DAVID Y. IGE
Governor

SHAN S. TSUTSUI
Lt. Governor

SCOTT E. ENRIGHT
Chairperson, Board of Agriculture

PHYLLIS SHIMABUKURO-GEISER
Deputy to the Chairperson

State of Hawaii
DEPARTMENT OF AGRICULTURE
1428 South King Street
Honolulu, Hawaii 96814-2512
Phone: (808) 973-9600 FAX: (808) 973-9613

September 18, 2015

Ms. Jessica E. Wooley, Director
Office of Environmental Quality Control
Department of Health, State of Hawai'i
235 S. Beretania Street, Room 702
Honolulu, Hawai'i 96813

Dear Ms. Wooley:

Subject: Final Environmental Assessment and Finding of No Significant Impact
Kunia Agricultural Park, Kunia, O'ahu, Hawai'i
Tax Map Key: (1) 9-4-002-080

With this letter, the State of Hawai'i Department of Agriculture (HDOA) hereby transmits the Final Environmental Assessment and Finding of No Significant Impact (FEA-FONSI) for the Kunia Agricultural Park situated at (1) 9-4-002:080, in the 'Ewa District on the island of O'ahu for publication in the next available edition of the Environmental Notice.

The HDOA has included copies of comments and responses that it received during the 30-day public comment period on the draft environmental assessment and anticipated finding of no significant impact (DEA-AFONSI).

Enclosed is a completed OEQC Publication Form, two copies of the FEA-FONSI, an Adobe Acrobat PDF file of the same, and an electronic copy of the publication form in MS Word. Simultaneous with this letter, we have submitted the summary of the action in a text file by electronic mail to your office.

Should you any questions, please contact Mr. Glenn Okamoto, Project Manager of our office at 973-9436, or our consultant Mr. Brian Takeda of R. M. Towill Corporation at 842-1133 or by email at BrianT@rmtowill.com.

Sincerely,

Phyllis Shimabukuro-Geiser

for Scott E. Enright, Chairperson
Board of Agriculture

Enclosures

c: Brian Takeda, R. M. Towill Corporation

Island Fresh

AGENCY ACTION
SECTION 343-5(b), HRS
PUBLICATION FORM

Project Name: Kunia Agricultural Park
HRS §343-5 Trigger(s): Proposed use of state lands and funds
Island: O'ahu
District: 'Ewa
TMK: (1) 9-4-002: 080
Permits: Community Noise Permit; National Pollutant Discharge Elimination System (NPDES) Permit Authorizing Discharges Associated with Construction Storm Water; NPDES Permit Authorizing Discharges Associated with Hydrotesting Effluent; DCAB Facilities Access Design Review; Water Use Permit; State of Hawai'i Department of Transportation (HDOT) Roadway Access; HDOT Plan Review; Agricultural Cluster Housing Permit; Subdivision Approval; Grading Permit; Sewer Connection; and, Utility Company Plan Review.

Proposing/Determination Agency:
(*Address, Contact Person, Telephone*) State of Hawai'i Department of Agriculture
1428 South King Street
Honolulu, Hawaii 96814
Contact: Glenn Okamoto
Phone: 973-9436

Accepting Authority:
(for EIS submittals only)
Consultant:
(*Address, Contact Person, Telephone*) R.M. Towill Corporation
2024 North King Strett, Suite 200
Honolulu, Hawai'i 96819-3494
Contact: Brian Takeda
Phone: 842-1133

Status (check one only):

__DEA-AFNSI	Submit the proposing agency notice of determination/transmittal on agency letterhead, a hard copy of DEA, a completed OEQC publication form, along with an electronic word processing summary and a PDF copy (you may send both summary and PDF to oeqchawaii@doh.hawaii.gov); a 30-day comment period ensues upon publication in the periodic bulletin.
_X_FEA-FONSI	Submit the proposing agency notice of determination/transmittal on agency letterhead, a hard copy of the FEA, an OEQC publication form, along with an electronic word processing summary and a PDF copy (send both summary and PDF to oeqchawaii@doh.hawaii.gov); no comment period ensues upon publication in the periodic bulletin.
__FEA-EISPN	Submit the proposing agency notice of determination/transmittal on agency letterhead, a hard copy of the FEA, an OEQC publication form, along with an electronic word processing summary and PDF copy (you may send both summary and PDF to oeqchawaii@doh.hawaii.gov); a 30-day consultation period ensues upon publication in the periodic bulletin.
__Act 172-12 EISPN	Submit the proposing agency notice of determination on agency letterhead, an OEQC publication form, and an electronic word processing summary (you may send the summary to oeqchawaii@doh.hawaii.gov). NO environmental assessment is required and a 30-day consultation period upon publication in the periodic bulletin.

__DEIS	The proposing agency simultaneously transmits to both the OEQC and the accepting authority, a hard copy of the DEIS, a completed OEQC publication form, a distribution list, along with an electronic word processing summary and PDF copy of the DEIS (you may send both the summary and PDF to oeqchawaii@doh.hawaii.gov); a 45-day comment period ensues upon publication in the periodic bulletin.
__FEIS	The proposing agency simultaneously transmits to both the OEQC and the accepting authority, a hard copy of the FEIS, a completed OEQC publication form, a distribution list, along with an electronic word processing summary and PDF copy of the FEIS (you may send both the summary and PDF to oeqchawaii@doh.hawaii.gov); no comment period ensues upon publication in the periodic bulletin.
__ Section 11-200-23 Determination	The accepting authority simultaneously transmits its determination of acceptance or nonacceptance (pursuant to Section 11-200-23, HAR) of the FEIS to both OEQC and the proposing agency. No comment period ensues upon publication in the periodic bulletin.
__Section 11-200-27 Determination	The accepting authority simultaneously transmits its notice to both the proposing agency and the OEQC that it has reviewed (pursuant to Section 11-200-27, HAR) the previously accepted FEIS and determines that a supplemental EIS is not required. No EA is required and no comment period ensues upon publication in the periodic bulletin.
__Withdrawal (explain)	

Summary (Provide proposed action and purpose/need in less than 200 words. Please keep the summary brief and on this one page)**:**

The State of Hawai‘i Department of Agriculture (HDOA) proposes to develop the Kunia Agricultural Park project, which will encompass approximately 150 acres of State lands currently under cultivation and suited to a variety of crops. The project is designed to fulfill the State’s legislative mandate to increase the supply of leased diversified agricultural lands that are known to be highly suited to various crops, and for which agricultural water is available.

The proposed project would afford 24 lessees the ability to farm and live on the property through the lease of agricultural lots and farm dwellings which are part of an agricultural housing cluster development. HDOA will be responsible for developing and maintaining the agricultural infrastructure and for securing irrigation water for the project. HDOA’s request for an allocation of agricultural water from the Waiāhole Ditch is pending before the State of Hawai‘i Department of Land and Natural Resources, Commission on Water Resource Management.

The estimated development cost is $23 million dollars, and construction is anticipated to start in October 2016, contingent on funding and permit approvals.

Final Environmental Assessment / Finding of No Significant Impact
per Hawai‘i Revised Statutes (HRS), Chapter 343

Kunia Agricultural Park
Kunia, O‘ahu, Hawai‘i

Department of Agriculture
State of Hawai‘i
1428 South King Street
Honolulu, Hawai‘i 96814

September 2015

Final Environmental Assessment / Finding of No Significant Impact
per Hawai‘i Revised Statutes (HRS), Chapter 343

Kunia Agricultural Park

Kunia, O‘ahu, Hawai‘i

Prepared for:
Department of Agriculture
State of Hawai‘i
1428 South King Street
Honolulu, Hawai‘i 96814

Prepared By:
R. M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawai‘i 96819

September 2015

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APPENDICES

ACRONYMS AND ABBREVIATIONS

ALISH	Agricultural Lands of Importance to the State of Hawai‘i
ADA	American with Disabilities Act
AIS	Archaeological Inventory Survey
AASHTO	American Association of State Highway and Transportation Officials
BMPs	Best Management Practices
BWS	Board of Water Supply (City and County of Honolulu)
CCH	City and County of Honolulu
CPR	Condominium Property Regime
CWA	Clean Water Act of 1972, as amended
CWB	Clean Water Branch (State)
CWRM	Commission on Water Resources Management (State of Hawai‘i)
CSH	Cultural Surveys Hawai‘i, Inc.
DEA	Draft Environmental Assessment
DEM	Department of Environmental Management (City and County of Honolulu)
DOJ	Department of Justice
DCAB	Disability and Communication Access Board
DLNR	Department of Land and Natural Resources (State of Hawai‘i)
HDOH	Department of Health (State of Hawai‘i)
DPP	Department of Planning and Permitting (City and County of Honolulu)
EA	Environmental Assessment
EPA	Environmental Protection Agency
EMS	Emergency Medical Services
FEA	Final Environmental Assessment
FONSI	Finding of No Significant Impacts
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
GP	City and County of Honolulu General Plan
HECO	Hawai‘i Electric Company

ACRONYMS AND ABBREVIATIONS

HAR	Hawai‘i Administrative Rules (State of Hawai‘i)
HDOA	Department of Agriculture (State of Hawai‘i)
HDOT	Department of Transportation (State of Hawai‘i)
HRS	Hawai‘i Revised Statutes (State of Hawai‘i)
LSB	Land Study Bureau
LUO	Land Use Ordinance (State of Hawai‘i)
MPH	Miles Per Hour
MGD	Million Gallons Per Day
MOU	Memorandum of Understanding
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NOI	Notice of Intent
PD-H	Planned Development Housing
OSC	O‘ahu Sugar Company
ROW	Right of Way
ROH	Revised Ordinances of Honolulu (City and County of Honolulu)
SHPD	State Historic Preservation Division (State of Hawai‘i)
SIHP	State Inventory of Historic Properties
SCP	Sustainable Communities Plan
TAR	Traffic Assessment Report
TMK	Tax Map Key
USDA	United States Department of Agriculture
WWRP	Water Resources Protection Plan
WUPA	Water Use Permit Application

Note: Spelling of Hawaiian place names follows Pukui et al. *Place Names of Hawai‘i* [1974].

Project Summary

Project:	Kunia Agricultural Park
Applicant:	State of Hawai'i, Department of Agriculture 1428 South King Street Honolulu, Hawai'i 96814
Accepting Authority:	State of Hawai'i, Department of Agriculture
Agent:	R. M. Towill Corporation 2024 North King Street, Suite 200 Honolulu, Hawai'i 96819 Contact: Brian Takeda, (808) 842-1133
Island	O'ahu
Region	Kunia
Tax Map Key(s):	(1) 9-4-002: 080
Proposed Action:	Development of a new state agricultural park for the promotion of diversified agricultural production.
Land Area:	Approximately 150 acres
State Land Use District:	Agriculture
O'ahu Sustainable Community Plan Land Use	Residential and Low Density Apartment
Present Zoning:	AG-1. Restricted Agriculture
Existing Land Use:	Agriculture and Open Space
Special Management Area:	No
Required Permits and Entitlements:	Completion of a Hawai'i Revised Statutes (HRS), Chapter 343, and Hawai'i Administrative Rules (HAR), Chapter 11-200 Compliant Environmental Assessment; Community Noise Permit; National Pollutant Discharge Elimination System (NPDES) Permit Authorizing Discharges Associated with Construction Storm Water; NPDES Permit Authorizing Discharges Associated with Hydrotesting Effluent; DCAB Facilities Access Design Review; Water Use Permit; State of Hawai'i Department of Transportation (HDOT) Roadway Access; HDOT Plan Review; Agricultural Cluster Housing Permit; Subdivision Approval; Grading Permit; Sewer Connection; and, Utility Company Plan Review.

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1.0 Introduction

1.1 Project Location and Area of Use

The site for the proposed Kunia Agricultural Park (Project) is a 150-acre property (Property) located at tax map key (1) 9-4-002: 080 (Property), in Kunia, on the island of O'ahu. The Property lies along the eastern side of Kunia Road between the Royal Kunia residential community to the south and Wilikina Drive in Wahiawā to the north. See **Figure 1**. The regional context for the Project is an area with predominantly large agricultural parcels surrounding the Property. See **Figure 2**.

1.2 Purpose of the Environmental Assessment

In accordance with HRS, Chapter 343, Section 5, this Project involves the following action that requires the preparation of an Environmental Assessment (EA):

(1) Propose the use of state or county lands or the use of state or county funds;

In accordance with HRS, Chapter 343-5, the applicant and accepting authority is the State of Hawai'i, Department of Agriculture (HDOA).

This Final Environmental Assessment (FEA) was prepared in conformance with the regulatory and documentation requirements prescribed under HRS, Chapter 343, *Environmental Impact Statements*, and HAR, Chapter 11-200, *Environmental Impact Statement Rules*, A Draft Environmental Assessment (DEA) was published in the March 23, 2013 Office of Environmental Quality Control (OEQC) issue of *The Environmental Notice.* The 30-day public comment period for the review of the DEA ended on April 22, 2013. Subsequently, this FEA was prepared based upon the comments received in the DEA. A Finding off No Significant Impact (FONSI) is being issued for this Project. The DEA comment and response letters can be found in **Appendix E**.

1.3 Purpose and Need for Proposed Project

Following the decline and eventual disappearance of both sugar cane and pineapple production on O'ahu, there is considerable interest in the use of prime agricultural lands for diversified agriculture. Yet, the barriers to entry for small-scale farmers are significant due to infrastructure cost and the difficulty of securing a stable agricultural water source. The HDOA addresses these barriers by taking responsibility for developing and maintaining agricultural infrastructure and for securing irrigation water at its agricultural parks. The overall Project plan also provides the ability for lessees to live near their agricultural lots through lease of farm dwelling lots.

The Property will be subdivided into 25 agricultural lots ranging in size from 5 to 8 acres. A condominium property regime (CPR) comprised of 25 lots will be established on one of the agricultural lots. Farm dwellings will be constructed on 24 of the CPR lots. The remaining CPR lot will be primarily used for utility connections with Royal Kunia, Phase II development and emergency access. Accessory agricultural related structures many also be placed on the lot. There will be 24 agricultural lots and 24 farm dwellings.

Figure 1 Regional Context

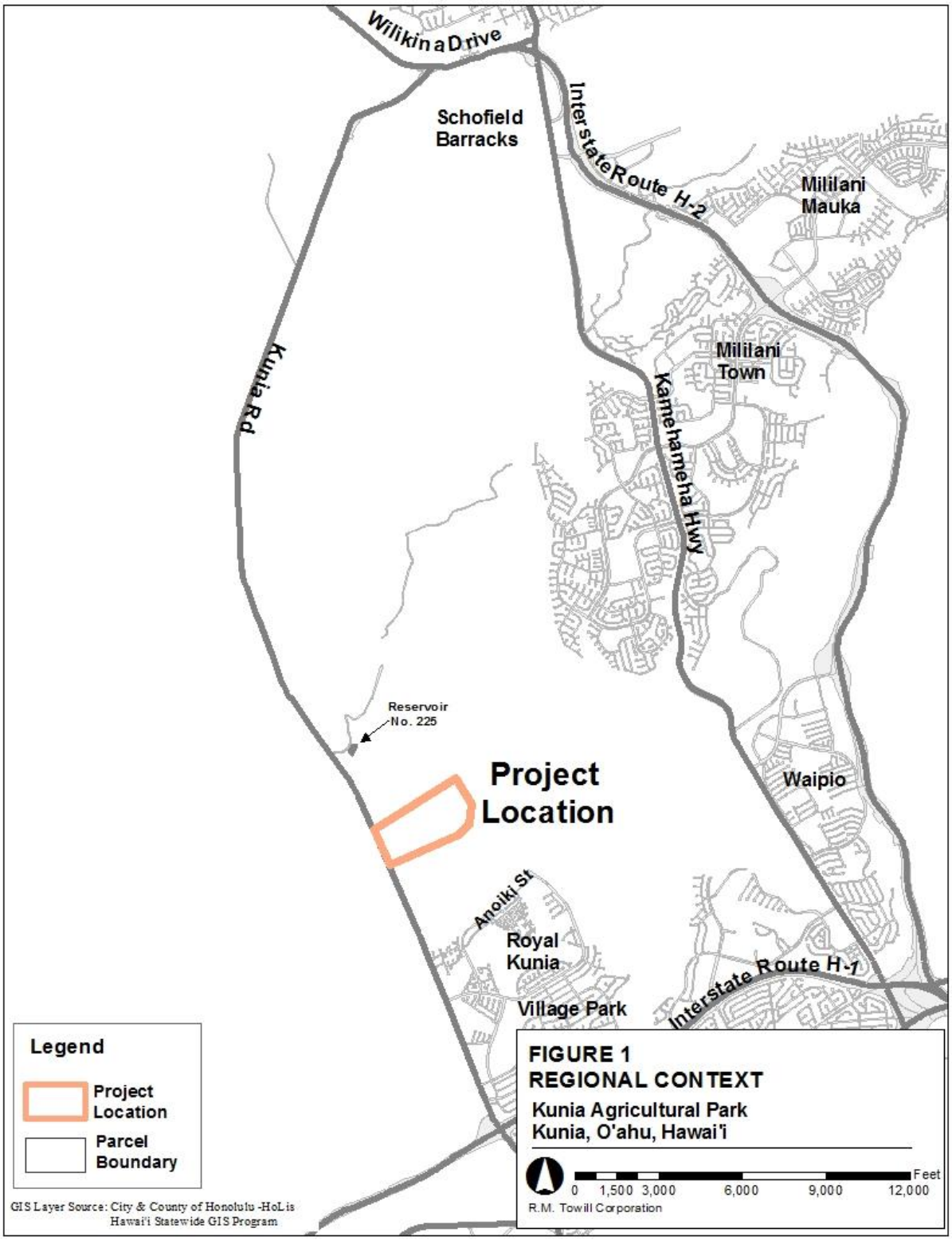
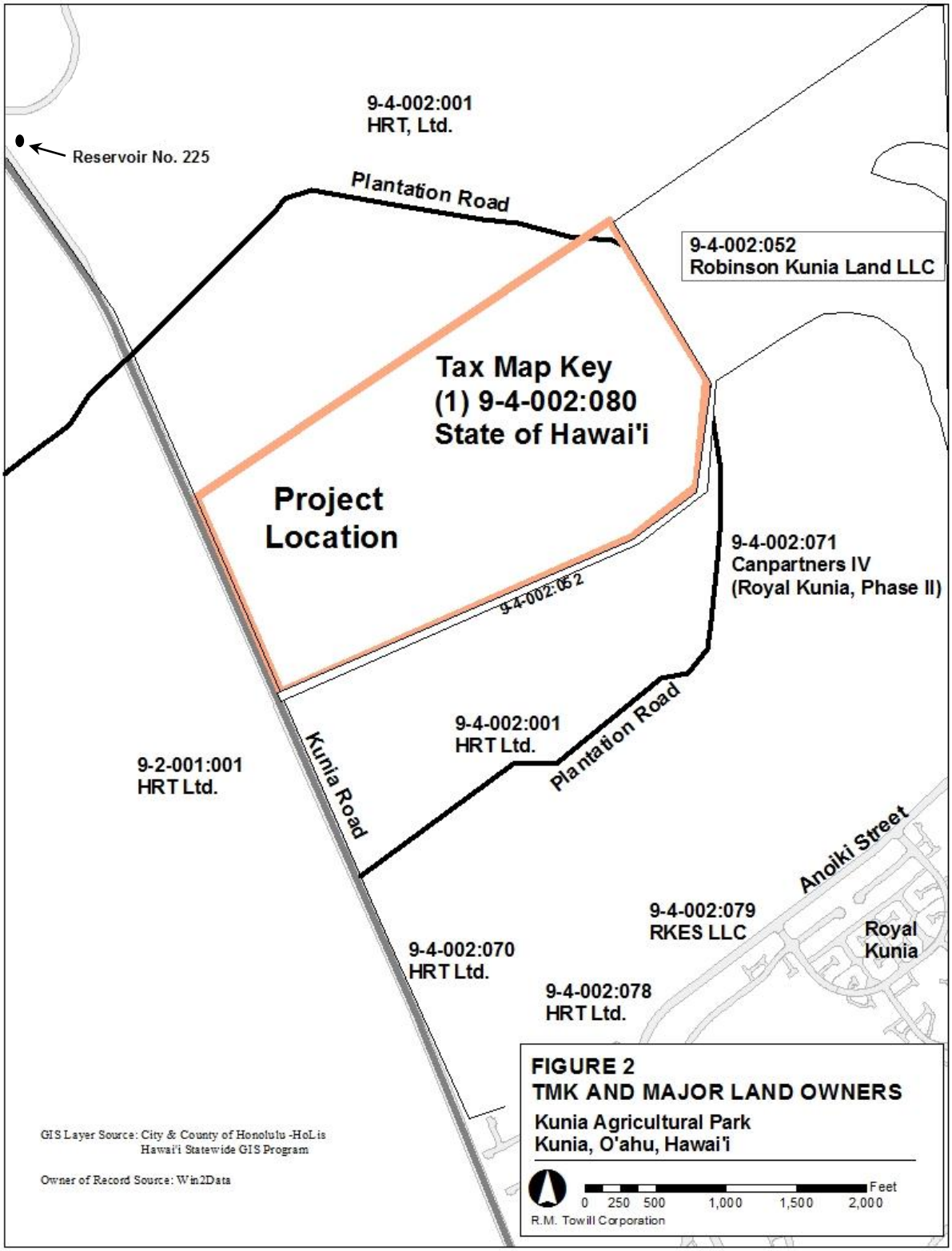


Figure 2 Tax Map Key and Major Land Owners



1.4 Overview of the State of Hawai‘i Agricultural Park Program

The Project is designed to fulfill the State of Hawai‘i’s legislative mandate to increase the supply of leased diversified agricultural land that is known to be highly suited to a variety of crops and has agricultural water available. HRS, Chapter 166, *Agricultural Parks*, confers on the HDOA the authority to plan, develop and manage agricultural parks on public lands to increase the supply of diversified agricultural lands.

HRS, Section 166-1 states the goals and objectives of the state agricultural park program:

Goals of Agricultural Parks:

Important agricultural lands should be preserved for productive purposes; the contribution of diversified agriculture and aquaculture to export and local markets should be expanded, thereby increasing its importance to the State’s economy; and continued use of the State’s agricultural land resources should be ensured by providing lands to new farmers, displaced farmers, and other qualified farmers.

Objectives

Lands of appropriate size and productive potential, with an adequate supply of water, to ensure economically viable farm operations; lands at reasonable cost with long term tenure and security from urbanization pressure; and lands with common facilities and activities to encourage farm production and distribution economies.

HRS, Section 166-2 defines agricultural parks as:

… any agricultural or aquacultural complex so designated by the board [of Agriculture, State of Hawai‘i], for which state land or state funds are used, in order to meet the goals and objectives stated in Section 166-1. Agricultural buildings, farm residences, and employee dwellings necessary to the production and distribution of agricultural and aquacultural commodities may be considered part of the agricultural park.

There are ten existing agricultural parks in the State of Hawai‘i as shown in **Table 1**. The Project would be the fifth such facility on O‘ahu; representing a 15% increase in O‘ahu agricultural park acreage and a 41% increase in the number of agricultural park lots on the island.

Table 1. State Agriculture Parks

Island	Agricultural Park Name / Location	Acres	Total Agricultural Lots	Available Agricultural Lots
Oʻahu	Waimānalo	126	14	0
Oʻahu	Waiʻanae	150	17	2
Oʻahu	Kahuku	225	24	0
Oʻahu	Kalaeloa	10	2	0
Subtotal Oʻahu		*972*	*58*	*2*
Hawaiʻi	Pāhoa	553	56	0
Hawaiʻi	Panaʻewa	460	28	0
Hawaiʻi	Keāhole	179	34	0
Hawaiʻi	Hāmākua	509	11	0
Subtotal Hawaiʻi		*1,701*	*129*	*0*
Kauaʻi	Kekaha	158	19	0
Molokai	Molokaʻi	753	22	0
TOTAL EXISTING		**3, 584**	**228**	**2**

Source: HDOA, Agricultural Resource Management Division Website, 2012

The Project is expected to be developed in three phases: Master Planning, Design, and Construction.

