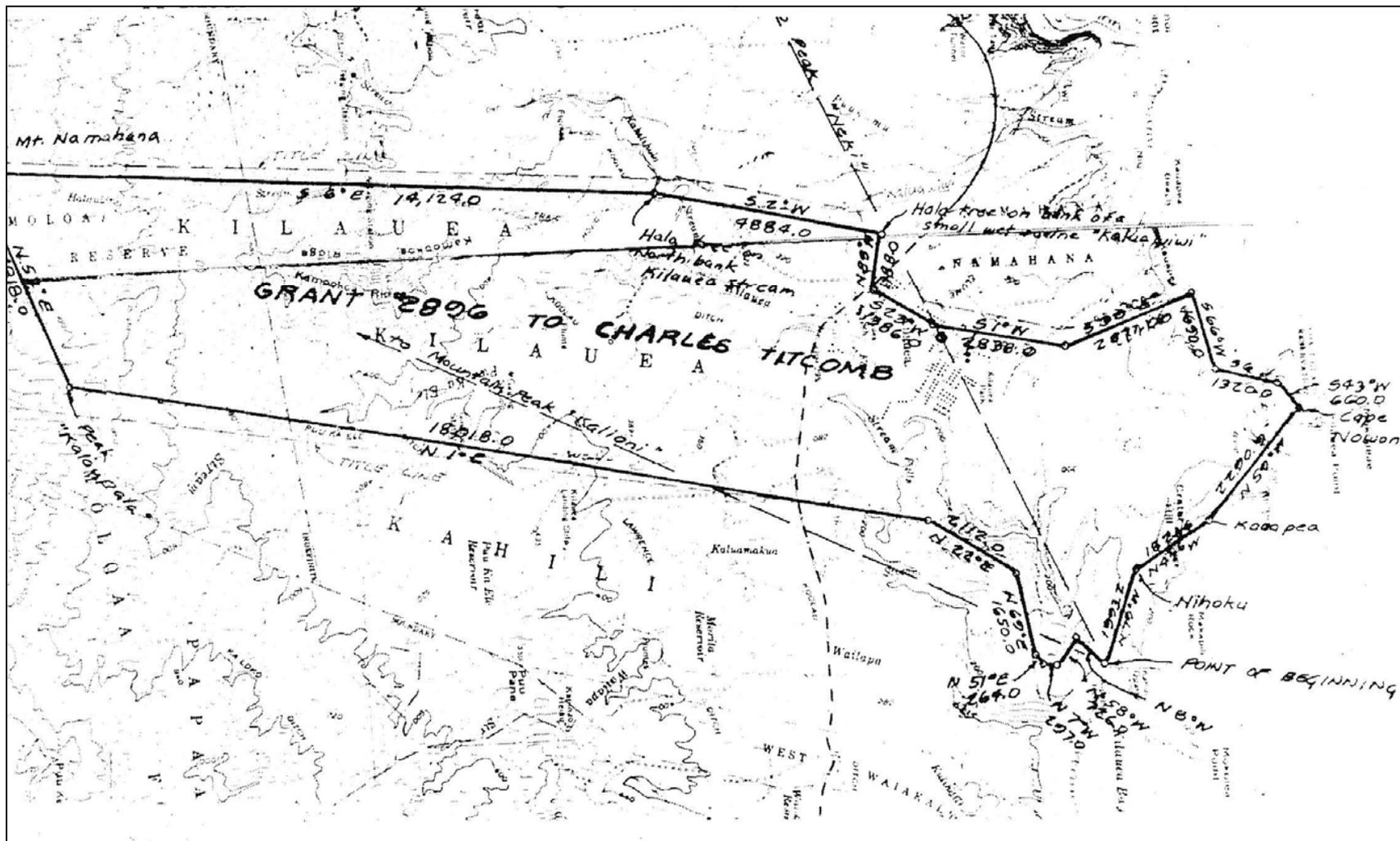


Figure 11. Map of Grant 2896 (Kīlauea Ahupua‘a) sold to Charles Titcomb (from Aikin 1988:18)

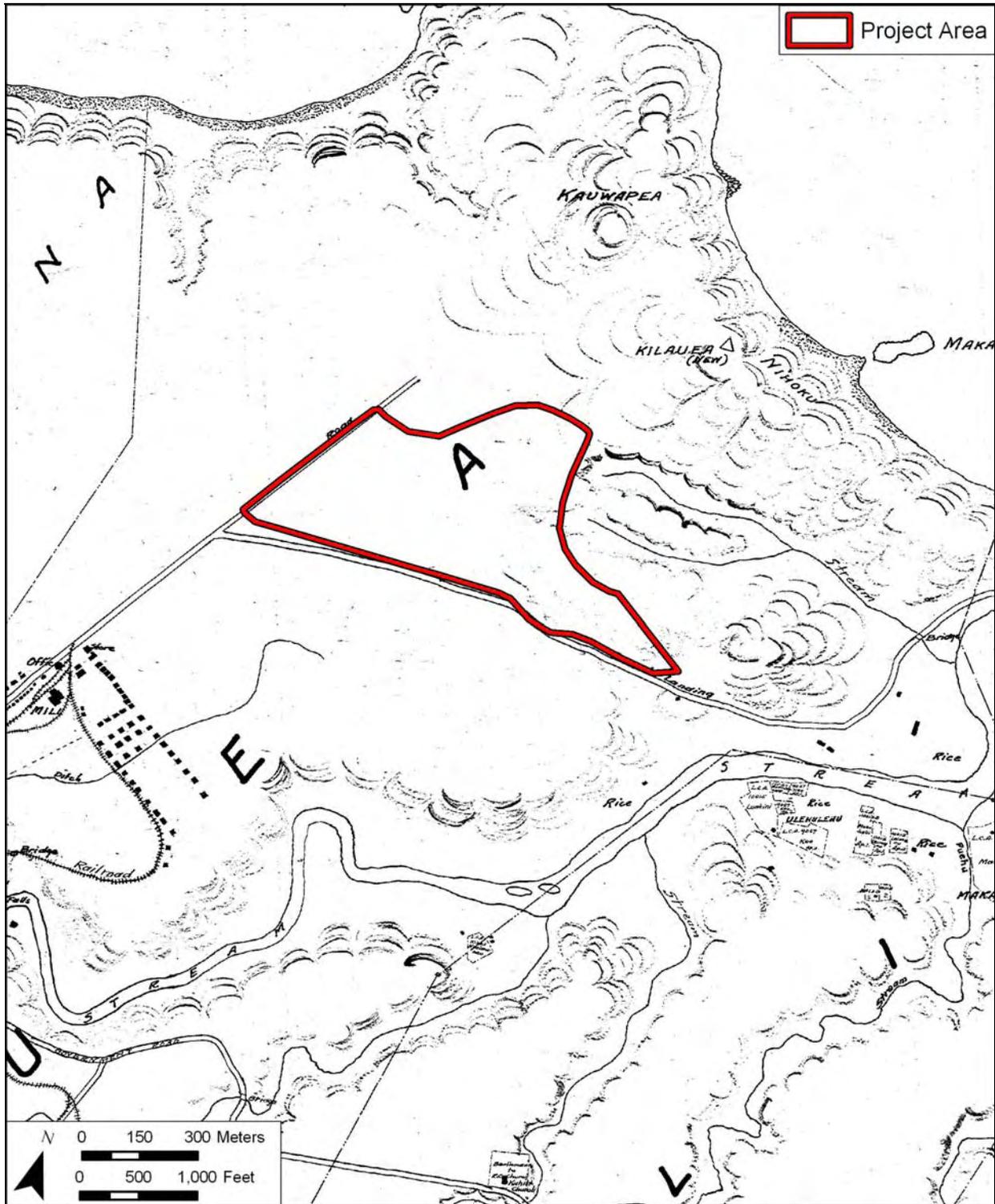


Figure 12. Portion of Monsarrat map of “Kau‘i Between the Kalihiwai and Moloaa Streams” showing general development in the project area and vicinity circa 1892

(Site 50-30-04-1811). Kahili Quarry was located on Kīlauea Bay at the mouth of Kīlauea Stream, about a kilometer northeast of the project area. Rock from the quarry was hauled by rail car and later by truck through the plantation fields where it was used to reinforce the field roads (Fredericksen and Fredericksen 1989:8). The road to the landing (“Quarry Road”) ran along the south edge of the present project area and a spur road running toward Mokolea Point formed the west boundary by 1892 (see Figure 12)

In 1938, trucks were employed to transport harvested cane, and by 1942, the rail system was abandoned entirely (Conde and Best 1974). Sugar continued as a crop until 1971 when Kilauea Sugar Co. was terminated (Custodial Chronology of the Sandy Saemann Property, Kilauea, Kauai 1989).

A 1910 U.S. Geological Survey Map, Kilauea Quadrangle (Figure 13) shows the plantation infrastructure and other development in the vicinity of the project area at that time. The spur railroad line running down to Mokolea Point ran along the road on the south side of the present project area but then curved into the present project area along the west and north sides of the tributary gulch. A second unimproved road out to Mokolea Point ran along the west side of the project area and then across the north portion of the project area. A cemetery is shown north of the present project area.

A Condé and Best (1974:159) 1930 map of the Kilauea Plantation (Figure 14) shows the plantation’s sugar cane fields and associated infrastructure. The map indicates that sugar was cultivated in the majority of the project area, (shown as field “20”). The map also shows the plantation rail line heading from Kīlauea Town to the landing at Mokolea Point in the east portion of the present project area.

Rice Production at Kīlauea Stream

Concurrent with the sugar plantation, was the introduction of the first train. By the 1890s, much of the old *kalo* growing areas of this portion of Kaua‘i were now producing rice, farmed by Chinese immigrants. There were 55 acres of land in rice production in the Kīlauea-Kāhili area in 1892 and eventually a rice mill on Kīlauea Stream (Char and Char 1979). While it is understood that this rice mill was begun by Chinese, it clearly went into Japanese management. A photograph of the interior of the Kilauea Rice Mill (Figure 15) suggests that it was not a mom and pop affair but rather a good-sized enterprise, (*Garden Island* March 31 1978). The mill is known to have been on the stream terrace east of Kīlauea Stream. Rice and vegetable cultivation is also indicated along the banks of Kīlauea Stream circa 1925.

The 1963 U.S. Geological Survey map (Figure 16) does not indicate any structures within the project area other than an unimproved road extending down to the Kahili Quarry, bordering the southeastern portion of the project area. The 1963 map also indicates Kipapa Heiau, located on the sandy shoreline of Kīlauea Bay, near the mouth of Kīlauea Stream a kilometer east of the present project area.

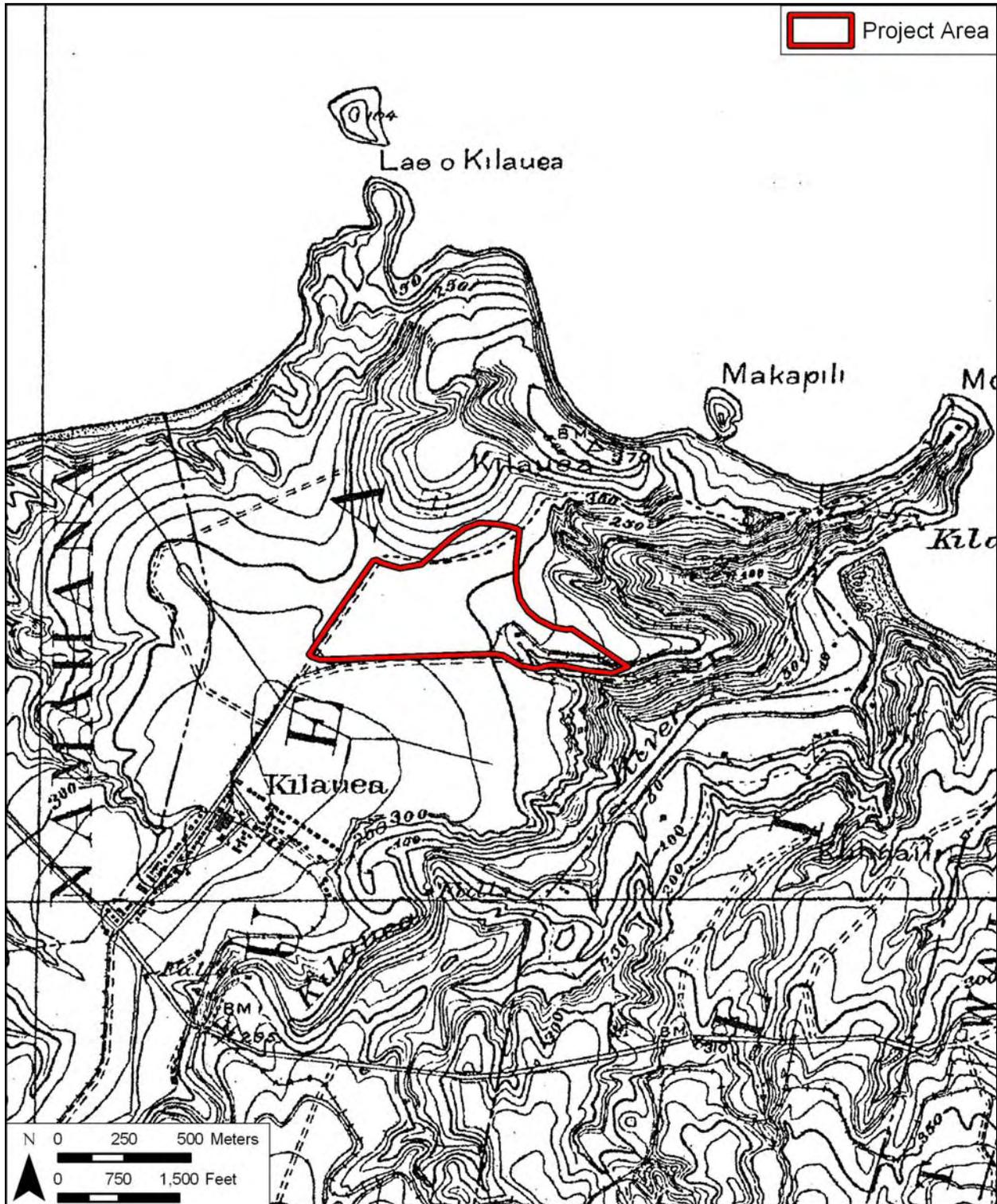


Figure 13. Portion of 1910 U.S. Geological Survey 1:31680 Scale Topographic Map, Kilauea Quadrangle, showing the location of the project area



Figure 14. 1930 Map of the Kilauea Sugar Company note railroad down to Mōkōlea Point but otherwise no infrastructure in or adjacent to project area



Gone are the days . . .

THE ONCE BUSY KILAUEA RICE MILL . . . has now become a part of Kauai's history but a photo lent by the Kauai Museum brings back memories of the days when the fields from Hanalei to Wailua were planted with rice . . . and identifies the young workers as . . . (l to r) Imada, Kagawa, Okimoto, Okasaka, and Miyashiro.

Figure 15. Historical photo of the interior of the Kilauea Rice Mill showing that it was a relatively large rice mill for Kaua'i and also that it was run by Japanese (note aprons "KIL A")

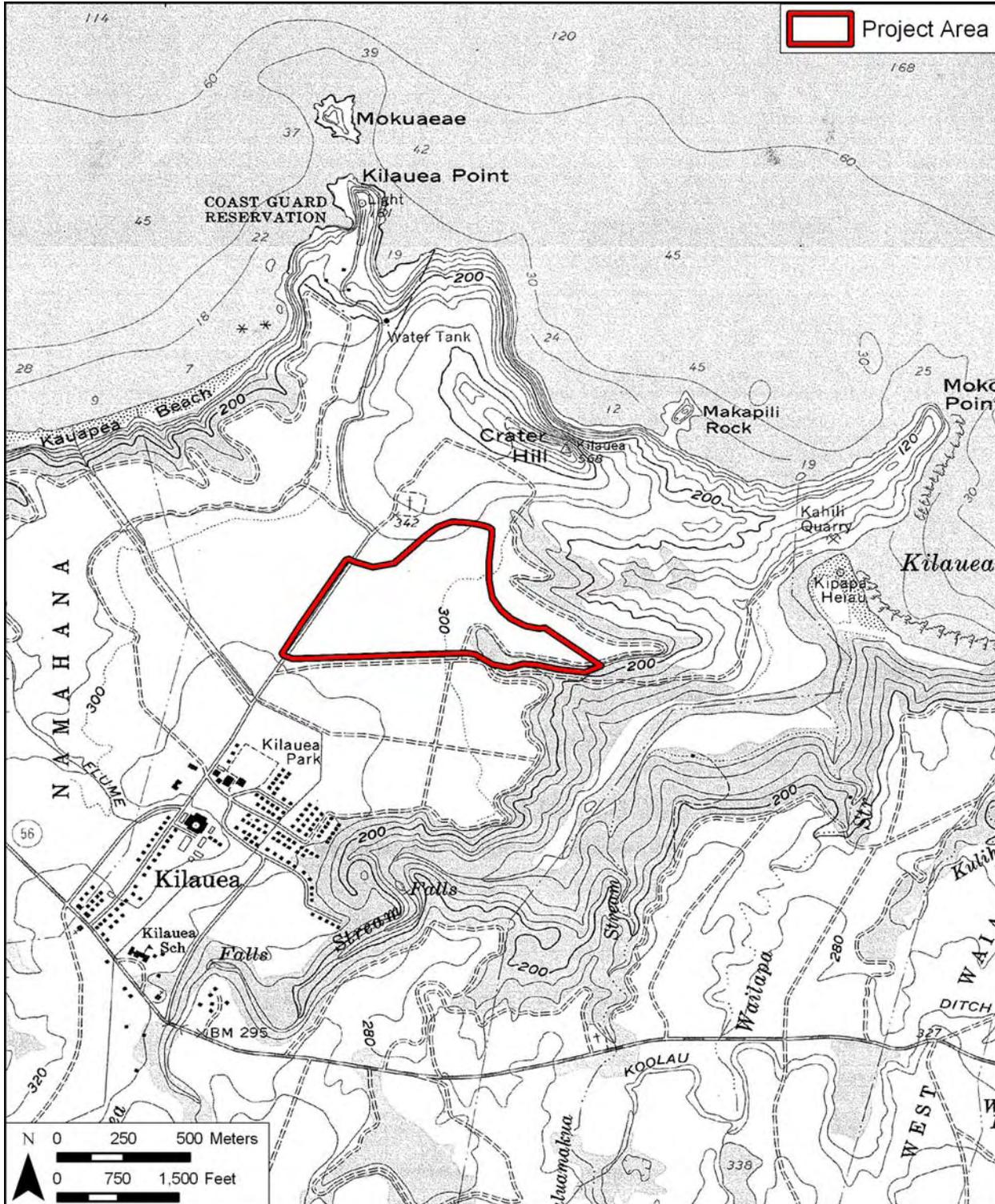


Figure 16. 1963 U.S. Geological Survey Topographic Map, Anahola Quadrangle, showing the location of the project area. (Note: Kipapa Heiau and the Kahili Quarry northeast of the project area)

3.2 Previous Archaeological Research

No archaeological study of land within the boundaries of the subject property is documented. Archaeological studies in the vicinity are summarized in Table 4 and are located in Figure 17. More detailed discussion of some of the more pertinent studies follows.

3.2.1 Thrum's *Heiau* Study (1906)

Thomas Thrum compiled the first systematic listing of Kaua'i Island archaeological sites in his study of "Heiaus and Heiau Sites Throughout the Hawai'i Islands" (Thrum 1906:36-44). In the vicinity he briefly described four *heiau*: Pailio at central Kilauea, Kapinao and Kapuohau'e at Waiakalua and Kipapa at Kāhili as follows:

- Pailio - Central Kilauea – a round heiau of about 100 feet diameter; class unknown. Site covered in cane field
- Kapinao - Waiakalua-east - A large heiau of about 200 x 400 feet, high walled and stone paved. Still in existence. Of po'okanaka class.
- Kapuohau'e – Waiakalua-uka – a small round heiau, paved, with high walls of husbandry class; still standing
- Kipapa – Kahili - A large heiau of some 300 by over 100 feet in size, paved, walls five feet high, standing in cane field in partial ruins.

3.2.2 Bennett's Survey (1931)

During his 1928/1929 landmark survey of the island of Kaua'i Wendell Clark Bennett identified five sites (sites 129 to 133) within the Ko'olau District of Kaua'i between Pila'a to the east and Kalihiwai to the west including Site 129, Kapinao heiau, in Waiakalua Valley, Site 130, Taro terraces, in East Waiakalua and West Waiakalua valleys and Site 131, House sites, in East Waiakalua and West Waiakalua Valleys and on the ridge between.

In Kīlauea Bennett described two *heiau* sites: Site 132 Kipapa heiau and Site 133 Pailio heiau. Bennett described Site 132 Kipapa Heiau as follows:

Site 132 Kipapa heiau, on the end of the first bluff east of Kilauea River in Kahili section. Described by Thrum as "A large heiau of some 300 by over 100 feet in size, paved, walls five feet high, standing in cane field in partial ruins." Since that time the stones have been removed.

U.S. Geological Survey maps indicated Kipapa Heiau as located on the east side of the mouth of Kīlauea Stream just 200 m or so northeast (outside) of the northeast edge of the present project area. A brief effort was expended in the course of the fieldwork to find any evidence of Kipapa Heiau but no trace was found.

Bennett described Site 133 Pailio Heiau as follows:

Site 133 Pailio heiau in the canefields shorewards of Kilauea. The site does not have a view of the river valley. Thrum says that it was, "A round heiau of about

Table 4. Archaeological studies near the present Kīlauea project area

Source	Nature of Study	Location of Study	Findings
Handy and Handy 1972	Native Planters of Hawaii	Archipelago-wide	Conclude Kīlauea a relatively small producer of taro because of the nature of its hinterland
Ching Bordner 1978	Archaeological Investigation of Heiau and Subsurface Survey	East and West Waiakalua Valleys and the Ridge in Between	Kapinao Heiau, House Sites and Taro Terraces
Kikuchi 1987	Archaeological Survey	Proposed Visitor Center, Kīlauea Point, National Wildlife Refuge Kalae O Kīlauea,	Surface remains of historic structures associated with Kīlauea Lighthouse are described, but no traditional Hawaiian sites were found
McMahon 1988	Fieldcheck for Curatorship	Kapinao Heiau TMK 5-1-05:51	Focused on Kapinao Heiau site 50-30-04-129
Fredericksen and Fredericksen 1989	Archaeological Inventory Survey	Crater Hill and Mokolea Point of Kīlauea Point National Wildlife Refuge, Kīlauea	Identifies historic structural remains related to the transport and loading of sugar at Mokolea Point, a Second World War era radar installation on Crater Hill and Kīlauea Lighthouse.
Kennedy 1990	Surface Reconnaissance	19 Acres Located at Kalihiwai Ridge, Kīlauea, TMK 4-5-2-002:010	No sites identified
Toenjes and Hammatt 1990	Archaeological Survey	94 Acres in Kīlauea	No sites identified
Kennedy 1991	Archaeological Inventory Survey and Testing	Kalihiwai Ridge Subdivision-Phase II, TMK: 5-2-, 02:11, Kalihiwai,	Site 50-30-03-06007
Hammatt and Chiogioji 1992	Archaeological Inventory Survey	15-Acre Property in the Ahupua'a of Namahana and Kalihiwai	No sites identified

Source	Nature of Study	Location of Study	Findings
Hammatt and Robins 1993	Archaeological Inventory Survey	Proposed Kilauea Golf Course in the Ahupua'a of Namahana 204 acres	Site 50-30-04-00572 consisting of 3 irrigation ditches
Hammatt et al 1996	Archaeological Inventory Survey	5 acre parcel TMK 5-2-021:005 on east slope of Kilauea Valley	3 sites:
Ida and Hammatt 1996	Reconnaissance Survey	Kilauea Bridge	Railroad bridge foundation
Ida and Hammatt 1997	Archaeological Inventory Survey	89-Acre Parcel in Kāhili Ahupua'a, (TMK: 4-5-1-5:52)	Identifies plantation infrastructure sites 50-30-04-640, -641, -642, -643
McGerty et al. 1997	Archaeological Inventory Survey	Portion of a 26 Acre Parcel, Kāhili Ahupua'a, [TMK 5-2-21:7]	Identifies sites 50-30-04-974, -975, -976 and -977 including traditional Hawaiian sites down in the valley
Carson et al. 1998	Data Recovery Report	Kāhili Ahupua'a,	Focuses on a portion of Sites 50-03-04-974 & 975
Hammatt and Shideler 1998	Archaeological Inventory Survey	164.1-Acre Parcel in West Waiakalua Ahupua'a, (TMK [4] 5-1-05:3)	No finds, all traces of plantation infrastructure obliterated
McGerty and Spear 1998	Archaeological Inventory Survey	Proposed Driveway Corridor, Kilauea Ahupua'a	Site 50-30-04-644
Burgett et al. 2000	Archaeological Inventory Survey	An approximately 27.56 acre parcel, Kāhili Ahupua'a	Sites 50-30-04-632, -633, -1993
Cleghorn 2001	Archaeological Monitoring Report	Kilauea Japanese Cemetery, (TMK: 5-2-4:49)	No significant finds
McGerty and Spear 2001	Inventory Survey	Approximately Six-Acre Parcel in Kāhili Ahupua'a, [TMK: 5-2-21:4]	Sites 50-30-04-625, -998 and -999

Source	Nature of Study	Location of Study	Findings
Moore et al. 2001 a, b	Archeological Inventory Survey Report and an Addendum	Property at TMK: 5-2-13:12 & 13,(por.) TMK: 5-2-17:25 (Portions of Lots 2, 3, 4, & 5) & 26 in Kalihiwai Ahupua'a,	50-30-03-02060 and -2061
Rechtman et al. 2001	Archaeological Inventory Survey	Halaulani Property (TMK: 4-5-2-02:11, 12) Kilauea and Kalihi Wai Ahupua'a,	Sites 50-30-03-2060, -2062, -2063, 2064
Yeomans, and Fager 2001	Archaeological Inventory Survey with Subsurface Testing	Nā 'Āina Kai Botanical Gardens, West Waiakalua, [TMK 5-1-05-20, TMK 5-1-05-23, TMK 5-1-05-22, and TMK 5-1-05-004],	Eight sites with 73 features identified incl. terraces, alignments and mounds – mostly agricultural features with a pre-Contact temporary habitation
Shideler, Tulchin and Hammatt 2007	Archaeological field inspection and literature review	An approximately 74-Acre portion of the Kilauea Falls Ranch Property, (TMK: [4] 5-2-012:035 por.)	Four specific areas of pre-contact agricultural terraces were observed. A posited mill site (CSH 1) in the north side of the southwest project area was noted. An extensive complex of long well-built terraces supporting a series of what appear to have once been ponded fields (CSH 2) was noted.
Shideler, Yucha and Hammatt 2008	Archaeological Inventory Survey	An approximately 74-Acre portion of the Kilauea Falls Ranch Property, (TMK: [4] 5-2-012:035 por.) (roughly the same as Shideler et al. 2007)	Five historic properties: SIHP # 50-10-04-579, an agricultural terrace; # 50-10-04-580, 53 agricultural terraces and 2 possible habitation areas (probably related to agriculture as field shelters); # 50-10-04-581, a stone retaining wall with cement and alignments and a rock-faced trail understood as a post-contact permanent habitation; # 50-10-04-582, agricultural terraces and # 50-10-04-583, agricultural terraces

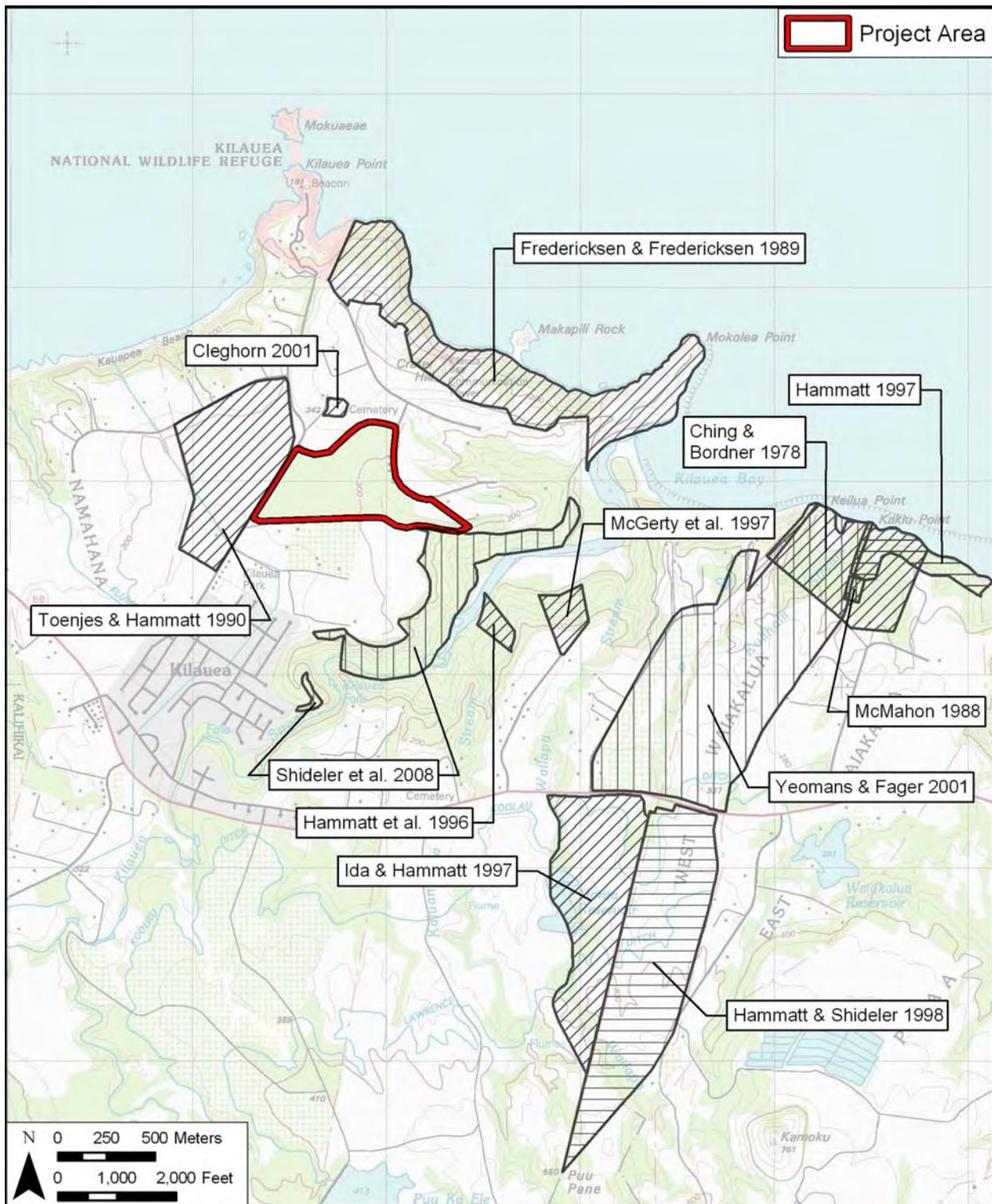


Figure 17. Map showing locations of previous archaeological studies in the vicinity of the project area

100 feet diameter: class unknown. Site covered in cane field.” Nothing remains of the heiau today [c. 1928].

The location is uncertain (Bennett didn't find any trace) but the description suggests Pailio Heiau was not close to the present project area.

3.2.3 Handy and Handy's Native Planter Observations (1972)

Handy and Handy (1972) carried out a summary study of traditional Hawaiian agriculture and the life, lore and environment of native planters throughout the Hawaiian Islands and noted the following at Kīlauea and Kāhili

Kīlauea is watered by a small river whose headwaters take the flow of streams above Kalihiwai as well as those coming down sloping kula lands above Kīlauea. This is a peculiar terrain, with terraces along the north side of the river toward its seaward end belonging to Kīlauea and those on the south side to the small ahupua'a named Kahili. A mile upstream is a small terraced area, but beyond this there were no terraces, for the main stream flows in a narrow gulch, and so do other side streams which flow into the Kīlauea River. Hawaiians evidently never developed lo'i here because the neighboring kula land is too high above the streams for irrigation. This kula would have been excellent sweet-potato land. On the whole, Kīlauea, despite a sizable river flowing through it, was a relatively small producer of taro because of the nature of its hinterland.

Kahili is, as indicated above, part of the complex that includes Kalihiwai, Kalihikai and Kīlauea. The three streams empty into the Kīlauea River, which forms the boundary between Kīlauea and Kalihi below the falls of the river. There are terraces on the south side of Kīlauea River watered by two of Kahili's streams. This is doubtless why this area was part of Kahili rather than of Kīlauea. Only one stream had terraces back from the river. Here to the kula land was good for sweet-potato planting. (Handy and Handy, 1972:421).

At least two archaeological surveys have been conducted in and adjacent to areas proposed as extensions to the Kīlauea Point National Wildlife Refuge.

3.2.4 Kikuchi's Kīlauea Point National Wildlife Refuge Survey (1987)

In 1987, Wm. K. Kikuchi surveyed the present grounds of the Kīlauea Point National Wildlife Refuge and areas of proposed extension. Considering the significance to native Hawaiians of seabird nesting colonies found within the refuge, Kikuchi extended the limits of his survey to search for associated cultural features or material. One area of his survey abuts the northeastern end of the present project area at the west bank of the mouth of Kīlauea Stream. Surface remains of historic structures associated with Kīlauea Lighthouse are described, and limited subsurface testing was performed, but Kikuchi found no evidence of remains related to native Hawaiian culture.

3.2.5 Xamanek Researches Kīlauea Point National Wildlife Refuge Survey (1989)

Xamanek Researches (Fredericksen and Fredericksen 1989) surveyed extensions to the wildlife refuge including Crater Hill and Mōkōlea Point (parcel 19 of approximately 38 acres). Land use and history of tenure is well documented, followed by detailed descriptions of historic structural remains related to the transport and loading of sugar at Mōkōlea Point, a Second World War era radar installation on Crater Hill and Kīlauea Lighthouse. Though archaeological evidence of native Hawaiian exploitation of seabird colonies was one object of the survey, no such remains were observed.

3.2.6 Toenjes and Hammatt Study of 94-Acres at Kīlauea (1990)

Two loci suggesting previous traditional Hawaiian activity were found and tested for subsurface deposits. Locus A was located in the southwest corner of the 94-acre parcel and was under papaya cultivation. Upon finding a water-rounded cobble and a small fragment of coral, an examination was made of the soil between every other row of trees in the grove. Indications of archaeological deposits were sparse and included two pieces of coral, one fragment of unidentified marine shell and several possible basalt flakes dispersed through the grove. The area of the papaya grove and scatter covered approximately 3,800 square meters (41,000 square feet).

Locus B was located in the central portion of the 94-acre parcel in an extensive former sugar cane field, then lying fallow. Much of the ground surface was clearly visible, with scattered indications of recent mechanized disturbance. The only suggestion of previous cultural activity consisted of sparsely scattered coral across an area of about 7,500 square meters (80,700 square ft.) No bone or shell material was observed in association with Locus B or anywhere else in the project area. Several possible flakes of basalt and one basalt core or possible adze blank were observed dispersed across the surface of the field apart from the coral scatter.