HAR, Title 4, Chapter 153-8(b), *Agricultural Park Program Rules*, sets forth responsibilities of the HDOA in developing new state agricultural parks.

Table 2 on the following page compares the responsibilities of HDOA in developing state agricultural parks (left column) to the current status of planning (right column).

1.5 Project Schedule and Cost

The Project's three phases are currently planned according to the following schedule:

Master Planning Phase: June 2010 to June 2013

Design Phase: June 2013 – December 2015

Construction Phase: October 2016 – December 2017 (pending funding)

The estimated development cost is $23 million dollars to be financed with State of Hawaiʻi funds.

Table 2. Responsibilities of the HDOA in Developing State Agricultural Parks

HDOA Responsibility	Current Stage of Development
1. Site selection analysis	The site has been selected and procured by the State of Hawai'i and a general site plan has been developed.
2. Preliminary engineering report	Conceptual engineering has identified preliminary infrastructure requirements and costs. A preliminary engineering report is pending. A traffic assessment report has been prepared (**Appendix C**).
3. Agricultural feasibility analysis	An agronomic assessment has been completed (**Appendix A**). A non-potable water study has been completed (**Appendix B**).
4. Environmental Impact Statement[1]	This EA has resulted in a FONSI.
5. Land use entitlements	No land use entitlements are required for this Project. **State Agriculture District –** The current and proposed state land use district will remain "agriculture." A state land use district boundary amendment will not be needed. **County Plans –** The Kunia Agricultural Park will be consistent with current plans. Specifically, the General Plan (GP) of the City and County of Honolulu (CCH) supports the continued use of prime agricultural lands, specifically identified in Kunia, and the further development of diversified agriculture on O'ahu. The Project is located within the *Central O'ahu Sustainable Communities Plan (SCP)* Urban Growth Boundary in an area identified as Residential and Low Density Apartment and "Non-Urban Area" regarding the location of existing and proposed master planned communities in Central O'ahu. **Zoning Amendments** – No amendment is required. Current zoning is AG-1, Restricted Agriculture.
6. Survey and cadastral work	Survey is completed. An agricultural cluster housing and preliminary Subdivision application will be submitted after the FONSI is issued.
7. Design of project improvements including agency approvals and arrangements with utility companies	Design and construction of the proposed Project, including on-site road and irrigation facilities, will be the responsibility of HDOA. Construction plans for the Project will be prepared during the Design Phase.
8. Consultation and advice during construction.	The construction management responsibilities of HDOA will be carried out during the Construction Phase of developing the new state agricultural park.

[1] The environmental impacts of agricultural parks have been evaluated primarily via environmental assessments with Findings of No Significant Impact.

2.0 Project Description

2.1 Existing Land Use

Approximately 70% of the Property is presently leased for diversified agriculture use under a Revocable Permit with a one-year, renewable term, to Waikele Farms, Inc. An unused southern area within the Property has similar farm potential. The existing source of irrigation water is the Waiāhole Irrigation System (Waiāhole Ditch). Irrigation water is transported by on-grade piping from Reservoir 225 adjacent to Kunia Road.

Existing agricultural operations surrounding the Property include the seed farms operated by Pioneer, Monsanto, and Syngenta, the test-plot fields of the Hawai'i Agricultural Research Center, and the cash-crop (grown for sale) Aloun Farms and Waikele Farms, Inc.

Figure 3, shows Waikele Farms, Inc. field on the Property between crops. The fallow soil shows evidence of harvesting, harrowing, and that the previous crop was melons. Waikele Farms, Inc. practices crop rotation and long fallowing between crops. The absence of rainfall in late 2009 kept this particular field clean and weed-free. **Figure 4,** shows seed corn in the eastern portion of the Property. Field roads define the perimeter of fields or plots. Portable irrigation pipeline, located on the side of the field road, brings water from the Waiāhole Ditch (Development Strategies, LLC, 2009).

Figure 3 Existing Land Use #1

Source: Development Strategies, LLC

Figure 4 Existing Land Use #2

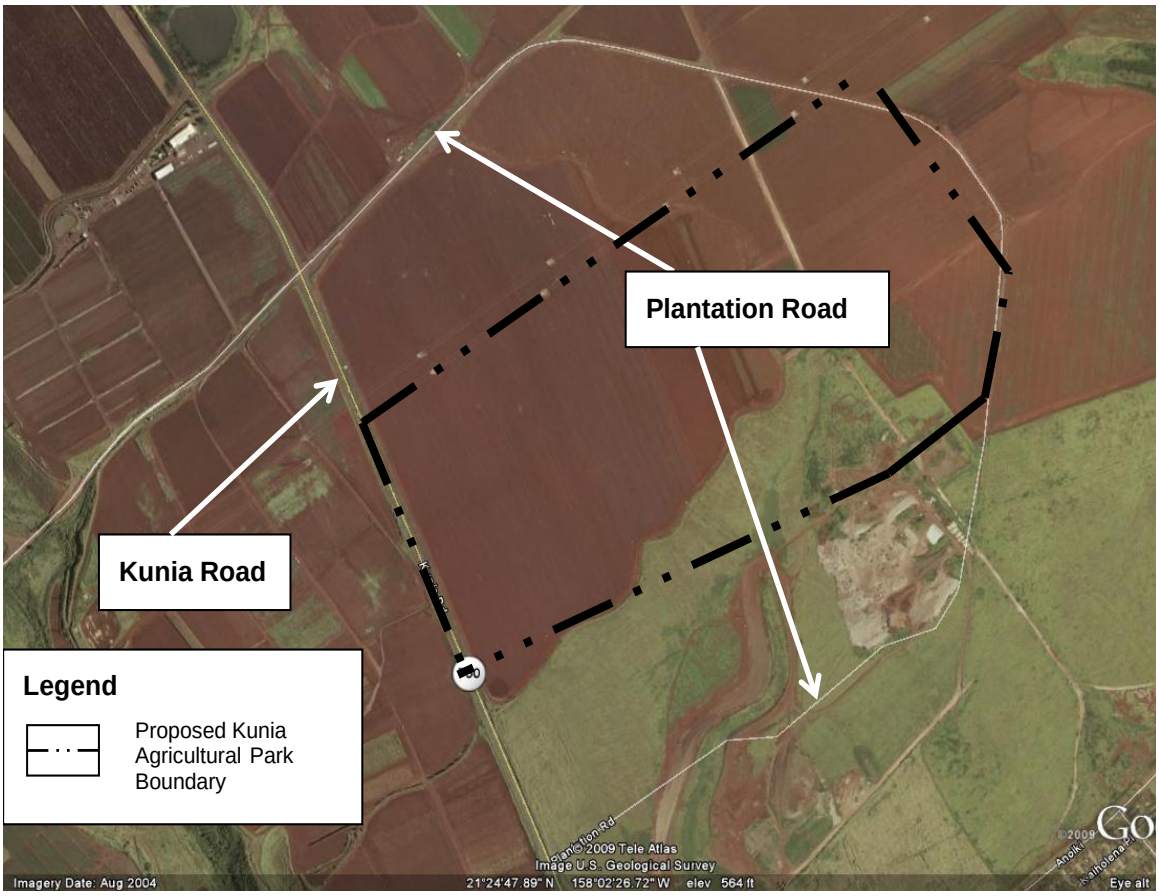
Source: Development Strategies, LLC

2.2 Existing Access

Current entry to the Property is from Kunia Road via "Plantation Road" that loops around the Property, intersecting it at several points and via graded (dirt) field roads within the site as shown in **Figure 5**. The field roads are graded to follow the perimeter of planted areas.

Plantation Road is a paved, privately owned and maintained roadway that circumnavigates the north, east, and south perimeters of the Property. In places, Plantation Road is as far as 1, 000 feet from the Property to the north, but briefly intersects its' eastern boundary. North of the Property, Plantation Road is well maintained and forms a major crossing with Kunia Road. This crossing is utilized extensively by Syngenta on the west of Kunia Road and by the cash-crop operations located on the east of Kunia Road. Seed farms also access various leased plots on the east side of Kunia Road via this intersection. The east and south portions of Plantation Road are less well maintained. Field roads to the east, some within the Project site, accommodate various farm vehicles and farm equipment (Development Strategies, 2009a).

Figure 5 Existing Property Access



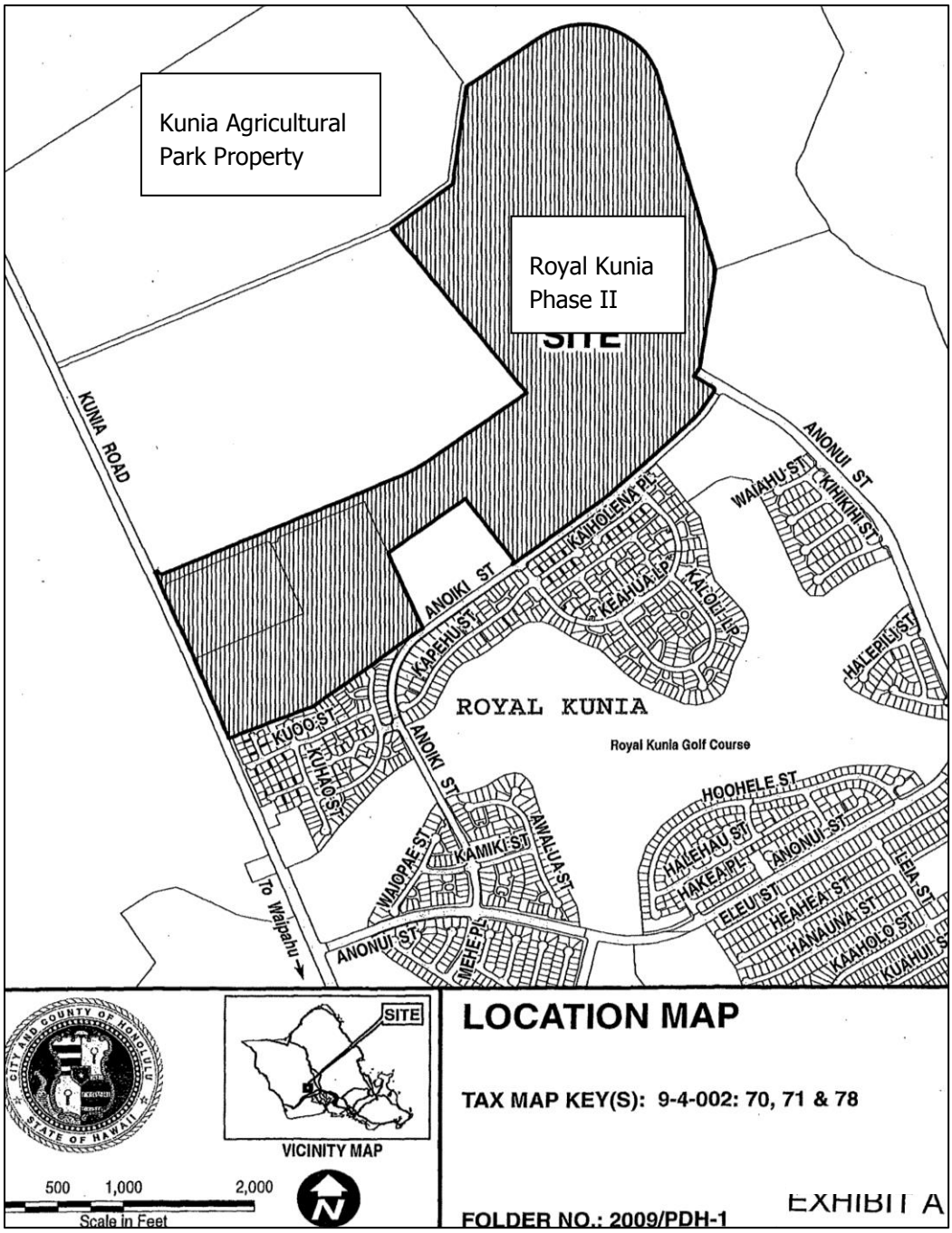
Source: Google Earth

2.3 Relationship of the Project to Royal Kunia, Phase II

Halekua-Kunia, LLC and HRT, Ltd., own approximately 210 acres of land bordering the southern and eastern portion of the Property. These lands are to be developed as the Royal Kunia, Phase II project. Halekua-Kunia has received approval of its application for a Planned Development-Housing (PD-H) permit through a Decision and Order from the CCH, Department of Planning and Permitting (DPP), dated July 2, 2009 (CCH, 2009).

Plans for Royal Kunia, Phase II include 2,007 single-family and multi-family dwelling units to be conveyed as fee simple properties. The Project also will include several community parks and associated recreational facilities. See **Figure 6.**

Figure 6 Royal Kunia Phase II Location Map



Source: DPP, 2009

2.4 Memorandum of Understanding

HDOA and Halekua Development Corporation (Halekua) entered into a Memorandum of Understanding (MOU) in March 1993 to the establishment and integration of a state agricultural park into the Royal Kunia, Phase II development. The Original MOU was amended and restated in March 2007 (Amended MOU). Under the terms of the Amended MOU, land for the proposed Project was conveyed from Halekua, owner of lands planned for development of Royal Kunia, Phase II, to the HDOA. A summary of the Amended MOU is provided below.

Paragraph A. Confirmation of Conveyance of 150-Acre Parcel.

HDOA does hereby acknowledge and confirm that by Warranty Deed with Reversion dated February 23, 2004…the agreed-upon 150 acres of land within the Royal Kunia Phase II developed was conveyed by Halekua to the State of Hawai'i…

Paragraph B. Use of State Agricultural Park.

The state agricultural park is intended to benefit the small diversified farmer and use of the state agricultural park shall be intended for diversified agricultural production, including, without limitation, floriculture, foliage and orchard production...

In addition, the HDOA shall have the right and option (but is not required) to develop and construct up to a maximum of fifty (50) related agricultural farm dwellings or farm employee housing units with the state agricultural park. If any of these agricultural farm dwellings or farm employee housing units are developed by the HDOA on the state agricultural park the same shall not at any time be offered for sale by the HDOA.

Paragraph C. Certain Prohibitions within State Agricultural Park.

Since the state agricultural park will be located adjacent to an urban residential community [the future Royal Kunia, Phase II], commercial livestock and aquaculture production or other activities associated with or related thereto shall be prohibited within the state agricultural park.

Paragraph D. Halekua to Include State Agricultural Park in Land Plan for Royal Kunia, Phase II.

Halekua shall incorporate the state agricultural park into its land plan for the Royal Kunia Phase II subdivision and jointly with the HDOA shall prepare a preliminary site plan for the state agricultural park reflecting the locations of the roadway and infrastructure connections to be provided to the boundary of the state agricultural park parcel…The HDOA shall determine the final layout of the state agricultural park's interior configuration, subject to review and concurrence by Halekua, and shall arrange for and provide funding for construction of the improvements within the interior of the state agricultural park.

Paragraph E. Halekua to Design and Construct Certain Off-Site Infrastructure to the State Agricultural Park.

Halekua shall design and construct off-site infrastructure improvements for the state agricultural park including roadway, potable and irrigation water lines (exclusive of water commitment), and

sewer lines and utility connection, up to the property boundary of the state agricultural park at no cost to the HDOA.

Time limits for developing the preliminary site plan under Paragraph E above have caused several updates of the MOU, which remains in effect.

2.5 Evaluation of Agronomic Feasibility for the Agricultural Park

An *Agronomic Assessment* of *TMK Parcel 9-4-002: 080* was completed in December 2009 by Development Strategies, LLC. See **Appendix A**. The purpose of the study was to do a preliminary assessment of the agricultural value of the Property and evaluate its agronomic potential for various crops. The discussion below is based on the analysis and conclusions of the *Agronomic Assessment* and another consultant study, entitled, *Assessment, Non-Potable Water for Irrigation, Kunia Agricultural Park* which was also completed in December 2009 by Development Strategies, LLC. See **Appendix B**.

Agronomic (crop cultivation) feasibility is analyzed using numerous feasibility factors, including:

- Factor 1 Land Availability (per lot; overall);
- Factor 2 Soil Suitability;
- Factor 3 Topography;
- Factor 4 Climatic Conditions (rainfall, temperature, wind) expressed as a comparative "crop factor;"
- Factor 5 Agricultural Water for Irrigation;
- Factor 6 Infrastructure Requirements; and,
- Factor 7 Economic Viability of Anticipated Crops.

Agronomic Feasibility Factor 1: Land Availability

To maximize flexibility in implementing development of the Project, HDOA has leased the land under a one-year Revocable Permit No. 26 to Waikele Farms, Inc., which is annually renewed and can be terminated with 30 days' notice.

Agronomic Feasibility Factor 2: Soil Suitability

Soils contribute significantly to the productive potential of the Kunia fields. These soils are typically very deep, well-drained, highly weathered, geographically homogenous, uniformly well-structured, easily tilled to practical depths, accommodating of grading for conservation planning, trafficable, and responsive to amendments (organic and chemical). They are also friendly to drip irrigation designs and irrigation schedules. Under cultivation by O'ahu Sugar Company (OSC), the fields in the southern portion of Kunia consistently produced among the highest sugar yields in the state (Development Strategies, 2009b).

The United States Department of Agriculture (USDA) *Soil Survey of Islands of Kaua'i, O'ahu, Maui, Moloka'i and Lāna'i* (USDA, 1972) rated the Wahiawā, Lahaina, and Moloka'i soil series among the state's most highly productive soils. Although rock-free soils are truly rare, even among Wahiawā and Lahaina soil series, relatively few stones, rocks and boulders in much of the Kunia plateau makes its soils that much easier to cultivate, compared to the soils of similarly large open-field areas.

As shown in **Figure 7**, the Wahiawā and Lahaina soils on the Property are classified "1" , Prime Agricultural Land, by the Agricultural Lands of Importance to the State of Hawai'i (ALISH) rating system, although the limited productivity of the gully was recognized with a lesser classification of "3." The Land Study Bureau (LSB) assigned the entire Property its highest productivity rating of "A" (on a scale of "A" to "E"). **Figure 7,** also shows the continuity of agricultural value among the surrounding lands, which share the same classification and rating. A description of the ALISH and LSB rating systems are provided in Section 3.2 of this document.

Agronomic Feasibility Factor 3: Topography

Elevation of the Property ranges from 590 feet above mean seal level (msl) to 540 feet msl. Overall the Property slopes gently downward from northwest to southeast at about 3%. Specifically, the western 70% of the Property (with 3 to 7% slope), is separated from the eastern area (with 0-3% slope) by a soil-rich gully (with 7 to 15% slope) (USDA, 1972). See **Figure 8**.

Agronomic Feasibility Factor 4: Climate Conditions

The climate of the Property is very favorable for a variety of diversified agricultural crops in terms of rainfall, solar intensity, wind conditions and temperature. This favorable climate has contributed to the consistently high agricultural productivity of the subject lands.

Agronomic Feasibility Factor 5: Agricultural Water for Irrigation

Agricultural water for irrigation is perhaps the single most defining crop productivity factor (Development Strategies, 2009a). Agricultural water, as it relates to feasibility, is a function of both *supply* (procuring a dependable source) and *demand* (how much water is required for a certain crop mix on the specific parcel).

Agricultural water demand for various diversified agricultural crops were analyzed in the *Assessment [of] Non-Potable Water for Irrigation, Kunia Agricultural Park*. Historically, OSC used both Waiāhole Ditch water and well water on the southern Kunia fields to achieve maximum production (Development Strategies, 2009b).

Three alternative sources of agricultural water for the Project were examined: Kunia Wells, Honolulu Board of Water Supply (BWS), and the Waiāhole Ditch.

Kunia Wells – In selling their agricultural lands in Kunia, the Estate of James Campbell (Estate) made provisions to service the fields located to the west of Kunia Road with water from three agricultural wells located in proximity to Kunia Village in Central O'ahu (Kunia Wells). To assure the long-term availability of agricultural water, the Estate also formed a private water company made up of the various landowners in the service area to assume ownership, management and maintenance of the Kunia Wells and the related water distribution system.

Figure 7 ALISH and LSB Soils

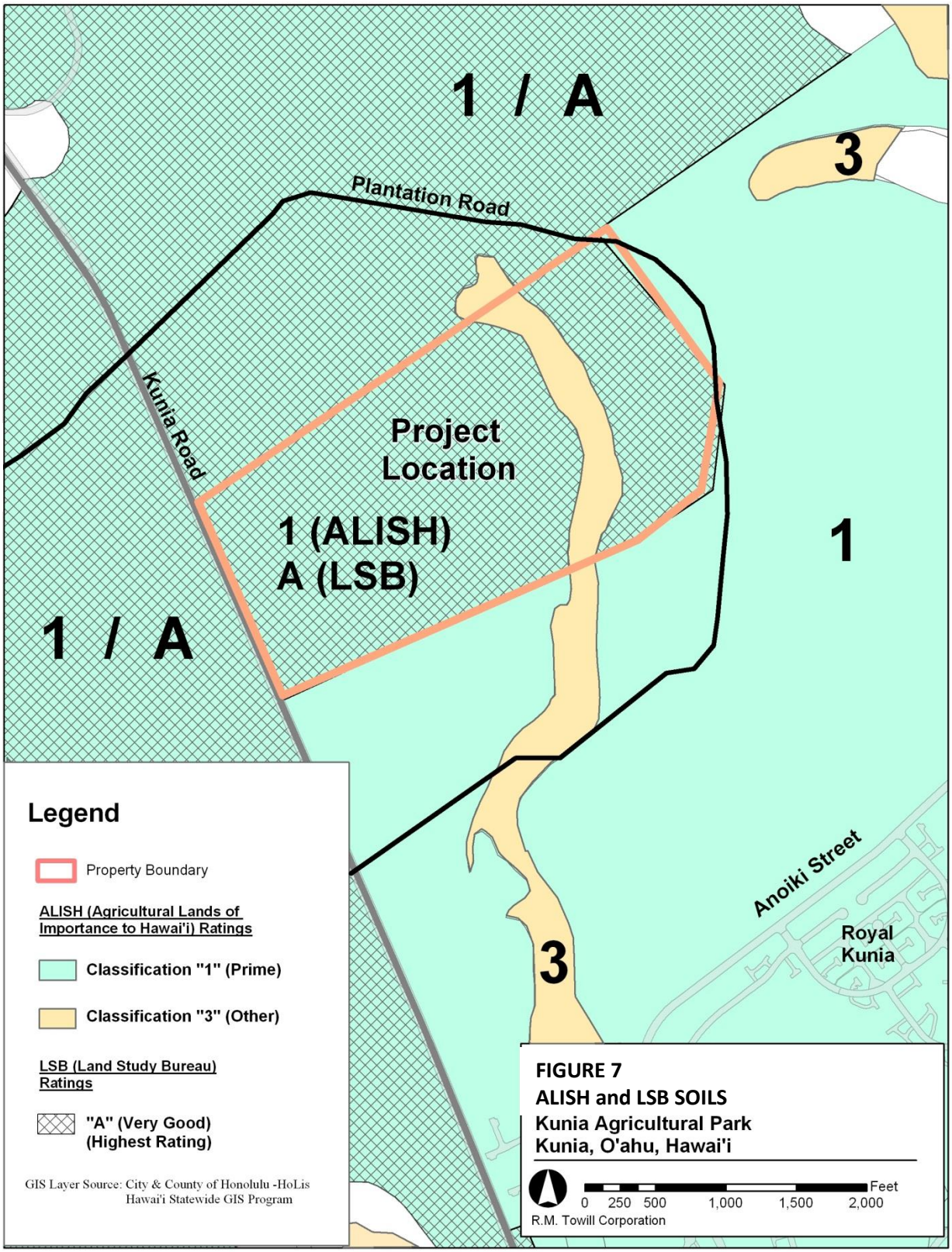
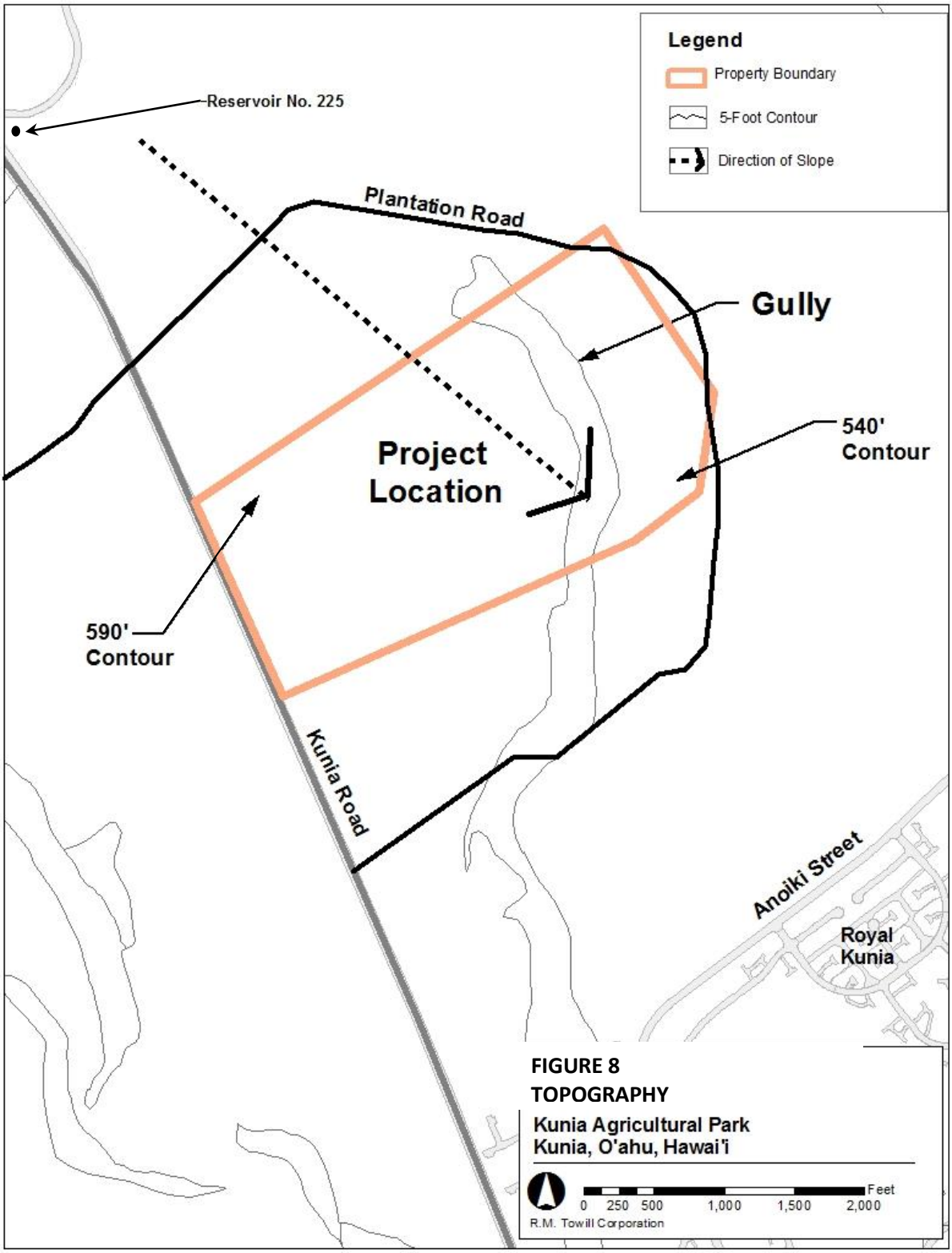


Figure 8 Topography



The Project is not able to obtain agricultural water from the Kunia Wells as the Property is located outside of its service area.

Honolulu Board of Water Supply (BWS)– Agricultural water from the BWS was regarded as infeasible for the Project because: 1) the BWS prioritizes use of potable water for domestic purposes; 2) use of potable water from BWS sources is even less likely if other agricultural water sources exist in Project vicinity; and 3) potable water is prohibitively expensive as an irrigation source for small-scale farming.

Waiāhole Irrigation System (Waiāhole Ditch) – This facility is considered the best choice as a source of agricultural water for the Project. It has numerous advantages, including: 1) location: the water flows through the Kunia plateau; 2) current usage: it currently serves the Property, adjacent agricultural parcels, and is physically connected to the Property already; and 3) infrastructure: a Waiāhole Irrigation System Reservoir 225 is located north of the Property along Kunia Road.

While the Waiāhole Ditch is the best supply of agricultural water, its use requires allocation by the State of Hawai'i Department of Land and Natural Resources (DLNR) Commission on Water Resources Management (CWRM). On January 3, 2011, CWRM accepted HDOA's Water Use Permit Application (WUPA) requesting an allocation of 0.422 million gallons per day (mgd) of agricultural water based on the estimated demand in both **Tables 3** and **4**, to service the Project.

The demand for agricultural water varies by the water needs of the various crops. A comparison of crops' tendency for water loss vs. water retention, the so-called "crop factor," can be used to estimate the demand for agricultural water. **Table 3** identifies the various diversified agricultural crops deemed feasible for cultivation on the Property and their crop factors (relative need for water). **Table 4** summarizes the estimated water requirements for the proposed Project. **Table 5** provides the detailed analysis which is summarized in **Tables 3** and **4** below.

Table 3. Comparative Crop Water Loss / Retention (Development Strategies, 2009a)

91% Crop Factor		**95% Crop Factor**		**1.02 Crop Factor**	**1.12 Crop Factor**
Lettuce Ong Choi Bitter Melon Chives	Basil Leaf Curry Leaf Basil Peppermint	Lychee Malongai Lalot Fruit Trees	Long Beans Eggplant Long Eggplant Galonga	Banana	Taro Taro Leaf

Table 4. Summary of Agricultural Water Requirements (Development Strategies, 2009b)

A. 12-month Average Daily Demand per Acre for Kunia Agricultural Park (gallons per acre per day)	B. Net Cultivated Lot Area	E. A x B Total Average Daily Water Demand for Kunia Agricultural Park (gallons per day)
3,700 gallons per acre per day (Note: This figure is a maximum. If this amount cannot be allocated to the Kunia Agricultural Park, specific water conservation practices will need to be employed.)	114 Acres	422,000 gallons per day (rounded) Note: This figure is a maximum.

Table 5. Preliminary Evaporation Projection (leading to agricultural water demand)

(Development Strategies 2009a)

Kunia Agricultural Park
Irrigation Requirements
Weather Data - Station 738.40
Oahu Sugar Company Field 155

Month	Adj. Mean Rainfall	Mean Pan Evaporation	Net Evaporation	Ave. Crop Factor	Adj. Net Evaporation	Irrigation Efficiency	Projected Demand	Days per Month	Daily Demand	1" per Acre/Day	Demand Acre/Day
JAN	6.42	5.06	-	0.95	-	0.85	-	31	-	27,154	-
FEB	4.29	5.31	1.02	0.95	0.97	0.85	1.14	28	0.04	27,154	1,106
MAR	3.11	6.28	3.17	0.95	3.01	0.85	3.54	31	0.11	27,154	3,103
APR	2.36	6.10	3.74	0.95	3.55	0.85	4.18	31	0.13	27,154	3,661
MAY	1.65	7.12	5.47	0.95	5.20	0.85	6.11	31	0.20	27,154	5,355
JUN	0.83	7.38	6.55	0.95	6.22	0.85	7.32	30	0.24	27,154	6,626
JUL	0.83	7.68	6.85	0.95	6.51	0.85	7.66	31	0.25	27,154	6,706
AUG	0.98	7.63	6.65	0.95	6.32	0.85	7.43	31	0.24	27,154	6,510
SEP	1.18	6.79	5.61	0.95	5.33	0.85	6.27	30	0.21	27,154	5,675
OCT	2.56	6.19	3.63	0.95	3.45	0.85	4.06	31	0.13	27,154	3,554
NOV	2.99	5.07	2.08	0.95	1.98	0.85	2.32	30	0.08	27,154	2,104
DEC	4.69	4.40	-	0.95	-	0.85	-	31	-	27,154	-
		Annual Total	44.77				50.04		Total Daily Demand/Acre (12-Months)		44,401
		12-Month Average	3.73				4.17		12-Month Average Daily Demand/Acre		3,700
									Peak Month Average Daily Demand/Acre		6,700

91% Crop Factor		95% Crop Factor	1.02 Crop Factor
Lettuce	Lychee	Long Beans	Banana
On Choi	Malongai	Eggplant	
Cucumber	Lalot	Long Eggplant	
Bitter Melons	Fruit Trees	Galonga	1.12 Crop Factor
Chives			
Basel Leaf			Taro
Curry Leaf			Taro Leaf
Basel			
Peppermint			

GROSS PROJECT AREA	150.0	acres
Less: Housing and Roads	16.0	acres
Less: Major Gully	14.0	acres
NET LOT AREA	120.0	acres
Less: Field Roads/Drainage	6.0	acres
NET CULTIVATED LOT AREA	114.0	acres*

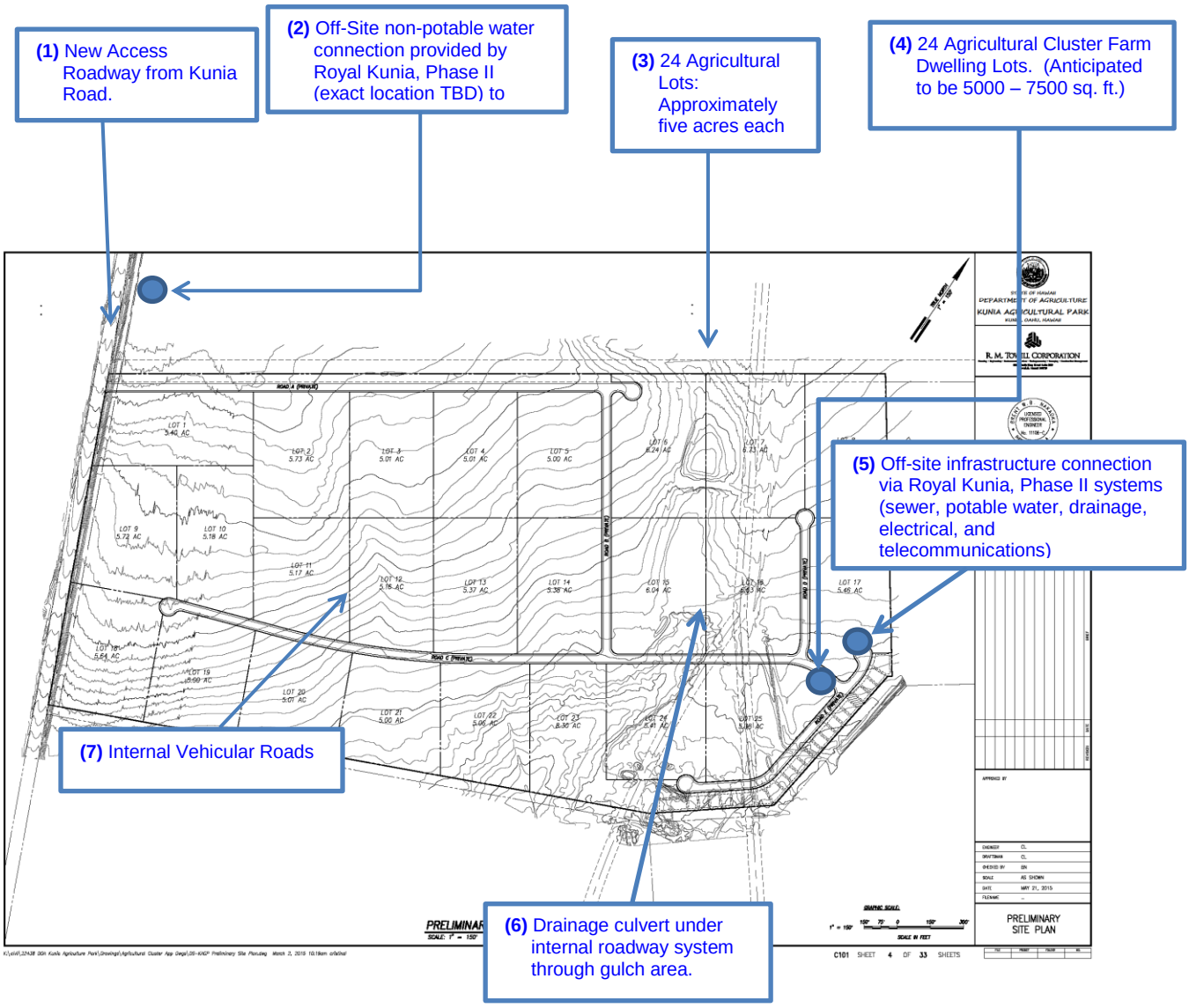
**Note: No adjustment for field rotation.*

AVERAGE DAILY WATER DEMAND	421,809	gpd
SAY	422,000	gpd

Agronomic Feasibility Factor 6: Infrastructure Requirements

Infrastructure within the Kunia Agricultural Park will vary according to land use, i.e., agricultural lots vs. farm dwelling lots. See **Figure 9.**

Figure 9 Infrastructure



Infrastructure planned for the site, clockwise from the top left in **Figure 9**, includes:

(1) New Roadway Access – the connection point to Kunia Road will be determined under a pending agreement with HDOT, Highways Division.
(2) Off-site Non-Potable Water Connection – This is to be provided to the northern border of the Property by Royal Kunia, Phase II under the Amended MOU with HDOA.

(3) Twenty four Agricultural Lots – Approximately five acres each with electrical, agricultural water, and limited potable water services to the lot's property line.
(4) Twenty four Agricultural Clustered Farm Dwelling Lots – A paved access road with curb and gutter and utilities will be constructed to serve the farm dwelling lots.
(5) Off-Site Infrastructure – The Projects' site plan limits the urban on-site and off-site infrastructure requirements to the area designated for clustered farm dwellings. The off-site infrastructure (sewer, potable water, drainage, power and telecommunications) will be provided to the southeastern portion of the Property by the Royal Kunia, Phase II owners, and will connect to that project's infrastructure for water, sewer, drainage, electrical, cable, and telephone.
(6) Drainage Culvert - Natural drainage through the existing gully will be aided by culverts beneath each intersection of the gully with the internal access road.
(7) Internal Vehicular Roads – The HDOA plans to construct a paved agricultural access road to provide access to the agricultural lots and CPR farm dwelling lots. The right-of-way (ROW) width is to be determined. This internal roadway will include a connection to Kunia Road.

As shown in **Figure 9**, the Preliminary Site Plan calls for the following land uses: crop cultivation lots, clustered farm dwelling lots, on-site and off-site infrastructure, open space farm lots through the existing gully to accommodate storm water runoff. The existing gully may not be suitable for cultivating all types of crops.

The approximately 150-acre Property is expected to provide approximately 114 net acres of agricultural land divided into 24 agricultural lots.

Agronomic Feasibility Factor #7: Economic Viability

Use of the Property for crop production is expected to be economically viable based on experience within the Property and surrounding agricultural land uses. These include the Waikele Farms, Inc., Aloun Farms, Monsanto Company and Syngenta operations.

Historically, the Property was used successfully by the OSC for sugar production until commodity prices for sugar and other factors forced the company to cease operations. Today, the proposed use of the site for an agricultural park will allow for a diversified and economical approach to maintaining the use of the prime land in agriculture.

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3.0 Environmental Setting, Potential Impacts and Mitigation Measures

3.1 Climate

The climate in Kunia 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. According to data from Weather Station 738.40, OSC Field 155, average monthly rainfall in the Project site varies from a low of 0.8-0.9 inches in the summer months to a high of 6.4 inches in January.

The average monthly temperature recorded at the Wheeler Army Airfield ranges from 66 and 80 degrees. Normal annual rainfall is over 40 inches. Three-fourths of this total, on the average, falls during the seven-month wet season which extends from October through April. The dry season includes the months of May through September. Winds are predominantly from the northeast at speeds of 10 to 13 knots. Relative humidity, moderate to high in all seasons, is slightly higher in the wet season than in the dry. The area is known for relatively high solar radiation intensity due to elevation, good air quality, and minimal cloud cover (Jurik and Jurik, 1998).

Potential Effects and Mitigation

There will be no short- or long-term impacts from the proposed Project on regional climate. The favorable trade winds, temperature conditions, and intense sunlight at the site are anticipated to contribute to the productivity of diversified crops.

3.2 Geology, Topography and Soils

Geography

The Project is located in O'ahu's central region in an area known as the "Kunia plateau." This large and productive plateau has been the subject of preservation efforts for its agricultural value. Agricultural operations that are presently nearest to the Property include the corporate seed farms of Pioneer, Monsanto Company, and Syngenta, the test-plot fields of the Hawai'i Agricultural Research Center, and the cash-crop farms of Aloun Farms and Waikele Farms, Inc.

Topography

The Property slopes gently downward from northwest to southeast at about 3% with elevations ranging from 590 feet msl to 540 feet msl. Specifically, the western 70% of the Property (with 3 to 7% slope), is separated from the eastern area (with 0-3% slope) by a soil-rich gully (with 7 to 15% slope). See **Figure 8.**

Soils

The *Soil Survey of Islands of Kaua'i, O'ahu, Maui, Moloka'i and Lāna'i, State of Hawai'i* (USDA, 1972), identifies soil types, locations, and uses. Approximately 10% of the northwest corner of the Property is classified as Wahiawā silty clay, 80% Lahaina silty clay, and 10% sloping Moloka'i silty clay loam that forms a gully running from the center of the Property to its southern boundary. See **Figure 10.**

The University of Hawai‘i LSB *Detailed Land Classification-Island of Kaua‘i* (LSB, 1967) classifies lands based upon soil productivity ratings and is utilized in conjunction with the State Land Use Law as set forth in HRS, Chapter 205. This classification system was developed in relation to overall agricultural suitability, master suitability and specific crop suitability. Master suitability ratings range from “A” to “E”; with “A” representing the highest and “E” representing the poorest suitability. Soils within the Project site are classified as “A.”

The HDOA’s Agricultural Lands of Importance to the State of Hawai‘i for Kaua‘i, O‘ahu, Maui, Moloka‘i, Lāna‘i, and Hawai‘i (HDOA, 1977) also classifies lands based upon soil productivity ratings. ALISH lands are classified into one of four categories: Prime, Unique, Other Important Agricultural lands, and Unclassified. Prime lands have soil quality, growing season, and moisture supply needed to produce sustained crops yield economically. Unique lands have the combination of soil quality, location, growing season, and moisture supply currently used to produce sustained yield of a specific crop. Other Important Agricultural Lands include lands not rated as Prime or Unique. The gully is classified as Other with the remaining portion of the Project site classified as Prime.

Observations on an agronomic site visit in August 2009 support the descriptions above and support the soils classification of the Project site among the surrounding agricultural units. No obvious limitations were observed to distinguish the Property as potentially less productive than surrounding agricultural lands.

Potential Effects and Mitigation

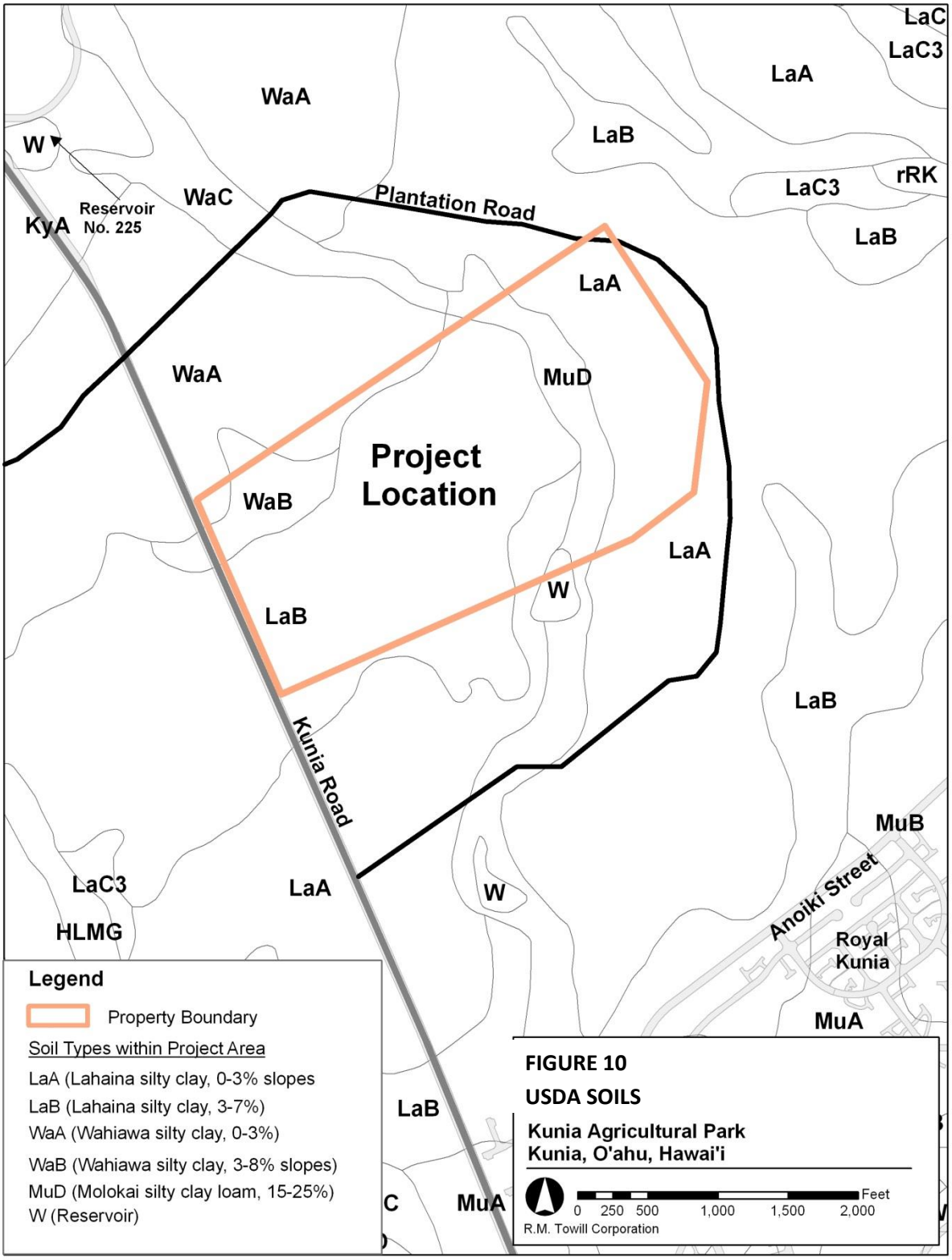
Short-Term

Temporary impacts associated with construction related ground disturbance activities are anticipated. To mitigate potential impacts erosion control measures will be employed during construction. Best Management Practices (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.

Long-Term

No long-term effects to soils, topography or geology are expected as a result from this Project. The Project’s site plan was designed to take advantage of natural grades with a minimal amount of ground disturbance.