Subsurface testing at Locus A and Locus B, as well as in the area from which a basalt core was collected was conducted. Excavation exposed no culturally modified lithics. The presence of coral and coral sand in cane fields was noted as common, having been historically imported for the purpose of "liming" the soil. Lacking other archaeological components of Hawaiian culture, e.g. bone and shell midden, lithic debris or modified coral, the significance of these scatters was regarded as minimal. Examination of all other fields of the property indicated no archaeological remains of informational significance were present.

3.2.7 Hammatt et al. 5-Acres at Kāhili (1996)

Hammatt, Folk and Ida (1996) documented three archaeological sites at a 5-acre parcel at the east side of Kīlauea Valley in Kāhili Ahupua'a. The sites included: Site 50-30-04-625 a field system of terraced retaining walls and planting areas, SIHP 50-30-04998 a circa 1900 charcoal kiln, and Site 50-30-04-999 a free-standing wall thought to have been constructed to exclude cattle. A radiocarbon date of AD 1400 – 1650 was recovered from a weak cultural layer.

3.2.8 McGerty et al. Study of 26-Acres at Kāhili (1997)

McGerty, Fortini and Spear (1997) noted that much of the project area had been extensively bulldozed but identified four archaeological sites with 47 features including alignments, terraces,

walls, enclosures, fire pits, a hearth, an *imu*, a possible buried facing and a post-hole. The sites included:

Site 974 included 26 features (alignments, terraces, a wall, enclosure, pit features, hearth and *imu*) and was interpreted as a late pre-Contact/early post-contact permanent habitation complex. Site 974 was recommended for further data recovery work.

Site 975 included nine features(enclosures, alignments, terraces, wall) and was thought to relate to the Site 974 permanent habitation complex. Two features were thought to possibly be burials. Site 975 was recommended for both further data recovery work and preservation.

Site 976 included seven features (enclosures, terraces, posthole) and was interpreted as a late pre-Contact/early post-contact permanent habitation site. Site 976 was recommended for preservation.

Site 977 included three features (an alignment and terraces) and was interpreted as being utilized for late pre-Contact/early post-contact agriculture. Site 977 was recommended for no further work.

Two radiocarbon dates were obtained calculated as AD 1795-1955 and AD 1660-1955

3.2.9 Yeomans and Fager (2001) Waiakalua Archaeological Inventory Survey

Scientific Consultant Services carried out an Archaeological Inventory Survey of a 220-acre project area extending from Kūhiō Highway to the coast in West Waiakalua Ahupua'a. Eight sites with a total of 73 features were identified. The features were all agricultural (both dry-land and irrigated) in function except for one pre-Contact temporary habitation feature (dating to A.D. 1380-1640). Most of the features were in stream bottom lands near the coast.

3.2.10 Shideler et al. (2007) & (2008) Studies for Kilauea Falls Ranch

CSH carried out two studies for Kilauea Falls Ranch on the west side of Kilauea Stream (aka Kahili Stream). A total of 62 features were identified within a total of five sites in a proposed agro-forestry area. Four of these five sites (SIHP # 50-30-04-579, -580, -582 and -583) are primarily or exclusively agricultural terraces. The only exception at these four sites is SIHP # 50-30-04-580 features L and MM that are interpreted as temporary habitation features related to the agricultural terraces. One site (SIHP # 50-30-04-581) was understood as primarily post-contact and either a permanent habitation or work area.

The inventory survey study (Shideler et al. 2008:69) concluded that the approximately 1500-1800 mm (60-70 in.) of annual rainfall within that project area made cultivation possible without irrigation. While it was concluded that there may well have been pre-contact ponded field (*lo'i*) taro cultivation along the Kilauea Stream flood plain, it was suggested that the vagaries of hurricane, tsunami, and flood may have made such planting down by the stream precarious. It was suggested that cultivation up on the steep slope may have been more secure.

The evidence from the *māhele* records indicates that there was little or no pre-contact permanent habitation within the Kilauea Falls Ranch project area per se although there was a community on the southeast side of the stream mouth from the 1840s well into the twentieth century. An interviewee, Ms. Sara H. Keahonui Jones, born in 1919 who had lived in the *makai*

area of Kāhili Ahupua'a most of her life, remembered: "the homes were all on stilts and once the water rose all the way up under the house." The propensity of the Kāhili/Kīlauea Stream to flood may have encouraged development on the steep slope.

Particularly relevant in the Kilauea Falls Ranch study was SIHP # 50-30-04-580 that consisted of a dense cluster of 55 archaeological features including 53 soil-retaining terraces and two possible habitation areas. These features were in a relatively compact area just south of the east end of the present study area (Figure 18).

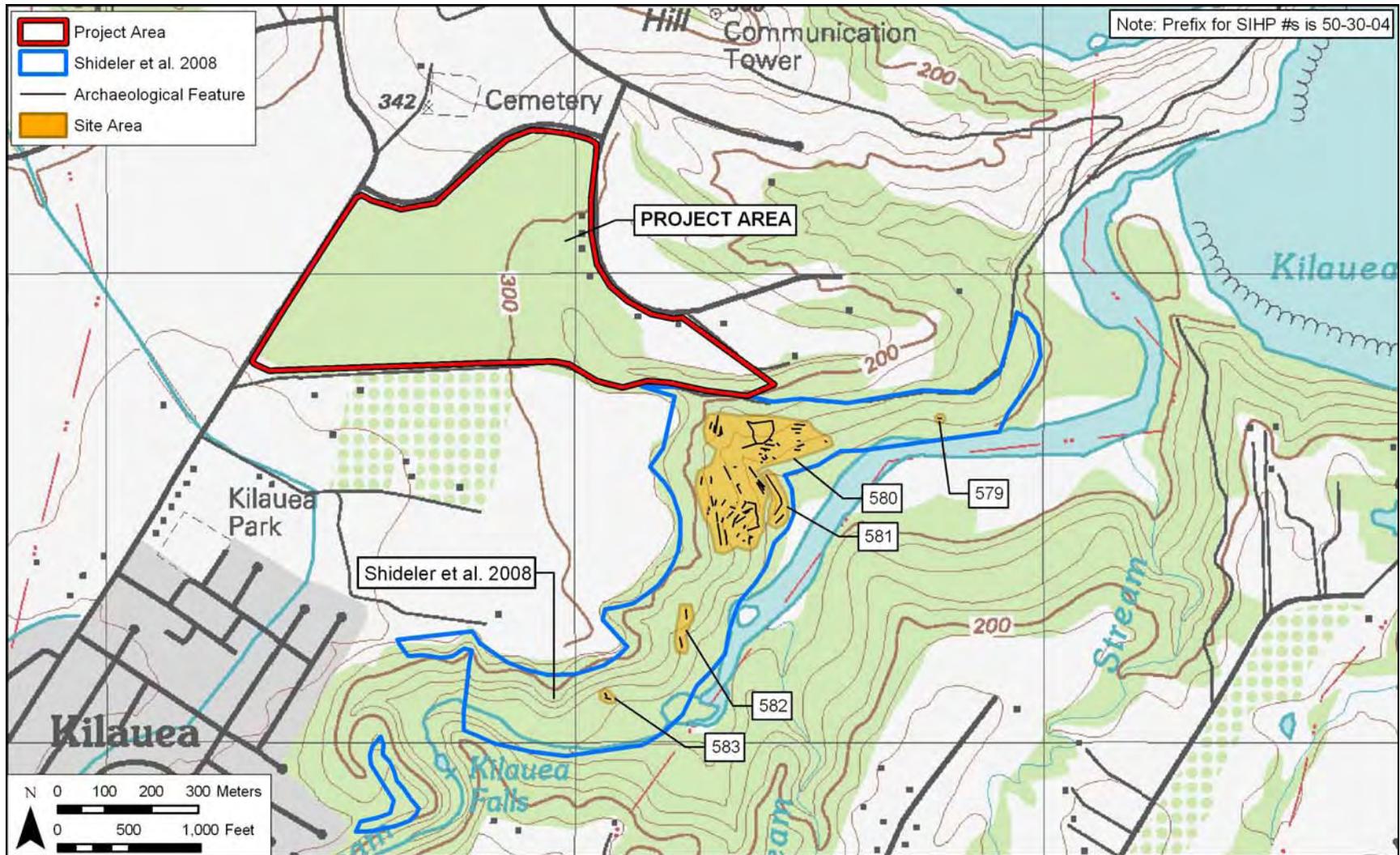


Figure 18. U.S. Geological Survey 7.5 Minute Series Topographic Map, Anahola Quadrangle (1996), showing the location of historic properties identified in the Kilauea Falls Ranch (Shideler et al. 2008) study in relation to the present study area

3.3 Background Summary and Predictive Model

Most of the archaeological studies in the flat tablelands of Kīlauea Ahupua'a and vicinity (Toenjes and Hammatt 1990, Hammatt and Robins 1993, Ida and Hammatt 1997, Hammatt and Shideler 1998) have encountered very few sites other than remnants of plantation agriculture. Somewhat curiously the studies along the coastline (Kikuchi 1987, Fredericksen and Fredericksen 1989) found no pre-contact sites or deposits. Very few sites other than remnants of plantation agriculture would be expected in the flat tableland portion of the Kīlauea Agricultural Park project area. Some remnant of the Kilauea Plantation railroad (such as a railroad bed) might still be extant in the southeast corner of the project area (see Figure 13 and Figure 14) curving around the north side of the small tributary gulch.

On the other hand, the studies (Ching and Bordner 1978, Hammatt et al. 1996, McGerty et al. 1997, Shideler et al. 2008) of un-bulldozed valley areas that were less disturbed by plantation agriculture have reported a number of permanent habitation and agricultural complexes.

The most probable area of concentrated population and industry would have been along Kīlauea Stream and its tributaries. Thus it would seem possible that pre-contact sites relating particularly to agriculture and also to related habitation would have been present in the southeastern valley portion of the present project area.

Section 4 Results of Fieldwork

4.1 Survey Findings

Cultural Surveys Hawai'i's fieldwork was conducted between October 14 – November 12, 2010 by two CSH archaeologists, Gerald Ida, B.A. and Missy Kamai, B.A., under the general supervision of Hallett H. Hammatt, Ph.D. The fieldwork required approximately 22 person-days, or 178 hours, to complete. In general, the purpose of the initial field work was to develop data on the nature, density, and distribution of archaeological sites within the project area. Archaeological sites or site areas were documented with brief written descriptions, photographs, and were located with Garmin GPS V survey technology (accuracy 3-5 m).

Four sites were identified in the project area (Figure 19). A total of five features were identified within a total of four sites. These are summarized in Table 5 and are discussed in detail in the following Site Description section. All four historic properties were located within the tributary gulch of the Kīlauea Stream Valley in the southeastern portion of the project area. No sites were identified within the level tablelands previously utilized for sugarcane cultivation.

The relatively small number of historic properties observed within the project area can be attributed to the majority of it being located within lands that have been under sugarcane production for nearly a century. The pedestrian inspection of the project area confirmed that the majority of the project area has been disturbed through land modifications associated with historic sugarcane cultivation.

Table 5. Summary of Identified Sites

Site (50-30-04-xxx)	Form	Function	Comments
-2123	Stacked cobble and boulder terrace (1-4 courses) comprised of stone construction on two corners connected by a linear ledge of soil	Historic habitation terrace	Poor condition
-2124	2 concrete wall structures, including one linear form and one U-shaped form with concrete flooring	Unknown; likely plantation-era infrastructure	Poor condition
-2125	Stacked cobble and boulder terrace (1-4 courses) retaining soil	Agricultural terrace	Good condition
-2126	Excavated ditch with soil berm	Drainage ditch	Good condition

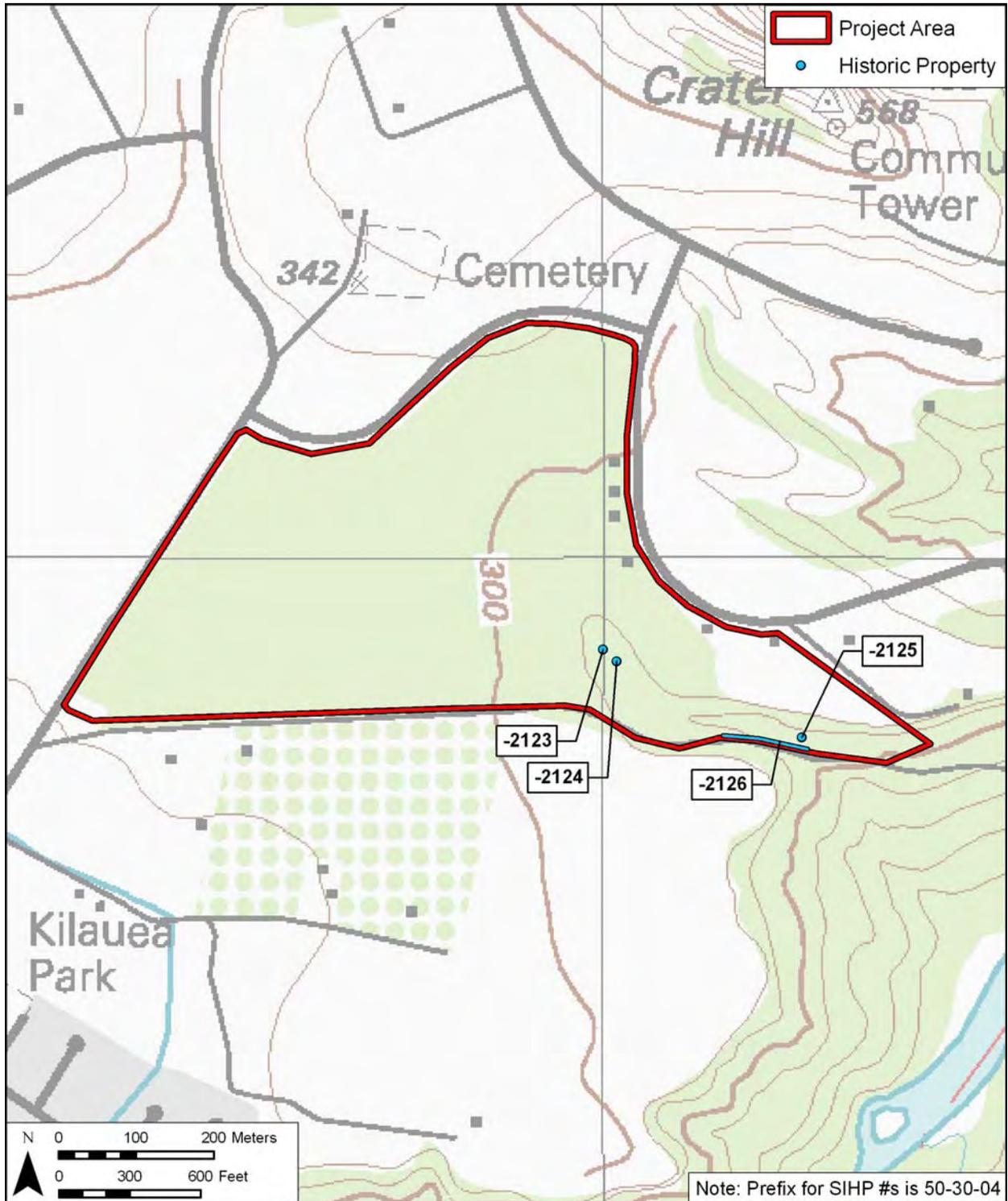


Figure 19. U.S. Geological Survey 7-5 Minute Series Map, Anahola Quadrangle (1996), showing the location of historic properties identified within the project area

4.2 Site Descriptions

4.2.1 SIHP #: 50-30-04-2123

SITE TYPE: Terrace
FUNCTION: Habitation
FEATURES: 1
DIMENSIONS: 4.8 m long by 0.6 m wide by 0.56 m high
CONDITION: Poor/Remnant
PROBABLE AGE: Historic
TAX MAP KEY: [4] 5-2-004:099

DESCRIPTION:

SIHP # 50-30-04-2123 consisted of a single historic habitation terrace located at the base of the north slope of the tributary gulch in the southeastern portion of the project area. The terrace consisted of a soil ledge with stacked cobbles and boulders on both extremities. The terrace was oriented NW-SE and measured 4.8 m long by 0.6 m wide by 0.56 m high. The northwestern corner was constructed with a single course of cobbles and boulders, while the southeastern corner consisted of four courses with an intact vertical facing (Figure 20, Figure 21, Figure 22). SIHP # 50-30-04-2123 was observed to be in poor condition.

A shovel test, measuring 1 m long by 0.5 m wide by 0.42 m deep, was conducted within the northwestern corner of the terrace to determine the presence or absence of subsurface cultural deposits. A profile map of the north wall showing the observed stratigraphy was created (Figure 23, Figure 24).

The sediment profile of SIHP # 50-30-04-2123 consisted of:

Stratum Ia: 0-3 cmbs	Natural Sediment; 7.5 YR 3/3 (dark brown); clay loam; weak, coarse, crumb structure; dry, weakly coherent consistency; plastic; weak cementation; terrestrial sediments; clear and wavy lower boundary; few, fine roots; modern A-horizon
Stratum Ib: 3-23 cmbs	Natural Sediment; 7.5 YR 3/4 (dark brown); clay loam; moderate, coarse, crumb structure; dry, slightly hard consistency; plastic; strong cementation; terrestrial sediments; clear and irregular lower boundary; inclusions of bottle glass fragments, nails, cane slag and one piece of coral; probable erosional material from gulch wall
Stratum II: 5-33 cmbs	Natural Sediment; 5 YR 3/3 (dark reddish brown); clay loam; moderate, coarse, crumb structure; dry, weakly coherent structure; slightly plastic; weak cementation; terrestrial sediments; clear and smooth lower boundary; few, very fine to medium roots; inclusions of ceramic, porcelain, bottle glass and metal fragments; buried A-horizon cultural layer
Stratum III: 18-42 cmbs	Natural Sediment; 5 YR 3/4 (dark reddish brown); clay loam; moderate, coarse, crumb structure; dry, slightly hard consistency; plastic; strong cementation; terrestrial sediments; few, fine roots

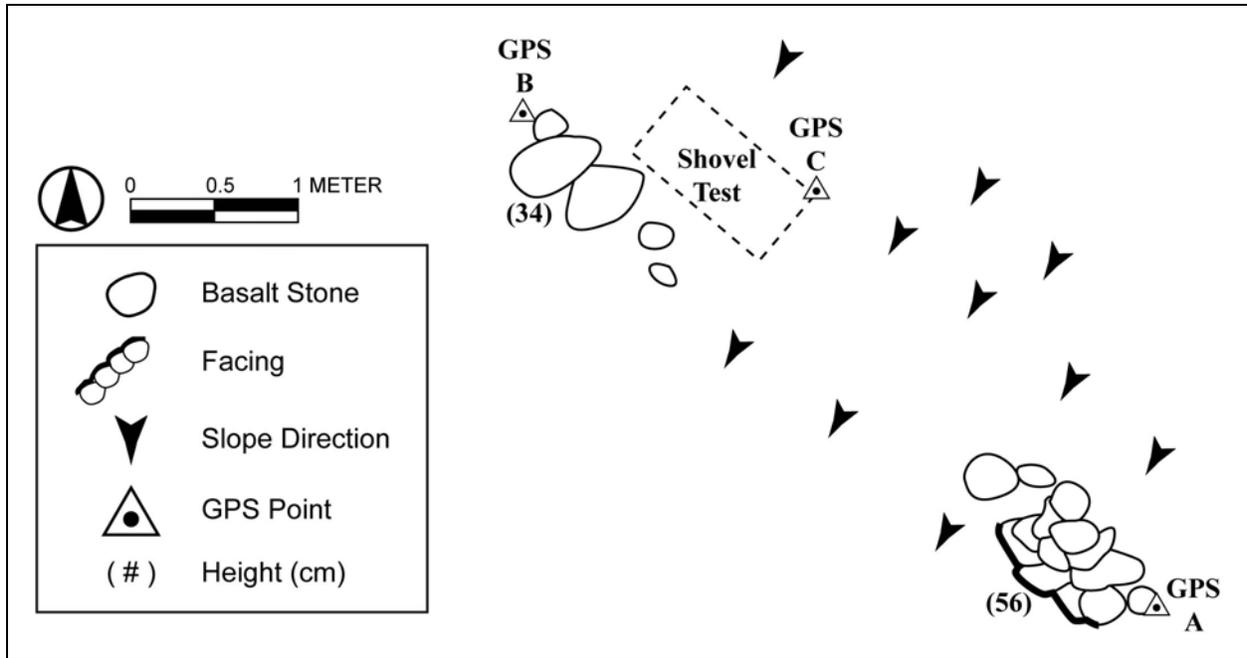


Figure 20. Plan-view diagram of SIHP # 50-30-04-2123



Figure 21. Photograph of SIHP # 50-30-04-2123 historic habitation terrace, view to northeast, showing northwestern corner with single-course stone construction



Figure 22. Photograph of SIHP # 50-30-04-2123 historic habitation terrace, view to northwest, showing southeastern corner with four course stone stacking

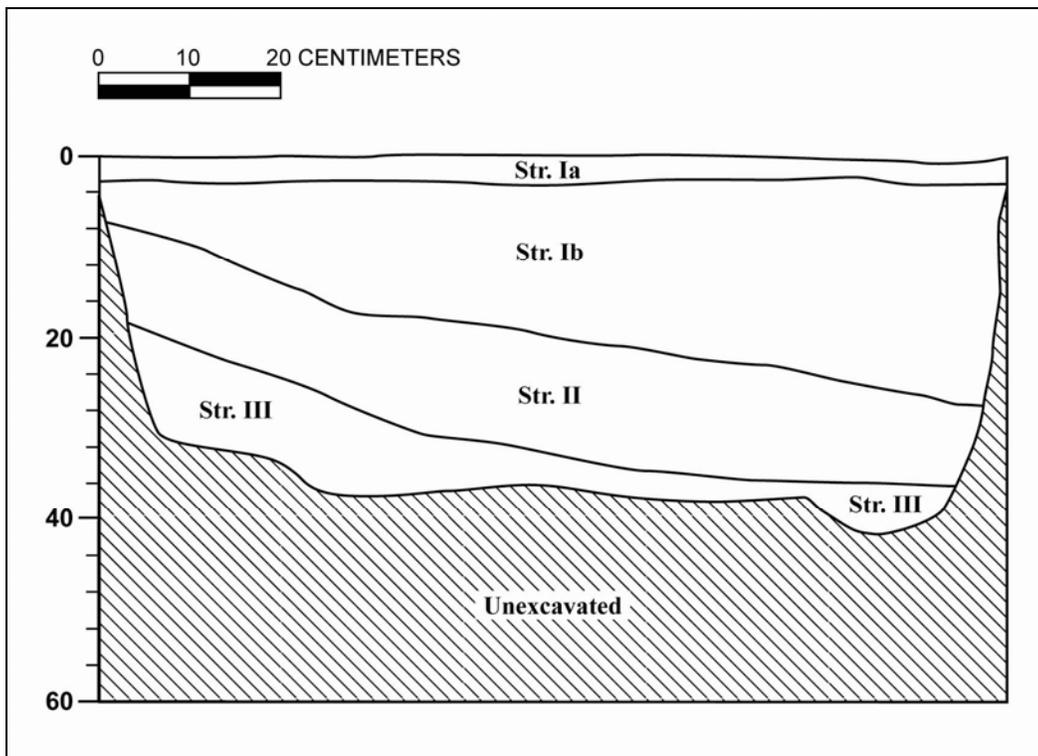


Figure 23. North wall profile of SIHP # 50-30-04-2123 test pit



Figure 24. Photograph of north wall profile of SIHP # 50-30-04-2123 test pit

Modern cultural material was observed within Stratum Ib and Stratum II, indicating historic origin. Stratum Ib contained 5 bottle glass fragments, 6 square or cut nails, cane slag and one piece of coral. The only diagnostic artifacts within Stratum Ib consisted of six square nails - a style of nail that was produced between 1840-1890 (see Analysis of Artifacts discussion). However, as Stratum Ib consisted of likely erosional material associated with the natural weathering within the gulch, the artifacts may not be originally associated with SIHP # - 2123. Stratum II contained numerous small to medium bottle glass fragments, two indeterminate nails, small metal fragments, two ceramic shards and two large fragments of a blue and white porcelain bowl. The corrosive state of the nails and the lack of any identifying maker's mark upon the ceramics prevented any reasonable dating of the stratum. However, the artifacts indicate historic origin, likely from the plantation era.

4.2.2 SIHP #:	50-30-04-2124
SITE TYPE:	Concrete wall structures
FUNCTION:	Unknown
FEATURES:	2
DIMENSIONS:	9 m long by 3 m wide
CONDITION:	Poor to Good
PROBABLE AGE:	Historic
TAX MAP KEY:	[4] 5-2-004:099
DESCRIPTION:	

SIHP # 50-30-04-2124 consisted of two historic features located at the base of the north slope of the gulch in the southeastern portion of the project area (Figure 25, Figure 26, Figure 27). Feature A consisted of a poured concrete wall, measuring 2.05 m long by 0.16 m wide by 0.82 m high. The north slope of the gulch appeared to have been cut away to construct the wall, hence the structure may have served to function as a retaining wall. Feature A was observed to be in poor condition.

SIHP # 50-30-04-2124, Feature B, consisted of a “U-shaped” concrete wall with a soil-covered concrete floor within the interior. The structure measured 3.61 m long by 3.19 m wide with an exterior height of 0.46 m and an interior height of 0.05 m. Wall thickness measured 0.12 m. Both ends of the “U-shaped” wall were buried in the north slope of the gulch. A threaded metal pipe, measuring 2 inches wide by 0.9 m long, protruded from the ground 1.1 m to the northwest of the feature. The structure likely served as the foundation for an overlying wooden structure. Feature B was observed to be in good condition.

A shovel test, measuring 1 m long by 0.5 m wide by 0.33 m deep, was conducted at the exterior of the southeastern corner of Feature B to determine the presence or absence of subsurface cultural deposits. A profile map of the north wall showing the observed stratigraphy was created (Figure 28, Figure 29).

The sediment profile of SIHP # 50-30-04-2124 consisted of:

Stratum Ia: 0-3 cmbs	Natural Sediment; 7.5 YR 3/3 (dark brown); clay loam; weak, coarse, crumb structure; dry, weakly coherent consistency; plastic; weak cementation; terrestrial sediments; clear and smooth lower boundary; few, very fine to fine roots; modern A-horizon
Stratum Ib: 3-29 cmbs	Natural Sediment; 7.5 YR 3/4 (dark brown); clay loam; moderate, coarse, crumb structure; dry, slightly hard consistency; plastic; strong cementation; terrestrial sediments; clear and smooth lower boundary; few, fine to coarse roots; inclusions of metal fragments, round nails and cane slag; likely erosional material from gulch wall
Stratum II: 29-33 cmbs	Natural Sediment; 5 YR 3/4 (dark reddish brown); clay loam; moderate, coarse, crumb structure; dry, slightly hard consistency; plastic; strong cementation; terrestrial sediments; few, fine roots; inclusions of decomposing basalt bedrock pebbles

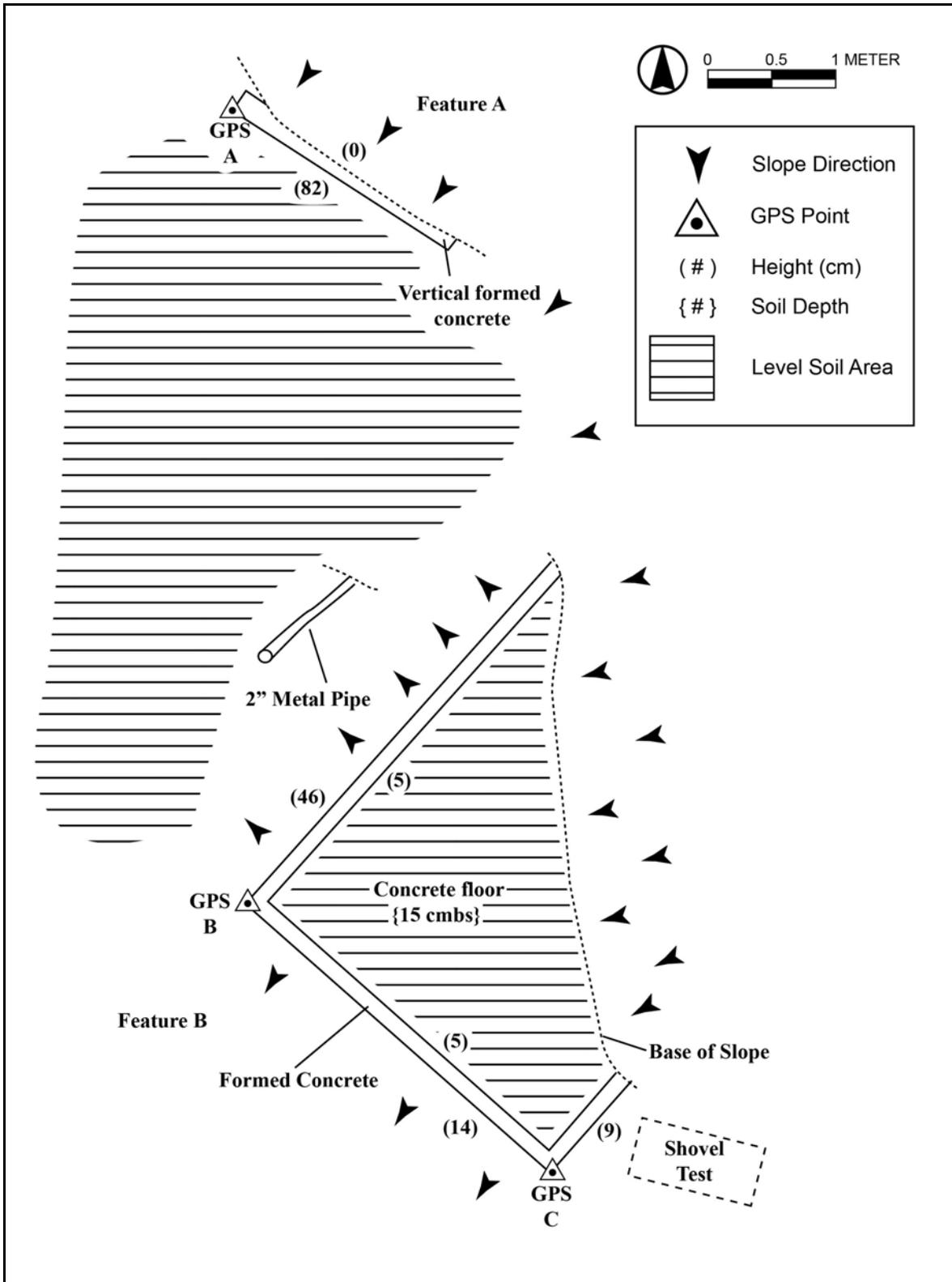


Figure 25. Plan-view diagram of SIHP # 50-30-04-2124



Figure 26. Photograph of SIHP # 50-30-04-2124, Feature A, possible concrete retaining wall, view to north



Figure 27. Photograph of SIHP # 50-30-04-2124, Feature B, U-shaped concrete structure, view to northeast

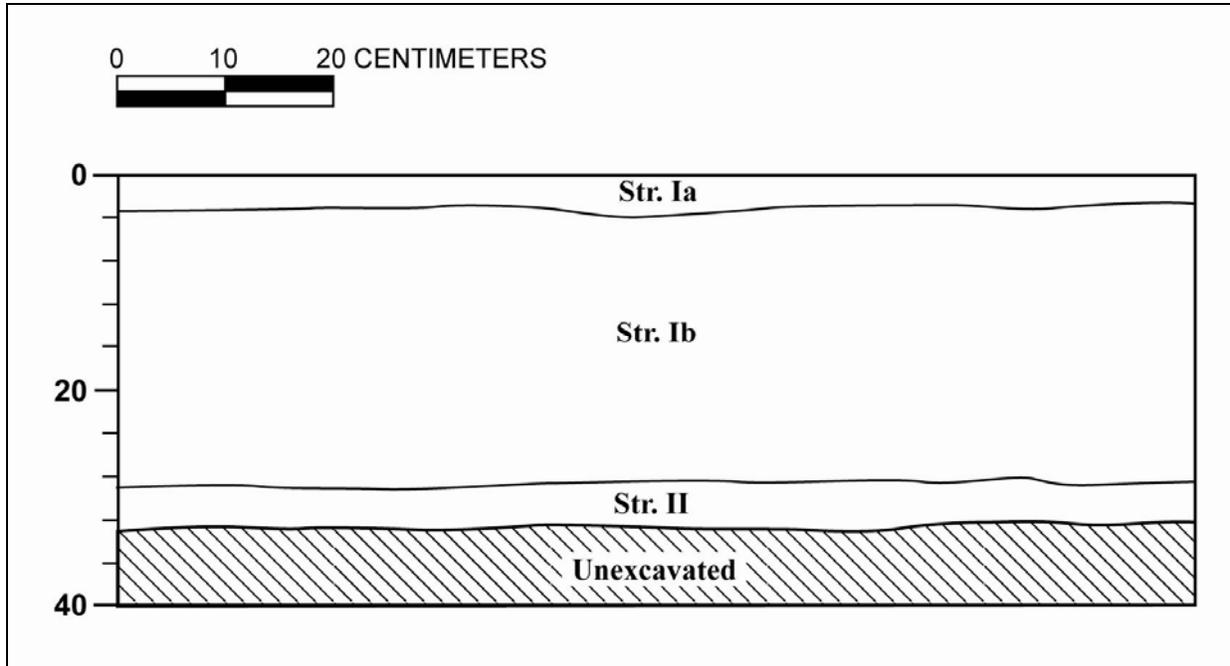


Figure 28. North wall profile of SIHP # 50-30-04-2124 test pit



Figure 29. Photograph of north wall profile of SIHP # 50-30-04-2124 test pit

Modern cultural material was observed within Stratum Ib of SIHP # 50-30-04-2124, including cane slag, metal fragments, eight wire nails, and one railroad spike. The stratum was interpreted to be likely erosional material from the gulch wall, thus the artifacts may not be originally associated with SIHP # - 2124. Due to the construction materials, style, and location, the two features of SIHP # - 2124 were interpreted as likely associated with the plantation era.

4.2.3 SIHP #: 50-30-04-2125

SITE TYPE: Terrace
FUNCTION: Agriculture
FEATURES: 1
DIMENSIONS: 5.45 m long by 0.38 m wide by 0.41 m high
CONDITION: Good
PROBABLE AGE: Pre-Historic
TAX MAP KEY: [4] 5-2-004:099

DESCRIPTION:

SIHP # 50-30-04-2125 consisted of a single, soil-retaining agricultural terrace located on the north slope of the gulch in the southeastern portion of the project area (Figure 30 and Figure 31). SIHP # - 2125 was composed of one to four courses of stacked basalt cobbles and small boulders, measuring 5.45 m long by 0.38 m wide with a maximum height of 0.41 m. The terrace was oriented northwest-southeast. SIHP # - 2125 was observed to be in good condition.

A shovel test, measuring 1 m long by 0.5 m wide by 0.24 m deep, was conducted at the southeastern corner of the terrace to determine the presence or absence of subsurface cultural deposits. A profile map of the north wall showing the observed stratigraphy was created (Figure 32, Figure 33).

The sediment profile of SIHP # 50-30-04-2125 consisted of:

Stratum Ia: 0-3 cmbs	Natural Sediment; 7.5 YR 3/3 (dark brown); clay loam; weak, coarse, crumb structure; dry, weakly coherent consistency; plastic; weak cementation; terrestrial sediments; clear and smooth lower boundary; few, fine roots; modern A-horizon
Stratum Ib: 3-15 cmbs	Natural Sediment; 7.5 YR 3/4 (dark brown); clay loam; moderate, coarse, crumb structure; moist, friable consistency; plastic; terrestrial sediments; clear and smooth lower boundary; few, fine roots; likely erosional material from gulch wall
Stratum II: 15-24 cmbs	Natural Sediment; 5 YR 3/4 (dark reddish brown); clay loam; moderate, coarse, crumb structure; moist, very firm consistency; plastic; terrestrial sediments; few, fine to medium roots; inclusions of decomposing basalt bedrock pebbles

No cultural material was observed during excavation. However, due to the construction style of SIHP # 50-30-04-2125 and its proximity to a previously documented cluster of pre-contact agricultural terraces (# -580)(Shideler et al. 2008), the terrace is likely of pre-contact origin.

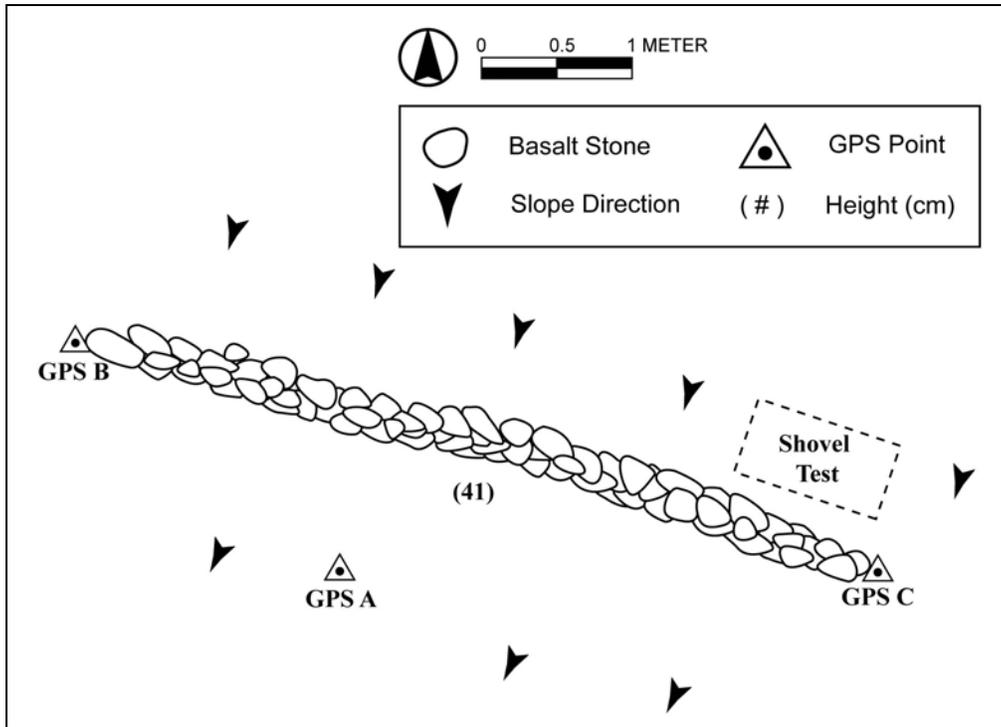


Figure 30. Plan-view diagram of SIHP # 50-30-04-2125



Figure 31. Photograph of SIHP # 50-30-04-2125, agricultural terrace, view to northeast

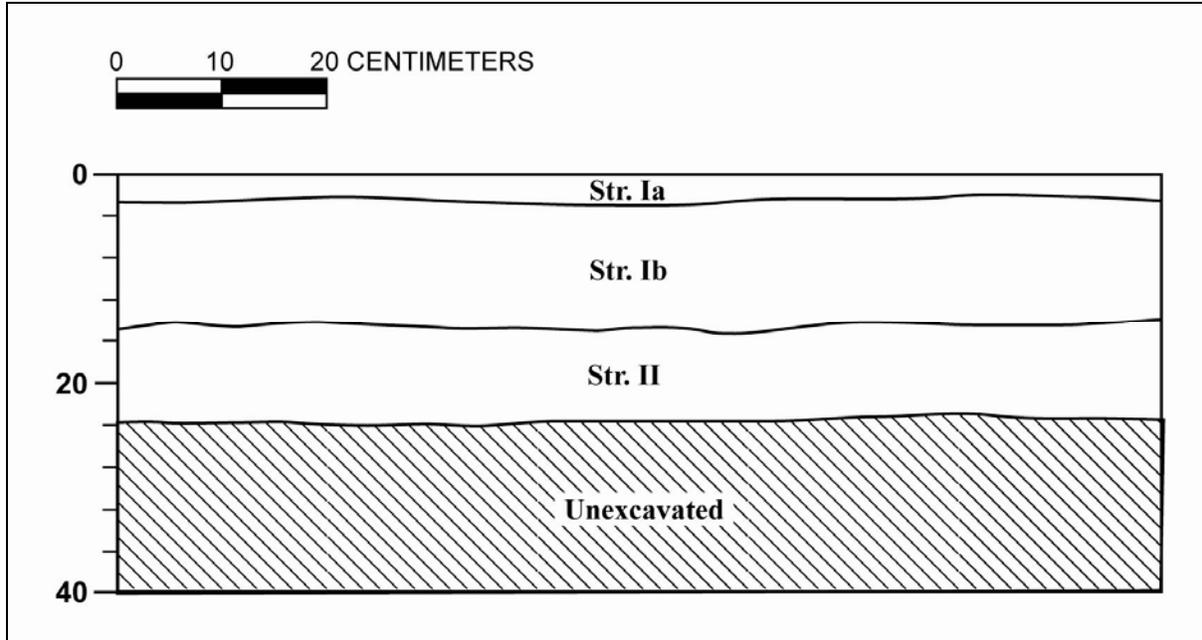


Figure 32. North wall profile of SIHP # 50-30-04-2125 test pit



Figure 33. Photograph of north wall profile of SIHP # 50-30-04-2125 test pit

4.2.4 SIHP #: 50-30-04-2126

SITE TYPE: Ditch
FUNCTION: Drainage
FEATURES: 1
DIMENSIONS: 109.75 m long by 1.75-7.0 m wide by 3.9 m high
CONDITION: Good
PROBABLE AGE: Historic
TAX MAP KEY: [4] 5-2-004:099

DESCRIPTION:

SIHP # 50-30-04-2126 consisted of an unpaved ditch located on the southern side of the gulch in the southeastern portion of the project area (Figure 34, Figure 35, Figure 36). SIHP # - 2126 appeared machine-excavated, with the spoils deposited along the north side of the ditch, forming a rough berm. The existing portion of the ditch within the project area measured 109.75 m long by 1.75 m wide at the base and 7.0 m wide at the top, with a height of 3.9 m. SIHP # -2126 appeared to have been disturbed (buried and cut) along its southern length by the modern Kāhili Quarry dirt road. The site did not appear to have functioned as an irrigation canal but rather as drainage for excess or flood water from the upper plateau to the Kīlauea Stream Valley below. SIHP # -2126 was observed to be in good condition.

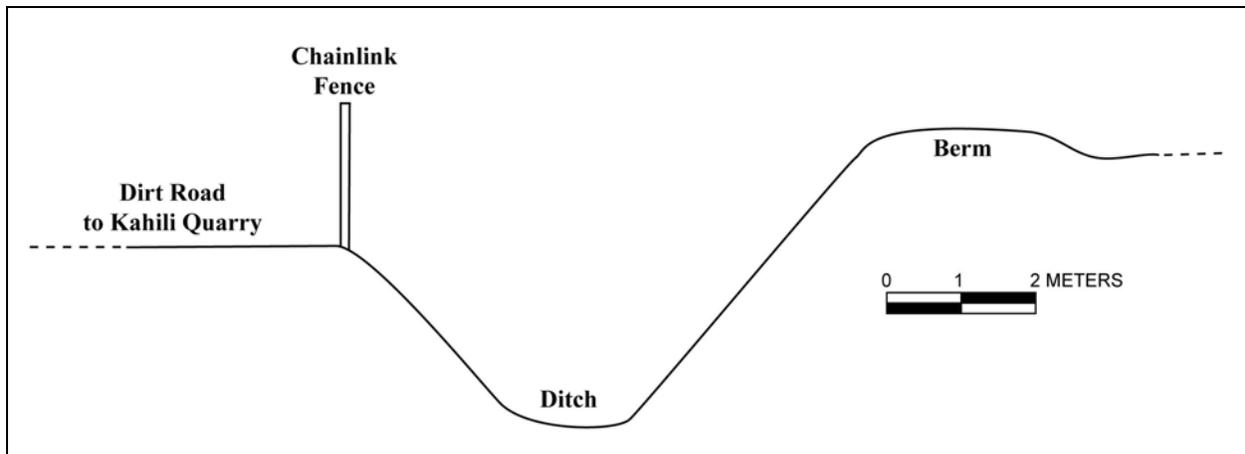


Figure 34. Cross-section diagram of SIHP # 50-30-04-2126, drainage ditch



Figure 35. Photograph of SIHP # 50-30-04-2126, drainage ditch, view to west



Figure 36. Photograph of SIHP # 50-30-04-2126, drainage ditch, view to east

Section 5 Artifact Analysis

Archaeological inventory survey investigations identified four historic properties within the project area, consisting of a total of five features. Three test units were excavated. Two of the test units recovered numerous historic artifacts (SIHP # 50-30-04-2123, SIHP # 50-30-04-2124), while the third, excavated within a pre-contact agricultural terrace, yielded no artifacts or other cultural material (SIHP # 50-30-04-2125).

SIHP # 50-30-04-2124, interpreted to be a historic habitation terrace, yielded numerous historic artifacts within both Stratum Ib and Stratum II. Artifacts recovered from Stratum Ib included one piece of coral, cane slag, five bottle glass fragments and six nails. All six nails were identified as square or cut nails, providing diagnostic potential. Cut nails began being produced around 1790 and were “sliced by machine from sheet iron” and the heads were shaped by hammering (Hume 1970). Early wrought iron square nails, used prior to 1830, can be identified by the crosswise pattern of the metal fibers. Early machine-headed square nails had irregular heads and were produced until around 1840. Machine-headed square nails with longitudinal grain and square ends were produced around 1840 and became the dominate nail type until around 1890-1910 with the advent of the wire nail (Center for Historic Preservation 2002). The nails recovered during this investigation appear to be machine-headed square nails with longitudinal grain and square ends indicating a date between 1840-1910 (Figure 37). However, due to the high erosional conditions of the gulch in which the historic property was located, the stratum was interpreted to be likely erosional and the above dates may not be originally associated with the historic property. In addition, it should be noted square nails are still produced and used today.

Artifacts recovered from Stratum II of SIHP # -2123 included 15 small to medium bottle glass fragments, several indeterminate metal fragments, two indeterminate nails, two ceramic shards and two pieces of a blue and white porcelain bowl. The porcelain bowl fragments included nearly the entire bottom portion of the piece (Figure 38). However, there was no identifying maker's mark to indicate origin or time period. The design is Asian in style and symbolism, including the two grazing deer within the central portion of the bowl. According to traditional Chinese symbolism, deer represented longevity and are often depicted grazing on the plant of immortality found at the lower trunk and roots of certain trees (Beer 1999:96).

A test excavation at SIHP # 50-30-04-2124, Feature B, interpreted as a historic, likely plantation-era concrete foundation, recovered cane slag, metal fragments, eight round or wire nails, and one railroad spike from Stratum Ib (Figure 39). Wire nails began replacing square nails circa 1890 (see above discussion), indicating a likely twentieth century date. The railroad servicing Kīlauea was constructed in 1881 and remained in use until 1938. Historic maps show a branch of the railroad running along the west and north sides of the project area gulch (see Figure 13 and Figure 14). However, as with Stratum Ib of SIHP # -2123 (see discussion above), the stratum was interpreted to be likely erosional, associated with the weathering action of the gulch walls, and the above dates may not be originally associated with the historic property.



Figure 37. Photograph of square (cut) nails recovered from SIHP # 50-30-04-2123, Stratum Ib



Figure 38. Photograph of porcelain bowl recovered from SIHP # 50-30-04-2123, Stratum II



Figure 39. Photograph of artifacts recovered from SIHP # 50-30-04-1216, Stratum Ib, including eight round (wire) nails and one railroad spike

Section 6 Summary and Interpretation

In compliance with and to fulfill applicable Hawai'i state historic preservation legislation, CSH completed this archaeological inventory survey investigation for the planned Kīlauea Agricultural Park.

Per the Hawai'i state requirements for archaeological inventory surveys [HAR Chapter 13-276], this inventory survey investigation includes the results of cultural, historical, and archaeological background research and fieldwork. The background research focused on summarizing the project area's pre-contact and post-contact land use, cultural significance, and types and locations of potential historic properties within the project area and its vicinity.

Pedestrian inspection of the project area identified four historic properties: SIHP #50-30-04-2123, a post-contact habitation terrace; SIHP #50-30-04-2124, a post-contact concrete wall and concrete foundation structure; SIHP #50-30-04-2125, a pre-contact agricultural terrace, and SIHP # 50-30-04-2126, a post-contact ditch. All four historic properties are located within the southeastern portion of the project area within a natural gulch feeding into Kīlauea Stream Valley. This area has been designated as "Lot 8" of the planned Kīlauea Agricultural Park and proposed as an orchard and an irrigation reservoir.

The archaeological inventory survey did not identify any historic properties within the remaining project area. The majority of the project area, comprised of a level plateau or tableland, was cultivated by Kīlauea Sugar Company between 1880 and 1971. The lack of historic properties likely reflects the significant modifications that ensued due to sugar cane cultivation and infrastructure development.

The findings of this archaeological inventory survey are largely in keeping with expectations. An inventory survey study by CSH for the nearby Kīlauea Falls Ranch project (Shideler et al. 2008) identified a pre-contact cluster of 55 archaeological features, including 53 soil-retaining terraces and two possible habitation areas, in the area downslope of the gulch located within the present project area. SIHP # 50-30-04-2125, a pre-contact agricultural terrace located within the gulch, is likely associated with this previously identified cluster.

Due to the proximity of the Kīlauea Sugar Company located on the plateau above, the gulch was likely modified with plantation-era infrastructure. SIHP # 50-30-04-2124, a concrete wall and concrete foundation structure, is likely associated with the plantation. SIHP # 50-30-04-2126, a drainage ditch, is also likely associated with the plantation and may have served to drain excess irrigation water from the sugar cane fields on the upper plateau down into the Kīlauea Stream Valley. A remnant banana farm encountered within the gulch may also have modified the area.

Based on the archaeological inventory survey and background research, it is unlikely that subsurface historic properties associated with pre-contact land use may be present within the tableland portion of the project area. It is more likely that any remnant subsurface properties would be associated with plantation agriculture and infrastructure. It is, however, possible that subsurface historic properties associated with pre-contact land use may be present within the gulch in the southeastern portion of the project area. Evidence of pre-contact land use could be in the form of subsurface cultural deposits containing human burials, midden deposits, and artifacts

(i.e. stone tools). Evidence of post-contact land use could be in the form of subsurface trash deposits and plantation infrastructure.

Section 7 Significance Assessments

There were four historic properties identified during the archaeological inventory survey. Each historic property identified by the current study was evaluated for significance according to the criteria established for the Hawai'i Register of Historic Places. The five criteria are:

- A Associated with events that have made an important contribution to the broad patterns of our history;
- B Associated with the lives of persons important in our past;
- C Embodies the distinctive characteristics of a type, period, or method of construction, represents the work of a master, or possesses high artistic value;
- D Have yielded, or is likely to yield information important for research on prehistory or history;
- E Have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property, or due to associations with traditional beliefs, events or oral history accounts – these associations being important to the group's history and cultural identity.

SIHP # 50-30-04-2123, a historic habitation terrace, is assessed as significant under Criterion D (have yielded, or is likely to yield information important for research on prehistory or history).

SIHP # 50-30-04-2124, a concrete wall and concrete foundation structure, likely associated with the Kīlauea Sugar Company, is assessed as significant under Criterion D (have yielded, or is likely to yield information important for research on prehistory or history).

SIHP # 50-30-04-2125, a pre-contact agricultural terrace, is assessed as significant under Criterion D (have yielded, or is likely to yield information important for research on prehistory or history).

SIHP # 50-30-04-2126, a post-contact drainage ditch, likely associated with the Kīlauea Sugar Company, is assessed as significant under Criterion D (have yielded, or is likely to yield information important for research on prehistory or history).

Section 8 Project Effect and Mitigation Recommendations

8.1 Project Effect

The following project effect determination and cultural resource management recommendations are intended to facilitate project planning and support the proposed project's required historic preservation consultation. This determination is based on the results of this archaeological inventory survey investigation.

8.2 Mitigation Recommendations

Four historic properties were identified during the archaeological inventory survey. All four historic properties were located within the natural drainage gulch in the southeastern portion of the project area. All four historic properties were thoroughly documented and three subsurface test excavations were conducted. No further historic preservation work is recommended for these historic properties.

Three historic properties were likely associated with the plantation era: SIHP # 50-30-04-2123, SIHP # 50-30-04-2124, and SIHP # 50-30-04-2126. Sufficient information regarding the location, function, age, and construction methods of the historic properties have been generated by the current inventory survey investigation to mitigate any adverse effect caused by proposed development activities.

SIHP # 50-30-04-2125, a pre-contact agricultural terrace, was likely associated with or an outlier of SIHP #50-30-04-580, a large cluster of agricultural terraces located downslope of the gulch and previously recommended for preservation (Shideler et al. 2008). As an outlier that lacks distinctive characteristics and which has been tested for subsurface deposits and artifacts during the current inventory study, it is not recommended that any further preservation work be pursued.

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Appendix A Land Commission Awards within Kāhili Ahupua'a within 200 m of the Present Project Area

A-1 LCA 9067 to Keo

Claim Number:	09067
Claimant Name:	Keo
Mokupuni (Island):	Kaua'i
Moku (District):	Halele'a
Ahupua'a (Division):	Kalihi
'Ili (Section):	Kilauea, Kahili, Ulehulehu
Royal Patent:	3486

No. 9067, Keo
Native Register Volume 9, page 403

The Land Commissioners, greetings: I hereby state my claim for seven lo'i, two mala of wauke and the house lot.

KEO X

Kahili, Kauai, January 17, 1848

No. 9067, Keo, Claimant
Foreign Testimony Volume 12, page 166

Luakini, sworn, says I know Claimant's lands in Kalihi. They are 7 Lois in three distinct pieces. Kahili & a house lot in Kilauea.

No. 1 is house lot in Kilauea.
No. 2 is 5 Lois & kula in Kanaele - Kahili.
No. 3 is 1 loi in "Uleulehu" - Makai.
No. 4 is 1 loi in "Uleulehu" - Mauka.

No. 1 is bounded:
Mauka by Government kula
Napali by Luakini's house lot
Makai by Government kula
Anahola by Government kula.

No. 2 is bounded:
Mauka by Luakine's lois
Napali by Kanialama's lois
Makai by Hapakui's lois

Anahola by Konohiki's kula.

No. 3 is bounded:

Mauka by Mamuakalono's loi
Napali by Kahili River
Makai by Uncultivated lands
Anahola by Loko "Kanaio."

No. 4 is bounded:

Mauka by my loko [Luakini]
Napali by Konohiki's koele
Makai by Apahu's loi
Anahola by my loko [Luakini].

These lands were given by the Konohiki to Claimant in the days of Kaumualii & have been held undisturbed till this time.

Inoaole, sworn, says I know the lands of Kea & all that Luahini has testified is true.

No. 9067, Keo

Native Testimony Volume 12, page 177

Kuakini, sworn, he has seen Keo's land in Kalihi of seven lois and a house lot.

Section 1 - House lot.

Mauka by Government pasture
Napali by Luakini's house lot
Makai by Government pasture
Anahola by Government pasture.

Section 2 - Five lois and a pasture together.

Mauka by Luakini's loi
Napali by Kaniauna's land
Makai by Hapakua's land
Anahola by Government pasture.

Section 3 - One loi, Ulehulehu.

Mauka by Mamuakalono's land
Napali by Kahili river
Makai by With weeds, land
Anahola by Kanaio, the Konohiki's pond.

Section 4 - One loi mauka of Ulehulehu.

Mauka by Luakini's land (Pond)
Napali by Konohiki koele

Makai by Apahu's land
Anahola by Luakini's land.

Land had been from Kaumualii I to Keo's parents and from them to Keo, all is peaceful to the present.

Inoaole, sworn, he has seen Keo's land, the house lot, the five lois and the pasture. One loi is in section 3, in Ulehulehu and the other lois is mauka of Ulehulehu as section four.

He has known in the same way as Luakini concerning Keo's land, the house lot and his lois.

[Award 9067; R.P. 3486; Ulehulehu Kahili Halelea; 3 ap. 2.25 Ac 18 rods]

A-2 LCA 10013 to Leimanu

Claim Number:	10013
Claimant Name:	Leimanu, B
Secondary Claimant:	Mokuhalii
Mokupuni (Island):	Kaua'i
Moku (District):	Ko'olau
Ahupua'a (Division):	Kahili
'Ili (Section):	Kahililalo, Kaukahinu
Royal Patent:	3879

No. 10013, Leimanu, Koloa, Kauai, January 16, 1848
Native Register Volume 9, page 252

The Land Commissioners, greetings: We, Leimanu and Mokuhalii, are Hawaiian subjects living at Kahili on the island of Kauai. We hereby state our claims for land, some lo'is and a kula and a house claim. These are all within the diagram:

[DIAGRAM]

I, Leimanu, a Hawaiian subject, hereby state my claim at Kahililalo, for a kula for planting wauke; its diagram is as follows:

[DIAGRAM]

Respectfully,
LEIMANU

No. 10013, Leimanu, Claimant
Foreign Testimony Volume 12, page 228

Mokuhalii, sworn, says I know the lands of Leimanu in Kahili. They are in 3 pieces as follows:

No. 1 is house lot, 3 lois & kula in "Kaukahiwai."

No. 2 is 2 Lois in "Kaukahinau."

No. 3 is kula in "Nanohala."

No. 1 is bounded:

Mauka by Luaili's lois
Hanapepe by Daniela's lois
Makai by Koalaiki's lois
Anahola by Koalaikia's lois.

No. 2 is bounded:
Mauka by my lois [Mokuhalii]
Hanapepe by Kahili river
Makai by Alaiki's lois
Anahola by Keokea's lois.

No. 3 is bounded:
Mauka by Hapakui's kula
Hanapepe by Kahili River
Makai by Daniela's kula
Anahola by Konohiki's kula.

These lands have been held peaceably since 1840. Claimant had them from his brother-in-law. They had been held by the parents of the brother-in-law from the days of Kaumualii.

Pupu, sworn, says I know Claimant's lands in Kahili. I have heard all that Mokuhalii has testified. It is all true.

No. 10013, Leimanu, B
Native Testimony Volume 12, page 234

Kumokuhalii, sworn, he has seen claimant's land in Kahili.

Section 1 - House lot and a pasture in Kaiaakahiunu.
Mauka by Two ili land
Halelea by Daniela's land
Makai by Koalaiki's land
Anahola by Koalaiki's land.

Section 2 - Two lois.
Mauka by Mokuhalii's land
Halelea by Kahili river
Makai by Alaiki's land
Anahola by Keokea.

Section 3 - Pasture at Namohala.
Mauka by Land
Halelea by Kahili river
Makai by Daniela's pasture

Anahola by Konohiki pasture.

Land from the Konohiki to Leimanu's brother-in-law at the time of Kaumualii.

Leimanu received this land in 1844, no objections.

Kipu, sworn, verifies Mokuhalii's testimony is correct, he has known in the same way.

[Award 10013; R.P. 3879; Kaukahinu Kahili Koolau; 3 ap.; 1 Ac 1 rood 4 rods]

A-3 10013B to Mokuhalii

Claim Number:	10013B
Claimant Name:	Mokuhalii
Secondary Claimant:	Leimanu
Mokupuni (Island):	Kaua'i
Moku (District):	Halele'a
Ahupua'a (Division):	Kahili
'Ili (Section):	Hoopala, Kapunahoe
Royal Patent:	3880

No. [10013B], Mokuhalii

Native Register Volume 9, page 252
 [Listed erroneously as 10013; should be 10013B]

I, Mokuhalii, hereby state my claim in another place, as follows: 5 chains on two sides, 9 chains on another side and 30 in another side /?sic/.

I am respectfully,
 MOKUHALII

No. 10013[B], Mokuhalii, Claimant /no claim in Index/
 Foreign Testimony Volume 12, page 162

Kauoha, sworn, says I know lands of Mokuhalii in Kahili in ili "Hoopala" & some kula embracing a house Lot & an Orange Tree in "Kapunahoa."

No. 1 is house lot & kula adjoining.
 No. 2 is 5 Lois in "Hoopala."

No. 1 is bounded:
 Mauka by Konohiki's kula
 Napali by Kalunaaina's loi
 Makai by Kahili River
 Koolau by Kaleimanu's lois.

No. 2 is bounded:
 Mauka by Kalunaaina's lois
 Napali by Kahili River

Makai by Kaleimanu's lois
Koolau by Alaiki's lois.

These lands have been held by Claimant & his parents from the days of Kaumualii. They came into the full possession of Claimant in 1844. No one has disputed his claim.

Kealawaa, sworn, says, I know claimant's lands. I have hears the testimony of Kauoha. It is all true.

No. 10013!, Mokuhalii
Native Testimony Volume 12, page 171

[should be 10013B]

Kanoha, sworn, he has seen claimant's land in the ili of Hapala, also the pasture in the koa growth.

Section 1 - Pasture and house lot.
Mauka by Konohiki pasture
Napali by Landlord's lois
Makai by Kahili river
Koolau by Kaleimanu's lois.

Section 2 - 5 lois in Hapala.
Mauka by Landlord's land
Napali by Kahili river
Makai by Kaleimanu's lois
Koolau by Alaiki's lois.

Land to Kumokuhalii from his parents at the time of Kaumualii 1. Kumokuhalii as a son received it directly in 1844, title secured from parents.

Kealawaa, sworn, he has seen Kumokuhalii's land in Kahili of Hoopala ili land. Verifies Kealawaa's statements as true and accurate, life has been peaceful.

[Award 10013B; R.P. 3880; Hoopala Kahili Koolau; 2 ap.; 1 Ac 1 rood 7 rods]

A-4 LCA 10015 to Luakini

Claim Number:	10015
Claimant Name:	Luakini
Alternate Name:	
Secondary Claimant:	
Mokupuni (Island):	Kaua'i
Moku (District):	Ko'olau
Ahupua'a (Division):	Kilauea
'Ili (Section):	
Royal Patent:	3762

No. 10015, Luakini, Koloa, Kauai, January 16, 1848
Native Register Volume 9, page 253

The Land Commissioners, greetings: I, Luakini, a Hawaiian subject living at Kahili on the island of Kauai, hereby state my claim for land. The diagram follows:

[DIAGRAM]

My house is in a separate place.
I am, respectfully,
LUAKINI

No. 10015, Luakini, Claimant
Foreign Testimony Volume 12, page 165

Inoaole, sworn, says I know Claimant's lands in Kahili & Kilauea. They are in two pieces.

No. 1 is house lot in Kilauea

No. 2 is 2 Lois & kula with 2 orange trees

No. 1 is bounded:
Mauka by Konohiki's kula
Napali by Konohiki's kula
Makai by Konohiki s kula

Anahola by Konohiki s kula.

No. 2 is bounded:

Mauka by Papai's kula

Napali by Kahili River

Makai by my Lois [Inoaole]

Anahola by my kula [Inoaole].

These lands were given Claimant in the days of Kaumualii & have been held in peaceable possession till this time.

Holokuhine, sworn, says I know Claimant's lands as above described and have heard the testimony of Inaole. It is all true.

No. 10015, Luakini

Native Testimony Volume 12, page 176

Inoaole, sworn, he has seen Luakini's land of two lois, a pasture and a house lot all in one area in Kilauea. Two orange trees also are on this land. This claim has been absolutely secured since the beginning to the present time.

Section 1 Mauka and all around is government pasture.

Section 2

Mauka by Papai's pasture.

Napali by Kahili river

Makai by Inoaole's land

Anahola by Inoaole's land.

Land from the Konohiki at the time of Kaumualii, the first and this has been secured since that time to the present.

Holokukini, sworn, he has seen Luakini's land, the pasture, the two orange trees and the house lot. He has known in the same way as Inoaole.

[Award 10015; R.P. 3762; Kahili Koolau; 1 ap.; 2 Acs]

A-5 LCA 10082 to Mamao

Claim Number:	10082
Claimant Name:	Mamao
Secondary Claimant:	Pipili, father, Kupahu, mother
Mokupuni (Island):	Kaua'i
Moku (District):	Ko'olau
Ahupua'a (Division):	Kahili
'Ili (Section):	Makaihuwaa, Kapuka
Royal Patent:	4074

No. 10082, Mamao
Native Register Volume 9, page 262

The Land Commissioners, greetings: I hereby state my claim for an 'ili named Makaihuwaa. The boundaries of this 'ili.* All the rights in this 'ili are mine, and that is my claim which is stated to you. I also have a claim in the 'ili of Kapuka, for two lo'i and some scattered lo'i, a total of six.

MAMA O
Kahili, Kauai,
January 17, 1848

*[Boundaries] Not stated.

No. 10082, Mamao, Claimant
Foreign Testimony Volume 12, page 230

Daniela, sworn, says I know the lands of Mamao in Kahili. It is an ili called "Makaihuwaa." This ili was given by the Konohiki to Pipili at the close of the war of 1824. Pipili held it in peace till his death in 1837. His widow (Kupahu) then held the land in peaceable possession till 1847, when she gave it to her son, the Claimant who has held it in peace to the present time. No one has disputed the claim:

Bounded as follows:
Mauka by Konohiki's kula
Halelea by "Kalama"
Makai by Kahili River
Anahola by pali of "Makaihuwaa."

Keo, sworn, says I know the lands of Mamao in Kahili. The ili "Makaihuaaa." It belongs to Mamao & to no one else.

Note: This claim embraces a whole ili, but Claimant relinquishes a larger part of the kula & takes that part that borders on his kalo land below the pali.

No. 10082, Mamao
Native Testimony Volume 12, page 233

Daniela, sworn, he has seen claimant's land in Kahili of one section consisting of a whole ili and a house lot in Makaihuwaa.

Land from the Konohiki to Pipili after the battle of Wahiawa, no objections. Pipili died in 1837, land was given to Kupahu, the widow, no disputes. In 1847, the widow gave the ili land to her son Mamao.

Boundaries of that ili:
Mauka by Konohiki pasture
Halelea by Kalama's land
Makai by Kahili river
Anahola by Konohiki pasture.

Keo, sworn, he has seen Mamao's ili land and it is his (Mamao) own land just as Daniel, the witness has related. Both Keo and Daniela have known in the same way.

[Award 10082; R.P. 4074; Makaihiwaa Kahili Koolau; 1 ap.; 5.5 Ac 30 rods]

A-6 LCA 10083 to Mamuakalono

Claim Number:	10083
Claimant Name:	Mamuakalono
Mokupuni (Island):	Kaua'i
Moku (District):	Ko'olau
Ahupua'a (Division):	Kahili
'Ili (Section):	
Royal Patent:	7754

No. 10083, Mamuakalono, Kahili, Kauai, 17 January 1848

Native Register Volume 9, page 262

The Land Commissioners, greetings: I hereby state my claims for one lo'i, a mala of noni, a mala of wauke and the house lot.

MAMUAKALONO X

No. 10083, Mamuakalono, Claimant

Foreign Testimony Volume 12, page 228

Keo, sworn, says I know Claimant's land in Kahili. It is 1 lo'i & I gave it to him previous to 1839 & it has been held in peaceable possession till now.

Bounded as follows:

Mauka by Luakini's lo'i

Halelea by Kahili River

Makai by Keo's lo'i

Anahola by Koele lo'i.

[no more testimony here]

No. 60083!, Mamuaakalono

Native Testimony Volume 12, page 232

[should be 10083]

Keo, sworn, he has seen claimant's land in Kahili of one piece with a lo'i in Kahili.

Mauka by Luakini's land

Halelea by Kahili river
Makai by Keo's land
Anahola by Koele.

Land from the Konohiki in 1839, no disputes to the present.

[Award 10083; R.P. 7754; Kahili Koolau; 1 ap.; 33 rods]

A-7 LCA 10333 to Naaimaneo

Claim Number:	10333
Claimant Name:	Naaimeneo, wahine
Alternate Name:	Naiamaneo
Secondary Claimant:	Oopu, her husband (deceased)
Mokupuni (Island):	Kaua'i
Moku (District):	Ko'olau
Ahupua a (Division):	Kahili
'Ili (Section):	Kupa
Royal Patent:	3370

No. 10333, Naiamaneo, Koloa, Kauai, 16 January 1848
Native Register Volume 9, page 283

The Land Commissioners, greetings:

I, Naiamaneo, a subject of Hawaii living at Kahili, island of Kauai, hereby state my claim:

The house is in another place.
I am, respectfully,
NAIAMANEO

No. 10333, Naaimaneo, (wahine) Claimant
Foreign Testimony Volume 12, page 229

Leimanu, sworn, says I know the lands of Naaimaneo in Kahili. They are a field of Kalo embracing a number of small lois & kula adjoining in ili "upa"

Bounded as follows:
Mauka by Ahupuaa of Kilauea
Halelea by Kahili River
Makai by brook "ilauea"
Anahola by Kahili River.

These lands were given by the Konohiki to Claimant's Husband, Oopu, in the days of Kamualii. Oopu died in 1847 & the lands fell to the widow (Claimant). She has held them in peace till this time.

Appendix H

Cultural Impact Assessment
Kīlauea Agricultural Park Project
Kīlauea Ahupua‘a, Hanalei District, Kaua‘i
Cultural Surveys Hawai‘i, March 2011

Draft for Review

**Cultural Impact Assessment for the
75-Acre Kīlauea Agricultural Park Project,
Kīlauea Ahupua‘a, Hanalei District, Kaua‘i Island
TMK: [4] 5-2-004:099**

**Prepared for
R. M. Towill Corporation**

**Prepared by
Hallett H. Hammatt, Ph.D.**

**Cultural Surveys Hawai‘i, Inc.
Kailua, Hawai‘i
(Job Code: KILAUEA 4)**

March 2011

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Prefatory Remarks on Language and Style

A Note about Hawaiian and other non-English Words:

Cultural Surveys Hawai'i (CSH) recognizes that the Hawaiian language is an official language of the State of Hawai'i. Hawaiian language is important to daily life, and using it is essential to conveying a sense of place and identity. In consideration of a broad range of readers, CSH follows the conventional use of italics to identify and highlight all non-English (i.e., Hawaiian and foreign language) words in this report unless citing from a previous document that does not italicize them. CSH parenthetically translates or defines in the text the non-English words at first mention, and the commonly-used non-English words and their translations are also listed in the *Glossary* (Appendix A) for reference. However, translations of Hawaiian and other non-English words for plants and animals mentioned by community participants are referenced separately (see explanation below).

A Note about Plant and Animal Names:

When community participants mention specific plants and animals by Hawaiian, other non-English or common names, CSH provides their possible scientific names (Genus and species) in the *Common and Scientific Names of Plants and Animals Mentioned by Community Participants* (Appendix B). CSH derives these possible names from authoritative sources, but since the community participants only name the organisms and do not taxonomically identify them, CSH cannot positively ascertain their scientific identifications. CSH does not attempt in this report to verify the possible scientific names of plants and animals in previously published documents; however, citations of previously published works that include both common and scientific names of plants and animals appear as in the original texts.