Figure 10 USDA Soils

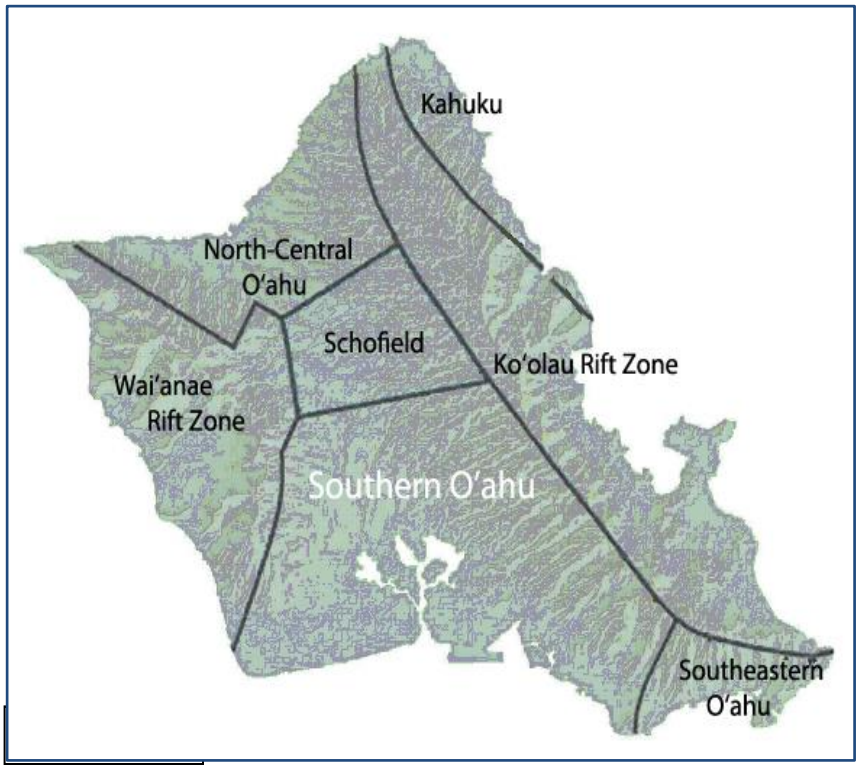


3.3 Ground Water

An important source of ground water supply for the Island of O‘ahu is an exceptional lens of basal groundwater in the Honolulu-Pearl Harbor area (USDA, 1972). Southern O‘ahu's coastal plain is underlain by sedimentary deposits that form a caprock which retards the seaward movement of fresh ground water from the basal aquifer. The caprock extends along the coastline from 800 to 900 feet below sea level.

O‘ahu has been divided into seven major ground water areas, primarily on the basis of geologic or hydrologic differences. See **Figure 11**. The entire Project area is located within the designated Southern O‘ahu Ground Water Area. Water levels in the Southern O‘ahu Ground Water Area generally range from about 25 to 30 feet above sea level inland to about 15 to 20 feet above sea level near the shore where the water is under artesian pressure because it is confined by caprock. The caprock impedes the seaward movement of fresh ground water. In the eastern part of the area, thick valley fill and underlying weathered rocks form partial barriers to ground water flow. In the western part of the area, the weathered zone near the unconformity separating Ko‘olau Basalt from underlying Wai‘anae Volcanics impedes the flow of water between the two volcanic-rock aquifers (USGS, 1999).

Figure 11 **O‘ahu Aquifers**

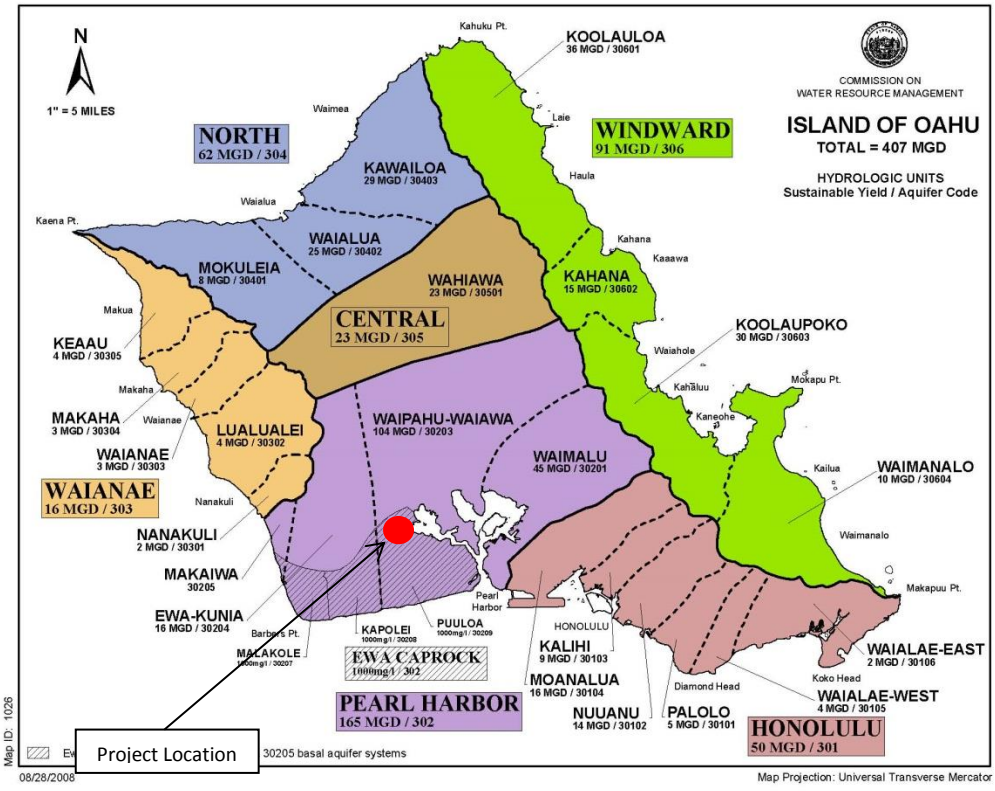


Source: USGS, 2009

The CWRM classifies water resources in Hawai'i as either ground or surface water. Ground water is located beneath the surface of the earth and is stored in a number of geologic settings. Surface water is comprised of streams, springs, ditches and canals, as well as reservoirs. The CWRM *Water Resources Protection Plan, 2008* (WRPP) utilizes a hydrologic unit approach to manage both ground and surface water resources.

Ground water hydrologic units are comprised of a series of aquifers. An Aquifer Sector Area is the largest aquifer unit; it is then further divided into sub-regional hydrologic units known as Aquifer System Areas. The Project site is located in the Pearl Harbor Aquifer Sector, a designated ground water management area, within the Waipahu-Waiawa Aquifer System. The sustainable yield for the Pearl Harbor Aquifer Sector is 165 mgd. The sustainable yield for the Waipahu-Waiawa Aquifer System is 104 mgd. As of 2005, 83.892 mgd from the Waipahu-Waiawa Aquifer System was allocated with 53.354 mgd being used. **Figure 12** shows the groundwater hydrological units and their associated sustainable yields.

Figure 12 Groundwater Hydrologic Units, O'ahu



Source: WRPP, 2008

Non-potable water for agricultural irrigation in Central O'ahu, including the Property, is provided by the Waiāhole Ditch, which transports ground water from the Ko'olau Mountains. It's approximately 26.3 miles of ditches, tunnels, concrete lined ditches, and two reservoirs. Waiāhole Ditch is a ground water resource designated by CWRM as ground water management area. Ongoing litigation regarding Waiāhole Ditch water, currently limits water withdrawal for Central and West O'ahu.

Potential Effects and Mitigation

Short-Term

Temporary impacts associated with construction related ground disturbance activities are anticipated. To mitigate potential short-term impacts to groundwater resources during construction, the Project will be subject to the conditions stipulated by a NPDES permit from the State of Hawai'i Department of Health (HDOH) authorizing storm water discharge associated with construction activities as required by HAR, Chapter 11-55, *Water Pollution Control*. A BMP plan will be submitted in conjunction with the NPDES permit application.

Long-Term

No long-term adverse impacts to groundwater and hydrogeological resources are anticipated from the proposed Project. Appropriate and sufficient mitigative measures and controls will be applied consistent with sound engineering and operating practices

On-site drainage improvements will comply with *Rules Relating to Storm Drainage Standards* adopted by the DPP in 2012. Wastewater from the new farm dwelling lots will be collected and treated in accordance with HDOH wastewater regulations as prescribed in HAR, Chapter 11-62, *Wastewater Systems*. Wastewater disposal for the farm dwellings will be by the Honouliuli Wastewater Treatment Plant operated by the CCH Department of Environmental Management (DEM).

Since the Project site sits at the lowest elevation on Kunia's agricultural plateau, conservation planning is crucial both to water conservation during normal rainfall and to runoff protection during the rare high rainfall events. The HDOA will require that each agricultural lot awardee develop a Conservation Plan with the USDA Natural Resources Conservation Service (NRCS). This Conservation Plan will incorporate a BMP plan for the use and application of herbicides, pesticides, and fertilizers.

On January 3, 2011, CWRM accepted HDOA's WUPA requesting an allocation of 0.422 mgd of water from Waiāhole Ditch to service the Project's agricultural component. Availability of additional agricultural irrigation water from Waiāhole Ditch to service the 24 agricultural lots is subject to approval of the WUPA.

3.4 Surface Water

There is a gulch traversing the south east portion of the Property. However, it is not identified as a perennial or intermittent stream. To the north of the Property are open ditches and a reservoir that are part of the Waiāhole Ditch.

Potential Effects and Mitigation

There will no short- or long-term impacts to surface water resources from the Project.

3.5 Drainage

The Property is located in flood hazard zone D according to the Flood Insurance Rate Map (FIRM) No. 15003C0220F dated January 19, 2011. Zone D identifies an area in which flood zone hazards are undetermined.

Off-site drainage generally sheet flows through the Property as overland flow from the northwest to southeast or within the existing gulch. On-site drainage will be constructed and maintained by HDOA. The proposed Project is classified as priority A1 by *Rules Relating to Storm Drainage Standards* adopted by DPP in December 2012. Infiltration basins will be used as a permanent storm water quality measure to treat runoff from the new roadways and cluster housing development.

Natural drainage flows into the parcel from the north, and exits into the non-agricultural developments to the south (Royal Kunia, Phase I and Village Park), which is consistent with the northwest-to-southeast slope of the Kunia plateau. The farming activities on and around the parcel all appear to have conservation plans in place to divert drainage water into the fields and thus capture potential runoff and increase stored soil moisture (Development Strategies, 2009a).

Potential Effects and Mitigation

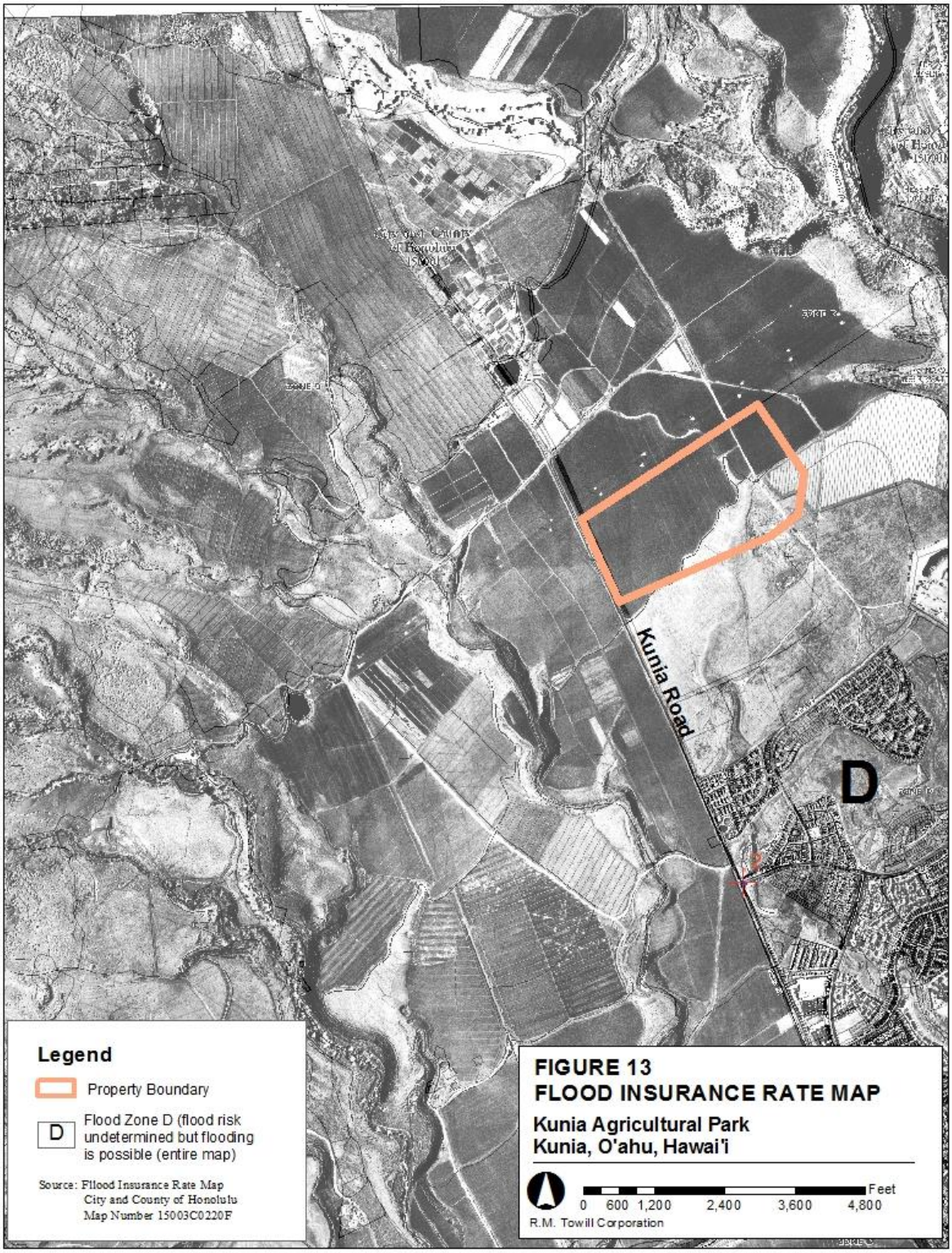
Short-Term

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 work to achieve proper elevations and grades for the farm dwelling lots and internal roadways. There will be a small increase in impervious area on the Property from the internal roadways and dwelling units. Potential effects include discharge of sediments or other pollutants in construction-related storm water runoff.

During construction, Project activities will be conducted in compliance with HAR, Chapter 11-54, *Water Quality Standards* and HAR, Chapter 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 authorizing storm water discharges associated with construction activities and possibly NOI form F, authorizing the discharges of hydrotesting effluent. These permits require implementation of BMPs, including site management measures and physical controls (e.g. silt fences and sediment basins) to reduce pollutants in construction storm water runoff and ensure that construction activities comply 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.

Figure 13 Flood Insurance Rate Map



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

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.
- 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 BMPs 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.

Due to the installation of new potable water lines, a NPDES NOI Form F for Hydrotesting Discharges from the HDOH may also be required. As feasible, any discharges of treated, dechlorinated hydrotesting effluent will be reused for dust control, or offered as irrigation water to area farmers.

Long-Term

No long-term impacts to drainage and storm water quality are anticipated as a result of this Project. The increased runoff is mainly a result of the vehicular access roads and farm dwelling lots. Any increased runoff will be retained on-site. Runoff changes from the agriculture lots are anticipated to be small due to the limited development of the lots.

On-site drainage improvements will comply with *Rules Relating to Storm Drainage Standards* adopted by DPP in December 2012. Infiltration basins will be used as a permanent storm water quality measure to retain and treat storm water runoff.

The internal drainage system of the state agricultural park will be constructed and maintained by the HDOA. Provisions in the design have been made for drainage within the 100-year flood boundary to pass through culverts within the field lots where the internal access road intersects the natural path of the drainage way. Drainage facilities for impervious area surrounding the farm dwellings will be incorporated into the roadway design in the cluster area.

HDOA will require that each agricultural lot awardee develop a Conservation Plan with the NRCS. This Conservation Plan will incorporate a BMP plan for the use and application of herbicides, pesticides, and fertilizers.

3.6 Flora and Fauna

Prior to its transfer to the HDOA, the Project site was part of the original Royal Kunia, Phase II development. Previous environmental documentation that also covers the Property includes: *Royal Kunia, Phase II, Environmental Impact Statement*, 1989 and *Royal Kunia, Phase II, Increment III, Final Environmental Assessment*, (Halekua Development Corporation, 1996). As the land use and conditions of the Property has remained unchanged since those assessments, botanical and faunal studies performed for past environmental documentation are still valid.

A botanical survey that included the Property, concluded that there were no federally listed, proposed, or candidate species situated within the study area. In addition, since the area had and has continued to be extensively used for crop production, there is little botanical interest in the Project site (Char & Associates, in Halekua Development Corporation, 1996).

An avifaunal survey concluded that there were no resident endemic or resident indigenous species of birds in the Project area or its surroundings. Of the indigenous migratory bird species, only the Pacific Plover (*Pluvialis fulva*) was recorded, mostly along agricultural roads and temporarily cleared field areas. A total of 15 species of exotic birds were also recorded, most of which are commonly found in this type of agricultural habitat along the Waipi‘o and Central O‘ahu area.

Potential Effects and Mitigation

No significant short- or long-term adverse impacts to plant or animal habitats or specific communities are anticipated as a result of the Project. Human-generated disturbance will continue to inhibit potential habitat at a level comparable to the present.

3.7 Visual and Scenic Resources

The Kunia plateau has long been, and still is, characterized by open space and vistas to the Koʻolau Mountains (east), Waiʻanae Mountains (west), and, in the vicinity of the Project site, urban development descending down the Pacific Ocean (south). The Property is immediately south of significant view planes identified in the Open Space Map of the *Central Oʻahu SCP.* See **Figure 14**.

Potential Effects and Mitigation

No significant short- or long-term impacts to visual resources are anticipated as a result of the Project. It will support the *Central Oʻahu SCP* open space plans by continuing agricultural use. Placement of the agricultural farm dwelling cluster component close to the planned housing of the Royal Kunia, Phase II project will result in a vista similar to the current one.

3.8 Air Quality

Air quality in the Kunia area is generally good. Although information on other pollution sources was not generally available from the HDOH for the proposed Project, the HDOH in its assessment of statewide air quality has noted," Air quality in the State of Hawaiʻi continues to be one of the best in the nation, and criteria pollutant levels remain well below state and federal ambient air quality standards" (HDOH, 2006).

Potential Effects and Mitigation

Short-Term

Short-term effects on air quality will occur either directly or indirectly as a consequence of Project site 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.

In order to minimize potential impacts during construction an effective dust control plan will be implemented by the Project contractor to ensure compliance with HAR, Chapter 11-59, *Ambient Air Quality Standards* and HAR, Chapter 11-60, *Air Pollution Control*. 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,

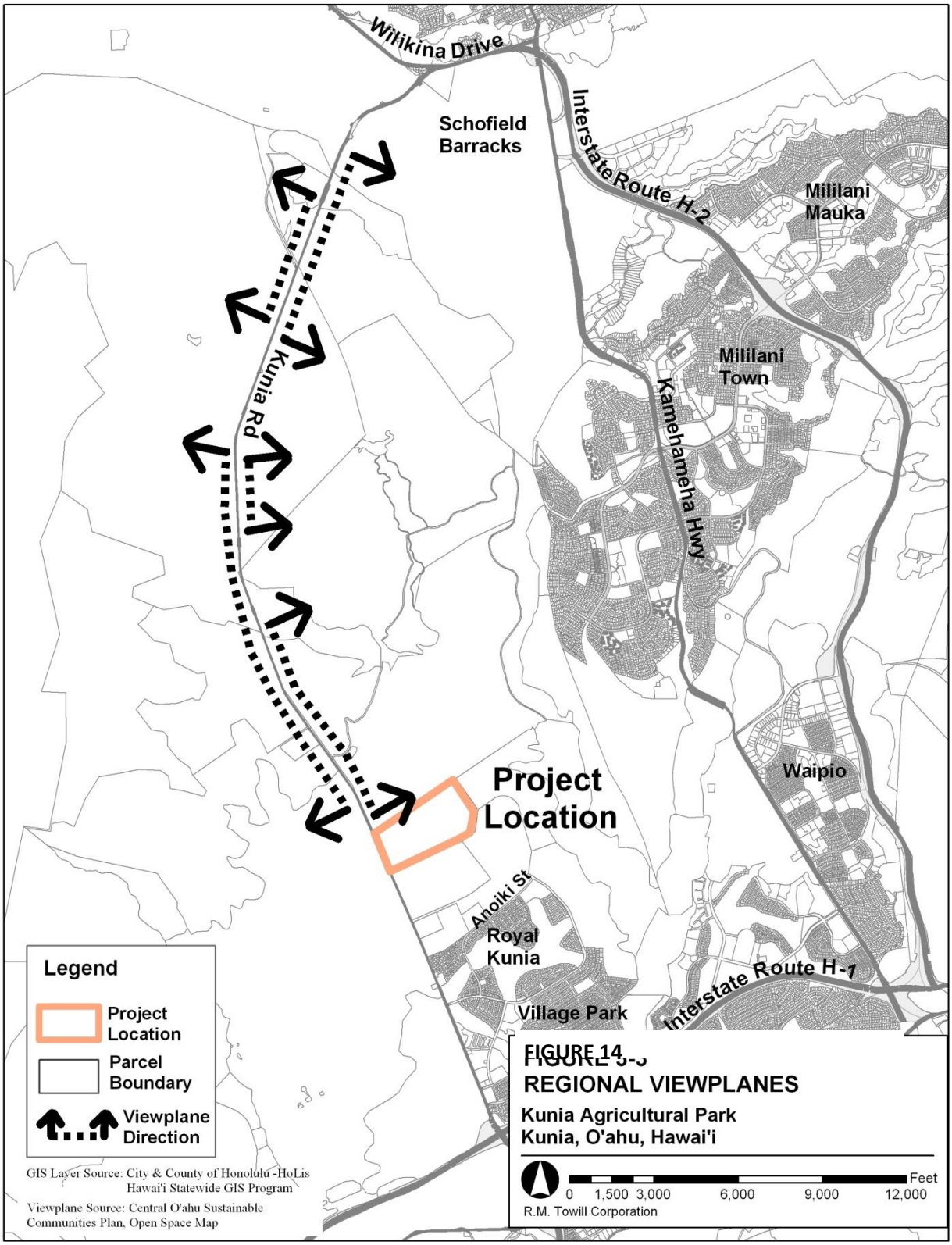
- Construction-related exhaust emissions will be mitigated by ensuring that Project contractors properly maintain their internal combustion engines and comply with HAR, Chapters 11-59 and 11-60.

Long-Term

No long-term adverse impacts related to air quality are expected as a result of this Project.

As mentioned previously, the HDOA will require each agricultural lot awardee to develop a Conservation Plan with the NRCS. This Conservation Plan will incorporate a BMP plan for the use and application of herbicides, pesticides, and fertilizers to minimize impacts on air quality. One measure to minimize impacts is to restrict uses based upon prevailing wind conditions. The Conservation Plan will also contain BMPs associated with plowing and other dust-generating activities that will continue to be practiced to minimize the loss of topsoil. Measures to reduce loss of soils include: erection of dust screens, planting of trees, and use of water trucks, as applicable.

Figure 14 Regional Viewplanes



3.9 Noise

Ambient noise in the proposed Project site is generated from natural and man-made sources. The location of the Property along Kunia Road is immediately north of the de facto dividing line between active agricultural areas to the north, east and west, future development and existing development to the south.

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 each phase of 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.

The planned farm dwellings will result in human generated noise, which includes vehicular traffic, recreational activities, and individual home uses. In the agricultural lot area, the sound of farm machinery, plus that of existing active farming activities in the vicinity, will mix with naturally occurring sounds from wind and other sources, generating relatively low background noise.

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.

In order to minimize potential impacts during construction 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 HDOH, Indoor and Radiological Health Branch. The provisions of the noise permit will require that contractor's 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 HDOH. Construction activities will be suspended on Sundays and during holidays.

Long-Term

No long-term adverse impacts related to noise quality are anticipated as a result of this Project.