Abbreviations

AIS	Archaeological Inventory Survey
AMSL	Above Mean Sea Level
APE	Area of Potential Effect
CIA	Cultural Impact Assessment
Ft	Feet
HAR	Hawai'i Administrative Rules
HRS	Hawai'i Revised Statutes
KHPRC	Kaua'i Historic Preservation Review Commission
KNIBC	Kaua'i/Ni'ihau Island Burial Council
LCA	Land Commission Award
OEQC	Office of Environmental Quality Control
OHA	Office of Hawaiian Affairs
SHPD	State Historic Preservation Division
SMA	Special Management Area
TCP	Traditional Cultural Property
USGS	United States Geological Survey

Management Summary

Reference	Cultural Impact Assessment for the 75-Acre Kīlauea Agricultural Park Project, Kīlauea Ahupua'a, Hanalei District, Kaua'i Island, TMK: [4] 5-2-004:099 (Hammatt 2011)
Date	March 2011
Project Number (s)	Cultural Surveys Hawai'i, Inc. (CSH) Job Code: KILAUEA 4
Project Location	The Kīlauea Agricultural Park Project is located at the juncture of Kīlauea Lighthouse Road and Quarry Road, approximately 1,100 ft northeast of Kīlauea Town and 1,200 ft southeast of Crater Hill. The Project area consists of a 75-acre parcel of predominantly level tableland with a natural drainage gulch in the southeastern corner. The Project area is depicted on the U.S. Geological Survey 7.5-Minute Series Topographic Map, Anahola Quadrangle (1996).
Land Jurisdiction	County of Kaua'i
Agencies	State Historic Preservation Division/Department of Land and Natural Resources (SHPD/DLNR)
Description	Proposed development within the Project area includes: grading and grubbing for the creation of agricultural lots, a composting and recycling area, energy farm, and community gardens and market; development of a 4,000 linear foot network of unpaved gravel roads and parallel drainage system; development of a 0.7-acre public parking lot comprised of 74 stalls; construction of windbreaks along the Project area perimeter; and the construction of an irrigation reservoir located within the upper portion of the gulch.
Project Acreage	75 acres
Area of Potential Effect (APE) and Survey Acreage	For the purposes of this Cultural Impact Assessment (CIA), the APE is defined as the approximately 75-acre Project area. While this investigation focused on the Project APE, the study area includes the entire <i>ahupua'a</i> (land division usually extending from the uplands to the sea) of Kīlauea.
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 cultural practices and resources. At the request of R. M. Towill Corporation, CSH is conducting this Draft CIA. Through document research and ongoing cultural consultation efforts, this draft report provides information pertinent to the assessment of the proposed Project's impacts to cultural practices and resources (per the <i>Office of Environmental Quality Control's Guidelines for Assessing Cultural Impacts</i>) which may include Traditional Cultural Properties (TCP) of ongoing cultural significance that may be eligible for inclusion on the

	<p>State Register of Historic Places, in accordance with Hawai'i State Historic Preservation Statute (Chapter 6E) guidelines for significance criteria (HAR §13-284) under Criterion E. The document is intended to support the Project's environmental review and may also serve to support the Project's historic preservation review under HRS Chapter 6E-42 and Hawai'i Administrative Rules (HAR) Chapter 13-284.</p>
<p>Consultation Effort</p>	<p>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 include the State Historic Preservation Division (SHPD), the Office of Hawaiian Affairs (OHA), the Kaua'i/Ni'ihau Island Burial Council (KIBC), Hui Mālama I Nā Kūpuna 'O Hawai'i Nei, Aha Punana Leo o Kauai, Kaua'i Island Hawaiian Civic Club, Hui o Laka, Kīlauea Point Natural History Association, Malama Kaua'i, Kīlauea Neighborhood Association, Kaua'i National Wildlife Refuge Complex, Alu Like, Ka Leo o Kaua'i, Kaua'i Historic Preservation Review Commission (KHPRC), U.S. Fish and Wildlife Service and community members of Kīlauea Ahupua'a.</p>
<p>Results of Background Research</p>	<p>Background research for this Project yielded the following results:</p> <ol style="list-style-type: none"> 1. Kīlauea is associated with specific <i>mo'olelo</i> (stories and oral histories) about (a) an <i>ali'i</i> (chief, noble), Lonoikamakahiki, who passed through with a companion and who remarked about vast tracts of <i>lauhala</i> (<i>Pandanus</i> sp.) and constant rain; and (b) Pele, who fought the sea goddess (Nā-maka-o-kaha'i) but was defeated by her and subsequently ridiculed by three beautiful sisters whom she later punished by turning them to stone; (c) a <i>mo'o</i> named Ka-mo'o-koa who was ordered by ruling chief Mano-kalani-pō to leave claw marks that became the remains of three, long, ancient, parallel irrigation ditches, thus opening up upper Kīlauea regions for agriculture; (d) the Menehune, who created the boulders lying between the islet of Moku'ae'ae and Kīlauea crater. 2. The Project area is located in Kīlauea and is comprised of mostly flat tableland at about 300 ft. elevation, with the east portion of the south side being a tributary gulch of the Kīlauea Stream Valley dropping down to approximately 200 ft. AMSL. Vegetation consists of exotic grasses, <i>hau</i> (<i>Hibiscus tiliatus</i>), ironwood (<i>Cassuarina equisetifolia</i>), Christmas berry (<i>Schinus terebinthifolius</i>), false <i>kamani</i> (<i>Terminalia catappa</i>) and Java plum (<i>Syzygium cumini</i>), among others. There is also extensive areas of <i>hau</i> (<i>Hibiscus tiliaceus</i>), <i>hala</i>, ironwood, bamboo, mango

	<p>(<i>Mangifera indica</i>), and <i>ti</i> (<i>Cordyline fruticosa</i>).</p> <ol style="list-style-type: none"> 3. In the Māhele of 1848, Kīlauea Ahupua‘a was retained as Government Lands and there were no entries for commoner land claims. However, 11 LCA awards in adjacent Kāhili provide a picture of what settlement near the Project area may have been like at the time. These 11 LCA awards in Kāhili are clustered along the south side of Kīlauea Stream, lying in a low, wide terrace next to the stream - evidently well-watered and well-suited for maintenance of taro <i>lo‘i</i> (irrigated terrace). Virtually all claims involve a house-lot, a few include <i>lo‘i</i>, and several claims mention “<i>kula</i>” (pasture) with <i>wauke</i> (paper mulberry), <i>noni</i> (Indian mulberry) and orange trees being cultivated. 4. The census of 1847 shows the combined population of 240 for Kīlauea and Kāhili Ahupua‘a, larger than that of the huge valleys of Kalalau or Wainiha. It likely means that the area was well-populated back in pre-Contact times. 5. The Project Area was land formerly used as a sugar plantation by the Kīlauea Sugar Company, which employed Chinese and Portuguese workers. The sugar company modified water resources in the uplands with dams, reservoirs, ditches and flumes (Joesting 1984), which may have damaged and ended large-scale native agricultural practices in Kīlauea and vicinity. The Kīlauea Sugar Company ended its operations in 1971. 6. In 1881, a railway was begun and Princess Lydia Kamakaeha (Lili‘uokalani) drove in the first spikes for the railroad bed. Sugar was delivered from Kīlauea to Kāhili landing (Condé and Best 1974:152). The rail system was abandoned entirely in 1942. 7. Documented sites within the Project area included four historic properties identified during the archaeological inventory survey (AIS). All four historic properties were located within the natural drainage gulch in the southeastern portion of the Project area. Three of the four historic properties were likely associated with the plantation era, and the fourth historic property is a pre-Contact agricultural terrace. No further historic preservation work is recommended for these historic properties.
<p>Summary of Consultation</p>	<p>CSH attempted to contact 38 community members, government agency and community organization representatives for this draft</p>

<p>Efforts</p>	<p>CIA report; thus far, 6 responded and two participated in formal interviews. The community consultation indicates:</p> <ol style="list-style-type: none"> 1. The Project area and environs has a history of use by Kānaka Maoli (Native Hawaiians) and other <i>kama 'āina</i> groups for a variety of past and present cultural activities and gathering practices. Community participant Mr. Gushiken discusses natural and cultural resources including the Kīlauea Stream abundant with 'o'opu, wi, and shrimp; the catching and enjoyment of fish like <i>kala</i>, <i>imanui</i>, <i>ulua</i>, <i>pāpio</i> and gathering of limu; the presence of aloe and gathering of <i>noni</i> and fruits like avocados. Community participant Mr. Smith describes presence of <i>lo 'i</i> (irrigated terrace) in the upper areas of the valley near the Project area and the nesting of 500 <i>nēnē</i> and presence of 90 <i>mōlī</i> (Laysan albatross nests) as well as wedgetailed shearwater birds that traditionally have been found in the area and which are now protected in nearby Kīlauea Point National Wildlife Refuge. Both participants recall Kīlauea town's sugar plantation past, with Mr. Gushiken noting the self-sufficiency of the town where most everybody grew their own vegetables to be shared with neighbors, while Mr. Smith expresses the wide interaction among different ethnicities which encouraged the growth of pidgin and the learning of diverse cultural backgrounds. 2. Mr. Smith shares several <i>mo'olelo</i> (stories, legends) about the places in the area, including the Hawaiian name of Kīlauea Point as Cape Wowoni, due to the feeling one gets when standing at the point where the waves roar and bellow and one feels it at the core; the origin of the name Nīhoku (known as Crater Hill), where the profile of the hill is like a standing or upright tooth and hence the meaning of the name; the name of a nearby hill, beach and wind called "Kauapea," which he interprets as the "sail filling rain." 3. According to Mr. Smith, the Project area was used as cattle grazing ground before being planted with sugar. After the end of sugar in 1971, sorghum, corn, prawns and guavas were attempted to be grown in the plantation. 4. Mr. Smith points to the valley portion of the Project area, formerly considered as 'ōpala (trash) lands, as being known by the name of "Pākē Man Place" and
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	<p>where such crops as peanuts, bananas and avocados were cultivated. Some of the crops are still gathered today.</p> <ol style="list-style-type: none"> 5. The Kīlauea Sugar Company once sprawled over nine <i>ahupua'a</i>, including Kīlauea. The nine <i>ahupua'a</i> were once part of the <i>moku</i> (district) of Ko'olau before Kīlauea was put in the Hanalei district. 6. In a letter to CSH, OHA suggests consideration of traditional land use concepts which emphasize land stewardship and also requests clarification on past and present land use of the Project area. 7. In a letter to CSH, SHPD voices concern with any ground disturbance work, which may uncover burials or burial sites as there is a cemetery north of the Project area. SHPD also calls for the continued access to cultural resources by the Hawaiian community and recreational users. 8. Both Mr. Smith and Mr. Gushiken voice their concerns about water for the agricultural park and for maintenance of the park once built. Mr. Smith recommends leasing the land, and not selling it, in order to ensure the perpetuity of the agricultural park.
<p>Impacts and Recommendations</p>	<p>Based on the information gathered for the cultural and historic background and community consultation detailed in this draft CIA report, CSH does not foresee potential impacts of the proposed Project on Native Hawaiian or other ethnic groups' cultural practices customarily and traditionally exercised for subsistence, cultural or religious purposes, but does foresee two potential impacts on cultural, historic, and natural resources. CSH clarifies these two potential impacts and makes the following recommendations:</p> <ol style="list-style-type: none"> 1. Land-disturbing activities may uncover burials or other cultural resources. Mr. Smith notes there are no known burials, but if there were any, it would most likely be in the valley portion of the Project area. Should historic, cultural or burial sites or artifacts be identified during ground disturbance, the construction contractor should immediately cease all work and the appropriate agencies notified pursuant to applicable law. 2. Although the Project area is outside the vicinity of Kīlauea Point National Wildlife Refuge, its proximity to the refuge may mean that occasional endangered birds may be found in or around the Project area. Care must be taken to ensure that these birds such

	as the <i>nēnē</i> , shearwaters and Laysan albatross or <i>mōlī</i> be unharmed and returned to the refuge.
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Section 1 Introduction

1.1 Project Background

At the request of R. M. Towill Corporation, Cultural Surveys Hawai'i (CSH) completed an archaeological inventory survey (AIS) for the planned 75-acre Kīlauea Agricultural Park Project, Kīlauea Ahupua'a, Hanalei District, Kaua'i Island (TMK [4] 5-2-004:099). The 75-acre land parcel was conveyed to the County of Kaua'i in 2006 by the developer of the Seacliff Plantation subdivision as a condition of development. The Project area is located at the juncture of Kīlauea Lighthouse Road and Quarry Road, approximately 1,100 ft northeast of Kīlauea Town and 1,200 ft southeast of Crater Hill (Figure 1, Figure 2, Figure 3).

The Kīlauea Agricultural Park is a County resource to be developed for the purpose of sustaining and supporting agricultural production in perpetuity for the citizens of Kaua'i. Present plans call for farm lots to occupy a total of 54.3 acres or 72.4% of the entire agricultural park. Present plans anticipate four organic farm lots of between 5.1 and 7.6 acres, five conventional farm lots ranging in size from 3.5 to 5.4, four incubator lots, approximately 1-acre each, for start-up farmers, and an orchard within the gulch area in the southeast corner of the Project lands, in the location of a remnant banana farm. Additionally, the plan provides for an energy farm, irrigation reservoir, composting and recycling area, community gardens, and market area (Figure 4). Infrastructure will include a network of interior roads, a public parking lot and perimeter windbreak/buffers. The extreme northern and eastern portions of the Project area lie within the boundary of the Special Management Area (SMA). The SMA is that portion of the coastal zone designated for more intensive land use management pursuant to Section 205A-2, HRS. Because portions of the agricultural park are located within the SMA boundary, an SMA permit is required. The Planning Commission is the approving authority in the County of Kaua'i.

This document is prepared to support the proposed project's historic preservation review under Hawai'i Revised Statutes (HRS) Chapter 6E-42 and Hawai'i Administrative Rules (HAR) Chapter 13-284. In consultation with the Hawai'i State Historic Preservation Division (SHPD), the AIS investigation was designed to fulfill the State requirements for an AIS per HAR Chapter 13-13-276.

1.2 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 cultural practices. CSH is conducting this draft CIA at the request of R. M. Towill Corporation. Through document research and ongoing cultural consultation efforts, this report provides information pertinent to the assessment of the proposed project's impacts to cultural practices and resources (per the *Office of Environmental Quality Control's Guidelines for Assessing Cultural Impacts*), which may include Traditional Cultural Properties (TCPs) of ongoing cultural significance that may be eligible for inclusion on the State Register of Historic Places, in accordance with Hawai'i State Historic Preservation Statute (Chapter 6E) guidelines for significance criteria in Hawai'i Administrative Rules (HAR) §13-275 under Criterion E, which states to be significant an historic property shall:

Have an important value to the Native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group's history and cultural identity.

The document is intended to support the Project's environmental review and may also serve to support the Project's historic preservation review under HRS Chapter 6E and HAR Chapter 13-275.

1.3 Scope of Work

The scope of work for this CIA includes:

1. Examination of cultural and historical resources, including Land Commission documents, historic maps, and previous research reports, 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. Review of previous archaeological work at and near the subject parcel that may be relevant to reconstructions of traditional land use activities; and to the identification and description of cultural resources, practices, and beliefs associated with the parcel.
3. Consultation and interviews with knowledgeable parties regarding cultural and natural resources and practices at or near the parcel; present and past uses of the parcel; and/or other practices, uses, or traditions associated with the parcel and environs.
4. Preparation of a report that summarizes the results of these research activities and provides recommendations based on findings.

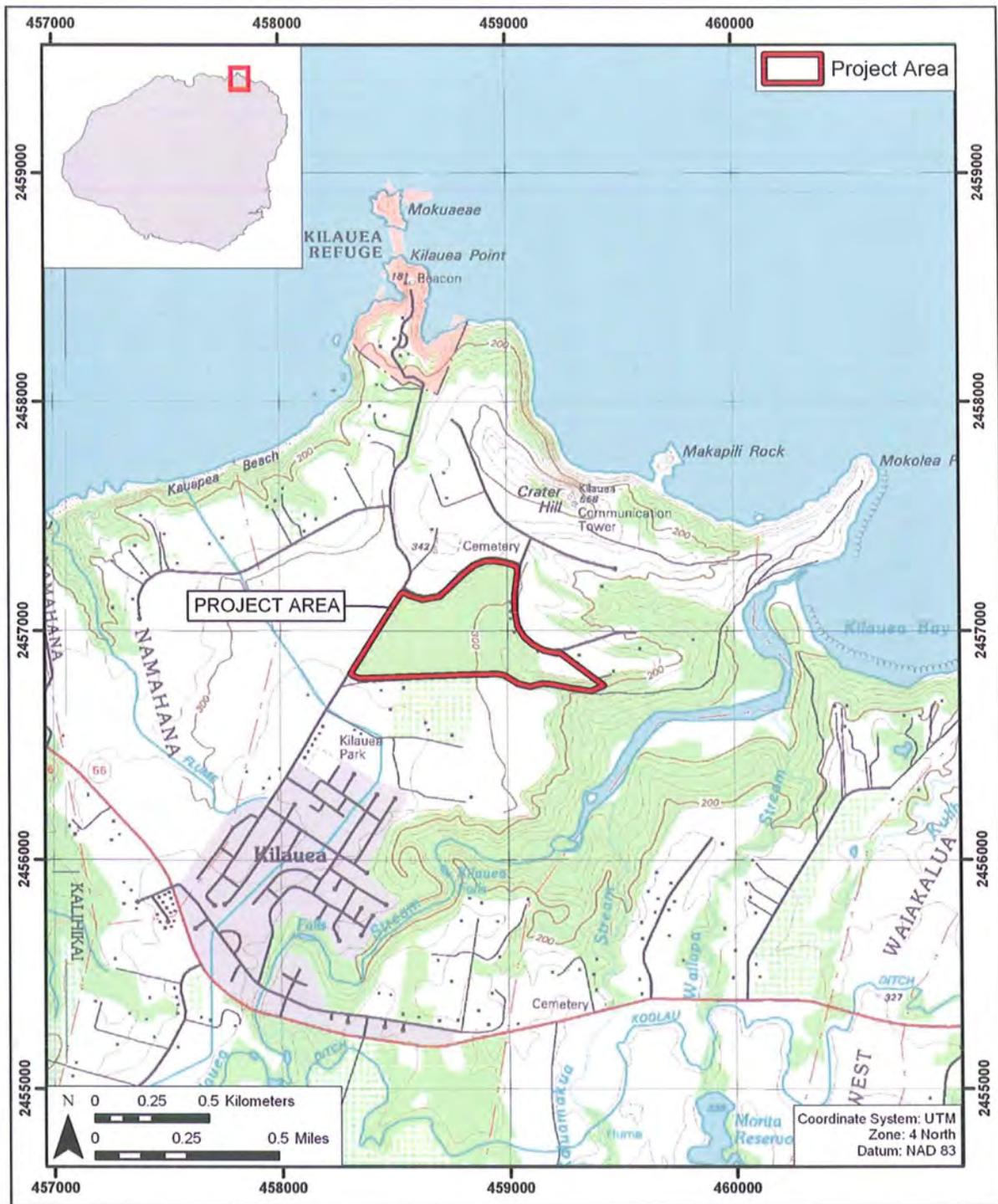


Figure 1. U.S.G.S. 7.5 Minute Series Topographic Map, Anahola Quadrangle (1996), showing the location of the Project area

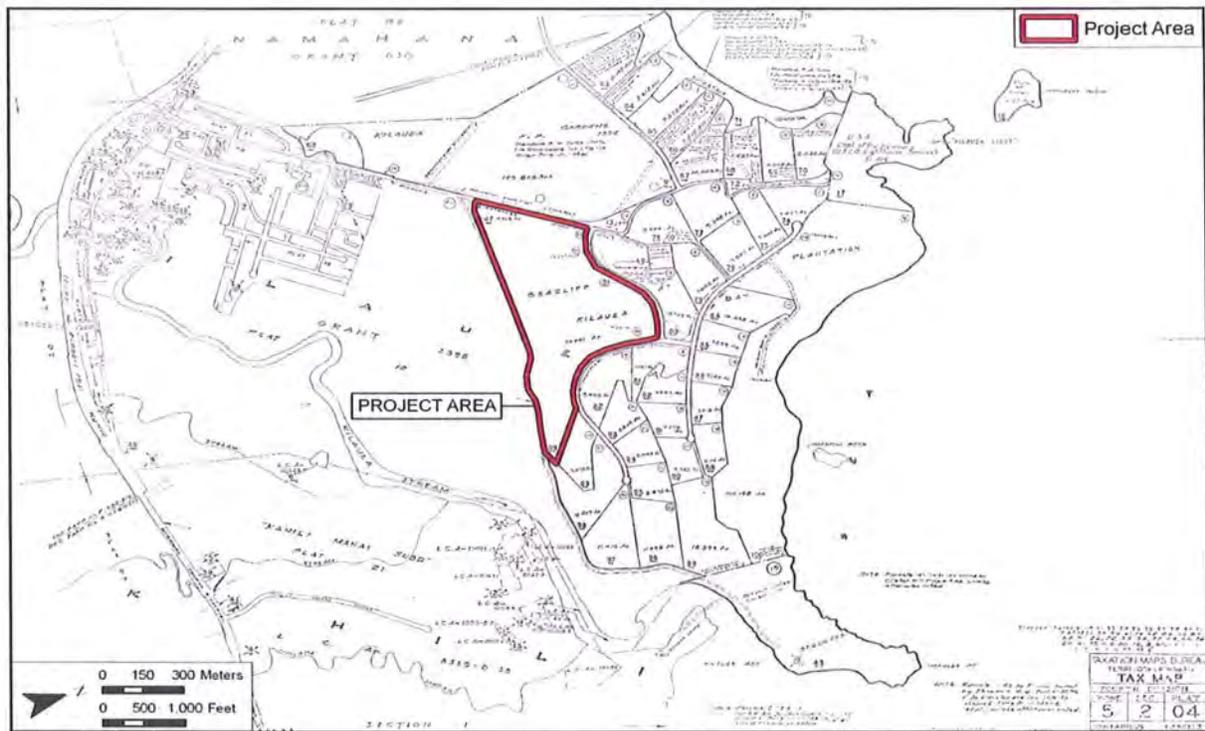


Figure 2. Tax Map Key (TMK) 5-2-014, showing the location of the Project area (Hawai'i TMK Service 2010)



Figure 3. Aerial photograph (source: Google Earth 2010) showing the location of the Project area

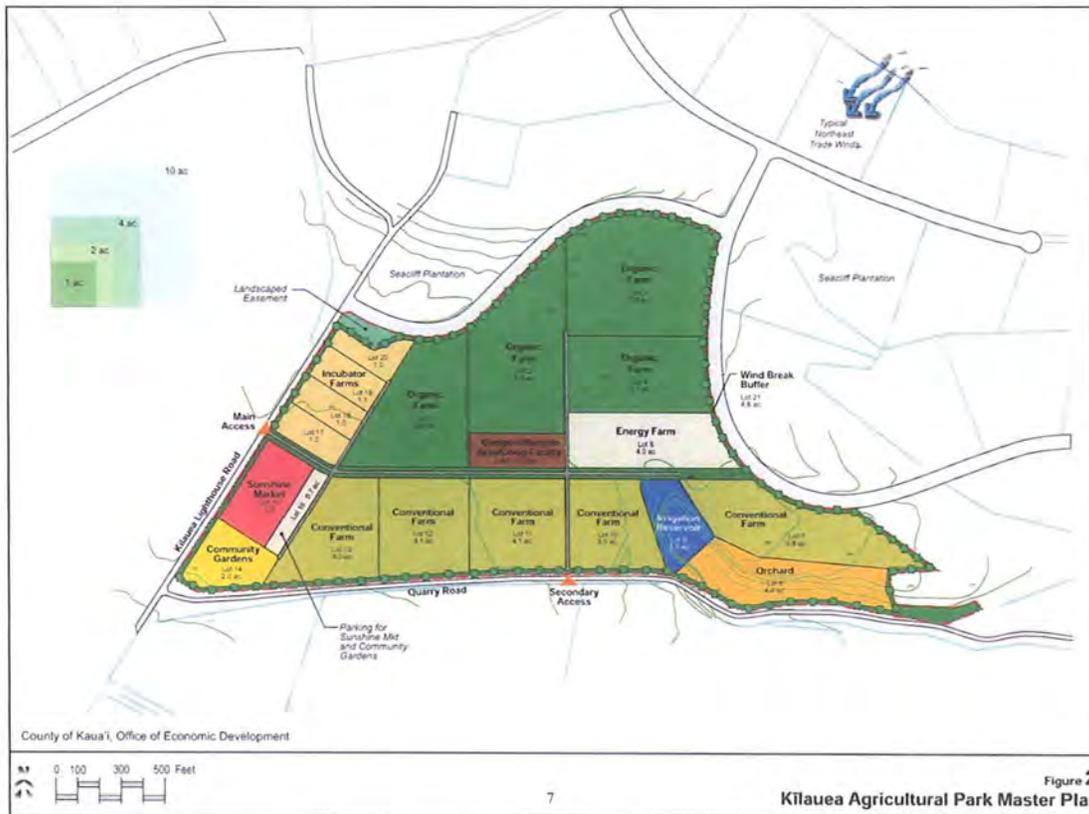


Figure 4. Kilauea Agricultural Park Master Plan (Kimura International 2009)

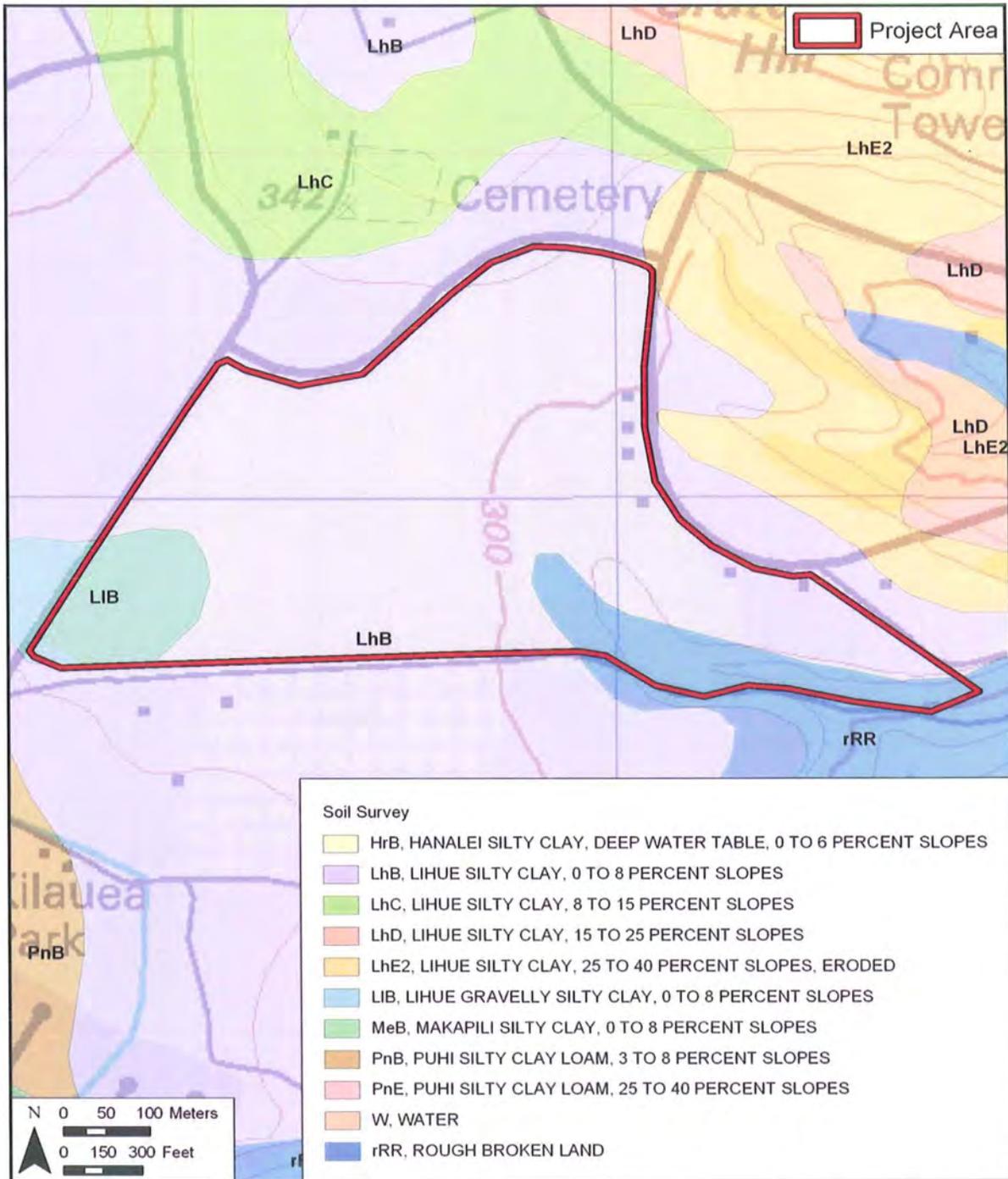


Figure 5. Overlay of Soil Survey of the State of Hawai'i (Foote et al. 1972), indicating soil types within the Project area

1.4 Environmental Setting

1.4.1 Natural Environment

The Project area includes mostly relatively flat tableland at about 300 ft. elevation (varying from about 308 ft. to 281 ft. AMSL but the east portion of the south side is a tributary gulch of the Kīlauea Stream Valley dropping down to approximately 200 ft. AMSL. Soils within the tributary gulch are primarily of Rough Broken Land (rRR) (Figure 5). Rough Broken Land is described as:

very steep land broken by numerous intermittent drainage channels. In most places it is not stony...Runoff is rapid and geologic erosion is active. These soils are variable. They are 20 to more than 60 inches deep over soft, weathered rock. In most places some weathered rock fragments are mixed with the soil material. Small areas of rock outcrop, stones, and soil slips are common. (Foote et al. 1972)

The vast majority of the Project area, however, is Lihue Silty Clay (LhD) with a small pocket of Lihue Gravelly Silty Clay (LIB) in the southwest corner. Soils of the Lihue Series are described as “well-drained soils on uplands...developed in material weathered from basic igneous rock” (Foote et al. 1972).

The Project area is indicated to receive approximately 1500-1800 mm (60-70 in.) of annual rainfall, with increased rainfall at higher elevations (Giambelluca et al. 1986). This is more than sufficient for most non-irrigated agriculture, and supports luxuriant and diverse vegetation. The vegetation within the Project area is almost entirely exotic. In the tributary gulch are extensive areas of exotic grasses, *hau* (*Hibiscus tiliatus*), ironwood (*Cassuarina equisetifolia*), Christmas berry (*Schinus terebinthifolius*), false *kamani* (*Terminalia catappa*) and Java plum (*Syzygium cumini*). Vegetation in the upper plateau includes Java plum, extensive areas of *hau*, *hala* (*Pandanus* sp.), ironwood, bamboo, Christmas berry, lantana (*Lantana* sp.), banana (*Musa* sp.), African tulip (*Spathodea campanulata*), mango (*Mangifera indica*), and ti (*Cordyline fruticosa*). There are also extensive areas of thorny exotic vegetation including cat's claw (*Caesalpinia decapetala*) and other quite thorny plants. The only native plant observed was *hala*.

The 203-acre Kīlauea Point National Wildlife Refuge is located along the Kīlauea shoreline, to the north of the Project area, and was created largely as a preserve for various seabird species. A popular guidebook notes:

Along the backshore, the lower reaches of Kīlauea Stream form one of the most pristine estuaries in the state. In former times it supported an important mullet fishery. Mullet and other fish are still found there, but are not fished commercially. (Clark 1990:22)

1.4.2 Built Environment

The majority of the Project area is comprised of former sugarcane land previously cultivated by Kīlauea Sugar Company from 1880–1971. Since the closure of Kīlauea Sugar Company the land has remained undeveloped (Figure 6 and Figure 7). In the southeastern portion of the Project area, a natural drainage gulch has been utilized as a banana farm and an informal vehicle dump (Figure 8 and Figure 9). The surrounding area is primarily rural, dominated by agricultural and luxury house lot development.



Figure 6. Photograph of Project area, view from Quarry Road to northeast (CSH October 14, 2010)



Figure 7. Photograph of eastern portion of Project area, view to east (CSH October 14, 2010)



Figure 8. Photograph of gulch in southeastern portion of Project area, showing remnant banana farm, view to east (CSH October 14, 2010)



Figure 9. Photograph of gulch in southeastern portion of project area, showing abandoned cars, view to west (CSH October 14, 2010)

Section 2 Methods

2.1 Archival Research

Historical documents, maps and existing archaeological information pertaining to Kīlauea were researched at the CSH library and other archives including the University of Hawai'i at Mānoa's Hamilton Library, the State Historic Preservation Division (SHPD) library, the Hawai'i State Archives, the State Land Survey Division, and the archives of the Bishop Museum. Previous archaeological reports for the area were reviewed, as were historic maps and photographs and primary and secondary historical sources. Information on Land Commission Awards (LCAs) was accessed through Waihona 'Aina Corporation's Māhele Data Base (www.waihona.com) as well as a selection of CSH library references. Research for the Cultural and Historical Background section centered on the following cultural and historic resources, practices, and beliefs: traditional subsistence land use and settlement patterns; gathering practices and agricultural pursuits; *wahi pana* (storied places) and associated *mo'olelo* (stories, oral traditions), *mele* (songs), *oli* (chants), and *'ōlelo no 'eau* (proverbs) (see Scope of Work above).

2.2 Community Consultation

2.2.1 Sampling and Recruitment

A combination of qualitative methods, including purposive, snowball, and expert (or judgment) sampling, were used to identify and invite potential participants to the study. These methods are used for intensive case studies, such as CIAs, to recruit people that are hard to identify, or are members of elite groups (Bernard 2006:190). Our purpose is not to establish a representative or random sample. It is to "identify specific groups of people who either possess characteristics or live in circumstances relevant to the social phenomenon being studied.... This approach to sampling allows the researcher deliberately to include a wide range of types of informants and also to select key informants with access to important sources of knowledge" (Mays and Pope 1995:110).

We began with purposive sampling informed by referrals from known specialists and relevant agencies. For example, we contacted the SHPD, Office of Hawaiian Affairs (OHA), Kaua'i/Ni'ihau Island Burial Council (KNIBC), and community and cultural organizations in Kīlauea for their brief response/review of the Project and to identify potentially knowledgeable individuals with cultural expertise and/or knowledge of the Project area and vicinity, cultural and lineal descendants, and other appropriate community representatives and members. Based on their in-depth knowledge and experiences, these key respondents then referred CSH to additional potential participants who were added to the pool of invited participants. This is snowball sampling, a chain referral method that entails asking a few key individuals (including agency and organization representatives) to provide their comments and referrals to other locally recognized experts or stakeholders who would be likely candidates for the study (Bernard 2006:192). CSH also employs expert or judgment sampling which involves assembling a group of people with recognized experience and expertise in a specific area (Bernard 2006:189–191). CSH maintains a database that draws on over two decades of established relationships with community

consultants: cultural practitioners and specialists, community representatives and cultural and lineal descendants. The names of new potential contacts were also provided by colleagues at CSH and from the researchers' familiarity with people who live in or around the study area. Researchers often attend public forums (e.g., Neighborhood Board, Burial Council and Civic Club meetings) in (or near) the study area to scope for participants. Please refer to Table 4, Section 4, for a complete list of individuals and organizations contacted for this CIA.

CSH focuses on obtaining in-depth information with a high level of validity from a targeted group of relevant stakeholders and local experts. Our qualitative methods do not aim to survey an entire population or subgroup. A depth of understanding about complex issues cannot be gained through comprehensive surveying. Our qualitative methodologies do not include quantitative (statistical) analyses, yet they are recognized as rigorous and thorough. Bernard (2006:25) describes the qualitative methods as "a kind of measurement, an integral part of the complex whole that comprises scientific research." Depending on the size and complexity of the project, CSH reports include in-depth contributions from about one-third of all participating respondents. Typically this means three to twelve interviews.

2.2.2 Informed Consent Protocol

An informed consent process was conducted as follows: (1) before beginning the interview, the CSH researcher explained to the participant how the consent process works, the Project purpose, the intent of the study and how his/her information will be used; (2) the researcher gave him/her a copy of the Authorization and Release Form to read and sign (Appendix C); (3) if the person agreed to participate by way of signing the consent form or providing oral consent, the researcher started the interview; (4) the interviewee received a copy of the Authorization and Release Form for his/her records, while the original is stored at CSH; (5) after the interview was summarized at CSH (and possibly transcribed in full), the study participant was afforded an opportunity to review the interview notes (or transcription) and summary and to make any corrections, deletions or additions to the substance of their testimony/oral history interview; this was accomplished either via phone, post or email or through a follow-up visit with the participant; (6) the participant received the final approved interview and any photographs taken for the study for record. If the participant was interested in receiving a copy of the full transcript of the interview (if there is one as not all interviews are audio-recorded and transcribed), a copy was provided. Participants were also given information on how to view the report on the OEQC website and offered a hardcopy of the report once the report is a public document.

2.2.3 Interview Techniques

To assist in discussion of natural and cultural resources and cultural practices specific to the study area, CSH initiated semi-structured interviews (as described by Bernard 2006), asking questions from the following broad categories: gathering practices, *mauka* and *makai* resources, burials, trails, historic properties, and *wahi pana*. The interview protocol is tailored to the specific natural and cultural features of the landscape in the study area identified through archival research and community consultation. For example, for this study cultivation and gathering were emphasized over other categories less salient to project participants. These interviews and oral histories supplement and provide depth to consultations from government

agencies and community organizations that may provide brief responses, reviews and/or referrals gathered via phone, email and occasionally face-to-face commentary.

2.2.3.1 In-depth Interviews and Oral Histories

Interviews were conducted initially at a place of the study participant's choosing (usually at the participant's home or at a public meeting place) and/or—whenever feasible—during site visits to the project area. Generally, CSH's preference is to interview a participant individually or in small groups (two–four); occasionally participants are interviewed in focus groups (six–eight). Following the consent protocol outlined above, interviews may be recorded on tape and in handwritten notes, and the participant photographed. The interview typically lasts one to four hours, and records the—who, what, when and where of the interview. In addition to questions outlined above, the interviewee is asked to provide biographical information (e.g., connection to the study area, genealogy, professional and volunteer affiliations, etc.).

2.2.3.2 Field Interviews

Field interviews are conducted with individuals or in focus groups comprised of with *kūpuna* (elder) and *kama 'āina* (Native-born) who have a similar experience or background (e.g., the members of an area club, elders, fishermen, *hula* dancers) who are physically able and interested in visiting the project area. In some cases, field visits are preceded with an off-site interview to gather basic biographical, affiliation and other information about the participant. Initially, CSH researchers usually visit the project area to become familiar with the land and recognized (or potential) cultural places and historic properties in preparation for field interviews. All field activities are performed in a manner so as to minimize impact to the natural and cultural environment in the project area. Where appropriate, Hawaiian protocol may be used before going on to the study area and may include the *ho 'okupu* (offering) of *pule* (blessing), and *oli*. All participants on field visits are asked to respect the integrity of natural and cultural features of the landscape and not remove any cultural artifacts or other resources from the area.

2.3 Compensation and Contributions to Community

Many individuals and communities have generously worked with CSH over the years to identify and document the rich natural and cultural resources of these islands for cultural impact, ethno–historical and, more recently, TCP studies. CSH makes every effort to provide some form of compensation to individuals and communities who contribute to cultural studies. This is done in a variety of ways: individual interview participants are compensated for their time in the form of a small honorarium and/or other *makana* (gift); community organization representatives (who may not be allowed to receive a gift) are asked if they would like a donation to a Hawaiian charter school or nonprofit of their choice to be made anonymously or in the name of the individual or organization participating in the study; contributors are provided their transcripts, interview summaries, photographs and—when possible—a copy of the CIA report; CSH is working to identify a public repository for all cultural studies that will allow easy access to current and past reports; CSH staff do volunteer work for community initiatives that serve to preserve and protect historic and cultural resources (for example in, Lāna'i and Kaho'olawe). Generally our goal is to provide educational opportunities to students through internships, share our knowledge of historic preservation and cultural resources and the State and Federal laws that

guide the historic preservation process, and through involvement in an ongoing working group of public and private stakeholders collaborating to improve and strengthen the Chapter 343 environmental review process.

Section 3 Background Research

3.1 Traditional and Historical Background

3.1.1 The Land of Kīlauea

The Project area lies on the *makai* (seaward) central portion of the traditional Hawaiian land division of Kīlauea Ahupua'a. The name "Kīlauea" is understood as meaning "Spewing, much spreading" (Pukui et al. 1974:111). In the case of the best known "Kīlauea" at Ka'ū District, Hawai'i Island (Hawaii Volcanoes National Park), the name is typically understood as referring to volcanic steam clouds or aerial fountains of volcanic eruptions. Wichman (1998:102) explains the name as referring to "spewing many vapors" and traces it rather generically to the streams of Kīlauea that flow between the Makaleha Mountains and the Kamo'okoa Ridge. The name may have originally been in reference to Kīlauea Falls itself. The relatively large volume of water, flowing over a relatively wide and high drop, flowing against the prevailing trade winds blowing approximately straight up the lower stretch of the valley can create a large volume of diffuse mist that may have inspired the name of the land. We see some support for this theory in that the portion of Kīlauea Stream that lies within Kāhili Ahupua'a (that does not include Kīlauea Falls) was evidently universally called Kāhili Stream by Hawaiian residents in that area. The name could however be in reference to the sea spray at Kīlauea Point and the Crater Hill cliff or it could be in reference to all of the above.

3.1.2 Mythological and Traditional Accounts

An exhaustive search of Hawaiian legends and myths in print produced only four mythological references.

Dole (1892) relates a somewhat vague account that at Kīlauea there were the remains of three long, ancient and parallel irrigation ditches attributed by the Hawaiians to the claw marks of a *mo'ō* (lizard, reptile). "The lizard had been ordered by [the famous ruling chief] Mano-ka-lani-pō to open Kīlauea's upper regions for agriculture" (Wichman 1998:102). In context the *mo'ō* is associated with the "brave lizard" Ka-mo'ō-koa after whom a ridge of the Makaleha Mountains is named.

Wichman (1998:102) relates an account, (that may have originated in a 1939 story contest - Juliette Ferreira's "Pele the Goddess of Fire" for the Martha W. Beckwith prize, Kamehameha School for Girls), that near the top of a volcanic cone open to the ocean:

Once stood three huge stones that have since been moved, with great difficulty, to make room for sugarcane. These three stone sisters of great beauty, were a warning that Pele, the volcano goddess, was not to be trifled with.... Pele [seeking to establish a home for herself and her Kaua'i lover Lohiau] caused an eruption here, but it was soon extinguished when the sea goddess [Nā-maka-o-kaha'i] broke down the walls of the crater, drowning the fire with the ocean. The laughter of the three beautiful sisters enraged Pele. They had seen Pele defeated and shamed. Their scorn was not to be endured. "What are your names?" Pele asked. And one replied "I am Kalama, this is Pua, and this is Lāhela." Pele repeated their names, touching them with her staff as

she did so, turning them to stone. They were a mute and visible warning not to laugh at or ridicule Pele. (Wichman 1998:103)

In a slight variant of the story Pele is motivated by jealousy of the three girls' beauty and fear they will make Lohiau fall in love with them and thus she turns them to stone to protect her love interest.

A third mythological account of Kīlauea related by Rice (1923:38, see also Wichman 1998:104) concerns the creation of a swath of awash boulders lying between the islet of Moku'ae'ae and Kīlauea crater:

Traveling on the Menehune moved a big stone to Kahili, below Kilauea, which they used to dive from. At Moku'ae'ae, the island off the present Kilauea lighthouse, they began to fill in the channel between the island and the mainland. They were just able to touch the bottom with a paddle when morning dawned, and their task was left unfinished.

In the Story of Lonoimakahiki (Fornander 1917:358-359) is a passing reference to the ruling chief Lonoikamakahiki traveling with a companion at Kīlauea and Kalihi (Kalihiwai, Kalihikai) Kaua'i. The account makes reference to "days of hunger" in which their hunger was appeased by eating the ripe flowers (or possibly fruit) of pandanus trees (*hele aku a ai i ka pua pala o ka hala, hala ia la poloi o ka ua ilaila, e ka hoa, he hoa i ka nahele lauhala loloa, mai Kilauea a Kalihi la*). The account emphasizes the great *lauhala* tracts and "the heavy and wind-blown rain, the ceaseless and general rain." The "ae-kai" is said to be the name of a wind specific to the vicinity of Moku'ae'ae Island and "the Wai-mio is the wind of Kilauea" (Aikin 1988:7). The wind name for the Ko'olau District of Kaua'i between Moloa'a and Kalihikai was the "Kiukainui" (Nakuina 1990:54).

3.1.3 Population

Our best data on the population of north Kaua'i comes from a census in the spring of 1847 (Table 1). For the purposes of the census, Kīlauea was lumped with adjacent Kāhili Ahupua'a. Even given this conflation of the two, it may be noted that the recorded population of 240 is relatively large, larger than the combined populations of Kalihiwai and Kalihikai to the west and larger than the combined populations of Waiakalua, Pāpa'a, Waipāke, and Lepeuli to the southeast. The population is larger than that of the huge valleys of Kalalau or Wainiha. The population density of Kīlauea/Kāhili thus would appear to have been relatively high for the Ko'olau District in 1847. Most likely this pattern of being relatively well-populated would have continued back well into pre-Contact times.

Table 1. Population of Northern Kaua'i (1847) (from Schmitt 1969:229), indicating a relatively large population (and high population density at "Kilauea and Kahili")

TABLE I. POPULATION OF NORTHERN KAUI, BY AHUPUAA: SPRING 1847						
<i>Ahupuaa</i> *						<i>Population</i>
Total	-	-	-	-	-	2,698
Kalalau	-	-	-	-	-	190
Haena	-	-	-	-	-	162
Wainiha	-	-	-	-	-	154
Lumahai	-	-	-	-	-	123
Waikoko	-	-	-	-	-	5
Waipa	-	-	-	-	-	66
Waioli	-	-	-	-	-	159
Hanalei	-	-	-	-	-	637
Kalihikai	-	-	-	-	-	87
Kalihiwai	-	-	-	-	-	78
Kilauea and Kahili	-	-	-	-	-	240
Waiakalua	-	-	-	-	-	43
Papaa	-	-	-	-	-	22
Pilaa	-	-	-	-	-	51
Waipake	-	-	-	-	-	60
Lepeuli	-	-	-	-	-	23
Moloaa	-	-	-	-	-	104
Papaa -	-	-	-	-	-	23
Anahola	-	-	-	-	-	280
Hoomaikawaa	-	-	-	-	-	32
Kumukumu	-	-	-	-	-	21
Kealia	-	-	-	-	-	143

* Listed from west to east. Two different areas are named "Papaa". See text and footnote 3 for further comment.

3.1.4 Early Historic Records

We have identified few early narratives of the vicinity of the Project area. In 1849, William DeWitt Alexander wrote the following passing account:

A little farther on we entered groves of hala, through which we continued to ride for the rest of our journey. We turned from the road to see the falls of the Kahili River. Though not large they are beautiful. Here the river falls in a jet of foam over a precipice of about 40 feet into a broad clear basin below.... (Alexander 1991:124)

3.1.5 Māhele Records

In the great land division or Māhele of 1848, Kīlauea Ahupua'a was retained as Government Lands. In the records for Land Commission Awards, there are no entries for commoner land claims associated with Kīlauea Ahupua'a.

While no commoner Land Commission Awards (LCAs) are listed in Kīlauea Ahupua'a, eleven awards are clustered along the south side of Kīlauea Stream in adjacent Kāhili Ahupua'a. Most of these commoner Land Commission Awards lie in a low, wide terrace next to the stream—evidently well-watered and well-suited for maintenance of taro *lo'i* (irrigated terrace).

It is unknown why there were no commoner *kuleana* land holdings within Kīlauea Ahupua'a at the time of the Māhele (1848) and the following Kuleana Act. There was, however, a pattern at the time of the division of lands in which the land overseers (*konohiki*) often tried to present their overlord *ali'i* (chief, noble) with undivided tracts of land believing that to be in the best interests of their masters. Thus it could be that there was a systematic pattern to discourage commoner land claims in Kīlauea Ahupua'a. It certainly seems odd that there was not a single claim in what should have been a well-populated *ahupua'a*.

The land claims just south across Kīlauea Stream (universally referred to as “Kāhili Stream” in the land records of claims within Kāhili Ahupua'a) are summarized below in Table 2. While these are all outside the Project area (indeed outside of Kīlauea Ahupua'a), they offer insight into such Hawaiian occupation as may have existed within Kīlauea Ahupua'a and gone unrecorded in the Māhele-era land documents. Virtually all claims involve a house-lot (understood as a permanent residence) and a few irrigated ponded fields for taro cultivation (*lo'i*). Several claims mention “*kula*” (pasture) which in this context probably refers both to pasturage and areas of dry land cultivation (with *wauke* specifically mentioned as a *kula* crop). Other specific cultigens mentioned are the bark-cloth plant *wauke*, *noni*, and orange trees.

Table 2. Commoner Land Commission Awards within Kāhili Ahupua'a

LCA #	Awardee	Place name	Area	Land Use
9067	Keo	Kāhili, Ulehulehu Kanaele given as place name of five <i>lo'i</i> & <i>kula</i> ; Ulehulehu given as place name of two <i>lo'i</i> ; Reference to <i>loko</i> "Kanaio"	2.25 acres	'Āpana 1, 2 & 3 were quite close together; claims seven <i>lo'i</i> , two <i>māla</i> of <i>wauke</i> & "a house lot in Kilauea"; Reference to at least two <i>loko</i> "Kanaio" and one owned by Luakini, also "Konohiki's pond"
10013	Leimanu	Kāhili (Kāhilihilo), Kaukahiwai & Kaiaakahiuunu named as place of house lot, <i>lo'i</i> and <i>kula</i> ; Kaukahinu (Kaukahinau) named as place of two <i>lo'i</i> ; Nanohala named as place of <i>kula</i>	1 acre	'Āpana 1, 2 & 3 were quite close together; claims five <i>lo'i</i> , <i>kula</i> for planting <i>wauke</i> & a house lot
10013B	Mokuhali'i	Kāhili, five <i>lo'i</i> in Ho'opala (Hapala); <i>kula</i> , house lot & orange tree in Kapunahoa	1 acre	'Āpana 1 & 2 were quite close together; claims five <i>lo'i</i> , <i>kula</i> , a house lot & an orange tree
10015	Luakini	Kāhili [in one account all holdings also said to be "in one area in Kilauea"]	2 acres	Claims two <i>lo'i</i> , <i>kula</i> , a house lot "in Kilauea" & two orange trees
10082	Mamao	Kāhili, Makaihiwa'a (var. Makaihuwa'a & Makaihuaaa) 'Ili; claims two <i>lo'i</i> in 'ili of Kapuka; reference to <i>pali</i> of Makaihuwa'a	5.5 acres	Claims six <i>lo'i</i> , & a house lot
10083	Mamuakalono	Kāhili	33 rods	Claims one <i>lo'i</i> , one <i>māla</i> of <i>wauke</i> , one <i>māla</i> of <i>noni</i> & a house lot
10333	Naaimaneo	Kāhili, Kupe; holdings said to be in 'ili of Upa (var. Kupa); brook named "Kilauea"	0.75 acre	Claims a field of <i>kalo</i> embracing a number of small <i>lo'i</i> & <i>kula</i>

3.1.6 Late 1800s

3.1.6.1 The History of Kīlauea Plantation

In January 1863, a former American whaler named Charles Titcomb purchased the entire *ahupua'a* of Kīlauea amounting to approximately 3,016 acres from Kamehameha IV for \$2,500 (Grant 2896) (Figure 10, Figure 11). This land grant included the present Project area. By this time, Charles Titcomb was already a veteran of several enterprises at Kōloa, Hanalei, and Kīlauea, Kaua'i, including efforts to cultivate silkworms, coffee, tobacco, sugarcane and cattle. He expanded his holdings to the west through further purchases within the next couple of years. The Kīlauea Plantation, begun in 1863 by Mr. Titcomb, became a sugar estate in 1877 when Captain John Ross and E. P. Adams, in partnership with Titcomb, purchased much of the land and leased another substantial tract (Aikin 1988:19). Titcomb and his family continued to be involved in the plantation. He, his Hawaiian wife, and two of his eight children are buried in a family plot near his former home behind the Kīlauea Elementary School.

The Kīlauea Plantation “was one of the smallest plantations in the Hawaiian Islands operating its own sugar mill” (Condé and Best 1973:159). In 1881, a railway was begun and Princess Lydia Kamakaeha (Lili'uokalani) drove in the first spikes for the railroad bed. The plantation infrastructure grew over the next twenty years:

Transportation system consists of 12 and a half miles of permanent track, five miles of portable track, 200 cane cars, six sugar cars and four locomotives. Kīlauea is situated three miles from the landing at Kahili, with which it is connected by the railway system. Sugar is delivered to the steamers by means of a cable device at the rate of from 600 to 800 bags an hour. Mr. J. R. Meyers was the plantation manager. (*San Francisco Chronicle*, July 18, 1910, in Condé and Best 1974:152)

The plantation employed Chinese and Portuguese workers. In the 1880s, Kīlauea Sugar Company began major modification of water resources in the uplands with dams, reservoirs, ditches and flumes (Joesting 1984). This may have had a major damaging effect on *lo 'i kalo* downstream and possibly signaled the end of large-scale native agricultural practices in Kīlauea and vicinity.

The Kīlauea Plantation Company started to be managed by C. Brewer and Company in 1910 and C. Brewer took over the controlling interest in 1948. The Kīlauea Plantation Company continued to operate until 1971.

The Monsarrat map of “Kaua'i Between the Kalihiwai and Moloaa Streams” (1898) shows the plantation infrastructure in place at that time (Figure 12). Overlays indicate that the “Government Road” lies at approximately the same elevation as the older “Hanalei Road” and the present Kūhiō Highway—well *mauka* of the Project area. The railroad, begun in 1881, and the Ko'olau Ditch are shown running from the mill at Kīlauea as far as the east side of East Waiakalua, terminating near the Government Road well *mauka* of the present Project area.

Part of this Kīlauea Plantation Company rail system passed by Kahili Quarry on the way to an off-loading station at Mokolea Point, where raw sugar was cabled down to transport ships

(Site 50-30-04-1811). Kahili Quarry was located on Kīlauea Bay at the mouth of Kīlauea Stream, about a kilometer northeast of the Project area. Rock from the quarry was hauled by rail car and later by truck through the plantation fields where it was used to reinforce the field roads (Fredericksen and Fredericksen 1989:8). The road to the landing (“Quarry Road”) ran along the south edge of the present Project area and a spur road running toward Mokolea Point formed the west boundary by 1892 (see Figure 12)

In 1938, trucks were employed to transport harvested cane, and by 1942, the rail system was abandoned entirely (Conde and Best 1974). Sugar continued as a crop until 1971 when Kīlauea Sugar Co. was terminated (Custodial Chronology of the Sandy Saemann Property, Kīlauea , Kaua'i 1989).

A 1910 U.S. Geological Survey Map, Kīlauea Quadrangle (Figure 13) shows the plantation infrastructure and other development in the vicinity of the Project area at that time. The spur railroad line running down to Mokolea Point ran along the road on the south side of the present Project area but then curved into the present Project area along the west and north sides of the tributary gulch. A second unimproved road out to Mokolea Point ran along the west side of the Project area and then across the north portion of the Project area. A cemetery is shown north of the present Project area.

A 1930 map (Figure 14) of the Kīlauea Plantation (Condé and Best 1974:159) shows the plantation's sugar cane fields and associated infrastructure. The map indicates that sugar was cultivated in the majority of the Project area, (shown as field “20”). The map also shows the plantation rail line heading from Kīlauea Town to the landing at Mokolea Point in the east portion of the present Project area.

3.1.6.2 Rice Production at Kīlauea Stream

Concurrent with the sugar plantation, was the introduction of the first train. By the 1890s, much of the old *kalo* growing areas of this portion of Kaua'i were now producing rice, farmed by Chinese immigrants. There were 55 acres of land in rice production in the Kīlauea-Kāhili area in 1892 and eventually a rice mill on Kīlauea Stream (Char and Char 1979). While it is understood that this rice mill was begun by Chinese, it clearly went into Japanese management. A photograph of the interior of the Kīlauea Rice Mill (Figure 15) suggests that it was not a mom and pop affair but rather a good-sized enterprise, (*Garden Island* March 31 1978). The mill is known to have been on the stream terrace east of Kīlauea Stream. Rice and vegetable cultivation is also indicated along the banks of Kīlauea Stream circa 1925.

The 1963 U.S. Geological Survey map (Figure 16) does not indicate any structures within the Project area other than an unimproved road extending down to the Kahili Quarry, bordering the southeastern portion of the Project area. The 1963 map also indicates Kipapa Heiau (temple), located on the sandy shoreline of Kīlauea Bay, near the mouth of Kīlauea Stream a kilometer east of the present Project area.

ROYAL PATENT.

KAMEHAMEHA IV. By the grace of God, King of the Hawaiian Islands, by this His Royal Patent, have I granted unto all men, that he has, for himself and his successors in office, this day granted and given, absolutely, in Fee Simple, unto *Charles Titcomb* my faithful and loyally disposed subject, for the consideration of *Two thousand five hundred* dollars

That I Encompass, all that piece of Land situated at *Kilauea* in the Island of *Hawaii* and known as the *Ahupua'a* and described as follows:

*Commencing at a stake on the Cliff overlooking the sea, near the Mouth of Kilauea River from which the Mt. Peak (Kaliou) bears S. 15 1/2° W., and Mt. Peak, Neki. bears S. 55° W. running N. 79° W. 30. 20 Chains along the edge of the Cliff bounding the sea to the high promontory or Cliff called *Nihoa*, from thence North 42° W. = 27. 60 Ch. along the sea to a Point of land or Cape called *Wawoni*, from thence S. 43° W. 10 Ch. along the sea to a Cliff from thence S. 6° W. 20 Ch. along the sea to a pile of rocks upon the land from thence S. 66° W. 25 Ch. more or less to the boundary*

Figure 10. Portion of Royal Patent Granting “the Ahupua’a Kilauea” to Charles Titcomb (from Aikin 1988:17)

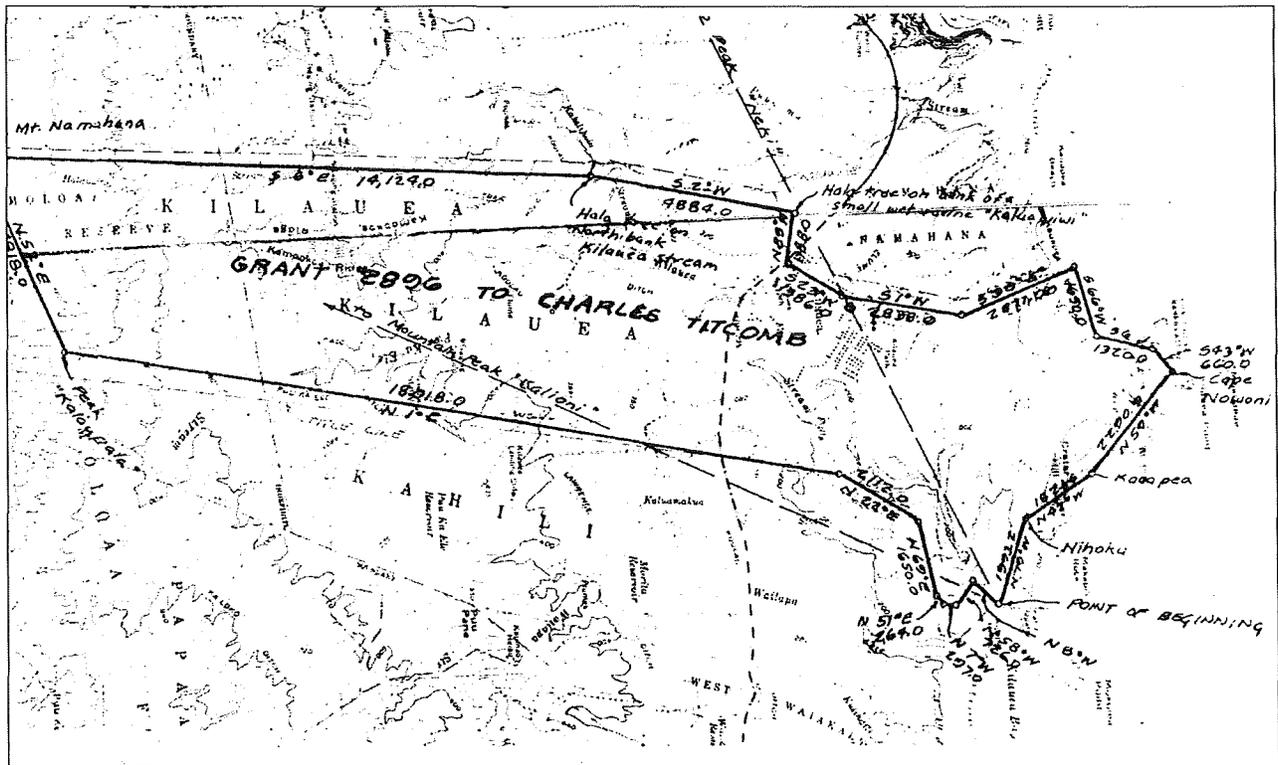


Figure 11. Map of Grant 2896 (Kilauea Ahupua'a) sold to Charles Titcomb (from Aikin 1988:18)

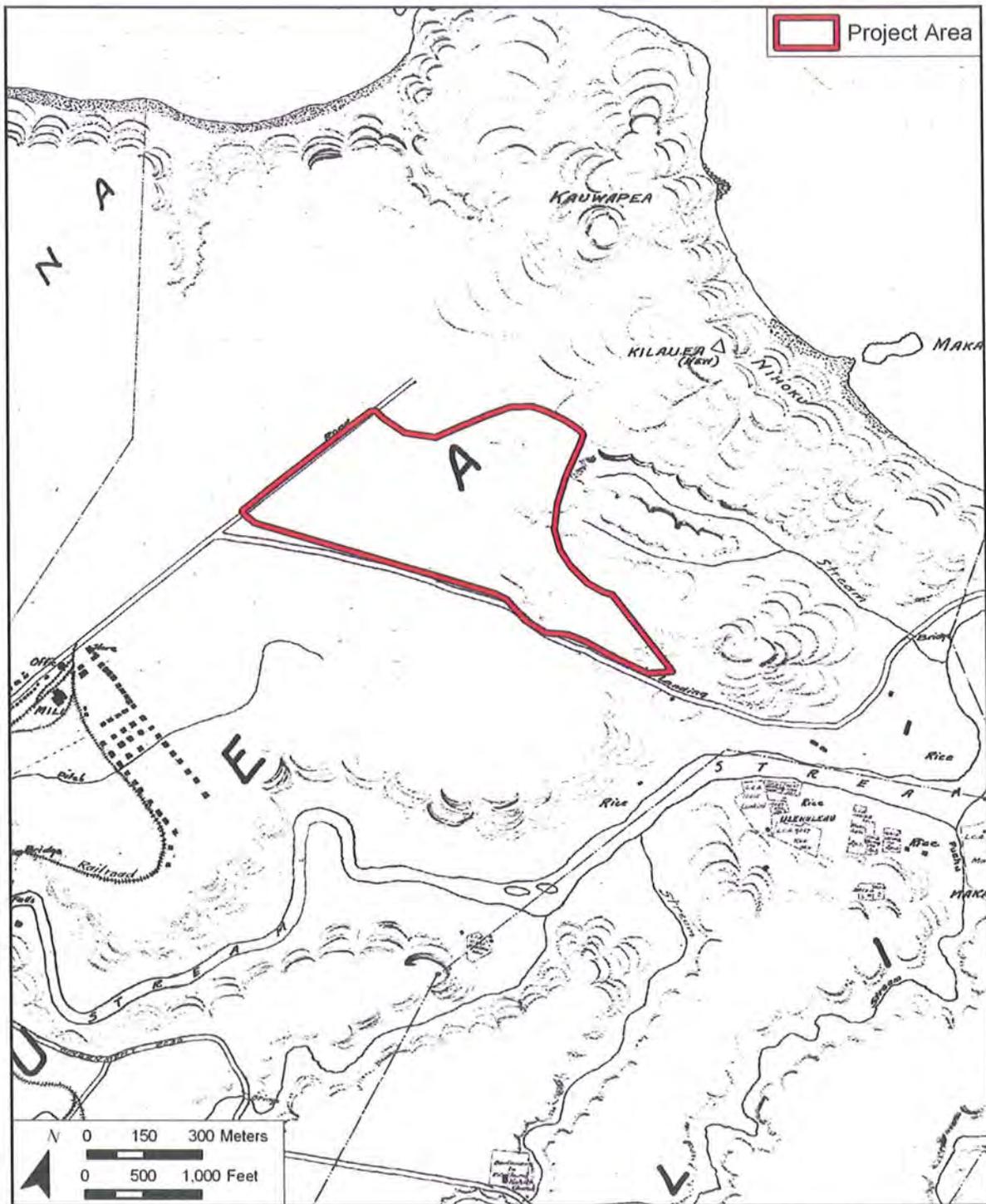


Figure 12. Portion of Monsarrat map of “Kaua’i Between the Kalihiwai and Moloaa Streams” showing general development in the Project area and vicinity circa 1892

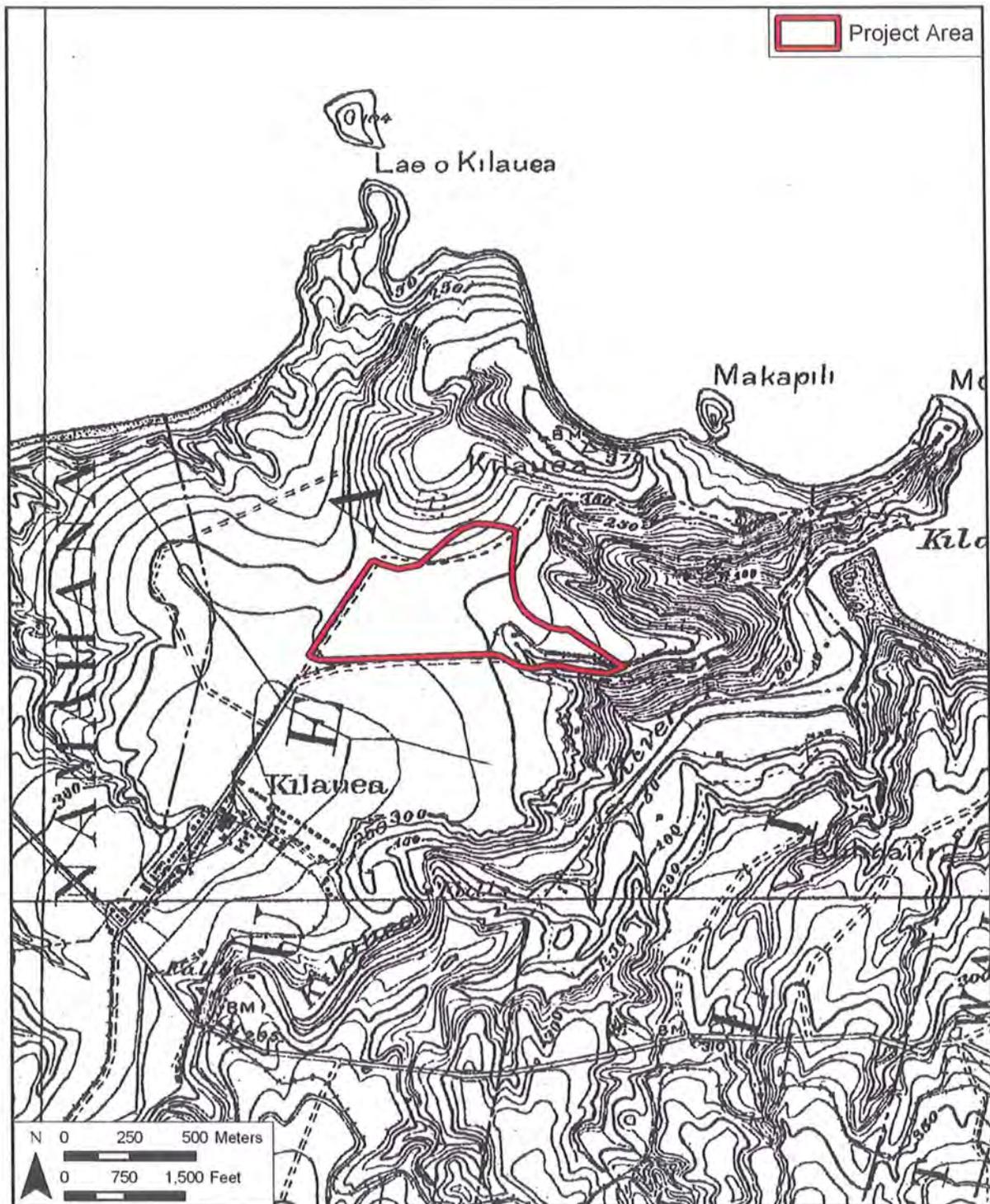


Figure 13. Portion of 1910 U.S. Geological Survey 1:31680 Scale Topographic Map, Kilauea Quadrangle, showing the location of the Project area