The noise generated by farming within the proposed Kunia Agricultural Park is expected to be similar to existing conditions, which feature active cultivation on the Project site and adjacent lands. What will change is the greater proximity of residential development as Royal Kunia, Phase II is constructed. The Project site plan, and cluster concept for farm dwellings, is designed to use the on-site residential area as a buffer between the Royal Kunia, Phase II development and the agricultural lots within the state agricultural park.

3.10 Flood Hazards

The Property is located in flood hazard zone D on Flood Insurance Rate Map (FIRM) No. 15003C0220F issued by the Federal Emergency Management Agency (FEMA). Zone D is used to denote unstudied areas where flood hazards are undetermined, but flooding is possible. See **Figure 13**.

Potential Effects and Mitigation

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

3.11 Hurricanes

The Hawaiian Islands are seasonally affected by Pacific hurricanes from the late summer to early winter months. O‘ahu 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 no more or less vulnerable than the rest of the island to the destructive winds and torrential rains associated with hurricanes. Damage would be expected to be to crops in various stages of growth, and, to a lesser degree, on the 24 farm dwellings permitted under the site plan.

Potential Effects and Mitigation

The Project is not expected to contribute to adverse effects from hurricanes. The main effect would be crop loss and possible damage to the 24 farm dwellings. Drainage facilities are in place to mitigate the effects of storm water.

3.12 Earthquake

Earthquakes occurring in Hawai‘i are closely linked to volcanic activity. Numerous earthquakes take place every year, with the majority occurring beneath the island of Hawai‘i. The Projects’ location on the island of O‘ahu has a peak acceleration value between 10 and 12 (expressed as a percentage of gravity).

Potential Effects and Mitigation

Damage from earthquakes on the Property is not expected to result in major loss to life or property due to the predominant open space land use. As necessary, farm dwellings will be required to comply with seismic standards for residential development.

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4.0 Public Services, Potential Impacts and Mitigation Measures

4.1 Traffic and Circulation

Interstate Route H-1 (H-1 Freeway)

The Interstate H-1 (H-1) is a five-lane interstate route in the vicinity of the Property. The closest H-1 Freeway interchange is the Kunia Interchange, located 1.4 miles directly south of the Project site. There are three through westbound lanes and two through eastbound lanes on the Kunia Interchange overpass. The posted speed limit on this segment of H-1 is 55 miles per hour (mph) (PBA, 2008).

Potential Effects and Mitigation

The Project is not expected to have significant short- or long-term adverse effect on traffic conditions on the H-1 Freeway or its Kunia Interchange.

Kunia Road

A new access road to the Property, from Kunia Road, will be developed as part of the Project. Kunia Road is a state owned and maintained principal north-south arterial roadway. At the road's southern terminus, its intersection with Farrington Highway, Kunia Road becomes Fort Weaver Road. In the north bound direction, Kunia Road is a six-lane principal arterial between Farrington Highway and the H-1 Interchange. The road transitions to a four-lane principal arterial through the Royal Kunia, Phase I area, and a two-lane minor road from Anonui Street to Schofield Barracks. North of Schofield Barracks Kunia Road reverts to a four-lane arterial. The posted speed limit on Kunia Road is 35 mph, transitioning to 45 mph north of Anonui Street.

The Royal Kunia, Phase II project land use entitlements require the dedication of additional ROW on both sides of Kunia Road; stretching north from the H-1/Kunia Interchange to the northern most boundary of the proposed Project. The State of Hawai'i, Department of Transportation (HDOT), has ordered the Royal Kunia, Phase II developer to prepare a new Traffic Impact Analysis for the Royal Kunia, Phase II project. The HDOT has expressed concern about the impact of the Royal Kunia, Phase II development on traffic congestion associated with the Kunia Interchange as well as the location and amount of widening of Kunia Road required to maintain an acceptable level of service along the roadway.

A *Traffic Assessment Report [TAR] for Kunia Agricultural Park* was prepared by Julian Ng in 2012 to identify the potential traffic impacts of an agricultural park that includes cluster homes planned on the Property (**Appendix C**). All Project-generated traffic was assumed to use the new access road that will connect directly to Kunia Road.

According to the TAR, traffic generated by the proposed Project would increase the existing traffic volumes on Kunia Road by 0.4% in the AM Peak Hour and 2.5% in the PM Peak Hour. These estimates assume worst-case conditions that all of the Project traffic will be destined for or originate from areas to the south. Distribution of traffic both north and south would reduce the traffic impact. Analyses of the intersection of the new access road with Kunia Road found that, while a southbound left turn lane is not warranted, a median refuge lane for left turns onto Kunia Road will mitigate very long delays for that movement and should be part of the intersection improvements.

Potential Effects and Mitigation:

Short-Term

Construction activities may result in temporary slow-downs along Kunia Road. To mitigate potential short-term impacts associated with construction activities, a traffic control plan will be prepared for the Project during the design phase and will be submitted to the CCH with the construction drawings for approval during plan review. Traffic control measures may include barricades, cones, signage, and lighting as necessary to alert drivers and delineate construction boundaries. Approach signs and a flag person will be positioned to direct traffic through temporary traffic control zones, and officers from the Honolulu Police Department (HPD) will be employed to direct traffic at road intersections as necessary. To minimize traffic effects to the nearby residents, the contractors may be required to schedule heavy truck activity as much as possible between the hours of 9:00 a.m. and 3:00 p.m. on weekdays. The HPD will be notified prior to periods of heavy truck activity or during transport and operation of heavy equipment.

The Project will also result in a temporary increase in vehicle trips attributable to workers traveling to and from work sites, and the use of construction vehicles during the course of work. With traffic control measures in place, significant short-term adverse effects to traffic are not anticipated. Further, all construction-related traffic effects are temporary, however, and will cease upon Project completion.

A conceptual plan for Kunia Road improvements will be submitted to HDOT for review and approval prior to construction.

Long-Term

Long-term traffic impacts from the Kunia Agricultural Park are not expected to be significant. The required additional ROW along Kunia Road is incorporated into the Project site plan.

Intersection improvements for the proposed Kunia Road connection will need to be designed to accommodate school buses and 30-foot single unit trucks. A median left turn refuge area for southbound vehicles turning left out of the Project site onto Kunia Road is recommended to alleviate delays.

Intersection lighting is proposed at the Kunia Road connection and will be designed in accordance with the Roadway Lighting Design Guide, AASHTO, 2005. The results of the traffic analysis do not indicate the need to install a traffic signal at the Kunia Road intersection.

Plantation Road

Current access to the Property is from “Plantation Road” via graded (dirt) field roads within the site. See **Figure 15**. Plantation Road is a paved, privately owned and maintained roadway that circumnavigates the north, east, and south perimeters of the Property. North of the Property, Plantation Road is well-maintained and forms a major crossing with Kunia Road (Development Strategies, 2009b).

Potential Effects and Mitigation

No significant adverse short- or long-term impacts to Plantation Road are expected as a result of the Project. There will be a decrease in the amount of vehicles using this road to access the Property once the new access roadway from Kunia Road opens.

Figure 15 Plantation Road

Source: Development Strategies, LLC

New Access Road and Internal Roadways

A new access road from Kunia Road to the Property will be developed to service the Project. The access road is part of the Projects' internal roadway system providing access to the agricultural lots and the clustered farm dwellings. One farm dwelling lot will be used as an emergency access, connecting roadways between the Project site and Royal Kunia, Phase II. HDOA will own and maintain the Projects' internal roadway system. **Figure 9** shows the proposed location of the new access road and the internal roadways.

Potential Effects and Mitigation

No short- or long-term impacts to the new access road and internal roadways are anticipated as a result of this Project. At the Kunia Road intersection, the TAR recommends a stop sign and a median left turn refuge area for southbound vehicles turning left onto Kunia Road to alleviate delays. Review and approval of the roads will be with HDOT for Kunia Road and with CCH for the internal roadways.

4.2 Parks and Recreation

There are no recreational resources in the Project area as it is in active agricultural production or temporarily fallow ("resting" between crops to regenerate the soil). The nearest park facility is Kunia Neighborhood Park to the south which serves the Royal Kunia master planned community. Additional parks to the south, but closer to the H-1, are Kupuoni Neighborhood Park and Hoae'ae Community Park. Central O'ahu Regional Park, located along Kamehameha Highway opposite Waipi'o, is located several

miles east of the Project. However, there is no direct roadway access between the Property and the Central O'ahu Regional Park due to large (100 acres +) agricultural parcels in between.

The Royal Kunia, Phase II development is committed to construct two minimum five-acre community parks and construct active and passive recreational amenities within those facilities (DPP, 2009).

Potential Effects and Mitigation

No short- or long-term adverse impacts to parks and recreational resources are expected from the proposed Project. The 24 farm dwelling lots are not expected to result in any significant difference in the demand for park and recreational facilities.

4.3 Schools

The Royal Kunia region is served by the State Department of Education (HDOE) Leeward District, Waipahu Complex. Public schools operated by the DOE that service Royal Kunia include Kaleiopu'u Elementary, Waipahu Intermediate and Waipahu High schools. In 2007, Act 245 directed the Board of Education to adopt school impact fees on new residential development within school impact districts. The proposed Project is located within the Leeward O'ahu School Impact Fee District established by the Board of Education on January 2012.

Potential Effects and Mitigation

The agriculture cluster farm dwelling component is considered a new residential development subject to Act 245. The HDOA acknowledges that they will be subject to the Leeward O'ahu School Impact fees for the farm dwellings.

4.4 Fire, Police and Medical Services

The Honolulu Fire Department (HFD) Waipahu Fire Station currently provides emergency service for the Project area. The Waipahu Fire Station has an engine and a ladder company. In addition, a new fire station is required to be built by the developer of Royal Kunia, Phase II, as a condition of its land use entitlements. At that point, back-up protection will be provided by the Waipahu Fire Station.

Police protection is provided to the Project area by the Honolulu Police Department (HPD) District 3, Pearl City Police Station.

The nearest medical service is available at The Queen's Medical Center West O'ahu in West Loch and Pali Momi Medical Center in Pearl Ridge. The Project site is within a 30-40 minute commute of the major hospitals in the O'ahu's primary urban center.

Potential Effects and Mitigation

Short -Term

There are potential short-term traffic related impacts during the construction phase. HDOA will coordinate and work with HFD, HPD, CCH Emergency Medical Services (EMS), and other emergency responders of the traffic control measures to ensure emergency access. All traffic control measures will be designed to minimize effects on continued traffic flow.

Long-Term

No long-term adverse impacts are anticipated from the Project. Agriculture is a low-intensity land use with regard to population. Police and emergency medical service providers will respond to emergency calls for service from agricultural park lessees on the 24 farm dwelling lots. The Project is not expected to result in a significant increase in calls for services.

4.5 Potable Water System

Potable water is provided to the Project site by the BWS. The Property is located 3,500 linear feet away from the BWS system. The BWS has potable wells, storage tanks and transmission facilities on the Kunia plateau. A major transmission main is located in the Kunia Road ROW, which runs along the western border of the Kunia Agricultural Park. Additionally, Kunia Wells I, II, III, and the 'Ewa shaft are located to south of the Project site.

Potable water service will be required for the residential portion of the Project which will be developed and maintained as an agricultural cluster development. Some of this water will be used for residential landscaping. Pursuant to the Amended MOU, HDOA will continue to work with Halekua to obtain and construct required improvements to the BWS system. HDOA will be responsible for on-site improvements while Halekua will be responsible for off-site improvements to be part of the adjacent Royal Kunia, Phase II project.

There will be very limited potable water use for the agricultural lots. Low-demand potable service laterals will be provided to the agricultural lots to provide limited water for workers. As discussed in **Section 3.3**, **Ground Water**, a separate agricultural irrigation water system will be developed, with Waiāhole Ditch water, to service the Projects' agricultural component.

Potential Effects and Mitigation

No potable or agricultural water allocation will be obtained from BWS by HDOA. Potable water requirements will be coordinate with Halekua. Potable water service will be dependent on the adequacy of BWS source, storage, and transmission facilities at the time of development. BWS will confirm the availability of potable water when building permits are submitted for approval.

An unresolved issue is the availability of potable water to service the Project.

4.6 Wastewater

Wastewater treatment for the Project site is provided by the DEM via the Honouliuli Wastewater Treatment Plant. As part of the agricultural cluster farm dwelling development, each farm dwelling will be provided with sewer facilities through an off-site connection to the sewer infrastructure of Royal Kunia, Phase II. The Project is included in the 2002 Royal Kunia Revised Sewer Master Plan. The agricultural lots will not be connected to the sewer infrastructure.

Potential Effects and Mitigation

No short- or long-term adverse impacts to wastewater facilities are anticipated from the Project. The increase in population and wastewater production from the farm dwellings on the Property have already been accounted for in the 2002 Royal Kunia Revised Sewer Master Plan.

Construction plans and Site Development Plan Master Application for sewer connection will be submitted to DPP for review and approval.

4.7 Electrical Demand

Hawaiian Electric Company (HECO) provides electrical service to the Project area. The primary source of electricity for the vicinity is the Wai‘au Power Plant.

Potential Effects and Mitigation

There will be no short- or long-term impacts from the Project. The present electric system is adequate to meet the needs of the Project in both the construction and maintenance phases. Short-term electrical power will be required during construction. Long-term electrical power will be required for limited lighting on agricultural lots, for the 24 farm dwellings, and for the Kunia Road intersection.

4.8 Communications (Cable, Internet, Telephone)

Local cable providers include Oceanic Time-Warner Cable and Hawaiian Telcom. Cellular phone service in a majority of the Project area is covered by Verizon, T-Mobile, AT&T, Sprint, and Nextel.

Potential Effects and Mitigation

There will be no significant short- or long-term impacts from the Project. The only usage of communications infrastructure will be by the farm dwellings (with the exception of cellular phone usage). Connections to off-site communications infrastructure will be through the Royal Kunia, Phase II development.

5.0 Public Services, Potential Impacts and Mitigation Measures

5.1 Socioeconomic Characteristics

The Property is not expected to materially change the socio-economic characteristics of Central O'ahu or its immediate vicinity. This is largely because the agricultural land use is a continuation of current use and only 24 households are expected to be added to the population base.

The 2010 and projected 2020 population of various areas within Central O'ahu are presented in **Tables 6** and **7**. The population growth for the Project area is contained in the "Village Park/Kunia" designation and reflects the development of Royal Kunia Phase II for residential use.

Table 6. Residential Population and Housing Units, 2010

Region	District	Total Resident Population	Visitor Housing Units	Resident Housing Units
Central O'ahu	**Village Park/Kunia**	**14,848**	**0**	**4,532**
	Waipahu	35,118	0	8,990
	Waikele	7,273	0	2,985
	Waipi'o	11,690	0	4,131
	Waiawa	9	0	3
	Mililani	32,876	0	11,239
	Mililani Mauka/Launani	19,647	0	7,770
	Wahiawa/Whitmore	20,359	15	7,117
	Schofield/Wheeler	17,145	197	4,689
O'AHU TOTAL		**911,841**	**33,596**	**340,906**

Table 7. Residential Population and Housing Units, 2020 Projection

	Total Resident Population	Population in Group Quarters	Visitor Housing Units	Resident Housing Units
Central O'ahu	**Village Park/Kunia**	**17,027**	**0**	**5,405**
	Waipahu	35,465	0	9,429
	Waikele	7,080	0	2,992
	Waipi'o	11,717	0	4,257
	Waiawa	4,855	0	1,671
	Mililani	33,679	0	11,867
	Mililani Mauka/Launani	19,282	0	7,859
	Wahiawā/Whitmore	20,192	13	7,300
	Schofield/Wheeler	16,781	169	4,693
O'AHU TOTAL		**969,467**	**35,703**	**372,256**

Source: DPP, 2010

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 prepared by Cultural Surveys Hawai'i, Inc. (CSH) to identify potential cultural resources and historic properties as part of the State of Hawai'i historic preservation review process. The AIS fieldwork was conducted from December 3 through December 12, 2014. Excerpts from the report are included herein, and the report in its entirety is included as **Appendix D**.

Fieldwork consisted of a 100% pedestrian inspection followed by subsurface, backhoe-assisted trench tests. The AIS recorded one historic site identified as State Inventory of Historic Properties (SIHP) #50-80-08-7758, comprised of five features specific to water control for OCS's agricultural activities. See **Figure 16.** CSH Feature 1 is a linear retaining wall. CSH Feature 2 and CSH Feature 3 are portions of a linear historic irrigation ditch. CSH Feature 4 is the structural remnant of a headwork's feature connecting CSH Features 2 and 3. CSH Feature 5 is a historic lithic workshop relating to the production of faced basalt boulders observed in CSH Features 1–4.

The recommended determination of effect for SIHP -7758 is "no historic property affected" as no evidence of traditional Hawaiian culture was encountered and the five features have been documented. The AIS recommends no further archaeological work.

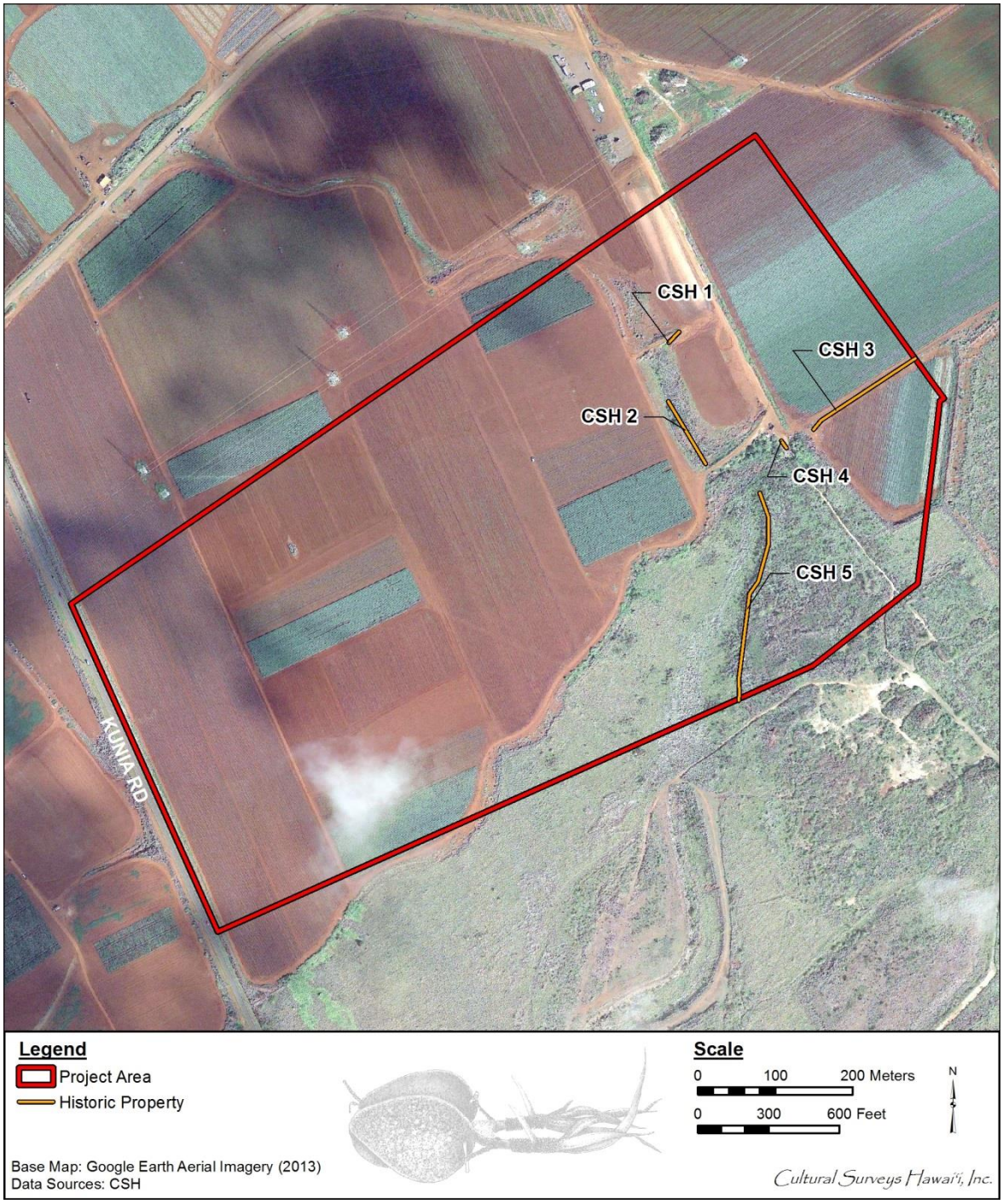
A summary of these features are provided below in **Table 8**.

Table 8. Summary of SIHP #50-80-08-7758

Feature ID#	Formal Type	Description
CSH 1	Buttress wall for road and sediment trap	Dry-stacked, faced basalt retaining (buttress) walls between 1.5 and 3 meters (m) tall, utilized as a sediment trap and road buttress wall
CSH 2	Irrigation ditch	Shaped basalt blocks averaging 30 centimeter (cm) x 30 cm and 10 cm thick, mortared together with white mortar to create long low walls running parallel to each other about 2 m apart and at a 120 degree angle to the white mortar and essentially level floor of the irrigation ditch
CSH 3	Irrigation ditch	Eastern portion Feature 2, heavily disturbed and stretching over 200 m and continuing beyond the Project area to the northeast
CSH 4	Two attached concrete and stone walls and cistern features	Irrigation headworks, concrete wall 9.4 m long x 0.8 m high x 0.2 m wide attached to a similar wall (2.6 m long x 1.8 m high x 0.25 m wide) made of shaped basalt boulders and white mortar; two cisterns (1.8 m high) built into this wall feature
CSH 5	Quarry piles and basalt stone reduction workshop	Basalt boulder and reduction debitage pile approximately 300 m long by 2 to 3 m high with prominences up to 8 m high; includes large basalt boulders at the base (over 50 cm) and at the top smaller (less than 50 cm) reduced basalt rubble, large thinning flakes relating to shaping stones for lining irrigation ditch walls

Source: CSH, 2015

Figure 16 Historic Features



Source: CSH, 2015

Potential Effects and Mitigation

The AIS was submitted to the State of Hawai'i Historic Preservation Division (SHPD) on February 9, 2015, and is currently being reviewed. No adverse effects to archaeological or historical resources are expected from the Project. However, 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 SHPD.

5.3 Cultural Resources and Practices

The historical land use context for this Project is continual agricultural production for at least 100 years, and urban development to the south. No cultural resources or practices are known on the site, according to *Sites of O'ahu* (Sterling and Summers, 1978).

Potential Effects and Mitigation

Adverse impacts to traditional/cultural resources or practices at the Property are not anticipated. The proposed Project involves diversified agriculture and limited residential (i.e. farm dwelling) use. The Property has been under cultivation since the early 1900s and is still in active agricultural use.

Construction and accessory use of the site for agricultural uses over the past decades is expected to have resulted in extensive ground disturbance and alteration of land forms. Potential cultural uses and archaeological and cultural sites that may have once been present would have been discovered and recovered, or have been unfortunately destroyed. There are no known traditional or contemporary cultural sites or practices in use. Agricultural use employs modern equipment for tilling and harvesting. There will be temporary disruption of agricultural uses while agricultural park infrastructure is installed. However, diversified agricultural production will resume after construction.

There are no known plants on the Property that are of significant importance for traditional or cultural uses.

The Project site is located approximately seven miles from the coastline. Therefore, access to the shoreline will not be affected by the Project.

No comments associated with cultural resources and practices were provided during the DEA review period.

6.0 Relationship to Land Use Plans Policies and Controls of the Potentially Affected Area

6.1 Overview

State and CCH policies, plans, and land use controls are established to guide development in a manner that enhances the environment and quality of life. The establishment of policies, plans, and land use controls at all levels of government are further promulgated to help ensure that the long-term social, economic, environmental, and land use needs of the community and region can be met. The proposed Project's relationship to land use policies, plans, and controls for the region and proposed activity are as follows.