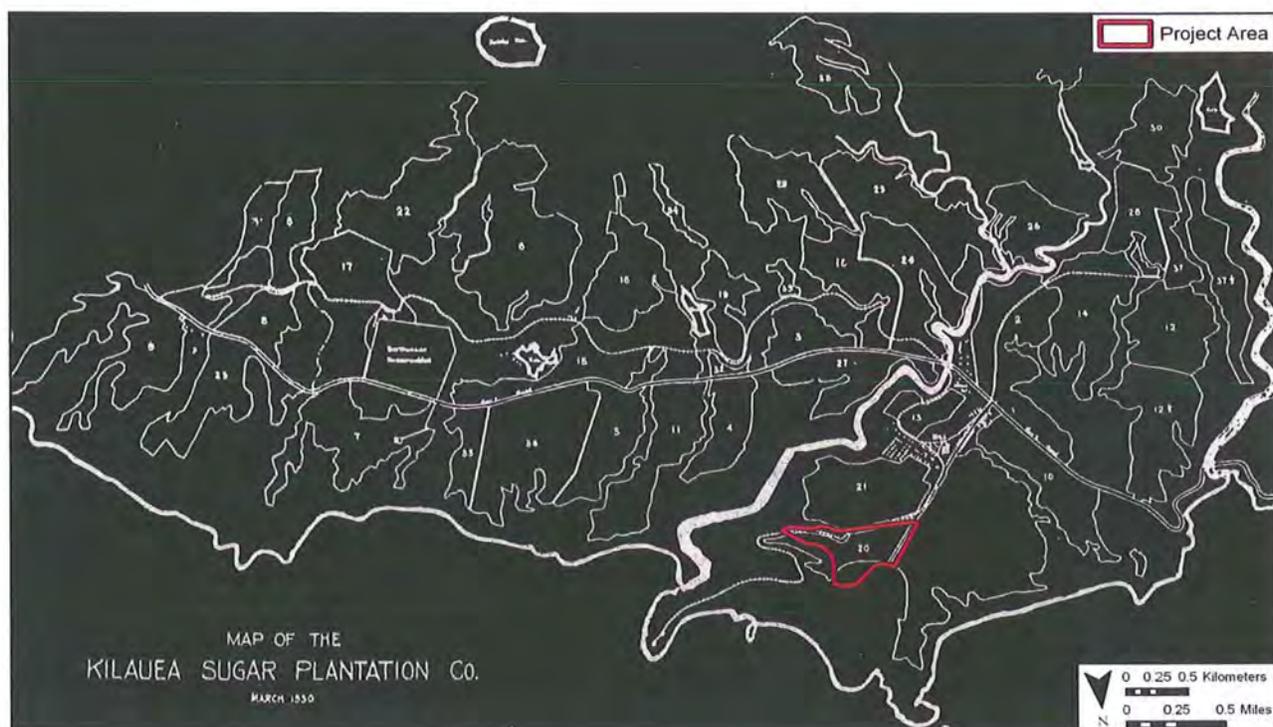


Figure 14. 1930 Map of the Kilauea Sugar Company note railroad down to Mōkōlea Point but otherwise no infrastructure in or adjacent to Project area



Figure 15. Historical photo of the interior of the Kilauea Rice Mill showing that it was a relatively large rice mill for Kaua'i and also that it was run by Japanese (note aprons "KIL A" (source: *Garden Island*, March 31, 1978)

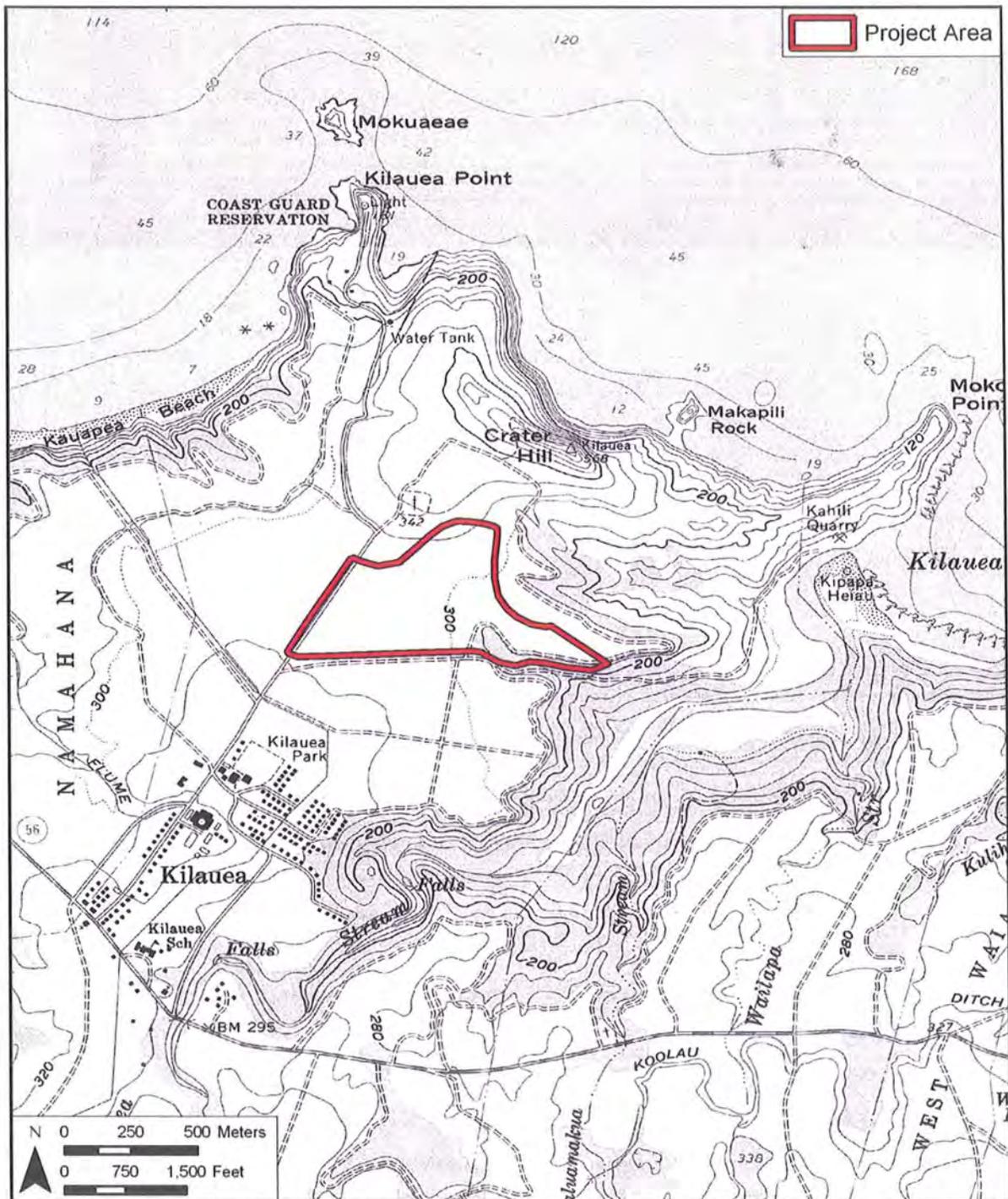


Figure 16. 1963 U.S. Geological Survey Topographic Map, Anahola Quadrangle, showing the location of the Project area. (Note: Kipapa Heiau and the Kahili Quarry northeast of the Project area)

3.2 Archaeological Research

No archaeological study of land within the boundaries of the subject property is documented. Archaeological studies in the vicinity are summarized in Table 3 and are located in Figure 17. More detailed discussion of some of the more pertinent studies follows.

3.2.1 Thrum's Heiau Study (1906)

Thomas Thrum compiled the first systematic listing of Kaua'i Island archaeological sites in his study of "Heiaus and Heiau Sites Throughout the Hawai'i Islands" (Thrum 1906:36-44). In the vicinity he briefly described four *heiau*: Pailio at central Kīlauea, Kapinao and Kapuohau'e at Waiakalua and Kipapa at Kāhili as follows:

- Pailio—Central Kīlauea – a round heiau of about 100 feet diameter; class unknown. Site covered in cane field
- Kapinao—Waiakalua-east - A large heiau of about 200 x 400 feet, high walled and stone paved. Still in existence. Of po'okanaka class.
- Kapuohau'e—Waiakalua-uka – a small round heiau, paved, with high walls of husbandry class; still standing
- Kipapa – Kahili - A large heiau of some 300 by over 100 feet in size, paved, walls five feet high, standing in cane field in partial ruins.

3.2.2 Bennett's Survey (1931)

During his 1928/1929 landmark survey of the island of Kaua'i Wendell Clark Bennett identified five sites (sites 129 to 133) within the Ko'olau District of Kaua'i between Pila'a to the east and Kalihiwai to the west including Site 129, Kapinao heiau, in Waiakalua Valley, Site 130, Taro terraces, in East Waiakalua and West Waiakalua valleys and Site 131, House sites, in East Waiakalua and West Waiakalua Valleys and on the ridge between.

In Kīlauea, Bennett described two *heiau* sites: Site 132 Kipapa *heiau* and Site 133 Pailio *heiau*. Bennett described Site 132 Kipapa Heiau as follows:

Site 132 Kipapa heiau, on the end of the first bluff east of Kilauea River in Kahili section. Described by Thrum as "A large heiau of some 300 by over 100 feet in size, paved, walls five feet high, standing in cane field in partial ruins." Since that time the stones have been removed.

U.S.G.S. maps indicated Kipapa Heiau as located on the east side of the mouth of Kīlauea Stream just 200 m or so northeast (outside) of the northeast edge of the present Project area. A brief effort was expended in the course of the fieldwork to find any evidence of Kipapa Heiau but no trace was found.

Bennett described Site 133 Pailio Heiau as follows:

Site 133 Pailio heiau in the canefields shorewards of Kilauea. The site does not have a view of the river valley. Thrum says that it was, "A round heiau of about

100 feet diameter: class unknown. Site covered in cane field.” Nothing remains of the heiau today [c. 1928].

The location is uncertain (Bennett didn't find any trace), but the description suggests Pailio Heiau was not close to the present Project area.

3.2.3 Handy and Handy's Native Planter Observations (1972)

Handy and Handy (1972) carried out a summary study of traditional Hawaiian agriculture and the life, lore and environment of native planters throughout the Hawaiian Islands and noted the following at Kīlauea and Kāhili

Kilauea is watered by a small river whose headwaters take the flow of streams above Kalihiwai as well as those coming down sloping kula lands above Kilauea. This is a peculiar terrain, with terraces along the north side of the river toward its seaward end belonging to Kilauea and those on the south side to the small ahupua'a named Kahili. A mile upstream is a small terraced area, but beyond this there were no terraces, for the main stream flows in a narrow gulch, and so do other side streams which flow into the Kilauea River. Hawaiians evidently never developed lo'i here because the neighboring kula land is too high above the streams for irrigation. This kula would have been excellent sweet-potato land. On the whole, Kilauea, despite a sizable river flowing through it, was a relatively small producer of taro because of the nature of its hinterland.

Kahili is, as indicated above, part of the complex that includes Kalihiwai, Kalihikai and Kilauea. The three streams empty into the Kilauea River, which forms the boundary between Kilauea and Kalihi below the falls of the river. There are terraces on the south side of Kilauea River watered by two of Kahili's streams. This is doubtless why this area was part of Kahili rather than of Kilauea. Only one stream had terraces back from the river. Here to the kula land was good for sweet-potato planting. (Handy and Handy, 1972:421).

At least two archaeological surveys have been conducted in and adjacent to areas proposed as extensions to the Kīlauea Point National Wildlife Refuge.

3.2.4 Kikuchi's Kīlauea Point National Wildlife Refuge Survey (1987)

In 1987, William K. Kikuchi surveyed the present grounds of the Kīlauea Point National Wildlife Refuge and areas of proposed extension. Considering the significance to native Hawaiians of seabird nesting colonies found within the refuge, Kikuchi extended the limits of his survey to search for associated cultural features or material. One area of his survey abuts the northeastern end of the present Project area at the west bank of the mouth of Kīlauea Stream. Surface remains of historic structures associated with Kīlauea Lighthouse are described, and limited subsurface testing was performed, but Kikuchi found no evidence of remains related to native Hawaiian culture.

3.2.5 Xamanek Researches Kīlauea Point National Wildlife Refuge Survey (1989)

Xamanek Researches (Fredericksen and Fredericksen 1989) surveyed extensions to the wildlife refuge including Crater Hill and Mōkōlea Point (parcel 19 of approximately 38 acres). Land use and history of tenure is well-documented, followed by detailed descriptions of historic structural remains related to the transport and loading of sugar at Mōkōlea Point, a Second World War era radar installation on Crater Hill and Kīlauea Lighthouse. Though archaeological evidence of native Hawaiian exploitation of seabird colonies was one object of the survey, no such remains were observed.

3.2.6 Toenjes and Hammatt Study of 94-Acres at Kīlauea (1990)

Two loci suggesting previous traditional Hawaiian activity were found and tested for subsurface deposits. Locus A was located in the southwest corner of the 94-acre parcel and was under papaya cultivation. Upon finding a water-rounded cobble and a small fragment of coral, an examination was made of the soil between every other row of trees in the grove. Indications of archaeological deposits were sparse and included two pieces of coral, one fragment of unidentified marine shell and several possible basalt flakes dispersed through the grove. The area of the papaya grove and scatter covered approximately 3,800 square meters (41,000 square feet).

Locus B was located in the central portion of the 94-acre parcel in an extensive former sugar cane field, then lying fallow. Much of the ground surface was clearly visible, with scattered indications of recent mechanized disturbance. The only suggestion of previous cultural activity consisted of sparsely scattered coral across an area of about 7,500 square meters (80,700 square ft.) No bone or shell material was observed in association with Locus B or anywhere else in the project area. Several possible flakes of basalt and one basalt core or possible adze blank were observed dispersed across the surface of the field apart from the coral scatter.

Subsurface testing at Locus A and Locus B, as well as in the area from which a basalt core was collected was conducted. Excavation exposed no culturally modified lithics. The presence of coral and coral sand in cane fields was noted as common, having been historically imported for the purpose of "liming" the soil. Lacking other archaeological components of Hawaiian culture, e.g. bone and shell midden, lithic debris or modified coral, the significance of these scatters was regarded as minimal. Examination of all other fields of the property indicated no archaeological remains of informational significance were present.

3.2.7 Hammatt et al. 5-Acres at Kāhili (1996)

Hammatt, Folk and Ida (1996) documented three archaeological sites at a five-acre parcel at the east side of Kīlauea Valley in Kāhili Ahupua'a. The sites included: Site 50-30-04-625, a field system of terraced retaining walls and planting areas, SIHP 50-30-04998, a circa 1900 charcoal kiln, and Site 50-30-04-999 a free-standing wall thought to have been constructed to exclude cattle. A radiocarbon date of AD 1400–1650 was recovered from a weak cultural layer.

3.2.8 McGerty et al. Study of 26-Acres at Kāhili (1997)

McGerty, Fortini and Spear (1997) noted that much of the project area had been extensively bulldozed but identified four archaeological sites with 47 features including alignments, terraces,

walls, enclosures, fire pits, a hearth, an *imu*, a possible buried facing and a post-hole. The sites included:

Site 974 which is comprised of 26 features (alignments, terraces, a wall, enclosure, pit features, hearth and *imu*) and was interpreted as a late pre-Contact/early post-Contact permanent habitation complex. Site 974 was recommended for further data recovery work.

Site 975 which is made up of nine features (enclosures, alignments, terraces, wall) and was thought to relate to the Site 974 permanent habitation complex. Two features were thought to possibly be burials. Site 975 was recommended for both further data recovery work and preservation.

Site 976 which is composed of seven features (enclosures, terraces, posthole) and was interpreted as a late pre-Contact/early post-Contact permanent habitation site. Site 976 was recommended for preservation.

Site 977 which is made up of three features (an alignment and terraces) and was interpreted as being utilized for late pre-Contact/early post-Contact agriculture. Site 977 was recommended for no further work.

Two radiocarbon dates were obtained and calculated as AD 1795–1955 and AD 1660–1955.

3.2.9 Yeomans and Fager (2001) Waiakalua AIS

Scientific Consultant Services carried out an AIS of a 220-acre project area extending from Kūhiō Highway to the coast in west Waiakalua Ahupua'a. Eight sites with a total of 73 features were identified. The features were all agricultural (both dry-land and irrigated) in function except for one pre-Contact temporary habitation feature (dating to A.D. 1380–1640). Most of the features were in stream bottom lands near the coast.

3.2.10 Shideler et al. (2007) & (2008) Studies for Kīlauea Falls Ranch

CSH carried out two studies for Kīlauea Falls Ranch on the west side of Kīlauea Stream (aka Kahili Stream). A total of 62 features were identified within a total of five sites in a proposed agro-forestry area. Four of these five sites (SIHP # 50-30-04-579, -580, -582 and -583) are primarily or exclusively agricultural terraces. The only exception at these four sites is SIHP # 50-30-04-580 features L and MM that are interpreted as temporary habitation features related to the agricultural terraces. One site (SIHP # 50-30-04-581) was understood as primarily post-Contact and either a permanent habitation or work area.

The inventory survey study (Shideler et al. 2008:69) concluded that the approximately 1500–1800 mm (60-70 in.) of annual rainfall within that project area made cultivation possible without irrigation. While it was concluded that there may well have been pre-Contact ponded field (*lo'i*) taro cultivation along the Kīlauea Stream flood plain, it was suggested that the vagaries of hurricane, tsunami, and flood may have made such planting down by the stream precarious. It was suggested that cultivation up on the steep slope may have been more secure.

The evidence from the Māhele records indicates that there was little or no pre-Contact permanent habitation within the Kīlauea Falls Ranch project area per se although there was a community on the southeast side of the stream mouth from the 1840s well into the twentieth

century. An interviewee, Ms. Sara H. Keahonui Jones, born in 1919 and who had lived in the *makai* area of Kāhili Ahupua'a most of her life, remembered the following: "The homes were all on stilts and once the water rose all the way up under the house" (Hammatt and Shideler 2010:17) The propensity of the Kāhili/Kīlauea Stream to flood may have encouraged development on the steep slope.

Particularly relevant in the Kīlauea Falls Ranch study was SIHP # 50-30-04-580 that consisted of a dense cluster of 55 archaeological features including 53 soil-retaining terraces and two possible habitation areas. These features were in a relatively compact area just south of the east end of the present study area (Figure 18).

Table 3. Archaeological studies near the present Kīlauea Project area

Source	Nature of Study	Location of Study	Findings
Handy and Handy 1972	Native Planters of Hawaii	Archipelago-wide	Conclude Kīlauea a relatively small producer of taro because of the nature of its hinterland
Ching and Bordner 1978	Archaeological Investigation of Heiau and Subsurface Survey	East and West Waiakalua Valleys and the Ridge in Between	Kapinao Heiau, House Sites and Taro Terraces
Kikuchi 1987	Archaeological Survey	Proposed Visitor Center, Kīlauea Point, National Wildlife Refuge Kalae O Kīlauea,	Surface remains of historic structures associated with Kīlauea Lighthouse are described, but no traditional Hawaiian sites were found
McMahon 1988	Fieldcheck for Curatorship	Kapinao Heiau TMK 5-1-05:51	Focused on Kapinao Heiau site 50-30-04-129
Fredericksen and Fredericksen 1989	AIS	Crater Hill and Mokolea Point of Kīlauea Point National Wildlife Refuge, Kīlauea	Identifies historic structural remains related to the transport and loading of sugar at Mokolea Point, a Second World War era radar installation on Crater Hill and Kīlauea Lighthouse.
Kennedy 1990	Surface Reconnaissance	19 Acres Located at Kalihiwai Ridge, Kīlauea, TMK 4-5-2-002:010	No sites identified
Toenjes and Hammatt 1990	Archaeological Survey	94 Acres in Kīlauea	No sites identified
Kennedy 1991	AIS and Testing	Kalihiwai Ridge Subdivision-Phase II, TMK: 5-2-, 02:11, Kalihiwai,	Site 50-30-03-06007
Hammatt and Chiogioji 1992	AIS	15-Acre Property in the Ahupua'a of Namahana and Kalihiwai	No sites identified

Source	Nature of Study	Location of Study	Finds
Hammatt and Robins 1993	AIS	Proposed Kīlauea Golf Course in the Ahupua'a of Namahana 204 acres	Site 50-30-04-00572 consisting of 3 irrigation ditches
Hammatt et al 1996	AIS	5 acre parcel TMK 5-2-021:005 on east slope of Kīlauea Valley	3 sites:
Ida and Hammatt 1996	Reconnaissance Survey	Kīlauea Bridge	Railroad bridge foundation
Ida and Hammatt 1997	AIS	89-Acre Parcel in Kāhili Ahupua'a, (TMK: 4-5-1-5:52)	Identifies plantation infrastructure sites 50-30-04-640, -641, -642, -643
McGerty et al. 1997	AIS	Portion of a 26 Acre Parcel, Kāhili Ahupua'a, [TMK 5-2-21:7]	Identifies sites 50-30-04-974, -975, -976 and -977 including traditional Hawaiian sites down in the valley
Carson et al. 1998	Data Recovery Report	Kāhili Ahupua'a,	Focuses on a portion of Sites 50-03-04-974 & 975
Hammatt and Shideler 1998	AIS	164.1-Acre Parcel in West Waiakalua Ahupua'a, (TMK [4] 5-1-05:3)	No finds, all traces of plantation infrastructure obliterated
McGerty and Spear 1998	AIS	Proposed Driveway Corridor, Kīlauea Ahupua'a	Site 50-30-04-644
Burgett et al. 2000	AIS	An approximately 27.56 acre parcel, Kāhili Ahupua'a	Sites 50-30-04-632, -633, -1993
Cleghorn 2001	Archaeological Monitoring Report	Kīlauea Japanese Cemetery, (TMK: 5-2-4:49)	No significant finds
McGerty and Spear 2001	Inventory Survey	Approximately Six-Acre Parcel in Kāhili Ahupua'a, [TMK: 5-2-21:4]	Sites 50-30-04-625, -998 and -999

Source	Nature of Study	Location of Study	Findings
Moore et al. 2001 a, b	Archeological Inventory Survey Report and an Addendum	Property at TMK: 5-2-13:12 & 13,(por.) TMK: 5-2-17:25 (Portions of Lots 2, 3, 4, & 5) & 26 in Kalihiwai Ahupua'a,	50-30-03-02060 and -2061
Rechtman et al. 2001	AIS	Halaulani Property (TMK: 4-5-2-02:11, 12) Kīlauea and Kalihi Wai Ahupua'a,	Sites 50-30-03-2060, -2062, -2063, 2064
Yeomans, and Fager 2001	AIS with Subsurface Testing	Nā 'Āina Kai Botanical Gardens, West Waiakalua, [TMK 5-1-05-20, TMK 5-1-05-23, TMK 5-1-05-22, and TMK 5-1-05-004],	Eight sites with 73 features identified incl. terraces, alignments and mounds – mostly agricultural features with a pre-Contact temporary habitation
Shideler, Tulchin and Hammatt 2007	Archaeological field inspection and literature review	An approximately 74-Acre portion of the Kīlauea Falls Ranch Property, (TMK: [4] 5-2-012:035 por.)	Four specific areas of pre-Contact agricultural terraces were observed. A posited mill site (CSH 1) in the north side of the southwest project area was noted. An extensive complex of long well-built terraces supporting a series of what appear to have once been ponded fields (CSH 2) was noted.
Shideler, Yucha and Hammatt 2008	AIS	An approximately 74-Acre portion of the Kīlauea Falls Ranch Property, (TMK: [4] 5-2-012:035 por.) (roughly the same as Shideler et al. 2007)	Five historic properties: SIHP # 50-10-04-579, an agricultural terrace; # 50-10-04-580, 53 agricultural terraces and 2 possible habitation areas (probably related to agriculture as field shelters); # 50-10-04-581, a stone retaining wall with cement and alignments and a rock-faced trail understood as a post-Contact permanent habitation; # 50-10-04-582, agricultural terraces and # 50-10-04-583, agricultural terraces

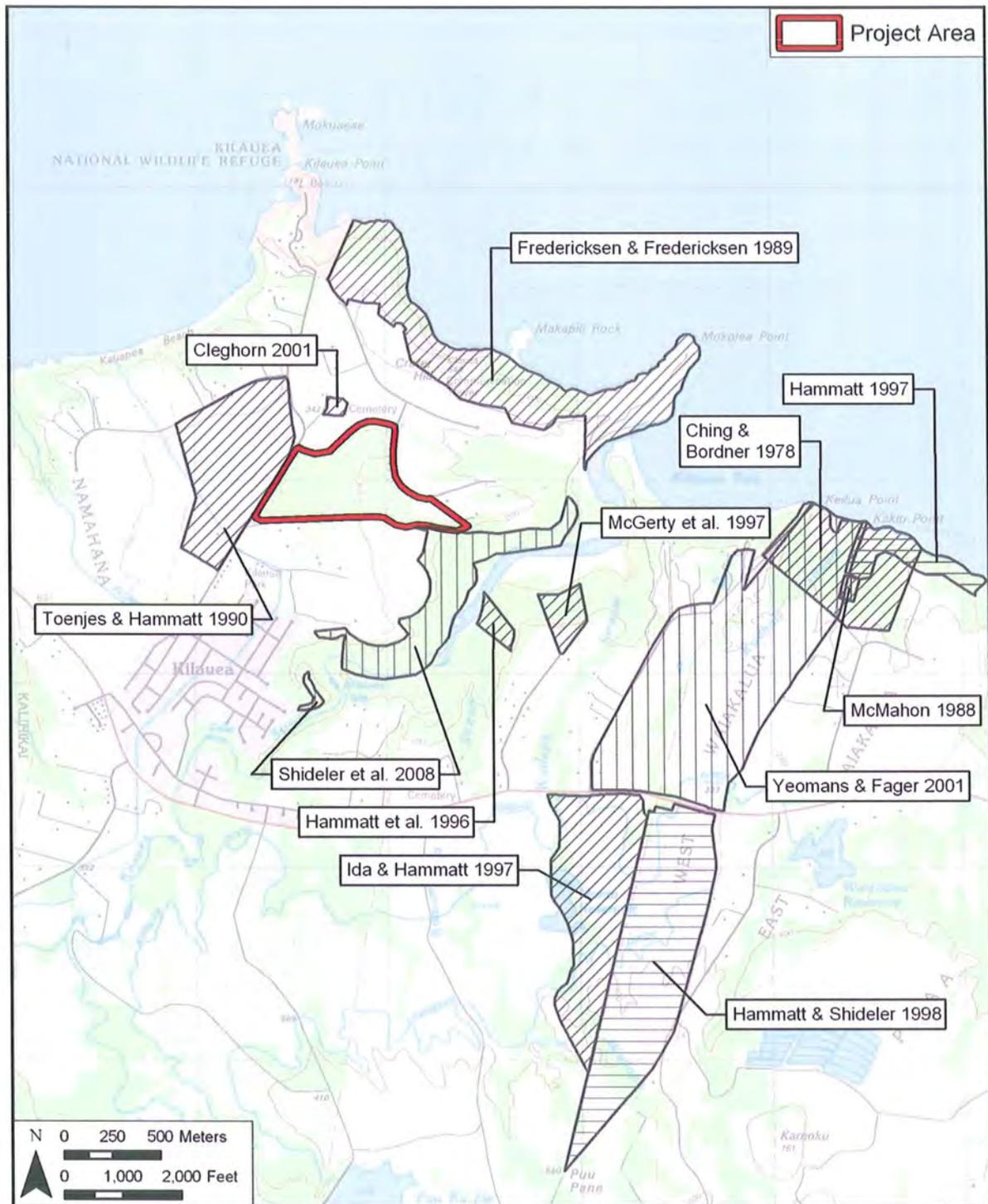


Figure 17. Map showing locations of previous archaeological studies in the vicinity of the Project area

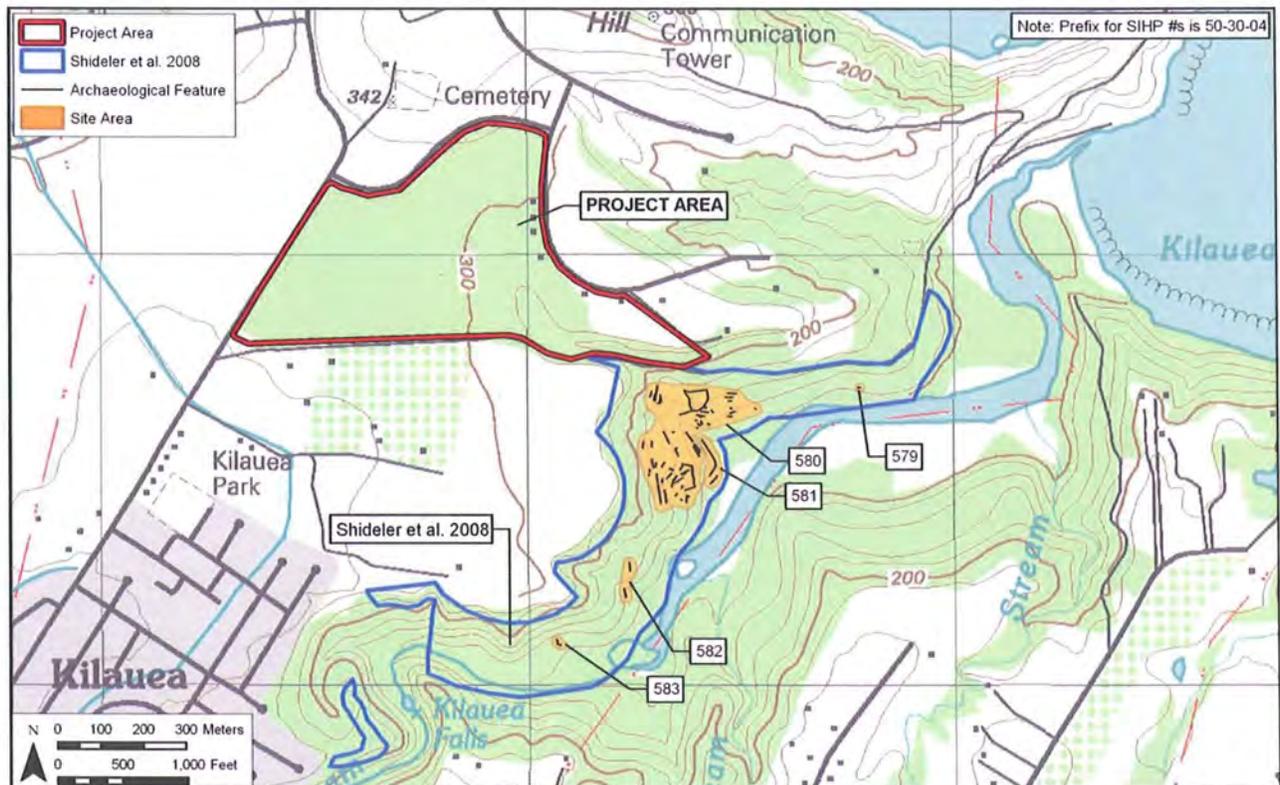


Figure 18. U.S. Geological Survey 7.5 Minute Series Topographic Map, Anahola Quadrangle (1996), showing the location of historic properties identified in the Kilauea Falls Ranch (Shideler et al. 2008) study in relation to the present study area

Section 4 Community Consultation

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, email, telephone and in-person contact. The initial outreach effort was started in November 2010 and as of the date of this draft report, is ongoing. In the majority of cases, letters along with a map and aerial photograph of the Project area were mailed with the following text:

At the request of R.M. Towill Corporation, Cultural Surveys Hawai'i, Inc. (CSH) is conducting a Cultural Impact Assessment (CIA) for the Kīlauea Agricultural Park Project, Kīlauea Ahupua'a, Ko'olau District, Kaua'i Island, (TMK [4] 5-2-004: parcel 099). The County of Kaua'i, Office of Economic Development, proposes to develop the Kīlauea Agricultural Park consisting of approximately 75 acres located in Kīlauea, Kaua'i.

The purpose of the project is to serve as a County resource to sustain and support agricultural production. According to the Kīlauea Agricultural Park Master Plan, a number of objectives were sought including:

The provision of affordable agricultural land for new and established farmers

- The promotion of farming as a viable livelihood
- To increase the local production of fresh foods
- To demonstrate a system of sustainable agricultural production
- To educate the community in environmental stewardship
- The development of a unique gathering space that enhances community life
- To encourage visitor participation in the bounty of North Shore crops
- To realize the agricultural park in a timely, efficient manner and at reasonable cost

The agricultural park has distinctive curvilinear boundaries with the interior elements laid out in a grid pattern. The main access road is planned to be oriented east-west across the entire length of the agricultural park. This road extends from the primary ingress/egress point, which is located off of Kīlauea Lighthouse Road, about midway on the property's western boundary. The east-west road divides the agricultural park into two main farming areas. There is a secondary access point off of Quarry Road that is intended for use by farmers only. Limiting the use of Quarry Road will lessen potential traffic and noise impacts to neighbors on the other side of the road. Directly off the Quarry Road, access is a north-south road that services the compost/recycling area as well as some of the interior farm lots.

The County has initiated special studies to ascertain the most viable final configuration and layout for uses. These studies include surveys and assessments

on agronomy, flora, fauna, archaeology, cultural effects, and infrastructure and utility requirements. The results of these studies will assist the County in helping to finalize its plans for the Park.

The project is being proposed for federal funding through the Economic Development Agency. Locally, the project proponent is the Office of Economic Development, County of Kaua'i. 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 cultural practices and resources. This CIA investigation may be used to support the National Historic Preservation Act (NHPA) Section 106 and the National Environmental Policy Act (NEPA) consultation, but does not, in itself, satisfy the cultural consultation requirements of either Section 106 or NEPA.

The purpose of this cultural study is to assess potential impacts to cultural practices as a result of potential development in Kīlauea Ahupua'a. We are seeking your *kōkua* 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 and *kama'āina* 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.**

In most cases, one to multiple attempts were made to contact individuals, organizations, and agencies apposite to the CIA for the Project. The results of the community consultation process are presented in Table 4. Written statements from organizations and individuals are presented below and summaries of interviews are presented in Section 5.

Table 4. Results of Community Consultation

Name	Affiliation/Background	Comments
Aha Punana Leo o Kauai	Hawaiian Immersion School	CSH emailed information on December 3, 2010. CSH again emailed letter on January 7, 2011
Ako, Uncle Valentine	Kupuna, with long-time ties to Kaua'i	<p>CSH called on November 30, 2010 and discussed the Project with Mr. Ako. Mr. Ako noted that most of the kūpuna for Kīlauea have passed away. He would be happy to review the information and comment.</p> <p>CSH mailed information on December 3, 2010. CSH called on December 20, 2010 and Mr. Ako noted he does not know Project area. He provided a referral to Mehana Vaughan, and suggested that CSH call back later for more referrals</p>
Aipoalani, Clisson (Kunane)	Chairman, KNIBC	CSH sent mail on November 15, 2010. Mail was returned on November 23, 2010. CSH emailed letter on December 17, 2010. CSH emailed letter on January 7, 2011
Akana, Kaipō	Kupuna, with long-time ties to Kaua'i	CSH left message on December 3, 2010, asking for referrals. CSH emailed on January 21, 2011
Apilado-Schumacher, Donna	Secretary, Kīlauea Neighborhood Association	CSH sent email to Kīlauea Neighborhood Association on January 21, 2011. CSH sent mail on January 24, 2011. Ms. Apilado-Schumacher replied on March 10, 2011, requesting CSH present on the Project in April meeting of the neighborhood association. CSH replied on March 13, 2011, stating that due to deadline, CSH cannot be at the neighborhood meeting.

Name	Affiliation/Background	Comments
		<p>However, all comments are welcome and can be incorporated in the final report. Ms. Apilado-Schumacher emailed CSH on March 25 and referred CSH to Rodney Yadao of the Kīlauea Agricultural Association</p>
Ayau, Halealoha	Hui Mālama I Na Kupuna 'O Hawai'i Nei	<p>CSH sent mail on December 3, 2010 and again on January 7, 2011. Mr. Ayau responded on January 11, 2011 and noted that he forwarded email to Kainani Kahaunaele, who then forwarded the information to the following people, including Ipo Torio Ka'uhane, Mehana Vaughan, Kamealoha Forrest, Lorilani Keohokalole and three other people. Below is a copy of the email sent by Kainani Kahaunaele:</p> <p>“Aloha mai kākou e ko Kīlauea!</p> <p>Lonoikamakahiki! My Halealoha often gets these cultural impact notices from Cultural Surveys in his capacity at Hui Mālama I Nā Kūpuna o Hawai'i Nei. If they are Kaua'i related, he sends them to me and I forward it to the natives of my Kaua'i. I thought of you folks in hopes that you or other Kīlauea associated 'ohana can “ identify the potential impacts to cultural practices in the Kīlauea area as a result of the proposed project”.... Please forward to others you think should chime in.</p> <p>Mālama pono, kainani”</p>
Cataluna, Don	OHA Trustee, Kaua'i/Ni'ihau	CSH sent mail on November 15,

Name	Affiliation/Background	Comments
		2010 and again on December 21, 2010. CSH sent mail on January 21, 2011
Cayan, Phyllis "Coochie"	SHPD History & Culture Branch Chief, State Historical Preservation Division	CSH sent mail on November 15, 2010. CSH sent email on January 7, 2011. CSH received a written reply dated December 14, 2010 from Ms. Cayan. See Section 4.2
Chisolm, Sterling	Kama'āina, Realtor	CSH phoned Mr. Chisolm on February 18, 2011 and left message. Mr. Chisolm phoned CSH on February 19, 2011 and informed CSH that he would not be returning to Kaua'i until February 22, 2011. Mr. Chisolm again phoned CSH on March 1, 2011, and indicated that he would be happy to respond to any questions and gave CSH his email. On March 1, 2011, CSH emailed the contact letter, the figures, the interview protocol, and the release form to Mr. Chisolm. On March 24, 2011, CSH phoned Mr. Sterling to see if he has had a chance to respond to the questions. Mr. Sterling called CSH on the same day and CSH again emailed the questions and information that day
Dehne, Monica	Owner, Healthy Hut Inc., in Kīlauea	CSH sent email on January 5, 2011. CSH mailed information on January 24, 2011
Erickson, Marsha	Executive Director, Hui o Laka, Koke'e Ecological Education Group, Waimea Valley Association	CSH sent email on December 3, 2010. Ms. Erickson replied on the same day with the following: "Thank you for including me. I will look over the material you attached. Because I am from the Waimea ahupuaa, there is a good chance I will have no comment.

Name	Affiliation/Background	Comments
		Me ke aloha, Marsha Erickson”
Ewing, Patricia	Owner, Kong Lung Historic Market Center	CSH sent email on January 7, 2011. CSH sent mail on January 24, 2011
Faye, Christine	Curator and local historian, Kaua'i Museum	CSH sent email on January 7, 2011. CSH called on February 7, 2011 and Ms. Faye referred CSH to Mr. Gary Smith
Gushiken, Jack	Agricultural Advisor and Historian	CSH called Mr. Gushiken on February 19, 2011. CSH met and interviewed Mr. Gushiken on the same day. CSH sent email on March 21, 2011 and on March 22, 2011. CSH phoned Mr. Gushiken on March 23, 2011. Mr. Gushiken approved his interview summary on March 24, 2011
Hoffman, Jane	Executive Director, Kilauea Point Natural History Association	CSH sent mail on January 7, 2011 and again on January 24, 2011. CSH called and left message on February 7, 2011. Ms. Hoffman called on February 9, 2011
Ka'ie'ie Foundation, Kaua'i Heritage Center	Kaua'i organization for the perpetuation of Hawaiian cultural traditions and values	CSH sent mail on November 15, 2010. CSH sent mail again on January 24, 2011
Kaua'i Island Hawaiian Civic Club	Association of Hawaiian Civic Clubs	CSH sent mail on December 3, 2010 and again on January 7, 2011
Kaua'i Museum	Repository of Kaua'i history, material culture with knowledge of <i>kama'āina</i> and <i>kūpuna</i>	CSH contacted the Kaua'i Museum on February 18, 2011. Jane, the executive director of Kaua'i museum suggested that CSH contact Mr. Sterling Chisolm, a realtor and historian of the area
Kealoha, Keone	Executive Director, Malama	CSH sent mail on December 3,

Name	Affiliation/Background	Comments
	Kaua'i	2010. Mr. Kealoha replied on the same day, and asked some information. CSH emailed reply on December 5, 2010. Mr. Kealoha emailed CSH on December 5, 2010 and confirmed that he will announce the information at the next Kīlauea Neighborhood Association meeting, of which he is a member. CSH sent email on January 21, 2011. CSH called on February 3, 2011 and left message. CSH emailed on February 10, 2011 and Mr. Kealoha replied, stating he will forward information to the Kīlauea Neighborhood Association
McMahon, Nancy	Officer, SHPD	CSH sent mail on December 3, 2010. SHPD sent reply dated December 14, 2010. See 4.2
MacNeil, Corrina and Steve Knox	Owners, Kīlauea Fish Market	CSH sent mail on February 7, 2011. Mail was returned on February 9, 2011. CSH mailed letter on February 14, 2011. CSH spoke to Mr. Knox in person on February 18, 2011. Mr. Knox indicated that he would contact CSH with his comments
Moriarty, Linda Paik	Honorary Chair, Kīlauea Point National History Association	CSH sent mail on January 7, 2011 and again on January 24, 2011
Muraoka, Auntie Beverly	Kupuna	CSH called on December 3, 2010 to ask if she could review information. Mrs. Muraoka asked to be contacted in two weeks. CSH talked with Mrs. Muraoka on February 17, 2011 and she noted that she is from the Wailua area

Name	Affiliation/Background	Comments
Nāmu'ō, Clyde	Administrator, OHA	CSH sent mail on November 15, 2010. OHA sent an email reply on December 16, 2010 requesting clarification on past and present land use of Project area. CSH replied via email on December 17, 2010. See Section 4.1
Oi, Tommy	DLNR-L Kaua'i Land Division	CSH sent mail on November 26, 2010. CSH sent mail again on January 24, 2011
Quinsaāt, Sandra	KNIBC Member	CSH sent mail on January 24, 2011
Scott, Sherry	Principal, Kīlauea Elementary School	CSH sent mail on January 21, 2011. CSH called and left message on February 7, 2011. CSH called and left message on February 11, 2011. Principal Scott called on and talked with CSH, stating she will inform several <i>kumu hula</i> about the Project and that she will pass on contact information
Smith, Gary	Historian, Kupuna	CSH sent email with Project information on January 21, 2011. Mr. Smith replied on January 24, 2011. See Section 4.3 below. CSH replied on January 25, 2011 with a request for an interview. Mr. Smith emailed CSH on January 28, 2011. CSH replied on January 29, 2011. Mr. Smith emailed on January 30, 2011 and called as well as emailed CSH on February 11, 2011. CSH interviewed Mr. Smith on February 18, 2011 and met with him again on February 19, 2011. CSH emailed Mr. Smith on March 19, 2011. Mr. Smith emailed reply on March 21, 2011. CSH emailed Mr. Smith on March 22 with revisions to

Name	Affiliation/Background	Comments
		statement. Mr. Smith emailed on March 22, 2011, stating he will review revisions when he has time. CSH emailed and called Mr. Smith on March 23, 2011. Mr. Smith emailed CSH on March 24, 2011 with revisions. CSH emailed Mr. Smith on March 25, 2011. Mr. Smith gave his approval for the interview summary on March 25, 2011. See Section 5 for interview
Smith, Shannon	Refuge Manager, Kaua'i National Wildlife Refuge Complex	CSH sent email on January 21, 2011. CSH called twice and left messages on February 3, 2011
Sproat, Linda	Kama'āina	Jennifer Waipa forwarded CSH's questions to Linda Sproat, her mother-in-law. On March 2, 2011, Linda Sproat phoned CSH and indicated that she would fill out the questions and return them via email. CSH contacted Jennifer Waipa on March 21, 2011 to inquire about the interview that Linda Sproat was sending via email. On March 22, 2011, Jennifer Waipa informed CSH that Linda Sproat would be away until early April. Jennifer Waipa asked that the interview be included in the final draft of the CIA.
Takamine, Vicky	Kumu Hula and lecturer on Hawaiian culture and chant	CSH sent email on November 26 and on December 15, 2010. CSH sent email again on January 21, 2011. CSH mailed letter on January 24, 2011
Trembath, Healani	Kupuna, lifetime resident of Kaua'i and member, Alu Like	CSH emailed Mrs. Trembath on February 8, 2011. Mrs. Trembath emailed CSH on February 10, 2011. She suggested that CSH contact

Name	Affiliation/Background	Comments
		Kupuna Dora Swain. CSH called Mrs. Trembath on February 17, 2011. She explained that she would be flying to O'ahu the following day and would not be available to meet
Trugillo, William	Ka Leo o Kaua'i	CSH sent email on November 26, 2010. CSH sent mail on January 24, 2011
Tsuchiya, Rick	Kaua'i County Planning	CSH sent email on November 26, 2010. Email bounced back. CSH called on November 29, 2010 and was told that Mr. Tsuchiya retired
Vaughan, Mehana Blaich	Teacher in Hawaiian immersion schools and doctoral student in Environmental Science	Ms. Vaughan was referred by Mr. Ako. CSH sent email on December 23, 2010 and mailed letter on January 24, 2011
Waipa, Jennifer	U.S. Fish and Wildlife Service Ranger (Kilauea)	<p>CSH phoned Ms. Waipa on February 18, 2011, but she was in the field. CSH again phoned Ms. Waipa on February 19, 2011 but she was still out of the office. Ms.</p> <p>Waipa phoned CSH on February 22, 2011. CSH sent email with letter, figures, questions and release form on February 23, 2011. CSH sent follow-up on March 21, 2011. Ms. Waipa replied via email on the same day and noted that her auntie Linda Sproat is unavailable at this time but will have comments to be incorporated in the final report. CSH emailed reply on March 22, 2011</p>
Wichman, Randy	Chair, KHPRC	CSH sent mail on January 24, 2011. CSH received a call on February 23, 2011 from Shannon, who assists at the KHPRC. The information for the

Name	Affiliation/Background	Comments
		Project will be discussed on March 3, 2011 meeting and if there are comments, these will be sent to CSH. On March 2, 2011, Shannon from KHPC called CSH and noted the meeting has been moved to March 8, 2011. As of the date of this draft report, no comments have been received
Yadao, Rodney	Longtime Resident of Kīlauea Ahupua'a	CSH phoned Yadao on February 18, 2011 and left message

4.1 Office of Hawaiian Affairs

CSH contacted Clyde Nāmu'ō, Administrator of OHA, on November 15, 2010. In a written response sent via email on December 16, 2010 (Figure 19), Mr. Nāmu'ō calls for consideration of traditional land use concepts which emphasize land stewardship and also requests clarification on past and present land use of the Project area. Mr. Nāmu'ō notes that DNLR – SHPD be provided an opportunity to comment. Because the Project will be funded federally in part, the provisions of the National Historic Preservation Act and National Environmental Policy Act are applicable and OHA expects to be contacted for consultation.

4.2 State Historic Preservation Division

CSH contacted Phyllis “Coochie” Cayan, History and Culture Branch Chief of SHPD, on November 15, 2010. In a written response dated December 14, 2010 (Figure 20), Mrs. Cayan states that SHPD is concerned with any ground disturbance work, which may uncover burials or burial sites as there is a cemetery north of the Project area. She also calls for the continued access to cultural resources by the Hawaiian community and recreational users. Mrs. Cayan refers KNIBC members John Kruse, Auntie Barbara Say, Jimmy Fujita, Keith Yap, Kunane Aipoalani and others such as Kumu Hula Nathan Kalama, Ms. Stella Burgess, the Sproat Family, and Ms. Kaliko Santos of OHA-Kaua'i.

4.3 Email Comment from Mr. Gary Smith

CSH first contacted Mr. Gary Smith on January 21, 2011. Mr. Smith replied with the following comment on January 24, 2011. In addition to the short comment, he was also interviewed on February 18, 2011 (see Section 5). In the January 24, 2011 email, Mr. Smith shared the following information:

I do have first hand knowledge of the property its history etc and at one time worked on the very thing you are doing...an ag park..probably even today there is no one who spent more time on it than I have....I dropped it years ago after being

bogged down in politics and beaurocracy....my fear is we will see more of the same. Water was and will always be a problem for the farmers we ultimately looked at a regional recreation park for North shore as current park is too small, with some farming etc etc. Question is, What is the highest and best use for this 75 acres and serves the greatest need and largest population base in the community? Recycle center? Small County Base yard? Park? Farmers Market?

PHONE (808) 594-1888

FAX (808) 594-1865



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

COPY

HRD10/5397

December 3, 2010

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

**RE: Pre- Cultural Impact Assessment Consultation
Kilauea Agricultural Park Project
Kilauea, Island of Kaua'i**

Aloha e Margaret Magat,

The Office of Hawaiian Affairs (OHA) is in receipt of your November 12, 2010 letter initiating consultation ahead of a cultural impact assessment (CIA) for the Kilauea Agricultural Project (project) on approximately 75 acres of land proposed by the County of Kaua'i-Office of Economic Development.

OHA applauds the County of Kaua'i for engaging in efforts to support sustainable agriculture. One of the fundamental objectives of the State Agricultural Function Plan (1991) is to encourage and develop diversified agriculture throughout Hawai'i which will support our local economy and contribute to reducing our dependence on imported products. We firmly believe this objective can be obtained by protecting and prioritizing initiatives on agricultural lands with the highest potential for productivity. OHA advocates that consideration be afforded to traditional land use concepts which emphasize responsible land stewardship as project plans are finalized.

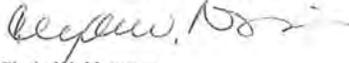
The past and current land uses of the project area are unclear to us at this time and we request clarification on this matter. The Department of Land and Natural Resources-State Historic Preservation Division should be provided with the opportunity to comment on the project to determine whether an archaeological inventory survey is warranted.

Your letter indicates that Federal funds will be used to support this project. Thus, the provisions of the National Historic Preservation Act and National Environmental Policy Act are applicable and we expect to be contacted for consultation to fulfill these requirements.

Margaret Magat, Researcher
Cultural Surveys Hawai'i, Inc.
December 3, 2010
Page 2 of 2

Thank you for initiating consultation at this early stage. We look forward to reviewing the CIA. Should you have any questions, please contact Keola Lindsey at 594-0244 or keolal@oha.org.

'O wau iho nō me ka 'oia'i'o,



Clyde W. Nāmu'o
Chief Executive Officer

C: OHA- Kaua'i Community Outreach Coordinator

Figure 19. OHA response letter

NEIL ABERCROMBIE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

WILLIAM J. AILA, JR.
INTERIM CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
GUY KALLUKUKUJI
INTERIM FIRST DEPUTY
LENORE N. OHYE
ACTING DEPUTY DIRECTOR - WATER
AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONSERVANCIES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAIKOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

December 14, 2010

LOG NO: 2010.3731
DOC. NO: 1012PC003

TO: Margaret Magat, Researcher
Cultural Surveys Hawai'i-Hawai'i Office, P.O. Box 1114, Kailua, Hawaii 96734

FROM: Phyllis Coochie Cayan, History and Culture Branch Chief

Subject: **KILAUEA 4: A Cultural Impact Assessment for the Kilauea agricultural Park Project, Kilauea Ahupua'a, Ko'olau District, Kaua'i Island.**
TMK: [4] 5-2-004; parcel 099.

Mahalo for the opportunity to comment on a CIA for the above subject matter to assess potential impacts to cultural practices as a result of potential development in Kilauea Ahupua'a. The purpose of this cultural study is to serve as a Kaua'i County resource to sustain and support agricultural production in accordance with the Kilauea Agricultural Park Master Plan.

While the general area has been agricultural in use, there is always a general probability that some cultural resources remain unknown or unseen. There are Hawaiian cultural practices in the general area which include but are not limited to access to religious sites, to the ocean and other areas for ceremonial and/or for recreational uses. SHPD is also concerned with any ground disturbance work which may uncover burials or burial sites as your map indicates a 'cemetery' north of the project area. The department is mindful that traditional cultural access in the project area to cultural places for resources in the general ahupua'a should also be considered in your study.

The folks listed may have mana'o to share or refer you to others about the project area:

- Auntie Barbara Say, KNIBC 296 Makani Rd. Kapaa 96746 Phone: 808-821-0430
- John Krusc P.O. Box 628, Koloa, HI 96756 Phone: 808-241-6222
- Jimmy Fujita KNIBC James.Fujita@hawaiiantel.net
- Keith Yap, KNIBC P.O. Box 1571, Kapaa, HI 96746 Phone: 808-632-2543
- Kunane Aipoalani Kauai Niihau Island Burial Council (KNIBC) ckaipoalani@hawaiiantel.net
- Kumu Hula Nathan Kalama Phone: 808-822-2166
- Ms. Stella Burgess sburgess@hyatt.com
- The Sproat Family no contact info
- Ms. Kaliko Santos Office of Hawaiian Affairs - Kauai Phone: 808-241-3506

Please do talk story with these folks for information or referrals of any traditional or cultural practices in the project area. Any questions, please call me at 808-692-8015 or via email at Phyllis.L.Cayan@hawaii.gov. #

Figure 20. SHPD response letter

Section 5 Interviews

Kama'āina and *kūpuna* with knowledge of Kīlauea Ahupua'a and the proposed Project area were contacted for participation in this assessment. CSH attempted to contact 38 community members, government agency and community organization representatives for this draft CIA report; of those, 16 responded and two participated in formal interviews. CSH initiated the interviews with questions from the following six broad categories: *wahi pana* and *mo'olelo*, agriculture and gathering practices, freshwater and marine resources, trails, cultural and historic properties, and burials. Participants' biographical backgrounds, comments, and concerns about the proposed development and Project area are presented below.

5.1 Acknowledgements

The authors and researchers of this report extend our deep appreciation to everyone who took time to speak and share their *mana'o* (thoughts, opinions) with CSH whether in interviews or brief consultations. We request that if these interviews are used in future documents, the words of contributors are reproduced accurately and not in any way altered, and that if large excerpts from interviews are used, report preparers obtain the express written consent of the interviewee/s.

5.2 Mr. Jack Gushiken

CSH interviewed Jack Gushiken on February 19, 2011, at his house in Kīlauea, Kaua'i, a few streets from the Project area. Often referred to as Uncle Jack, he is the Agricultural Advisor and Historian for Common Ground, "a consortium of non-profit entities based on sustainable business models" in Kīlauea 'Ahupua'a (Common Ground website). He is also a Consultant for Aiko Nursery. Uncle Jack is the third of six generations who have lived in Kīlauea Ahupua'a. According to the Common Ground website, his "family farming heritage extends beyond 115 years" (Common Ground). His mother was born on the same land where his house sits today. He worked at the Kīlauea Plantation from 1957 until 2004. Uncle Jack is in his seventies. He also holds 20 World Records for various types of fishing (The Garden Island 4/28/2009). Thirty years ago, Uncle Jack was also one of the founding members of a similar project regarding an agricultural farm in the same Project area.

While his family arrived on Kaua'i as contract laborers for the sugar plantation in 1898, he also knows of the Hawaiians who lived in the area prior to the plantation:

I think before the plantation, most Hawaiians actually lived down by the coastlines, or by the rivers. I don't know what they did on the lands because there was no irrigation. The *ahupua'a* system usually has a stream that runs right in there...Then the plantation came, and they started to build all the irrigation system, to start cultivating cane.

Uncle Jack describes two places names that he knows of near the mouth of Kalihiwai River: Kaupia (also Secret Beach) and Kahili (also Rock Quarry). He did not mention any *mo'olelo* associated with these places.

Regarding gathering practices in the area, Uncle Jack explains that, "In this area, there are all kinds of native plants, but most this area is more known for the fish and the *limu*." He clarifies which fish were once caught in the area: "All kinds. You got the *kala*, the *imanui*, *ulu*, *pāpio*... Even the streams are noted for the migration for fish, the 'o 'opu, but it's all gone today."

He described migration of the 'o 'opu and explained how Hawaiians once caught these fish:

The migration of the 'o 'opu, they live up in the mountains during the year. Then about August they come down and hatch all their fingerlings in the brackish water. They flow into the ocean. Then about March-April they come back and work their way upstream in the thousands, and this is where the Hawaiians would pick them up.

He adds that, "In my time, there were a lot of shrimp, *wi* and 'o 'opu."

Uncle Jack suggests that people still go hunting in the area, but it is illegal. Regarding medicinal plants, he mentions only *noni* and *aloe*. Because the area is dry, Uncle Jack offers that it is only *noni* that is still gathered in the area today. Uncle Jack also describes the plants growing within the Project area:

They have Christmas berries in here. The avocados are all cultivated, these are all farms. They're known for rambutans, avocados, lychee.

He also mentions the guava plantation up the valley, which developed after sugar began to disappear.

The only traditional trail that he knows of is the "railroad track line, but it's not there anymore." Uncle Jack also understands that Queen Lili'uokalani once visited the area and "drove the first spike with the railroad track." The only traditional ceremonies that Uncle Jack mentioned were performed at the irrigation station during the plantation era.

Uncle Jack describes an era, not too long ago, when Kīlauea was self-sufficient:

Kīlauea town way back in the early 1900's was self-sufficient. We grew our own vegetables, we had our own dairy here, we generated our own electricity...During the plantation days up until the 1970's...We could generate our own electricity. But one thing was that when the factory went down we didn't have lights...We had a lot of vegetables. In the early days, everybody grew and we shared among each other. Nowadays, most people grow vegetables and the first thing they think is selling...The sharing is gone already...Yeah, yeah, yeah. Because the plantation, there was a big plantation garden here. There was another plantation garden here, right over here [pointing to the map].

Uncle Jack raises concerns about water: "For me, I'm a little concerned. First of all, where are you going to get the water? There was an irrigation system that ran through here but it's gone." He describes the old Hawaiian method of water distribution, the terraces:

Most of the agricultural thing was down the river. Back of my house you could see terraces. Something you wondered was how Hawaiians were able to get the water...Just amazing.

Uncle Jack is also “curious how many people are still interested in doing it: doing the farming. It doesn’t make sense the county’s spinning its wheels and spending on all this consultant work. And actually to implement the farming...” Uncle Jack wants to ensure that people maintain the agricultural park once it is built.

5.3 Mr. Gary Smith

CSH met and interviewed Mr. Gary Smith in Kīlauea, Kaua‘i on February 18, 2011. At 60 years old, Mr. Smith grew up in Kīlauea and is quite familiar with the Project area, having worked on the land when it was part of the Kīlauea Sugar Plantation Company. He is known as a local historian and is also a successful businessman, owning and managing Mokihana Pest Control Inc. which recently was awarded as the “Best Northshore Employer for 2010” by the Hanalei Rotary Club. He also works as a volunteer for Kīlauea Point National Wildlife Refuge, devoting his time to promoting care and protection of the land, as well as Hawai‘i’s cultural and natural resources.

Mr. Smith’s father, Ernest A. Smith, was born in Pāpa‘ikou, Hawai‘i, in 1919. He was a member of the United States Army 100th Infantry during World War II and while he was in training in New York, he met and married Marion Campbell, Mr. Smith’s mother. After the war, Ernest Smith worked for C. Brewer Company and moved from plantation to plantation, arriving with his family of three boys and a girl in Kīlauea in 1953. Two more children, a girl and a boy, were soon added to the growing family. After a short stint back on the Big Island, in Pāhala, the Smiths moved back to Kīlauea in 1960.

Throughout the interview, Mr. Smith toured the Project area along with CSH, showing the delineation of the estimated 75-acre Project area. He touched on the history of the Kīlauea Sugar Company and its influence on the formation of the town, the place names of the surrounding area, and life during the sugar plantation era.

The tour of the Project started on Kīlauea Lighthouse Road. Mr. Smith pointed to the old Rock Quarry Road, which goes down to Kīlauea Bay and Mokolea Point. Mr. Smith noted that most of the 75-acre property is on flattened land, except for a valley portion.

Mr. Smith’s first job was in 1966 for the Kīlauea Sugar Company plantation, and it consisted of planting seedcane in ratoon (replant) fields. Re-planting furrow irrigated fields would entail bringing in mules with the *pulapula* “seed cane” packed 50 to a bundle with a rubber tire band. The bundles would then be carried one at a time by the “*hāpaikō*” man (the one to carry sugar cane bundles on his side) for planting. Mr. Smith recalls looking for blank spots in the furrow where he would then drop in the *pulapula* there. Someone behind him would cover the seed piece or *pulapula* with a hoe or merrytiller. It was difficult work for a beginner, and by lunchtime on his first day of work, which was particularly hot, the young Mr. Smith consumed nearly all his water, approximately one gallon for the day. “It was my first honest day of work where I got a paycheck for working. It was the hardest work I did in my life up until that time. I thought I was going to die [of thirst].”

Working a variety of agricultural jobs as a young man, Mr. Smith’s path toward being a business owner started after college. After he graduated from the University of Hawai‘i with a degree in Tropical Agriculture, he could not find work on Kaua‘i in his field except as a pest

control technician. Since he knew about chemical formulations, plants and was an insect collector, he was able to excel in the field and was constantly called to help fight pests. This led him to open his own business, Mokihana Pest Control, which employs some 20 local employees.

Married to his wife Bebe and the father of three grown children, two sons and one daughter, Mr. Smith manages his business while maintaining his many volunteer duties, including campaigning for the restoration of Kīlauea Point Lighthouse and assisting the staff and volunteers at the Kīlauea Point National Wildlife Refuge in its protection of the wildlife. He also serves as Secretary of the Kīlauea Japanese Association Inc., delegated with the responsibility of maintaining the Kīlauea Japanese Cemetery (north of Project area) and its membership.

Near the Project area, in the national wildlife refuge area, Mr. Smith estimates there are 500 *nēnē*, with 100 nests just this past year and approximately 90 “*mōlī*” (Laysan albatross) nests. It was in 1977 at Kīlauea Point that Mr. Smith and a friend found the first albatross chick in the recorded history of the Hawaiian Islands. Species like wedge-tailed shearwater and albatross birds are coming back to the area, and Mr. Smith is encouraged with their nesting success and is hopeful that endangered Newell shearwaters may one day have a viable colony at Kīlauea Point National Wildlife Refuge.

If the integrity of the habitat was threatened by human presence or use, he would support keeping most people out from the refuge, as unrestricted use by the general public would degrade the habitat and bring destruction:

The problem today is the public is irresponsible. Generally, people want to bring their dogs. They see no connection between their actions and everybody else wanting to do the same thing they do. When they drive on the beach with their truck, they see no ramifications for driving over the *pōhuehue* [beach morning glory] and other vegetation. They say, “If that guy can do it, I can do it too.” It’s just nonsense. It’s that kind of thinking that’s rampant in our society. So it’s blocked off or fenced off to keep predatory animals and people out. People are only allowed there when supervised under guided tours. I said at one time, if they have to close it down and never let a single soul go in there including me, I would support it as it would be the right thing to do, if it meant saving a species.

Describing the Project area of the proposed agricultural park, Mr. Smith lists the plants that are currently growing on the land, including *Koa haole*, Christmas berry, guava, leguminous vines, buffalo grass and castor beans. During a brief period in the early 1970s, seed corn and sorghum were grown there. But for a long time, from the beginning of the sugar plantation era in the 1860s to the last harvest of Kīlauea Sugar Plantation in 1971, the Project area was mostly sugar cane land. Pointing to the land, Mr. Smith states:

Oh yeah, it was total sugar cane here. All this flat land was sugar cane, all this was sugar cane. Everyplace that you looked was sugar cane, pretty much if it was flat. After the plantation closed, they [C. Brewer] attempted to diversify with prawns and then guava when they could not completely divest themselves of their land holdings. So the first thing they did was a prawn farm [prawns and guava culture were not done on the project site as it had been sold to others by that time]. This is after sugar, sorghum and corn. It’s the 1980s by then.

The only section of the Project area that was not sugar cane was the valley portion, which during his childhood and up until today by some long time residents, is referred to as “Pākē Man Place.” It was named after a Chinese farmer who stayed in the valley. He had raised crops and sold his peanuts to the community. But as far as the plantation was concerned, the valley area was a drainage basin thus referred to as *‘ōpala* (trash) land and not fit to be used. With a laugh, Mr. Smith shares that his father should have bought all the so-called *‘ōpala* land:

But today it’s an oxymoron because now *‘ōpala* land is the most prized land as it tends to be steep and or coastal with a view. Their version of *‘ōpala* land was if you couldn’t raise cattle on it or you couldn’t raise cane, it was *‘ōpala* land.

Mr. Smith provided a short history of the formation of Kīlauea town and how it was tied to the Kīlauea Sugar Company, noting that the Kīlauea Sugar Company once sprawled over nine *ahupua‘a*. Gradually, the plantation coalesced around the sugar mill and became more of a town for logistical reasons, drawing people like field workers, irrigators and ditchmen, as well as others in charge of the reservoirs. There were also little stores scattered throughout Kīlauea and a public school at Ko‘olau. World War II completed the consolidation of small scattered camps into the Kīlauea he knew. Mr. Smith describes the formerly vast layout of what used to be Kīlauea Sugar Company:

When I say Kīlauea, this is the *ahupua‘a* of Kīlauea right here going up to the mountains.... What we refer to as traditionally Kīlauea would be the nine *ahupua‘a* which were originally in the *moku* of Ko‘olau (13 *ahupua‘a*). That’s why you get Ko‘olau Beach and that area, Ko‘olau Road. It’s the old *moku* name for this district prior to them putting us in the Hanalei district and stopping that district at Kapuna Bridge in Moloa‘a. So Moloa‘a is the cutoff for where Kīlauea Sugar Co. ended. Once you hit the uplands of Moloa‘a, you’re out of the Kīlauea Sugar Company area. Once you hit Kalihiwai Bridge to the north, you’re out of the Kīlauea Sugar Company area. So what we refer to Kīlauea in the old days was that.

Kīlauea was “swallowed up” by Hanalei District and Moloa‘a was put under the Kawaihau District, and this effectively ended the Ko‘olau District, according to Mr. Smith. All this happened in the 1940s or even earlier.

Before sugar cane was raised in the Project area, the land was used for cattle-grazing. The cattle ran wild and ate whatever was in their way. Drawing from historical sources, Mr. Smith shares that:

The cattle just come in and eat up everything. They did well. They didn’t have any disease. They had grass; they could eat whatever they wanted to. And there was a *kapu* [taboo]. So the *kua‘āina* [person from the country], the *maka‘āinana* [commoner] couldn’t do anything about it.... Probably prior to contact, it was mostly a dryland forest, a coastal dryland forest that probably had *koa*, *‘ōhi‘a*.

Mr. Smith points out that *‘ōhia* and *koa* still grow on the wet Na Pali side, right on the cliffs:

They grow here no problem. But they’re vulnerable to the insects that were brought in and the cattle grazing and goats and whatever. They don’t have a

chance. I would say that the Hawaiians in this area would use this for gathering. They would come here and get big logs to build their *hale* [house] and get firewood or whatever....

Although I don't think there was a huge population, native population here. Just based on the amount of *lo 'i* that are here in the valley and the carrying capacity of this land and the ocean, I would say there was less than a thousand.... But sometimes you wonder—you can go to the Big Island, Kawa in the Ka'u district near Na'alehu, you have home sites galore, all the way down. But there's fresh water there. You think, why do people live over here, no more nothing over here, it's all dry, on this flat land. You think, over here, "Oh, this would be the place to live." But over here, it's a little bit different because if you built a *hale*, you probably have to rebuild it in a year or two because it'd be all rotten from the rain. Because it's high rainfall. That's why Hawaiians gravitated towards the Māhā'ulepū area on Kaua'i and the Kona area because it's drier, it's easier to live there than over here.

Reflecting about gathering practices, Mr. Smith notes that very few people still gather. In the valley section of the Project area, a Filipino (Pitong Jornacion), who once lived in town planted bananas, avocados and other crops that sometimes gets picked now by Filipino immigrants and on occasion, by transients. But the current Kīlauea community is composed of about 90 percent newcomers who do not gather, according to Mr. Smith:

They don't cut *koa haole* sticks to make bean poles or guava sticks to make bean poles.... Now I come to gather here.... If I need...to hold up my banana trees with a fork stick [*mata*], I'll come with my chainsaw and go to a guava tree and cut it down. But the only gatherers every year would be the Filipinos. They would go after wild bitter melon fruit and shoots and some of the wild beans, some of the weedy stuff that you think are weeds but they eat them anyway, that grow wild.

Showing CSH a section of the Project area covered by a canopy of trees, Mr. Smith relates that the natural cover of trees determines what grows in the area. More invasive trees means less gathering. He recounts the times when he used to go hunting in the area, even during the plantation days:

The plantation, sugar cane fields, they're not good places for hunting per se because once the field gets high enough, there's no food there. When you do monoculture like that, with no seeds and you don't put seeds or beans or something that the birds eat, they don't like it there. They're going to dig up nut grass and *hilahila* [*mimosa pudica*] and things like that. But once it [the sugar field] closes in, it's not the best place to go hunting. The pastures are better because the pheasants have more food to eat. They can scratch through the dung of cattle and get beetles, they can eat *hilahila* shoots, they can eat beggar weed seeds, nutgrass, guavas, it's more akin to that kind of... good hunting areas.

When Mr. Smith was younger, a favorite hunting place was in the Gay-Robinson lands. The Gay-Robinson family were land owners in west and northern Kauai and they owned the Olokele Plantation Sugar Company in Makaweli, and also Ni'ihau. "So we'd hunt in those cattle lands in

Kīlauea because any of the *‘ōpala* lands here in this area were leased to the Robinsons for 50 cents an acre a year for cattle grazing,” Mr. Smith states.

Mr. Smith relates that after the 1940s when the plantation dairy shut down, the Robinsons were able to let their cattle graze in the dairy cattle grazing areas on Nihoku (Crater Hill). The Robinsons were fortunate in that they had the upper hand since they owned Olokele which they leased to C. Brewer, Kīlauea Sugar’s owner. Olokele lands were, as Mr. Smith notes, “the best yielding fields in the state.” He narrates the story of the four Robinson brothers, each of them controlling the family interests in sugar, cattle ranching, and Ni‘ihau. The Robinson brothers were Sinclair (born 1886), Aylmer (born 1888), Selwyn (born 1892), and Lester (born 1901):

And they were old men by the time my dad dealt with them; they were old, old men. They were like my dad. The Robinsons, they were straight shooters but they weren’t your average type of person. They had a strict moral code and very Victorian upbringing. Very guarded with their social interactions with other people, even *haoles* [foreigners, Caucasians] or whatever, they would interact because they were business partners in plantations. They got along with plantation people.

Mr. Smith’s enthusiasm for local history is matched by his love for the *‘āina* (land) and Hawaiian culture. He has tried very hard to learn the language:

It’s my passion to learn about the history of this area. It’s my passion to learn Hawaiian. It’s hard to have any authority and speak about cultural things and Hawaiian things and of course if there’s an opinion from a Hawaiian person over there, I would defer to them out of respect. It’s hard to get the *mana ‘o* if you can’t speak the language. It’s hard to understand why things are the way they are, why the thought process was that way, if you don’t speak the language. I made it my passion so when I do my public speaking about the history of Kīlauea, I need to know something about Hawaiian thinking, Hawaiian habitation.... I strongly feel that the future of Hawai‘i is in the language. To save this culture, we can’t pick and choose what we want to save. We have to save it on the basis of the culture, which is the language.