6.2 Federal – Clean Water Act

The Environmental Protection Agency (EPA) is responsible for administering the Clean Water Act (CWA). States can use their water quality standards in CWA, 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.

NPDES permits are regulated under CWA, Section 402. In Hawai'i, the approval and enforcement of such permits are the responsibility of the HDOH-CWB . Information regarding NPDES General Permits can be found in HAR, Chapter 11-55, Appendices A through L.

Discussion

The proposed action requires a NPDES General Permit authorizing discharges of storm water associated with construction activities from HDOH-CWB pursuant to HAR, Chapter 11-55. Further, with the installation of new potable water lines on the Property, a NPDES General Permit authorizing discharges associated with hydrotesting effluent may also be required. As required, applications for these permits will be submitted at least 30 days prior to the respective activities and will be processed in compliance with HAR, Chapters 11-54 and 11-55.

6.3 Federal – American with Disabilities Act

Title II of the Americans with Disabilities Acts (ADA) requires that State and local governments give people with disabilities an equal opportunity to benefit from all of their programs, services, and activities. Administration and enforcement of Title II is by the Department of Justice (DOJ). Title II of the ADA requires compliance off new construction of government facilities, lease of private facilities by government agencies, and leasing off government facilities to private entities. The 2010 ADA Standards for Accessible Design requires that 5% of newly constructed residential dwelling units be ADA accessible.

In Hawai'i, the HDOH's Disability and Communication Access Board (DCAB) provides guidance and State and county agencies counties to ensure compliance with ADA.

Discussion

The proposed action is in compliance with the ADA. The HDOA will design and develop two of the 24 CPR farm dwellings as single-story farm dwellings meeting ADA requirements.

6.4 State of Hawai'i Constitution

The development of the state agricultural park pursuant to 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 states the following:

> *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 proposed Project is consistent with the provision of the Constitution as it promotes diversified agriculture and assures the availability of prime agriculturally suitable lands.

6.5 Hawai'i State Plan

HRS, Chapter 226, *Hawai'i State Plan* (Plan), 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, 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 objectives, policies, and priority guidelines:

> *§**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

The proposed Project is in conformance with the Hawai'i State Plan policies by continuing the statewide development of state agricultural parks for small independent farmers on prime agricultural lands. State ownership of agricultural parks allows extended leases to farmers that will continue to "assure the availability of agriculturally suitable lands with adequate water to accommodate present and future needs. Lastly, the proposed Project allows diversified agriculture to remain an important component of the State's economy.

6.6 State Land Use Law

State-level land use control is enabled by HRS, Chapter 205, *Land Use Commission* and was adopted in 1961. Also known as the "State Land Use Law," HRS, 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" under HRS, Chapter 205. The Project site is located within the state "Agriculture" district. See **Figure 17**. With a focus on cultivation of crops and clustered farm dwellings, the creation of a new agricultural park is consistent with the following provisions of the HRS, 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 but not limited to crops for bioenergy, flowers, vegetables, foliage, fruits, forage, and timber;*

*(4) **Farm dwellings**, employee housing, farm buildings, or activities or uses related to farming and animal husbandry. "Farm dwelling," as used in this paragraph, means a single-family dwelling located on and used in connection with a farm, **including clusters of single-family farm dwellings permitted within agricultural parks developed by the State**, or where agricultural activity provides income to the family occupying the dwelling;*

(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;***

(b)...Any deed, lease, agreement of sale, mortgage, or other instrument of conveyance covering any land within the agricultural subdivision shall expressly contain the restriction on uses and the condition, as prescribed in this section that these restrictions and conditions shall be encumbrances running with the land until such time that the land is reclassified to a land use district other than agricultural district

Discussion

The proposed Project is consistent with the State Land Use Law as it only contains allowable uses within the state agriculture district. Lands within the Project site are agriculturally important lands as they are;

- Rated "Prime" under the ALISH rating system. This system was established in 1977 in a collaborative effort spearheaded by the HDOA, USDA, and the University of Hawai'i College of Tropical Agriculture and Human Resources; and,
- Rated "A" (very good, and the highest rating) under the LSB rating system.

6.7 State Agricultural Parks, HRS, Chapter 166

HRS, Chapter 166 gives the HDOA the authority to plan, develop and manage agricultural parks on public lands set aside for that purpose throughout the State of Hawai'i. As such, this Project is wholly consistent with HRS, Chapter 166.

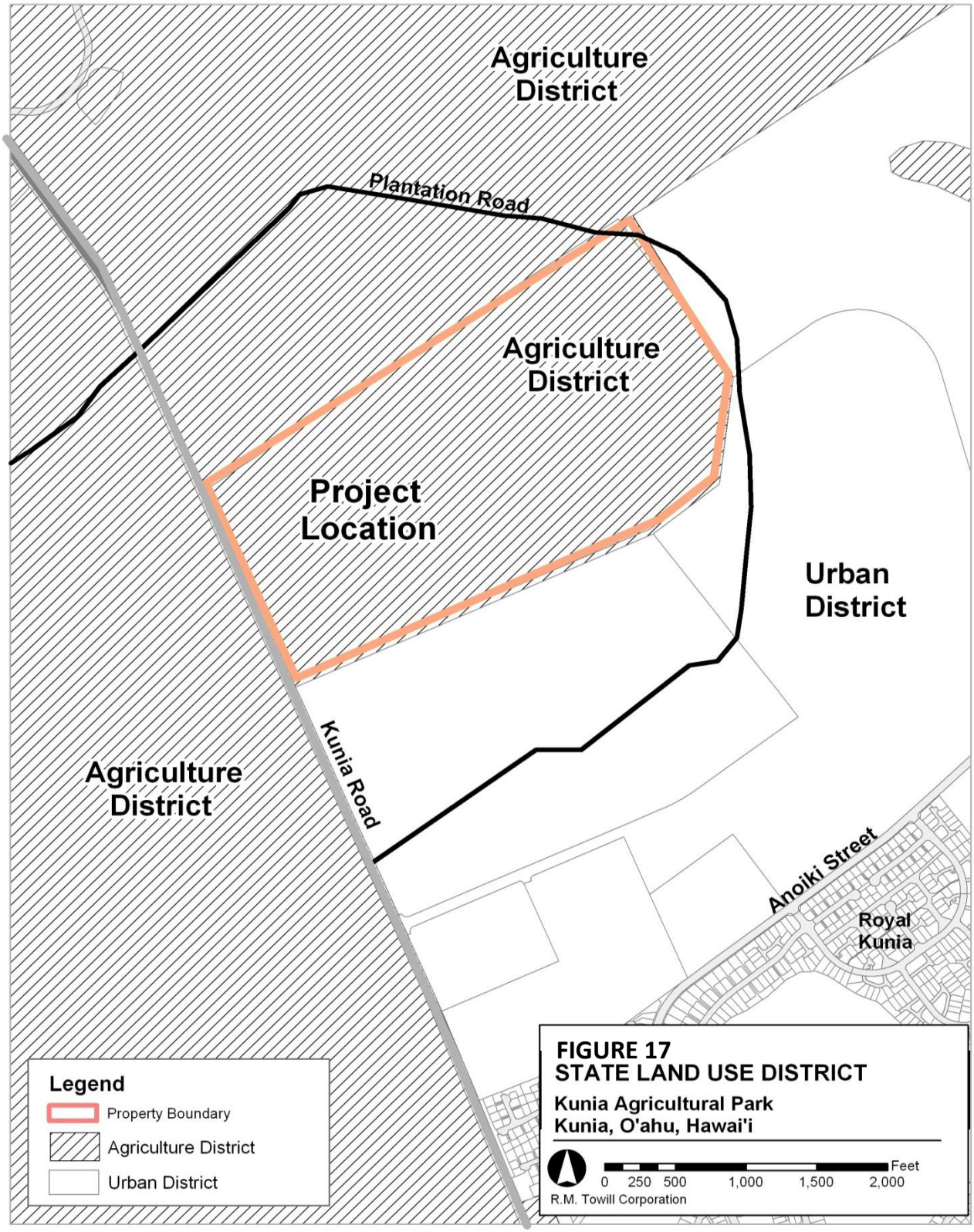
Section 166-4, Park development, exempts state agricultural parks from "all statutes, ordinances, charter provisions, and rules of any governmental agency relating to planning, zoning, construction standards for subdivisions, development and improvement of land, and the construction of buildings thereon…" However, the park cannot contravene "any safety standards and tariffs approved by the public utilities commission for public utilities" (Section 166-4(2)) and requires the review and approval of the agricultural park by "the legislative body in the county in which the agricultural park is situated shall have approved the agricultural park" (Section 166-4(3)).

Section 166-4(4) gives the state the "responsibility of maintaining all roads within the agricultural park if the roads are developed exempt from applicable county ordinances, charter provisions, and rules regarding roads."

Discussion

Although HRS, Chapter 166 allows HDOA to seek a number of exemptions for the development of agricultural parks, HDOA will instead submit an agricultural cluster housing permit with DPP. This permit provides HDOA with the required design flexibility while meeting all CCH and State development requirements.

Figure 17 State Land Use Districts



6.8 Coastal Zone Management

HRS, Chapter 205A, *Coastal Zone Management*, sets forth the state's Coastal Zone Management Program. This Project is consistent with the objectives identified under HRS, Section 205A-2. The following discussion is provided to demonstrate the Project's conformance with HRS, Chapter 205A.

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

The Property is located several miles inland from recreational coastal waters and therefore will not affect these resources.

Section 205A-2(c)

(2) Historic resources;

(A) Identify and analyze significant archaeological resources;

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

Discussion

The proposed Project will comply with the historic resources policies. An AIS of the Property was conducted and recorded one historic site identified as SIHP # 50-08-08-7758. This site is comprised of five features specific to water control for OSC agricultural activities. The recommended determination of effect for SIHP -7758 is "no historic property affected" as no evidence of traditional Hawaiian culture was encountered and the five features have been documented. The AIS recommends no further archaeological work.

(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 proposed Project will comply with policies on scenic and open space resources. The Project's site plan will help preserve and sustain open space resources by its predominantly agricultural land use. The farm dwelling portion of the site plan has been clustered into the southeast corner of the Property, near planned residential uses from Royal Kunia, Phase II. This strategy will maintain existing open space as the agricultural lots will remain in agricultural use.

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 Property is located several miles inland from coastal ecosystems and therefore will not significantly affect these resources.

(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 Property is located several miles inland from the coast and therefore is not a coastally dependent. The Project will comply with HAR, Chapters 11-55 and 55 regarding *Water Quality Standards* and *Water Pollution Control*, respectively.

(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 Property is not located in flood designated areas nor in proximity to coastal hazard areas.

(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 FEA has been prepared under HRS, Chapter 343 and HAR, Chapter 11-200 which allows for public review and participation. Consequently, the preparation of this FEA and disclosure of anticipated effects of the proposed Project comply with the policy on managing development.

6.9 City and County of Honolulu General Plan

The CCH GP "is a comprehensive statement of objectives and policies which sets forth the long-range aspirations of O'ahu's residents and the strategies of actions to achieve them. It is the focal point of a comprehensive planning process…" (CCH, 2006). The current GP, approved in 1992 and amended in October 2002, is a statement of long-range social, economic, environmental, and design objectives and a statement of broad policies which facilitate the attainment of the objectives of the GP.

The most relevant portion of the GP is Section II, Economic Activity, Objective C, which is *"To maintain the viability of agriculture on O'ahu."* The following includes specific policies under this objective.

Objective C, Policy 1
Assist the agricultural industry to ensure the continuation of agriculture as an important source of income and employment.

Discussion

The proposed Project is intended to boost the diversified agricultural industry as a source of income and employment by expanding the supply of agricultural land available to small diversified farmers.

Objective C, Policy 2
Support agricultural diversification in all agricultural uses on O'ahu.

Discussion

The proposed Project is aimed specifically at providing additional land for diversified agricultural crops.

Objective C, Policy 4
Provide sufficient agricultural land in 'Ewa, Central O'ahu, and the North Shore to encourage the continuation of sugar and pineapple as viable industries.

Discussion

The proposed Project is located in Central O'ahu and encourages diversified agriculture on lands previously dedicated to now-defunct sugar cane production and rapidly disappearing pineapple crops. Since the demise of sugar cane and precipitous decline of pineapple on O'ahu, specifically in the Kunia region, diversified agriculture has emerged as the "viable industry" in the agricultural sector.

Objective C, Policy 6
Encourage the more intensive use of productive agricultural land.

Discussion

Approximately 76% of the available land on the Property (114 out of 150 acres) will be dedicated to agricultural production. Rather than setting aside land within the agricultural lots for farm dwelling use, the proposed Project's site plan calls for clustering farm dwellings into a separate area. Each agricultural lot will be dedicated to and be exclusively used for crop infrastructure production.

Objective C, Policy 7
Encourage the use of more efficient production practices by agriculture, including the efficient use of water.

Discussion

The HDOA will assist all agricultural lessees in the latest and most effective production techniques.

Objective C, Policy 8
Encourage the more efficient use of non-potable water for agricultural use.

Discussion

On January 3, 2011, CWRM accepted HDOA's WUPA, requesting a 0.422 mgd allocation of agricultural irrigation water from the Waiāhole Ditch. This is a cost-effective approach because of existing Waiāhole Ditch infrastructure close to the Project location and in active use by the current lessee.

6.10 Central O'ahu Sustainable Communities Plan

The purpose of the development plans and sustainable community plans prepared by the DPP is to implement the GP in specific geographic areas. The *Central O'ahu SCP* area encompasses the upland plateau between the Wai'anae and the Ko'olau Mountain Ranges. The area includes the towns of Waipahu, Mililani, and Wahiawā and their surrounding communities.

The provisions of the *Central O'ahu SCP* are not regulatory but are meant to provide a coherent vision to guide resource protection and land use in Central O'ahu. However, the plan does provide guidance for development in Central O'ahu, public investment in infrastructure, zoning and other regulatory procedures, and the preparation of the CCH's annual capital improvement program budget.

The most recently-approved *Central O'ahu SCP* became effective in December 2002. It is the intent of the plan to:

> *…provide a guide for orderly and coordinated public and private sector development in the Central O'ahu sustainable communities plan area in a manner that is consistent with applicable general plan provisions, including the designation of Central Oahu as an urban fringe area which is to be developed to relieve development pressures in the remaining urban-fringe and rural areas and to meet housing needs not readily provided in the primary urban center (ROH, Section 24-5.2(b))*

According to the *Central O'ahu SCP* the Property is located within the Urban Growth Boundary in an area identified as "Residential and Low Density Apartment" on the *Central O'ahu SCP's* Open Space (A 1), Land Use (A2), Public Facilities (A3), and Phasing (A4) Maps. See **Figure 18**.

The *Central O'ahu SCPs'* Section 2.2.1 explains that the Urban Growth Boundary was drawn to provide adequate urban lands for the future while protecting 10,350 acres of prime and unique agricultural lands and for the preservation of open space. This includes agricultural lands along Kunia Road including the Project, north of Wahiawā, surrounding Mililani, and on the Waipi'o Peninsula.

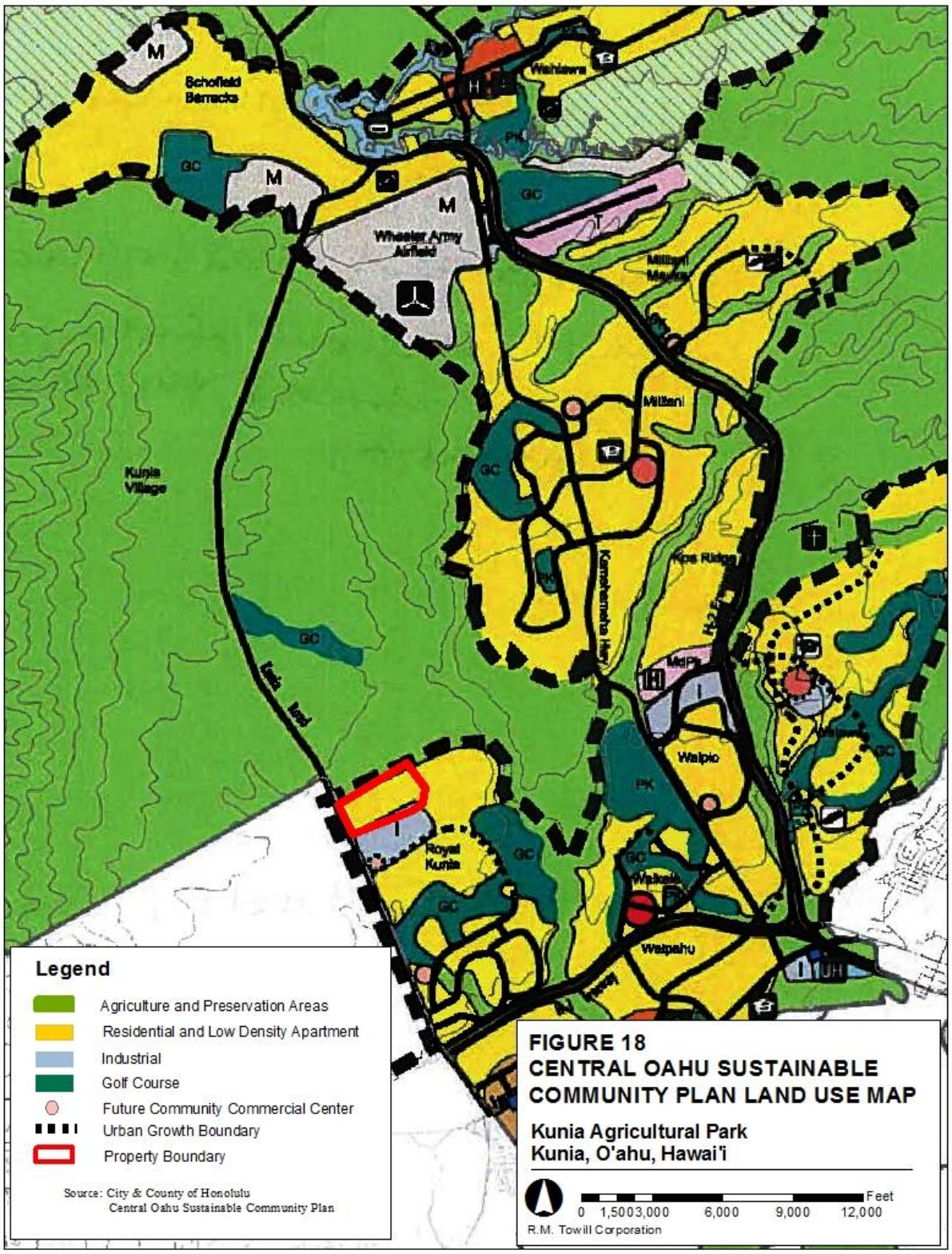
Though the Property is part of the Royal Kunia Master Plan, *Central O'ahu SCP's* Exhibit 2.3, Existing and Proposed Master Planned Communities, identifies the Property as being located in a "Non-Urban Area." Thus, the development of the Property is consistent with the City's long-range vision for Central O'ahu by retaining approximately 150 acres of prime agricultural land along Kunia Road for diversified agriculture.

The layout of the proposed agricultural farm dwellings shown in **Figure 9** are consistent with the *Central O'ahu SCP,* Section 3.1.4.4, *Agricultural Areas*, which provides guidelines that call for farm dwellings to be clustered and sited to avoid using more productive agricultural land and to reduce infrastructure costs.

Discussion

The proposed Project is consistent with the *Central O'ahu SCP* as it promotes diversified agriculture and perpetuates agricultural use of 150 acres of prime agricultural lands located in Central O'ahu. Although the Project is located inside of the Urban Growth Boundary on lands designated Residential and Low Density Apartment on the *Central O'ahu SCP* Land Use Map, the Property is also designated as a Non-Urban Area in Exhibit 2.3, Existing and Proposed Master Planned Communities in the *Central O'ahu SCP*. In addition the proposed Project supports the *Central O'ahu SCP* Open Space Map by continuing the existing agricultural use of the Property. The placement of the agricultural cluster farm dwelling component along the southeast portion of the Property, close to the planned housing of the Royal Kunia Phase II, will result in a vista quite similar to the current one.

Figure 18 Central O'ahu Sustainable Communities Plan



6.11 County Zoning

Land uses within the CCH jurisdiction are regulated under Revised Ordinance of Honolulu (ROH), Chapter 21, *Land Use Ordinance* (LUO). The purpose of the LUO, as stated in ROH, Section 21.1.20, is to:

> *… regulate land use in a manner that will encourage orderly development in accordance with adopted land use policies, including the O'ahu general plan and development plans, and to promote and protect the public health, safety and welfare."*

The zoning of the Property is AG-1, Restricted Agricultural district. See **Figure 19**.

According to ROH, Section 21-3.50(a):

The intent of the AG-1 restricted agriculture district is to conserve and protect important agricultural lands for the performance of agricultural functions by permitting only those uses which perpetuate the retention of these lands in the production of food, feed, forage, fiber crops and horticultural plants. Only accessory agribusiness activities which meet the above intent shall be permitted in this district.

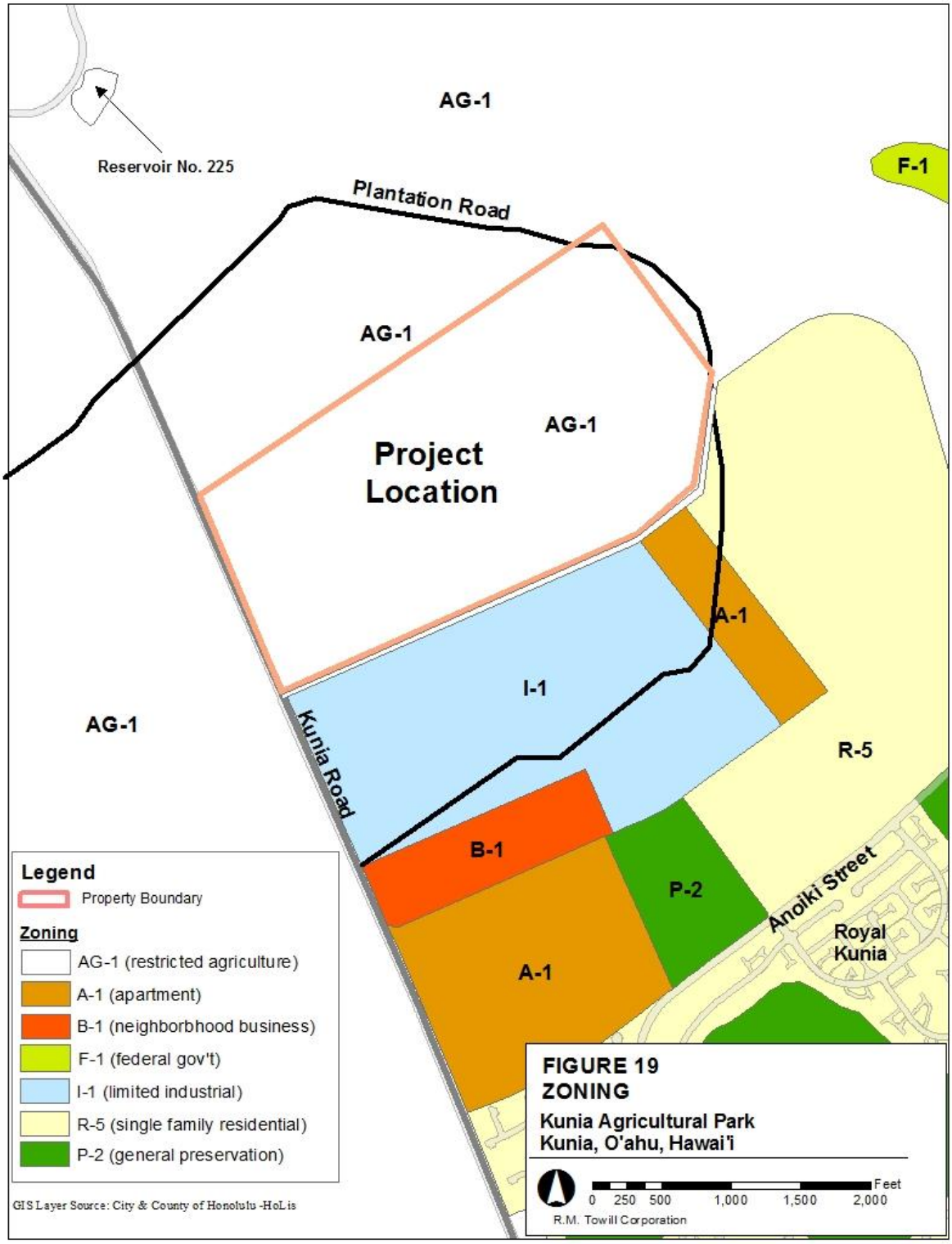
According to Section 21-3.5(c), AG-1 Restricted Agriculture district (AG-1) lands are to include:

- Lands in the state agricultural district.
- Lands designated agricultural by adopted city land use policies.
- Lands which are predominantly classified as prime or unique under the agricultural lands of importance to the state of Hawai'i system.
- Lands where a substantial number of parcels are more than five acres in size.