When asked about the place names of the surrounding environs, Mr. Smith pointed out the different land formations and discussed them, stating their Hawaiian names:

I know most of the place names, the Hawaiian place names of all the ahupua‘a, the mountain peaks of this area, the hillsides up there, the point. They’re all English names today, but they have Hawaiian names, which I discovered.... I discovered the name of Crater Hill, which is Nihoku. I discovered the meaning, which is not in the dictionary. The meaning is in the profile of the hill, Ni-ho-ku, it means standing or upright tooth. If you go there and you turn around, you say, “Oh, no wonder they call this place Nihoku” because Hawaiians, just like everyone else, they used geographic and geologic features to name places or feelings that you get at the place.

He gave the example of Kīlauea Point, whose original name undoubtedly came from the feeling one gets from standing near it and watching the thunderous waves crash into the shore:

But it wasn't called Kīlauea Point at the time of the survey when Kamehameha IV sold this is to Charles Titcomb, they referred to it as Cape Wowoni. No *kahakō* [macron], no nothing. So if you go in the Hawaiian Dictionary [Pukui et al. 1986], you see *wōwō* to bellow or roar.... And *hō'oni* means to shake, tremble, so when you go to Mokolea Point, when the waves are busting on that place, I don't care where you live, probably there's no place in Hawai'i Nei where you get that feeling because if you're out on the point, you get the roar and the bellow. And it's to your core that you feel it. You will "*wō-wō*" and "*hō'oni*." That's an answer where it's not a concrete thing; it's a feeling that you get from that.

Mr. Smith pointed to a nearby hill, stating that it was referred to as "Kauapea:"

Even the beach there was referred to as Kauapea ... to me it means "the rain, the sail filling rain, the sails are filled." So if you go to 'Anini Beach and you sit there by the pavilion and you see a big black cloud looming there by the lighthouse, you can see it, and you go, "Guaranteed in about 15 minutes we'll get a nice wind and this big rain (squall) will drive right through. And to me it's like Kauapea. So if you were sailing from Kīlauea to Hanalei and the kauapea came along hey, hallelujah, *maika'i no*, you know, we're on our way.

It was only when Mr. Smith learned the Hawaiian language that he began to understand the Hawaiian concepts about place names and their meanings. He explained how Hawaiian words came to be added in the pidgin dialect:

It took me a long time to get it, but I would never know that answer if I didn't venture out and take the language. It's rewarding to me because so many light bulbs went off in my head how many times. No wonder we spoke that way when we were kids. So we used a lot of Hawaiian in our pidgin English when we spoke. We didn't necessarily know it was Hawaiian words we were using. Sometimes, I thought when we were talking [that] we were using Filipino words. We'd speak to a Filipino guy who spoke only Ilocano and broken English.... We thought *mālama* [to take care of], "Oh, Filipino word." *Pololei* [straight, correct, right], *pololoi* same thing. The Filipino men used *pololoi* all the time. They would use those words.

Like all the new plantation immigrants, Filipinos spoke some Hawaiian because that was how people communicated during the sugar plantation era, narrates Mr. Smith:

They were all speaking Hawaiian for communication because that's how they were taught in the fields where they worked. All the jobs had Hawaiian names. Because from generations before the Filipinos came, that's how they were speaking on the plantations to the guys. You can almost think, what few Hawaiians worked in the field. By that time, most of the *luna* [foreman, overseer] were part-Hawaiian. That's how they spoke to the guys, maybe speaking to some of the Hawaiian workers. And from there it jumps to whoever comes in, learns this lingo, and from there, it carries on.

Speaking pidgin with pride, Mr. Smith notes that even his English is tinged by his childhood amongst the sugar cane fields of Kīlauea :

It kind of defines who I am, basically. It kind of defines how I speak, why I speak the way I do. Which I refuse to change. Lots of guys go the mainland, they come back, they start clanging away. I never went to the mainland to even try that. If I did, they'd probably go, "What did you say?" I'd just say it right over again. When I do public speaking, most of the people, I don't tell them where I was born, when I'm done, they'd say, "You have an accent, where is that accent from?" I say, "From Hawai'i, that's Hawai'i accent." They say, "Is it?" I say, "Yeah, but you probably don't hear it often anymore." I speak pidgin English but I can also speak English but it has an accent. But tough, that's the way it is. My name is Gary Smith but I'm not going to speak like a *haole*, what the hell?

Mr. Smith relates that he was in his late 30s when he started learning the history and culture of the Kīlauea area. Even before this, he already had a fascination and made it his hobby to speak to old-timers. He discusses the challenges in recording oral history:

There's a lot of people who knew a lot of stuff in the old days. I spoke to many of the old-timers here. There were many old-timers who can tell a wonderful story even better than I could tell you about their personal experience here. Most of them are gone, and most of them were very resistant to speaking in public or speaking on a recording. They don't like it—they clam up. That was the hard part. Most of the time when I spoke to them, I didn't record them, I just wrote down what they said. I spoke to them and asked them all kinds of questions.

Many of the old-timers knew a lot but did not want to share it to someone. Soon, Mr. Smith realized that if one is a person who knows a little about something, and is willing to talk about it, the time comes when that person becomes the one that will be asked to share. The critical task is to then learn as much as possible about the place:

I figured if I was going to be the one, I should learn as much as I can because I didn't want to talk stupid or say things that weren't true. A lot of things I say might be conjecture or based upon, "What would you do if you were in the situation?" Well I wasn't a Hawaiian living here a thousand years ago but what would I do? What would I have seen over here to lead me to believe me to think Hawaiians habited this area?... There could be *lo'i*, there are a lot of the terrace rows in Kīlauea in the upper areas of this valley along the old quarry road. I know they did a lot here. Based upon the amount of *lo'i* that you see. The *lo'i* probably could've carried about a thousand people. When you go to Kalalau, there's choke *lo'i* over there and you think, "How did they get the water over here?" So you just look and compare and say, "This place must've had a lot more people there than they had in Kīlauea." Even though in our thinking today, it's totally the other way, it's [Kalalau] totally inaccessible. But in their day it wasn't inaccessible at all.

According to Mr. Smith, there are no known burials in the Project area. If there are any, he points to the valley portion as being the most likely place for it. As for trails in the area, Mr. Smith notes that it would have been easy to walk all around the area because there was nothing to "impede your traveling:"

All these invasive stuff, they didn't have any of that. The thorny bushes or nothing. They had grasslands, all *pili* grass. Probably easy to walk along over here to get from place-to-place. That's all you do is walk—it's easy to cross all these rivers. If you cross at the river mouth, it's all like this here, except if there's a flood—easy to cross. So if you know there were public trails that came all through here for gathering, you know for the most part the trails had to be coastal.... You know they walked along the coast and if it was steep, they digressed and went up higher and came back down.

The closest archaeological site to the Project area, besides *lo 'i* and *pōhaku* (rock) according to Mr. Smith, was a *heiau* on the other side in the Kahili *ahupua'a* which is no longer there as it was allegedly plowed over by the plantation. Pointing west to a hill while standing on Kīlauea Lighthouse Road, Mr. Smith relates the story of the three rock outcroppings, known in oral tradition as the “Three Sisters” of Kīlauea . Mr. Smith describes their appearance:

They're there. The three sisters are as tall as the trees there.... They stick out of the crater like three outcroppings. And you know the Hawaiians when they saw that, prior to Western vegetation, you could see the three sisters from Moloa'a. Coming up Moloa'a hill and coming up Kīlauea you see Crater Hill, you can see the three sisters. In fact, you can even still see them if you have binoculars and you go from Moloa'a and you're coming back down from Waipake subdivision and you look to that side of the hill, you'll see those three outcroppings, and they're about that tall, maybe 20 feet tall.

Mr. Smith cites a written version of the legend of the three sisters who were turned to stone by Pele, but he also offers his own version of how the rock outcroppings came to be:

Kind of interesting it's called Kīlauea and we have a crater over there. Because the home of Pele is Kīlauea [on Hawai'i Island] and that's a huge crater [Nihoku] but half of it has fallen into the ocean. So when Hawaiians saw that, Hawaiians knew it was a crater. The last time it blew up was probably 500,000 years ago. They knew it was a *lua pele* [volcano crater]. No doubt. They knew what happened to the other side. But the way they explained it was that Pele is constantly fighting with her sister Namakaokaha'i, who is the goddess of the sea. There's constantly this conflict. She creates, in her destruction, she creates new land and her sister comes and washes it all away.... So the [three] sisters witness the fight. They are laughing because Pele is losing...“What good is your power if you can't beat your sister?” So that's why she turned them to stone. So that would be my reasoning, my version of the legend of why the sisters are there today.

Some years ago, Mr. Smith was involved with a different permutation of the proposed project. Along with others, he worked hundreds of hours to plan the agricultural park. Water was estimated to cost at least a million dollars to be brought in, and there was also the issue of people who were interested only in what the project can give them, not the overall good the project can have in the community, according to Mr. Smith. Eventually, the project folded. Coming from his past experience, Mr. Smith voices very strong opinions on what can make the project work. When CSH described the proposed plan, he states:

If you spend one dime to make an ag park over here, the county will end up footing the bill on a long and losing proposition, holding people up for nothing, unless there is a stipulation that the land be leased to interested parties. The land would be farmed. Otherwise, if people could buy it as affordable ag land, in a generation, it would no longer be an ag farm... To lease it is to ensure that the next person that comes along will have the same right to do so. I guarantee you, if you sell it to these people, they'll turn around and sell it to somebody who is willing to pay more for the same.

Leasing would help ensure that the agricultural park continue to be an agricultural park, and not become an expensive housing development. The 75 acres of the current Project area was thanks in part to the efforts of previous farmers and those that donated the land. Otherwise, Mr. Smith contends that the Project area would have been all gated community by now.

If the land is leased, the county will own the land, and only a certain number of people will be able to get in, perhaps ten or fifteen people, estimates Mr. Smith. Whether ten or fifteen people, they will need to contribute to the greater good of the community, which would ensure the caring of future generations:

Take care for the next generation and the generation after that so they can get some of the value, some of the enjoyment from this land and have something that functions and fills a need in the community. Being a private farmer growing your crops doesn't always necessarily fill the need of the community. We know that, because almost all our food is imported from the mainland. No one can compete at that level to raise crops compared to the mainland. Unless something big happens.

The greater good would be for the people leasing the agricultural land to give back to the community in the form of fruit stands and a farmers market, while providing a place to keep and park county equipment, and the use of a recycling center, that will serve the needs of the community. What drives Mr. Smith is his commitment to preserve the land:

I work on [this] land, not because I'm saving it for this generation. I work on this land not to save it for myself, I work on this project because I can see two generations from now, I can see people enjoy it and saying, "How lucky somebody did this. We don't know the guy who did this, but we are thankful that somebody did this because we can now enjoy this. We can come and see ten species of seabirds, or we can come to this place and we can recycle. Or we can come to this place and have a farmer's market, or come to this place and see a little Hawaiian farm growing down here in this valley. But if you turn all of this into private lots, it is not going to happen, it is not going to serve the greater good ... it will end up in the hands of non-farmers, and people who can pay the most for it, that's all. Go to Moloa'a and you will see it."

For Mr. Smith, the proposed agricultural park will be worthwhile if the taxpayers' money is not squandered. In addition to his recommendation to lease plots, there should also be rules to ensure that one can farm "in perpetuity:"

Not one or two generations, but in perpetuity. If you allow them to put a house on top, the game is over. Because someone will buy it who doesn't have to farm, doesn't want to farm, [but] just wants a place to live.

Section 6 Cultural Landscape

Discussions of specific aspects of traditional Hawaiian culture as they may relate to the Project area are presented below. This section integrates information from Sections 3–5 in order to examine cultural resources and practices identified within or in proximity to the Project area in the broader context of the encompassing Kīlauea cultural landscape.

6.1 Settlement and Habitation

The Project area includes mostly relatively flat tableland at about 300 ft. elevation although the east portion of the south side is a tributary gulch of the Kīlauea Stream Valley dropping down to approximately 200 ft. AMSL. It lies on the *makai* (seaward) central portion of the traditional Hawaiian land division of Kīlauea.

According to Handy and Handy (1972), Kīlauea was a relatively “small producer of taro” but neighboring *kula* would have made excellent sweet-potato land. The population, which numbered 240 in the spring of 1847 (Kīlauea and Kāhili population were counted together) likely settled along Kīlauea Stream and its tributaries. Thus, it would seem possible that pre-Contact sites relating particularly to agriculture and also to related habitation would have been present in the southeastern valley portion of the present Project area.

Although there are no commoner LCAs listed in Kīlauea Ahupua‘a, evidence that the population would have settled by the stream can be seen in the eleven LCA awards clustered along the south side of Kīlauea Stream in adjacent Kāhili Ahupua‘a. Most of these commoner Land Commission Awards lie in a low, wide terrace next to the stream—evidently well-watered and well-suited for maintenance of taro *lo‘i*.

Community participant Mr. Jack Gushiken notes that most Hawaiians would have probably lived down by the rivers or coastline. There was no irrigation until the sugar plantation came. Sugar then became an important crop but in the valley section of the Project area, community participant Mr. Gary Smith recalls a Chinese farmer who grew peanuts among other crops and a Filipino man who planted avocados and bananas. Mr. Gushiken adds that rambutans and lychee were also cultivated. Nearby the Project area is a guava farm.

Mr. Gushiken shares that Kīlauea town was self-sufficient in the early 1900s to the 1970s, with most people growing their own vegetables.

6.2 Cultural and Historic Properties

There are four historic properties identified during the AIS of the Project area: SIHP #50-30-04-2123, a post-Contact habitation terrace; SIHP #50-30-04-2124, a post-Contact concrete wall and concrete foundation structure; SIHP #50-30-04-2125, a pre-Contact agricultural terrace, and SIHP # 50-30-04-2126, a post-Contact ditch. All four historic properties are located within the southeastern portion of the Project area within a natural gulch feeding into Kīlauea Stream Valley.

The AIS did not identify any historic properties within the remaining Project area. The majority of the Project area, comprised of a level plateau or tableland, was cultivated by Kīlauea

Sugar Company between 1880 and 1971. The lack of historic properties likely reflects the significant modifications that ensued due to sugar cane cultivation and infrastructure development.

Near the vicinity of the Project area, Mr. Smith notes the presence of a *lo'i* “in the upper areas of this valley along the old quarry road.” There was also a *heiau* on the other side in the Kāhili *ahupua'a* which was allegedly plowed over by the plantation. Mr. Smith also discusses the three rock outcroppings approximately about 20 feet tall on a hill, west of the Project area which is known in oral tradition as the “Three Sisters.”

6.3 Gathering and Hunting

Mr. Smith shares that he used to go hunting in the Gay-Robinson lands that were considered *'ōpala* for cattle grazing. Plantation lands like the Project area were not good for hunting as it had monoculture. Mr. Gushiken suggests that people still go hunting in the area, but it is illegal. As for gathering of plants, he states that *noni* and aloe are present although *noni* is the only plant being gathered. Mr. Smith confirms that there is very little gathering taking place, except for Filipinos who come to get wild bitter melon and wild beans and greens. They also come for bananas and avocados that remain in the valley portion. Mr. Smith does come and gather on occasion guava stalks to make sticks.

6.4 Burials and Trails

There are no known burials in the Project area, according to participant Mr. Smith, but if there were, the valley portion would be the most likely place for it. As for trails, he voices the possibility that the Project area was likely easy to walk all over before the arrival of invasive plants. Coastal trails would have been utilized for gathering. Community contact Mr. Gushiken notes the railroad track line that once existed.

6.5 Wahi Pana and Mo'olelo

Kīlauea Ahupua'a is the subject of several *mo'olelo*, beginning with the name which means “Spewing, much spreading” (Pukui et al. 1974:111). In the case of the best known “Kīlauea” at Ka'ū District, Hawai'i Island (Hawaii Volcanoes National Park), the name is typically understood as referring to volcanic steam clouds or aerial fountains of volcanic eruptions. Wichman (1998:102) explains the name as referring to “spewing many vapors” and traces it rather to the streams of Kīlauea that flow between the Makaleha Mountains and the Kamo'okoa Ridge. The name may have originally been in reference to Kīlauea Falls itself.

In the Story of Lonoimakahiki, ruling chief Lonoikamakahiki travels with a companion passing through Kīlauea and Kalihi (Kalihiwai, Kalihikai), and the account notes the great *lauhala* tracts and “the heavy and wind-blown rain, the ceaseless and general rain” (Fornander 1917:358-359). The “ae-kai” is said to be the name of a wind specific to the vicinity of Moku'ae'ae Island and “the Wai-mio is the wind of Kilauea” (Aikin 1988:7). The wind name for the Ko'olau District of Kaua'i between Moloa'a and Kalihikai was the “Kiukainui” (Nakuina 1990:54).

There is a *mo'olelo* about the remains of three, long, ancient, parallel irrigation ditches attributed by the Hawaiians to the claw marks of a *mo'o* (Dole 1892). "The lizard had been ordered by [the famous ruling chief] Mano-ka-lani-pō to open Kīlauea's upper regions for agriculture" (Wichman 1998:102). Another account concerning Kīlauea (Rice 1923:38, see also Wichman 1998:104) concerns the creation of a swath of awash boulders lying between the islet of Moku'ae'ae and Kīlauea crater, when the Menehune left a task unfinished.

Wichman (1998:102-103) relates an account about the three huge *pōhaku* on a hill near the Project area, that were once three sisters of "great beauty" who laughed at Pele when the sea goddess, Nā-maka-o-kaha'i, managed to put out the fire that Pele created by breaking down the walls of the crater. Because they ridiculed Pele, they were transformed to stone. Mr. Smith also shares a similar account about the "Three Sisters."

In addition, Mr. Smith narrates that place names in Hawaiian usually came from feelings that one gets at the place. For example, the Hawaiian name for Crater Hill is Nīhoku:

The meaning is in the profile of the hill, Ni-ho-ku, it means standing or upright tooth. If you go there and you turn around, you say, "Oh, no wonder they call this place Nihoku" because Hawaiians, just like everyone else, they used geographic and geologic features to name places or feelings that you get at the place.

He gave the example of Kīlauea Point, whose original name of Cape Wowoni undoubtedly came from the feeling one gets from standing near it and watching the thunderous waves crash into the shore:

So if you go in the *Hawaiian Dictionary* [Pukui et al. 1986], you see *wōwō* to bellow or roar.... And *hō'oni* means to shake, tremble, so when you go to Mokolea Point, when the waves are busting on that place, I don't care where you live, probably there's no place in Hawai'i Nei where you get that feeling because if you're out on the point, you get the roar and the bellow. And it's to your core that you feel it. You will "wō-wō" and "hō'oni." That's an answer where it's not a concrete thing; it's a feeling that you get from that.

6.6 Marine and Freshwater Resources

Kīlauea Stream is near the Project area and a few miles to the north lies the Pacific Ocean. Mr. Gushiken shares that the area is known for fish and *limu*. Fish like *'o'opu* were once abundant in the streams, along with shrimp and *wi*. In the sea, fish like *kala*, *imanui*, *ulua*, and *pāpio* were caught and enjoyed.

6.7 History of Kīlauea Sugar Plantation

The history of the Project area is tied to the history of the Kīlauea Sugar Plantation. In January 1863, a former American whaler named Charles Titcomb purchased the entire *ahupua'a* of Kīlauea amounting to approximately 3,016 acres from Kamehameha IV for \$2,500, which included the present Project area. Mr. Titcomb began the Kīlauea Sugar Plantation in 1863, which was relatively a smaller sugar plantation. In 1881, a railway was begun and Princess Lydia

Kamakaeha (Lili'uokalani) drove in the first spikes for the railroad bed. The existence of the railroad track line was mentioned by participant Mr. Gushiken.

The Kīlauea Plantation Company started to be managed by C. Brewer and Company in 1910 and C. Brewer took over the controlling interest in 1948. The Kīlauea Plantation Company continued to operate until 1971.

Mr. Gushiken's family arrived as contract laborers in 1898, while Mr. Smith's father worked for the C. Brewer Company in Kīlauea. Mr. Smith himself worked on the plantation in the present Project area in 1966. He shares a short history of the formation of Kīlauea town, noting that the Kīlauea Sugar Company once sprawled over nine *ahupua'a*. Gradually, the plantation coalesced around the sugar mill and became more of a town for logistical reasons. Mr. Smith describes the formerly vast layout of what used to be Kīlauea Sugar Company:

When I say Kīlauea, this is the *ahupua'a* of Kīlauea right here going up to the mountains... What we refer to as traditionally Kīlauea would be the nine *ahupua'a* which were originally in the *moku* of Ko'olau (13 *ahupua'a*). That's why you get Ko'olau Beach and that area, Ko'olau Road. It's the old *moku* name for this district prior to them putting us in the Hanalei district and stopping that district at Kapuna Bridge in Moloa'a. So Moloa'a is the cutoff for where Kīlauea Sugar Co. ended. Once you hit the uplands of Moloa'a, you're out of the Kīlauea Sugar Company area. Once you hit Kalihiwai Bridge to the north, you're out of the Kīlauea Sugar Company area. So what we refer to Kīlauea in the old days was that.

6.8 Sugar Plantation Life and Development of Pidgin

Mr. Smith recalls life in the plantation as one of hard work. As a young man, he planted seedcane in ratoon (replant) fields. Re-planting furrow irrigated fields would entail bringing in mules with the *pulapula* "seed cane" packed 50 to a bundle with a rubber tire band and looking for blank spots in the furrow where he would then drop in the *pulapula* there. Someone behind him would cover the seed piece or *pulapula* with a hoe or merrytiller. It was difficult work for a beginner, and by lunchtime on his first day of work, which was particularly hot, the young Mr. Smith consumed nearly all his water, approximately one gallon for the day.

Mr. Smith shares how pidgin words came to be added, noting that when he was growing up, he and other kids used a lot of Hawaiian words:

We didn't necessarily know it was Hawaiian words we were using. Sometimes, I thought when we were talking [that] we were using Filipino words. We'd speak to a Filipino guy who spoke only Ilocano and broken English.... We thought *mālama* [to take care of], "Oh, Filipino word." *Pololei* [straight, correct, right], *pololoi* same thing. The Filipino men used *pololoi* all the time. They would use those words.

Like all the new plantation immigrants, Filipinos spoke some Hawaiian because that was how people communicated during the sugar plantation era, narrates Mr. Smith:

They were all speaking Hawaiian for communication because that's how they were taught in the fields where they worked. All the jobs had Hawaiian names. Because from generations before the Filipinos came, that's how they were speaking on the plantations to the guys. You can almost think, what few Hawaiians worked in the field. By that time, most of the *luna* [foreman, overseer] were part-Hawaiian. That's how they spoke to the guys, maybe speaking to some of the Hawaiian workers. And from there it jumps to whoever comes in, learns this lingo, and from there, it carries on.

Speaking pidgin with pride, Mr. Smith notes that even his English is tinged by his childhood amongst the sugar cane fields of Kīlauea :

It kind of defines who I am, basically. It kind of defines how I speak, why I speak the way I do. Which I refuse to change.

Section 7 Summary and Recommendations

CSH undertook this CIA at the request of R. M. Towill Corporation. The cultural survey broadly included the entire *ahupua'a* of Kīlauea, and more specifically the approximately 75 acres of the proposed Project. The proposed Kīlauea Agricultural Park's purpose is to sustain and support agricultural production in perpetuity for the citizens of Kaua'i.

7.1 Results of Background Research

Background research for this Project yielded the following results:

1. Kīlauea is associated with specific *mo'olelo* (stories and oral histories) about (a) an *ali'i* (chief, noble), Lonoikamakahiki, who passed through with a companion and who remarked about vast tracts of *lauhala* (*Pandanus* sp.) and constant rain; and (b) Pele, who fought the sea goddess (Nā-maka-o-kaha'i) but was defeated by her and subsequently ridiculed by three beautiful sisters whom she later punished by turning them to stone; (c) a *mo'o* named Ka-mo'o-koa who was ordered by ruling chief Mano-ka-lani-pō to leave claw marks that became the remains of three, long, ancient, parallel irrigation ditches, thus opening up upper Kīlauea regions for agriculture; (d) the Menehune, who created the boulders lying between the islet of Moku'ae'ae and Kīlauea crater.
2. The Project area is located in Kīlauea and is comprised of mostly flat tableland at about 300 ft. elevation, with the east portion of the south side being a tributary gulch of the Kīlauea Stream Valley dropping down to approximately 200 ft. AMSL. Vegetation consists of exotic grasses, *hau* (*Hibiscus tiliatus*), ironwood (*Cassuarina equisetifolia*), Christmas berry (*Schinus terebinthifolius*), false *kamani* (*Terminalia catappa*) and Java plum (*Syzygium cumini*), among others. There is also extensive areas of *hau* (*Hibiscus tiliaceus*), *hala*, ironwood, bamboo, mango (*Mangifera indica*), and *ti* (*Cordyline fruticosa*).
3. In the Māhele of 1848, Kīlauea Ahupua'a was retained as Government Lands and there were no entries for commoner land claims. However, 11 LCA awards in adjacent Kāhili provide a picture of what settlement near the Project area may have been like at the time. These 11 LCA awards in Kāhili are clustered along the south side of Kīlauea Stream, lying in a low, wide terrace next to the stream - evidently well-watered and well-suited for maintenance of taro *lo'i*. Virtually all claims involve a house-lot, a few include *lo'i*, and several claims mention "*kula*" (pasture) with *wauke* (paper mulberry), *noni*, (Indian mulberry) and orange trees being cultivated.
4. The census of 1847 shows the combined population of 240 for Kīlauea and Kāhili Ahupua'a, larger than that of the huge valleys of Kalalau or Wainiha. It likely means that the area was well populated back in pre-Contact times.
5. The Project Area was land formerly used as a sugar plantation by the Kīlauea Sugar Company, which employed Chinese and Portuguese workers. The sugar company modified water resources in the uplands with dams, reservoirs, ditches and flumes (Joesting 1984), which may have damaged and ended large-scale native agricultural

practices in Kīlauea and vicinity. The Kīlauea Sugar Company ended its operations in 1971.

6. In 1881, a railway was begun and Princess Lydia Kamakaeha (Lili'uokalani) drove in the first spikes for the railroad bed. Sugar was delivered from Kīlauea to Kāhili landing (Condé and Best 1974:152). The rail system was abandoned entirely in 1942.
7. Documented sites within the Project area included four historic properties identified during the archaeological inventory survey (AIS). All four historic properties were located within the natural drainage gulch in the southeastern portion of the Project area. Three of the four historic properties were likely associated with the plantation era, and the fourth historic property is a pre-Contact agricultural terrace. No further historic preservation work is recommended for these historic properties.

7.2 Results of Community Consultation

CSH attempted to contact 38 community members, government agency and community organization representatives for this draft CIA report; thus far, 16 responded and two participated in formal interviews. The community consultation indicates:

1. The Project area and environs has a history of use by Kānaka Maoli (Native Hawaiians) and other *kama 'āina* groups for a variety of past and present cultural activities and gathering practices. Community participant Mr. Gushiken discusses natural and cultural resources including the Kīlauea stream abundant with 'o'opu, *wi*, and shrimp; the catching and enjoyment of fish like *kala*, *imanui*, *ulua*, *pāpio* and gathering of limu; the presence of aloe and gathering of *noni* and fruits like avocados. Community participant Mr. Smith describes presence of *lo 'i* in the upper areas of the valley near the Project area and the nesting of 500 *nēnē* and presence of 90 *mōlī* (Laysan albatross nests) as well as wedgetailed shearwater birds that traditionally have been found in the area and which are now protected in nearby Kīlauea Point National Wildlife Refuge. Both participants recall Kīlauea town's sugar plantation past, with Mr. Gushiken noting the self-sufficiency of the town where most everybody grew their own vegetables to be shared with neighbors, while Mr. Smith expresses the wide interaction among different ethnicities which encouraged the growth of pidgin and the learning of diverse cultural backgrounds.
2. Mr. Smith shares several *mo 'olelo* (stories, legends) about the places in the area, including the Hawaiian name of Kīlauea Point as Cape Wowoni, due to the feeling one gets when standing at the point where the waves roar and bellow and one feels it at the core; the origin of the name Nīhoku (known as Crater Hill), where the profile of the hill is like a standing or upright tooth and hence the meaning of the name; the name of a nearby hill, beach and wind called "Kauapea," which he interprets as the "sail filling rain."

3. According to Mr. Smith, the Project area was used as cattle grazing ground before being planted with sugar. After the end of sugar in 1971, sorghum, corn, prawns and guavas were attempted to be grown in the plantation.
4. Mr. Smith points to the valley portion of the Project area, formerly considered as *'ōpala* (trash) lands, as being known by the name of “Pākē Man Place” and where such crops as peanuts, bananas and avocados were cultivated. Some of the crops are still gathered today.
5. The Kīlauea Sugar Company once sprawled over nine *ahupua'a*, including Kīlauea. The nine *ahupua'a* were once part of the *moku* (district) of Ko'olau before Kīlauea was put in the Hanalei district.
6. In a letter to CSH, OHA suggests consideration of traditional land use concepts which emphasize land stewardship and also requests clarification on past and present land use of the Project area.
7. In a letter to CSH, SHPD voices concern with any ground disturbance work, which may uncover burials or burial sites as there is a cemetery north of the Project area. SHPD also calls for the continued access to cultural resources by the Hawaiian community and recreational users.
8. Both Mr. Smith and Mr. Gushiken voice their concerns about water for the agricultural park and for maintenance of the park once built. Mr. Smith recommends leasing the land, and not selling it, in order to ensure the perpetuity of the agricultural park.

7.3 Impacts and Recommendations

Based on the information gathered for the cultural and historic background and community consultation detailed in this draft CIA report, CSH does not foresee potential impacts of the proposed Project on Native Hawaiian or other ethnic groups' cultural practices customarily and traditionally exercised for subsistence, cultural or religious purposes, but does foresee two potential impacts on cultural, historic, and natural resources. CSH clarifies these two potential impacts and makes the following recommendations:

1. Land-disturbing activities may uncover burials or other cultural resources. Mr. Smith notes there are no known burials, but if there were any, it would most likely be in the valley portion of the Project area. Should historic, cultural or burial sites or artifacts be identified during ground disturbance, the construction contractor should immediately cease all work and the appropriate agencies notified pursuant to applicable law.
2. Although the Project area is outside the vicinity of Kīlauea Point National Wildlife Refuge, its proximity to the refuge may mean that occasional endangered birds may be found in or around the Project area. Care must be taken to ensure that these birds such as the *nēnē*, shearwaters and Laysan albatross or *mōlī* be unharmed and returned to the refuge.

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Appendix A Glossary

To highlight the various and complex meanings of Hawaiian words, the complete translations from Pukui and Elbert (1986) are used unless otherwise noted. In some cases, alternate translations may resonate stronger with Hawaiians today; these are placed prior to the Pukui and Elbert (1986) translations and marked with "(common)."

Diacritical markings used in the Hawaiian words are the *'okina* and the *kahakō*. The *'okina*, or glottal stop, is only found between two vowels or at the beginning of a word that starts with a vowel. A break in speech is created between the sounds of the two vowels. The pronunciation of the *'okina* is similar to saying "oh-oh." The *'okina* is written as a backwards apostrophe. The *kahakō* is only found above a vowel. It stresses or elongates a vowel sound from one beat to two beats. The *kahakō* is written as a line above a vowel.

Hawaiian Word	English Translation
<i>ahupua'a</i>	Land division usually extending from the uplands to the sea, so called because the boundary was marked by a heap (<i>ahu</i>) of stones surmounted by an image of a pig (<i>pua'a</i>), or because a pig or other tribute was laid on the altar as tax to the chief
<i>ali'i</i>	Chief, chiefess, officer, ruler, monarch, peer, headman, noble, aristocrat, king, queen, commander
<i>Hale</i>	House
<i>Haole</i>	Foreigner, Caucasian
<i>Heiau</i>	Pre-Christian place of worship, shrine; some <i>heiau</i> were elaborately constructed stone platforms, others simple earth terraces. Many are preserved today
<i>hō'oni</i>	To shake, tremble
<i>'ili</i>	Land section, next in importance to an <i>ahupua'a</i> and usually a subdivision of an <i>ahupua'a</i>
<i>Kahakō</i>	Macron
<i>kama'āina</i>	Native-born, one born in a place, host; native plant; acquainted, familiar, Lit., land child
<i>Kapu</i>	Taboo
<i>Kī</i>	ti, a woody plant
<i>kua'āina</i>	Person from
<i>kupuna</i>	Elders (common). Grandparent, ancestor, relative or close friend of the grandparent's generation, grandaunt, granduncle. <i>Kūpuna</i> —

	plural of <i>kupuna</i>
<i>lua pele</i>	Volcano crater
<i>Limu</i>	Seaweed
<i>lo 'i</i>	Irrigated terrace, especially for taro, but also for rice; paddy
<i>maka 'āinana</i>	Commoner, populace, people in general
<i>Makai</i>	Seaward
<i>Malama</i>	To care
<i>Mauka</i>	Inland
<i>Moku</i>	District, island, islet, section
<i>mo 'olelo</i>	Story, tale, myth, history, tradition, literature, legend, journal, log, yarn, fable, essay, chronicle, record, article; minutes, as of a meeting. (From <i>mo 'o 'ōlelo</i> , succession of talk; all stories were oral, not written)
<i>'ōlelo no 'eau</i>	Proverb, wise saying, traditional saying
<i>'ōpala</i>	Trash
<i>Pōhaku</i>	Rock, stone
<i>'uala</i>	Sweet potato
<i>wahi pana</i>	Storied place (common). Legendary place
<i>Wōwō</i>	To roar and bellow

Appendix B Common and Scientific Names for Plants and Animals Mentioned by Community Participants

Common Names		Possible Scientific Names		Source
Hawaiian	Other	Genus	Species	
	aloe			
	Buffalo grass			
	Castor beans			
	Christmas berry			
	corn			
	guava	<i>Psidium</i>	<i>guajava</i>	Wagner et al. 1999
<i>Hilahila</i>			<i>Mimosa pudica</i>	
<i>Imananui</i>				
<i>Kala</i>		<i>Naso</i>	<i>Spp.</i>	Wagner et al. 1999
<i>kī</i>	ti	<i>Cordyline</i>	<i>Fruticosa</i>	Wagner et al. 1999
<i>Koa</i>		<i>Acaia</i>	<i>koa</i>	Wagner et al. 1999
<i>koa haole</i>		<i>Leucaena</i>	<i>Spp.</i>	Wagner et al. 1999
	Leguminous vines			
<i>Mōlī</i>	Laysan albatross			
<i>Nēnē</i>	Hawaiian goose			
<i>Noni</i>	Indian mulberry	<i>Morinda</i>	<i>Citrofolia</i>	Wagner et al. 1999
	Nut grass			
<i>'ōhi'a</i>		<i>Metrosideros</i>	<i>polymorpha</i>	Wagner et al. 1999
<i>'o'opu</i>	goby	General name for freshwater and saltwater fish	General name for freshwater and saltwater fish	Hoover 1993
<i>Pāpio</i>	Juvenile big eye jack	<i>Caranx</i>	<i>sexfasciatus</i>	Hoover 1993

<i>Pōhuehue</i>	Beach morning glory			
	prawns			
	sorghum			
<i>Ulua</i>	Crevalle, jack or pompano	<i>Pseudocarynx</i>	<i>dentex</i>	Hoover 1993
<i>Wi</i>				