Permitted uses in AG-1 are; aquaculture, crop production, forestry, open land, livestock grazing, livestock production minor, livestock veterinary services, and public uses and structures. The following are permitted uses in AG-1 only if they meet specific development standards: agricultural products processing, minor; centralized bulk collection, storage and distribution of agricultural products to wholesale and retail markets; composting, minor; sales and service of machinery used in agricultural production; sawmills; storage and sale of seed, feed, fertilizer and other products essential to agricultural production; livestock production, major; plant nurseries; farm dwelling; and utility installations, Type A.

The Property will be subdivided into 25 agricultural lots ranging in size from 5 to 8 acres. A CPR, comprised of 25 lots, will be established on one of the agricultural lots. Farm dwellings will be constructed on 24 of the CPR lots. The remaining CPR lot will be used to connect utilities and provide emergency roadway access with Royal Kunia Phase II. It is anticipated that the CPR lots will be developed using the R-5 Residential District development standards from the LUO. Lastly, accessory agricultural related structures many also be placed on the agricultural lots. Once completed, the Project will have 24 agricultural lots and 24 farm dwellings.

Figure 19 Zoning



The following Agricultural District development standards are taken from ROH, Table 21-3.1 P-2, *Agricultural* and *County Districts Development Standards*.

Table 9. Agricultural District Development Standards (ROH, Table 21-3.1)

Development Standard		**AG-1 Restricted**	**AG-2 General**
Minimum lot area (acres)		5	3 for major livestock production, 2 for all other uses
Minimum lot width and depth (feet)		150	150
Yard (feet)	Front	15	15
	Side and rear	10	10
Maximum building area (percent of zoning lot)		10[2]	10[2]
Maximum height (feet)[1]		15 - 25[3]	15 - 25[3]
Height setbacks		Per Section 21-3.50-4(c)	Per Section 21-3.50-4(c)

[1] *Heights above the minimum of the given range may require height setbacks or may be subject to other requirements. See the appropriate section for the zoning district for additional development standards.*
[2] *For nonagricultural structures*
[3] *Fifteen feet for nonagricultural structures and dwellings, up to 25 feet are permitted if height setbacks are provided.*

The HDOA will develop the farm dwelling portion of the Project as an agricultural cluster housing development. According to ROH, Section 21-8.50-1 Cluster housing, the intent of cluster housing is to:

- Allow development of housing sites which would otherwise be difficult to develop under conventional city subdivision standards, to allow flexibility in housing types;
- To encourage innovative site design and efficient open space, to minimize grading by allowing private roadways, narrower roadway widths and steeper grades than otherwise permitted; and,
- To provide common amenities when appropriate.

Cluster housing is also permitted on any agricultural zoned lands to promote economy of services and utilities and providing the most efficient use of the remainder area for agricultural uses.

As previously noted, farm dwellings are an allowable use in the AG-1 district as long as they meet specific development standards. ROH, Section 21-5.250, specifies that the following development standards apply to farm dwelling:

- The maximum number of farm dwellings in an AG-1 district agricultural cluster shall not exceed one unit per five acres; and,
- Within an agricultural cluster each dwelling may be sited on a lot not to exceed 5,000 square feet.

Table 10 shows how the Project meets the site and use specific development standards set forth in the LUO.

Table 10. Agricultural Cluster Housing Site Standards (ROH, Section 21-3.50-2)	
Restricted Agricultural District (AG-1)	**Kunia Agricultural Park**
1. Minimum land area of 15 contiguous acres	150 acres
2. The maximum number of farm dwellings in an AG-1 district agricultural cluster shall not exceed one unit per five acres	30 farm dwellings max 24 farm dwellings proposed
3. Within agricultural clusters, detached, duplex and multifamily dwellings shall be permitted. Multifamily dwellings shall not exceed four dwelling units in any structure	Detached farm dwellings
4. Within an agricultural cluster, all principal, accessory and conditional uses and structures permitted within the AG-1 restricted agricultural district and AG-2 general agricultural district shall be permitted, subject to the minimum standards and conditions specified in this chapter for these uses.	Crop production and farm dwellings are permitted uses within the AG-1 zoning district.
5. Within an agricultural cluster each dwelling may be sited on a lot not to exceed 5, 000 square feet. For structures with more than one dwelling unit, the maximum lot size shall be a multiple of 5, 000 square feet per dwelling	22 lots at 5,000 square feet and two lots at 7,500 square feet.
6. Height and yards shall be the same as permitted in AG-1 and AG-2 districts.	Will be designed to meet these requirements.
7. Parking, loading and sign requirements shall be specified in the approval of the agricultural cluster plan.	Will be designed to meet these requirements.

Discussion

The proposed Project is consistent with the intent and use of the AG-1 as it promotes diversified agriculture and perpetuates agricultural use of prime agricultural lands of Central O‘ahu. Each of the 25 agricultural lots will meet the agricultural district design standards. The Project also meets the development standards for farm dwellings as well as the agricultural cluster housing. Lastly, the agricultural cluster housing permit provides HDOA with the needed design flexibility to develop the Project while meeting all CCH and State requirements.

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7.0 Permits and Approvals That May Be Required

7.1 Federal

Compliance with Americans with Disabilities Act

The HDOA will coordinate compliance with ADA requirements with the DCAB.

7.2 State of Hawai‘i

NPDES Permit(s)

Project activities will require a NPDES NOI Form C authorizing storm water discharges associated with construction activities, and NOI Form F, Hydrotesting Waters, authorizing hydrotesting effluent. NPDES permits are obtained through HDOD-CWB.

Noise Permit

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

Approval of Wastewater Systems Plan

Review of wastewater plans by HDOH will be required where connection to municipal service is anticipated, or if individual wastewater systems (IWS) are utilized for the agricultural residence lots. The current plan calls for connection to CCH sewer facilities for farm dwellings.

Water Use Permit

Waiāhole Ditch water is regulated by CWRM. On January 3, 2011, CWRM accepted HDOA’s WUPA requesting 0.422 mgd of water from Waiāhole Ditch to service the Project’s agricultural component.

Permission for Roadway Access

A Roadway Access agreement with the HDOT will be required to obtain access to Kunia Road, a State of Hawai‘i Highway facility.

7.3 City and County of Honolulu

Agricultural Housing Cluster Permit

An Agricultural housing cluster permit will be required. The review and approval will be conducted by the Director of DPP.

Other Permits

Project activities will require the following ministerial permits: Subdivision, Grading, and Sewer Connection.

7.4 Utility Companies

Plan review by local utility companies will be undertaken as required and appropriate.

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8.0 Agencies, Organizations and Individuals Consulted

The DEA for the subject Project was published in the March 23, 2013 OEQC issue of *The Environmental Notice.* The 30-day public comment period for the review of the DEA ended on April 22, 2013. The following individuals and organizations were consulted during preparation of the DEA. Comment letters received in response to the DEA are identified with an " * " asterisk. All comment and response letters are included within **Appendix E**.

8.1 Federal Government

Natural Resource Conservation Service
U.S. Fish & Wildlife Service

8.2 State of Hawai'i

Department of Business, Economic Development & Tourism, Office of Planning
Department of Education *
Department of Health *
Department of Land and Natural Resources
- Commission on Water Resource Management *
- Land Division *
- State Historic Preservation Division *

Department of Transportation, Highways Division *
Office of Environmental Quality Control
Office of Hawaiian Affairs
Waipahu Public Library
Kapolei Public Library

8.3 City and County of Honolulu

Honolulu Board of Water Supply *
Fire Department
Department of Planning and Permitting *
Police Department
Department of Environmental Services
Department of Parks and Recreation *
Department of Facilities Management *

8.4 Elected Officials

Hawai'i State Legislature
Senator Donovan Dela Cruz
Senator Clayton Hee
Senator Michelle Kidani
Representative Rida Cabanilla
Representative Lauren Kealohilani Cheape
Representative Ty Cullen

Elected Officials (Continued)
Hawai'i State Legislature
Representative Richard Lee Fale
Representative Aaron Ling Johanson
Representative Marcus Oshiro

City and County of Honolulu
Office of the Mayor
Councilmember Breene Harimoto
Councilmember Joey Manahan
Councilmember Earnest Martin
Councilmember Ron Menor

8.5 Others

O'ahu Neighborhood Boards
Richard Poirier, Chair, No. 25 Mililani/Waipi'o /Melemanu
Michael Lyons, Chair, No. 27 North Shore
William Clark, Chair, No. 20 Aiea
Rito Saniatan, Chair, No. 22 Waipahu
Kimo Pickard, Chair, No. 21, Pearl City

Aloun Farms
Waikele Farms, Inc.
Monsanto Company
Pioneer Hi-Bred

9.0 Significance Determination

According to the HDOH's HAR, Chapter 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 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.

The proposed Project:

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

The proposed action will not involve an irrevocable loss of natural resources. One historic site, comprised of five features specific to water control for OSC, was located along the eastern portion of the Property. The AIS is currently under review by SHPD.

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

The proposed action will maintain the beneficial uses of the environment by keeping the land in agricultural use. Benefits include preservation of important agricultural lands for diversified agricultural use and preservation of open space and viewplanes. The farm dwelling component of the proposed action will occupy a very small amount of space within the larger landscape, leaving the agricultural lots for dedicated agricultural production.

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 action is consistent with the Environmental Policies established in HRS, Chapter 343, *State Environmental Policy*, and the National Environmental Policy Act (NEPA).

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

The proposed action will provide short-term employment opportunities during construction. Upon completion, it will increase the supply of public agricultural lots available to small-scale farmers under diversified agricultural leases with the HDOA. The Project supports State policies to preserve important agricultural lands, support diversified agriculture and promote the expansion of the state agricultural park program.

5. Substantially affects public health;

The proposed action is not anticipated to affect public health. During construction, there will be minor impacts to air quality and noise levels. After completion of the construction work, these will be insignificant or undetectable.

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

The proposed action is not anticipated to generate substantial secondary impacts to public facilities or changes to the area's population. HDOA is subject to the HDOE's Leeward O'ahu School Impact Fee for the 24 farm dwellings.

7. Involves a substantial degradation of environmental quality;

The proposed action will maintain the environmental quality by continuing agricultural use of the Property.

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

The proposed action does not commit resources or energy for a larger action. The land use is consistent with agricultural uses on adjoining lands.

9. Substantially effects any rare, threatened or endangered species or its habitat;

The proposed action will not affect rare, threatened or endangered plant or animal species or their habitat.

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

The proposed action is not anticipated to impact air quality, water quality or ambient noise levels. However, there will be short-term impacts to air quality, water quality, and ambient noise levels associated with construction activities. Fugitive dust from earth movement and emissions from construction equipment can impact air quality. Grading, grubbing, and excavation work can impact water quality. Lastly, construction equipment can increase ambient noise levels. All activities will be conducted in compliance with existing governmental regulations.

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 proposed action is not located in an environmentally sensitive area such as a tsunami zone, beach or erosion-prone area, geologically hazardous land, estuary, freshwater or coastal area. All activities will be conducted in compliance with existing governmental regulations.

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

The proposed action will not affect the scenic view corridor located just north of the Property in the Central O'ahu SCP. The open space character will also be preserved through the continuing agriculture use and the clustering of farm dwelling lots along the southeast border of the Property.

13. Requires substantial energy consumption;

The proposed action will not substantially increase energy consumption to support agricultural operations and 24 farm dwellings. There may be short-term increases of energy consumption associated with construction activities.

10.0 Findings

In accordance with the provisions set forth in HRS, Chapter 343 and the significance criteria in HAR, Chapter 11-200-12, this assessment has 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 determined that an Environmental Impact Statement (EIS) will not be required, and that a FONSI be issued for this Project. Page left blank intentionally.

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11.0 References

(Archaeological Consultants of Hawai'i, 1988). *Archaeological Walk-Through Survey of the Proposed Royal Kunia, Phase II.* Prepared by Joseph Kennedy. Prepared for Halekua Development Corporation. November 1988.

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Appendix A

Agronomic Assessment of TMK (1) 9-4-002:080

By Development Strategies, LLC and Lee Ingamells, Agronomist PhD.
August 2009

PRELIMINARY AGRONOMIC ASSESSMENT

OF TMK PARCEL 9-4-002:080

ABSTRACT

This preliminary assessment of the 150-acre TMK parcel 8-4-002:080 is based on the Soil Survey (1972, USDA), knowledge of previous sugarcane production on and around the Parcel by Oahu Sugar, a general understanding of the agricultural industry along Kunia Road, and a site visit on 05 Aug 2009.

Farming in this area of Oahu is markedly "corporate" with large operations run by both seed companies such as Syngenta and major growers of Oahu's produce (identified herein). The Parcel shares all the major soil features that make the Kunia plateau highly productive under irrigation.

Approximately 70% of the Parcel is presently farmed. An idle Southern area has similar farm potential. An unfarmed gully in the Southern part of the Parcel needs to be addressed for its recoverable soil.

While a pending assessment will identify potential crops, optimal use of the Parcel should be refined in conjunction with an overall conservation plan for the Southern Kunia plateau to the East of Kunia Road. This expertise is available to all farms upon registration as a "Cooperator" in the local Soil and Water Conservation District, which would be a condition to proceeding with this recommendation (discussed herein).

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07 Aug 2009 Submitted by:

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LOCATION AND SOIL SURVEY

Kunia encompasses a large productive plateau that has been the subject of preservation efforts for its agricultural value. Parcel 8-4-002:080 at the Southeast portion of the Kunia plateau comprises 150 acres and is located on the Southern perimeter of the greater agricultural area. The Parcel is located on the East side of Kunia Road, two miles North of H-1. Agricultural operations that are presently nearest to the Parcel include the corporate seed farms of Pioneer, Monsanto, and Syngenta, the test-plot fields of the Hawaii Agricultural Research Center, and the cash-crop farms of Alec Sou (Aloun Farms) and Larry Jefts.

Soils contribute significantly to the productive potential of the Kunia fields. These soils are typically very deep, well drained, highly weathered, geographically homogenous, uniformly well structured, easily tilled to practical depths, accommodating of grading for conservation planning, trafficable, and responsive to amendments (organic and chemical). They are also friendly to drip irrigation designs and irrigation schedules.

Under cultivation by Oahu Sugar, the fields in the Southern portion of Kunia consistently produced among the highest sugar yields in the State. Irrigation was an essential part of that productivity and continues today as, perhaps, the single-most defining productivity factor for all growers. Both Waiahole Ditch water and well water were used by Oahu Sugar on the Southern Kunia fields to achieve maximum production.

The Soil Survey shows the composition of the Parcel to be about 10% Wahiawa silty clay (Northwest corner), 80% Lahaina silty clay, and 10% sloping Molokai silty clay loam that forms a gully running from the center of the Parcel to the South boundary (Figure 1).

The Soil Survey (1972 USDA) rated the Wahiawa, Lahaina, and Molokai soil series among the State's most highly productive soils. Although rock-free soils are truly rare, even among Wahiawa and Lahaina soil series, relatively few stones, rocks and boulders in much of the Kunia plateau makes its soils that much easier to cultivate, compared to the soils of similarly large open-field areas.

Observations during the site visit of 05-Aug 2009 support the descriptions above and support the classification of the Parcel among the surrounding agricultural units. No obvious limitations were observed to distinguish the Parcel as potentially less productive than surrounding agricultural parcels. Observations regarding the opportunities and limitations to agriculture on the Parcel are discussed below.

AG CLASSIFICATION AND PRODUCTIVITY RATING

The Wahiawa and Lahaina soils on the Parcel were classified “1” (Prime Agricultural Land) in the Agricultural Lands of Importance to the State of Hawaii, although the limited productivity of the gully was recognized with a lesser classification of “3” (Figure 2). The Land Study Bureau assigned the entire Parcel its highest productivity rating of “A” (on a scale of A to E; Figure 3). Figures 2 and 3 show the continuity of agricultural value among the surrounding parcels, which share the same classification and rating.

ACCESS

The Parcel is not accessible directly from Kunia Road, but from the so-called “Plantation Road” (Figure 4) and via graded (dirt) field roads within the site. The field roads are graded to follow the perimeter of planted areas (Figure 5). Plantation Road is paved and circumnavigates the North, East, and South perimeters of the Parcel. In places, Plantation Road is as far as 1,000 feet from the Parcel to the North, but briefly intersects the Eastern boundary of the Parcel (Figures 1 to 3). North of the Parcel, Plantation Road is well maintained and forms a major crossing with Kunia Road. This crossing is utilized extensively by Syngenta located on the West of Kunia Road and by the cash crop operations located on the East of Kunia Road. Seed farms also access various leased plots on the East side of Kunia Road via this intersection.

The East and South portions of Plantation Road are less well maintained. Field roads to the East, some within the parcel, accommodate various farm vehicles and farm equipment. There is no agricultural activity to the South of the Parcel, where the idle land that will comprise the future Royal Kunia II Project is overgrown and difficult to discern (Figure 6).

PRESENT CONDITION AND USAGE

The Northwest half (about 50%) of the Parcel is presently cultivated by Larry Jefts (Figure 7), who also farms much of the Robinson Estate land to the North of the Parcel. Observations of standing corn during the visit of 05 Aug 2009 suggest that 20 to 30% (in the Northeast end) of the Parcel is under cultivation for seed production. The remaining 20 to 30% of the Parcel along its Southern boundary is idle and overgrown with various weeds that are now desiccated from an absence of rainfall (Figure 8).

Although virtually the entire Parcel is technically endowed with deep soil, the true tillable area is reduced by graded roads and pushed-up berms. Berms are commonly used in open-field farming to serve as barriers to traffic and/or runoff. They are often designed in conjunction with soil and water conservation programs. A major berm separates the idle, Southern 20% of the Parcel from the large field cultivated by Larry Jefts in the Northwestern 50% of the Parcel. The berm extends from Kunia Road through the center of the Parcel to the Northeast in serpentine fashion, and is viewable in GoogleEarth.com (Figure 9). This major berm does not extend into or affect the remaining 30% of the Parcel to the Northeast.

The overgrowth on the idle Southern portion of the Parcel indicates the fertility of the native soil. Such a fallow is undoubtedly improving the soil condition for future farming.

The gully appears not to have been farmed by Oahu Sugar and drains to the South and toward the old airstrip used by the plantation. Information from Oahu Sugar would be helpful to determine whether the gully was incorporated into a conservation or water management plan and if it was used for drainage, or if it was used in other ways. The volume of good soil within the gully should be regarded as a resource to enhance the agricultural potential of the Parcel, and might be transported out of the gully if the gully were to be deemed “not farmable.” Whether the gully itself is farmable could be determined by conservation planning, as discussed below.

TOPOGRAPHY AND DRAINAGE

As shown in the Soil Survey (Figure 1), the Western 70% of the Parcel with its 3 to 7% slope is divided from the Eastern 20% with its 0 to 3% slope by a soil-rich gully of 7 to 15% slope. Natural drainage is into the Parcel from the North, and exits into the non-agricultural developments to the South, which is consistent with the North-to-South slope of the Kunia plateau. The farming activities on and around the Parcel all appear to have conservation plans in place to divert drainage water into the fields and thus capture potential runoff and increase stored soil moisture.

Since the Parcel sits at the lowest elevation on Kunia’s agricultural plateau, conservation planning is crucial both to water conservation during normal rainfall and to runoff protection during the rare high rainfall events. A conservation plan for the Parcel should consider the operations to the North. It is recommended that a conservation plan be prepared by the Natural Resources Conservation Service (NRCS). The expertise and recommendations of NRCS will help to refine optimal utilization of the Parcel for agriculture. To initiate conservation planning by NRCS, the owner (DOA) must be a registered “Cooperator” in the West Oahu Soil and Water Conservation District (SWCD).

DIAGNOSING SOIL FERTILITY

Since the use of the Parcel has diversified since sugarcane was grown, an updated soil sampling effort should be planned to provide future tenants with a diagnostic description of soil fertility. Soil sampling should be done at the start of construction to provide a current characterization of soil fertility that will support amendment recommendations for the cultivation of different crops in various portions of the Parcel.

Figure 1
Soil Survey (1972 USDA)
150-Acre Parcel 9-4-002:080 Boundary in Red

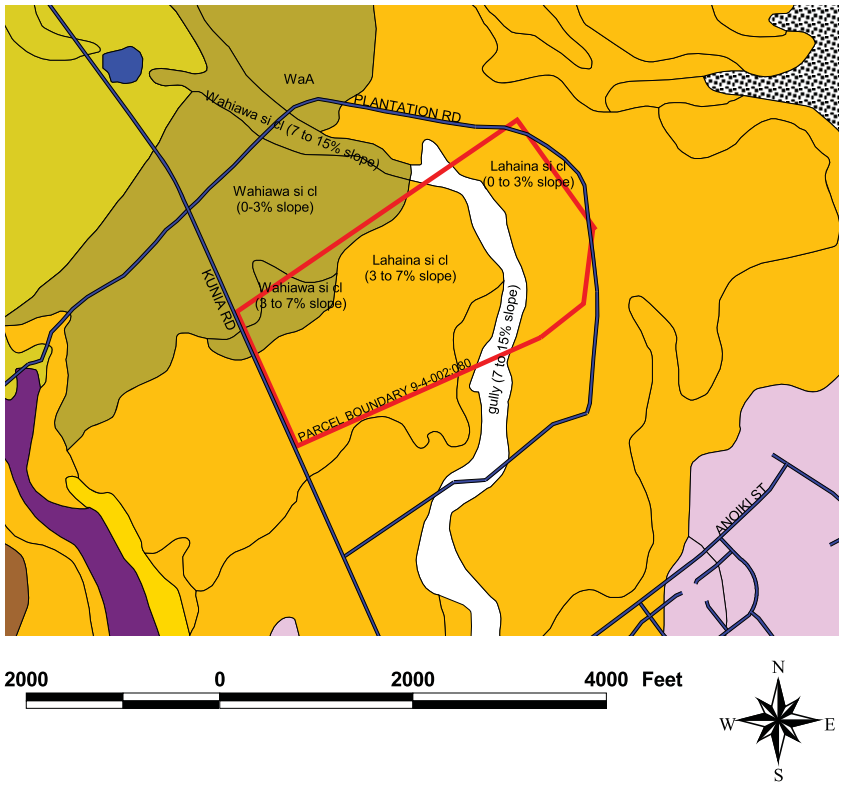

Figure 2
ALISH Classification

Figure 3
Land Study Bureau Rating

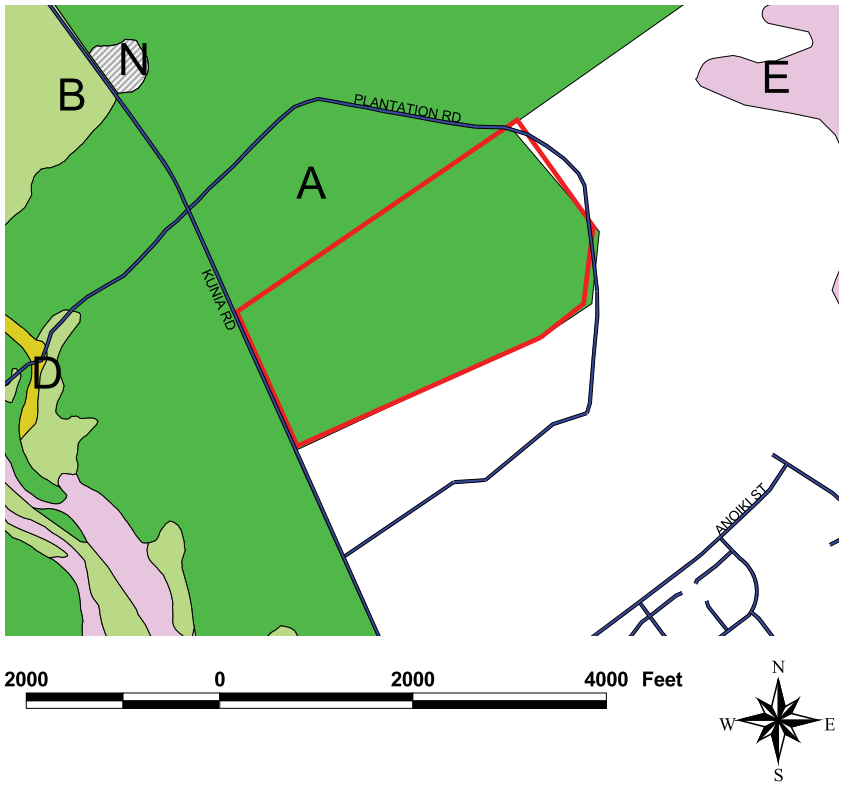

FIGURE 4

LOOKING WEST ALONG “PLANTATION ROAD” 1,000 FT NORTH OF PARCEL

The paved “Plantation Road” crosses Kunia road about 1,000 feet to the North of the Parcel. This road also provides access to Syngenta, one of three major seed companies cultivating large acreages on the West side of Kunia Road, and to a large portion of Larry Jefts’ operations to the North of the Parcel.

FIGURE 5

FIELD ROAD

The corn shown above is presumably seed corn grown by Syngenta in the Eastern portion of the Parcel. Field roads define the perimeter of fields or plots. Portable irrigation pipe, shown on the side of this field road, brings “allocated” water from distant locations.

FIGURE 6

IDLE LAND TO THE SOUTH

South of the Parcel at the intersection of Plantation Road and Kunia Road.

View to the North about 1,000 feet from the Parcel.

FIGURE 7

LARRY JEFTS' MELON FIELD

Larry Jefts' field is presently between crops and the fallow soil bears the marks of harvesting and harrowing. Larry Jefts practices crop rotation and long fallowing between crops. The recent absence of rainfall keeps this particular field weed free and it is a truly clean fallow. Picture shows evidence of harvesting, harrowing, and that the previous crop was melons.

FIGURE 8

IDLE LAND UNDER DESICCATED COVER

This view to the South is from the summit of the berm dividing Larry Jeft's melon field from the idle Southern portion of the Parcel.

FIGURE 9

BERM DIVIDES CULTIVATED FROM IDLE

The berm separating Larry Jefts' field to the Northwest from the idle land to the South serpentines through the Parcel. Modifications to the gully are apparent at the Eastern end of the berm.

Appendix B

Assessment: Non-Potable Water for Irrigation
Kunia Agricultural Park TMK (1) 9-4-002: 080

By Development Strategies, LLC
December 2009

ASSESSMENT

NON-POTABLE WATER FOR IRRIGATION

Kunia Agricultural Park
TMK: (1) 9-4-002:080

Prepared for:

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December 2009

Introduction

On the Island of Oahu, the subdivision of land is subject to the provision of Chapter 22, Revised Ordinances of Honolulu ("ROH"). Chapter 22, ROH, is implemented by the Subdivision Rules and Regulations of the City & County of Honolulu ("Subdivision Rules"). In addition to general provisions relating to the consolidation and subdivision of land, Section 1-115 of the Subdivision Rules stipulates special conditions pertaining to the subdivision of agricultural land. Among these, Section 1-115(a) provides that the subdivision of ag land be subject to a source of non-potable water to support agricultural activities:

> Verification by the Honolulu Board of Water Supply as to the availability of sufficient agricultural quality water to support agricultural use of all lots proposed for subdivision, whether such water is to be supplied by the Board or other water supplier.

RM Towill Corporation ("RMT") provided communications from the Department of Agriculture ("DOA") of the State of Hawaii (State") indicating that the source of non-potable water for the Kunia Agricultural Park ("Ag Park") would be the Waiahole Ditch System ("Waiahole Ditch"). Subsequent discussion with both RMT and DOA confirmed the intent to apply to the State Commission on Water Resource Management ("CWRM") for an allocation of water from the Waiahole Ditch for the Ag Park.

The Waiahole Ditch was constructed in the early 1900s to tap water collected in natural dikes in the Koolau Mountain Range and import the water to support the cultivation of sugarcane in Kunia and Ewa. In recent times, however, importing water from Windward Oahu has been subject to ongoing litigation initiated by farmers in Waiahole and Waikane, since the tapping of dike water reduces the flow of streams and groundwater. A partial settlement reached in the ongoing litigation limits withdrawals of water from the Waiahole Ditch for agricultural operations in Central and West Oahu to 2,500 gallons/acre/day.

Sources of Water for Crop Irrigation

Due to the legal issues surrounding the use of water from the Waiahole Ditch, several resources were interviewed to assess potential sources of ag water for irrigation of the Ag Park and to confirm the availability of water from the Waiahole Ditch. Findings from these interviews are summarized below:

Kunia Wells

In selling their agricultural lands in Kunia, the Estate of James Campbell ("Estate") made provisions to service the fields located to the west of Kunia Road with water from three agricultural wells located in proximity to Kunia Village in Central Oahu ("Kunia Wells"). To assure the long-term availability of ag water, the Estate also formed a private water company made up of the various landowners in the service area to assume ownership, management and maintenance of the Kunia Wells and the related water distribution system.

Two issues that impact the ability to secure water from the Kunia Wells for the Ag Park are:

1. The Ag Park is outside of the service area for the ag wells; and
2. Groundwater from sources in Central Oahu has been shown to contain trace contaminates due to the previous use of pesticides in the area for the cultivation of pineapple.

Based on the foregoing, the Kunia Wells do not appear to be an alternative source of non-potable water for the Ag Park.

Potable Water

The Honolulu Board of Water Supply ("BWS") has potable wells, storage tanks and transmission facilities on the Kunia plateau. A major transmission main is located in the right-of-way for Kunia Road which runs along the western border of the Ag Park. However, BWS prioritizes the use of potable water for domestic service and typically does not approve allocations for agricultural activities, particularly where there are non-potable water sources available within reasonable proximity.

An additional consideration is that potable water is relatively expensive for irrigation use. At the bulk rates for agriculture, the cost of BWS water ranges from $1.33 to $2.66 per 1,000 gallons. From the perspective on economic viability, potable water is too costly for the irrigation of diversified crops by small farmers. Given the foregoing, BWS water is not a viable source for the Ag Park.

Waiahole Ditch

Information received from several sources indicates that the Waiahole Ditch is the most viable source of non-potable water for the Ag Park from the standpoint of proximity and cost. However, recognition must be given to the fact that any application for water from the Waiahole Ditch will be subject to a challenge by the Waiahole-Waikane farmers. At this point, allocations from the partial settlement on the Waiahole Ditch litigation have been made to the various parcels and parties involved in the legal proceedings. The Ag Park was not a party to the settlement.

The Decision and Order ("D&O") covering the partial settlement (one of several issued over the years) also sets-aside an unallocated reserve of 1.5 million gallons/day to support unidentified, future agricultural requirements. The application for a Water Use Permit by Fat Law's Farms is for approximately 1.2 million gallons per day based upon 329 acres in cultivation. The case for Fat Law's Farms is likely to be impacted by the fact that Parcel 8 is included in the service area for the Kunia Wells. CWRM has held several hearings on the application, with the final hearing scheduled for December 18, 2009. The CRWM staff anticipates taking a recommendation to the Commission in early 2010.

Recapture of Unused Allocations

The CWRM staff has indicated that they are currently stepping up monitoring and review of previously issued Water Use Permits. There are several indications of consistent under utilization of the allocated water (i.e., possible over allocation), which may lead to recapture of the unused portion that might become a resource for reallocation to active use.

Considerations for service from Waiahole Ditch

There are several unresolved issues relating to the fact that the reservoir for the Waiahole Ditch is located about ¼-mile north (up-gradient) from the Ag Park site. The intervening land is owned by the Robinson Estate and the ability of the DOA to eventually convey water over/under/across the Robinson property needs to be perfected. In this regard, the following items need to be addressed:

Lack of Easement – No easement exists across the Robinson land between the reservoir and the boundary of the project site. In the past, there was a single landowner and a single lessee (Oahu Sugar Company), so no easement was designated. Today, however, fee ownership is held by different entities and there is no assurance that the Robinson Estate will not eventually sell off all, or portions of, their landholdings in Kunia. Accordingly, negotiations for a waterline easement should be initiated between the parties, so that the necessary cadastral and legal documentation can be put in place. Since the developer of

the Royal Kunia II master planned community is responsible for the delivery of the off-site infrastructure for the Ag Park, coordination with Stanford Carr Development ("SCD") will also be required to set the alignment of the easement.

Off-Site Water Transmission Main – The Agribusiness Development Corporation ("ADC"), the successor to the Campbell Estate in regard to management of the Waiahole Ditch, indicates that an old Oahu Sugar pipeline extends from the reservoir to the Ag Park site. The main previously supplied water to the site and other parcels located further down-gradient for the cultivation of sugar cane.

The existing pipeline is dilapidated and in poor condition. ADC recommends that a new main be constructed rather than attempting to rehab the existing pipe. In addition, the new main should be dedicated exclusively to servicing the Ag Park. ADC has other growers that currently jointly use other old pipelines extending out from the reservoir. However, this arrangement causes continual issues in terms of: a) maintaining the continuity of water service due to withdrawals by up-stream users and 2) the difficult in fixing responsibility for repairs to the distribution system.

With respect to the need to move forward on the ability to deliver water to the site, a cursory discussion with SCD indicated that the master plan for a PDH Permit (Planned Development Housing) for Royal Kunia II had been undergoing review by the City's Department of Planning & Permitting and just received City approval. The approved master plan revises a portion of the layout previously submitted and Park Engineering is in the process of revising the utility master plans to reflect the modified layout. Once the updated utility master plans have been completed, copies of the new master plan will be submitted to DOA for review.

The updated utility master plans will indicate the off-site utility connections to be provided for the Ag Park. Note, however, that SCD indicated minimal progress has been made with respect to the off-site improvements for non-potable water for the Ag Park and the potential for Royal Kunia II to use water from the Waiahole Ditch to irrigate landscaping.

Water Users Coop – ADC indicates that at such time as DOA secures an allocation for the Ag Park, they would work to bring DOA on board a member of the Kunia Water Users Coop (the Waiahole Ditch). ADC highly recommends that DOA, as the master lessor, be the user of record for the coop as this would provide the Ag Park with water at a very favorable rate. As a member of the coop, DOA would also have a seat on the governing board. Within the Ag Park, DOA could administer reallocations of water to individual lessees and billings for water consumption by individual farms would be handled as part of day-to-day operations.

Irrigation Water Projection

Discussions with the CWRM staff in regard to the 2,500 gallons/acre/day limitation on water withdrawal from the Waiahole Ditch confirmed that this would be monitored on the basis of a moving annual average, as this takes into account the seasonality of rainfall. In addition, staff also indicated that the 2,500 gallons/acre/day is viewed as a guideline - an application for a Water Use Permit would be reviewed within the larger context of a pan evaporation analysis. In addition to precipitation, this would factor in the net acres to be cultivated, specific crops and method of irrigation. Data submitted by the applicant would be compared with data generated by a computer model developed for CWRM by the College of Tropical Agriculture and Human Resources at the University of Hawaii at Manoa ("CATHR").

In discussing the projection of water demand for the irrigation of crops, staff indicated that the pan evaporation data provided by Fat Law's Farms for Parcel 8 was consistent with the results from the CATHR model. While the eventual mix of crops, net average to be cultivated and methods of irrigation are not precisely known at this very early stage of the Ag Park, the analysis attached as Exhibit A is based upon the pan evaporation (R-74)/rainfall (R-76) data and methodology used by AgTech Hawaii for Fat Law's Farms.

In preparing the analysis, an average Crop Factor of 0.95 was used based on the mix of crops proposed for Fat Law's Farms. The average Crop Factor was calculated based upon a straight average and a weighted average incorporating estimates of the cultivatable area. An average 0.95 crop factor was consistent for both computations. The adjustment for irrigation method assumed a combination of drip and micro-sprinkler, which produced an average efficiency of 85%. Based on the foregoing *assumptions*, a preliminary estimate of water demand is a 12 month average of 3,700 gallons/acre/day or 422,000 gallons/day based on 114 net acres in cultivation.

It is recognized that further adjustments will be required as the cultivatable area and crop mix are refined. However, the attached water demand projection provides a reasonable estimate at this preliminary point in time.

Conclusion

The foregoing assessment indicates that the Kunia Wells are not viable as a source of water for the irrigation of the Ag Park based upon location of the site outside of the service area for the private water company. While the BWS has a potable water main that runs along the western border of the project site, domestic use is a priority for potable water and the BWS bulk agricultural rates are too expensive to support small scale, diversified agriculture.

Conclusion: The Waiahole Ditch is the only viable source of agricultural water for the Ag Park. At the same time, the availability of water from this source is subject to addressing the following items:

1. Securing a Water Use Permit from CWRM;
2. Obtaining necessary easements from the Robinson Estate; and
3. Arranging for timely construction of the off-site non-potable water main from the reservoir to the project site.

Of the foregoing, the legal issues that surround securing a water allocation appear to be the most daunting and time consuming. However, the foregoing items are attainable and the project is at a stage that provides time for all three issues to be resolved in tandem.

Appendix C

Traffic Assessment Report
Kunia Agricultural Park
By Julian Ng Incorporated
November 2012

Traffic Assessment Report
Kunia Agricultural Park

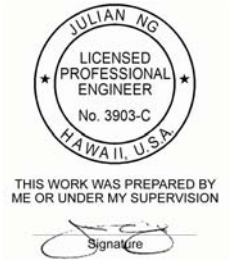
Waipahu, Oahu, Hawaii

Prepared for:

State of Hawaii
Department of Agriculture

and

R. M. Towill Corporation



Expiration Date: 4/30/2014

Prepared by:

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November 2012

Traffic Assessment Report
Kunia Agricultural Park
Waipahu, Oahu, Hawaii

Table of Contents

Traffic Assessment Report
Kunia Agricultural Park
Waipahu, Oahu, Hawaii

November 2012

Summary

This traffic assessment report was prepared to identify the potential impacts of an agricultural park that includes cluster homes planned on a(n approximately) 150-acre parcel north of the Royal Kunia development site in Waipahu, Oahu (identified by Tax Map Key 9-4-002:080). The project traffic has been assumed to all use a new access road that connects directly to Kunia Road, an existing two-lane State highway that connects Waipahu with Wahiawa in Central Oahu. Traffic generated by the proposed project would increase the existing traffic volumes on Kunia Road by 0.4% in the AM Peak Hour and 2.5% in the PM Peak Hour, under worst-case assumptions that all of the project traffic will be destined for or originate from areas to the south. Distribution of traffic both north and south would reduce the traffic impact.

Analyses of the intersection created by the site access road were used to determine the need for auxiliary lanes on Kunia Road. The analyses found that, while a southbound left turn lane is not warranted, a median refuge lane for left turns onto Kunia Road will mitigate very long delays for that movement and should be part of the intersection improvements.

Introduction

The State of Hawaii Department of Agriculture is preparing plans to create an agricultural subdivision on a site located adjacent to the Royal Kunia residential subdivision north of Waipahu. The site fronts on Kunia Road, a two-lane arterial highway under the jurisdiction of the State of Hawaii Department of Transportation Highways Division, but but there is currently no direct access to Kunia Road. Figure 1 shows the project location.

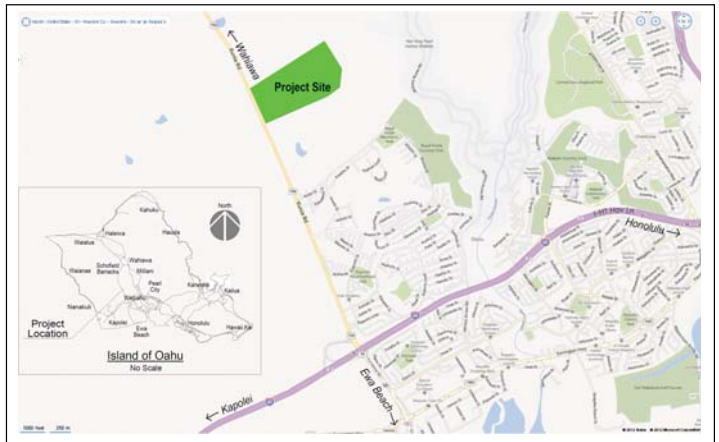


Figure 1 – Location Map

Current agricultural use of the site is served by a plantation road that loops around the site intersects with Kunia Road at unsignalized intersections located approximately 1,100 feet north of, and 1,400 feet south of, the project boundaries.

Background Information

Traffic studies for development projects are generally performed to determine traffic impacts and identify necessary roadway improvements to support the proposed action. The study would typically consider the weekday peak hours, when traffic on the adjacent roadways are the highest. The analyses will include existing conditions, projected future conditions without the project (if there is reason to believe that traffic volumes will increase), and future conditions with the project. Some projects may have higher traffic impacts at other times, and in those cases, traffic conditions in additional peak hours would be considered.

Several criteria to determine when a traffic study should be conducted have been suggested. The Institute of Transportation Engineers, an international professional association, has suggested a threshold of 100 added vehicle trips in a peak hour as the basis for conducting a traffic study "in lieu of another locally preferred guideline."[1]

The State of Hawaii Department of Transportation developed a proposed guideline[2] for Traffic Impact Reports (TIRs) that states that if "the TIR does not meet the trigger (minimum) for completing the analysis, it is in everyone's best interest to scale the effort appropriately before resources are wasted." It further states that actions

> *that generate relatively low number of trips, and are not expected to significantly increase or alter traffic generation or distribution may be documented with a Traffic Impact Assessment (TIA) memorandum. The memorandum would include a description of the project, the surrounding transportation system including any potential impacts, and also include some analyses regarding trips generated by the project. … Developments consisting of 100 or fewer trips during an hour and/or 500 or fewer daily trips, should prepare a Traffic Impact Assessment memorandum.*

Adoption of the proposed guideline has not yet occurred, and in the interim, the Highways Division has indicated that a 3% increase in peak hour traffic volumes would be considered significant and would require a traffic study. As described in the following sections, the proposed project will generate fewer than 100 hourly trips and this report is intended to meet the guidelines for a traffic assessment.

[1] Institute of Transportation Engineers, *Transportation Impact Analyses for Site Development,* Washington, D.C., 2005. Table 2-1

[2] State of Hawaii Department of Transportation, Highways Division. *Best Practices for Traffic Impact Reports,* May 2011 (not yet adopted).

Traffic engineers use the "Level of Service" concept to describe traffic operating conditions. Six Levels of Service ranging from "A" representing free flow and very little delay to "F" describing congested over-capacity conditions and very long delays. Levels of Service for intersections are based on average delays per vehicle, which are computed from capacities and other operating characteristics, using the methods described in the *Highway Capacity Manual*[3]. The table below summarizes the criteria for Levels of Service

Average Delay (seconds per vehicle) Unsignalized Intersections	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

For peak hour conditions, Level of Service D or better are considered acceptable.

[3] Transportation Research Board, National Research Council, *Highway Capacity Manual,* Washington, D.C. 2000.

Existing Traffic Conditions

Kunia Road is an arterial roadway designated Route 750 under the jurisdiction of the State of Hawaii Department of Transportation. The highway connects Waipahu to the south with Wahiawa to the north, paralleling other State highways located to the east (Kamehameha Highway and Interstate Route H-2). Kunia Road south of the project site has been widened as part of the residential developments in the abutting Village Park and Royal Kunia subdivisions, but along the project frontage, is the primary roadway a two-lane undivided highway. Posted speed limit on the widened portion to the south is 35 miles per hour and in most of the two-lane portion, the posted speed limit is 45 miles per hour.

The State of Hawaii Department of Transportation conducts a traffic counting program and publishes summaries of the count data. The latest available data for the count station on Kunia Road opposite Waiahole reservoir (approximately 0.5 mile north of the project site) is from a 48-hour machine count taken October 13-14, 2009. A total volume of 30,510 vehicles was counted over the two weekdays for an average two-way volume of 15,255 vehicles per day. Peak hours (highest total volumes) were recorded 6:30 AM to 7:30 AM ("AM Peak Hour") and 3:30 PM to 4:30 PM ("PM Peak Hour"). Summaries of data for the two most recent counts by direction of travel are shown in Table 1.

Table 1 – Traffic Counts on Kunia Road

Volumes on Kunia Road	First day		Second day	
	southbound	northbound	southbound	northbound
Feb. 28-March 1, 2007	6,572	6,971	1,518*	7,025**
AM Peak Hour	370	1,049	339	1,117
PM Peak Hour	812	402	0*	381
October 13-14, 2009	7,377	7,575	7,735	7,823
AM Peak Hour	382	1,012	374	1,013
PM Peak Hour	890	427	897	501

Source: State of Hawaii Department of Transportation, Highways Division. *Traffic Survey Data.*

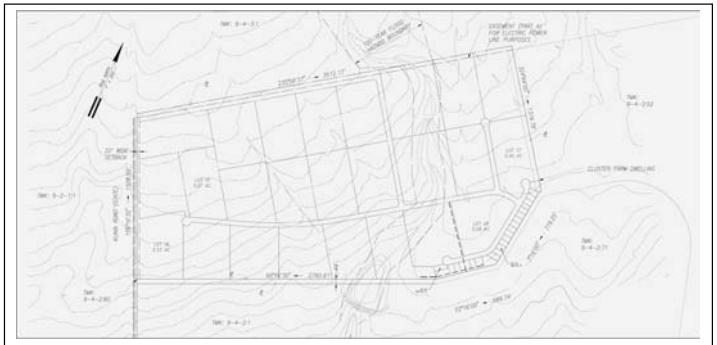
* apparent tube malfunction occurred about 10:15 AM March 1, 2007

** last 15-minute period (11:45PM-midnight) not included in 2007 report

There is no public bus service along Kunia Road fronting the project site. The nearest local bus service is provided by Route 434, which travels on Kupuna Loop in the Village Park (approximately 2½ miles from the site). Express buses operate limited service during weekday commute times and are routed on Anonui Street in Royal Kunia, approximately 2 miles fro the site).

Project Traffic Generation and Impact

The proposed project is an agricultural subdivision to create up to 26 small (approximately 5-acre) lots to lease to tenant farmers for diversified agriculture. Each agricultural lot lease will also include use of one dwelling unit that will be located in a residential cluster within the project site. A preliminary site plan is shown as Figure 2.



Source: R. M. Towill Corporation

Figure 2 – Preliminary Site Plan

Project traffic has been estimated using trip rates from the current version of *Trip Generation Manual,* published by the Institute of Transportation Engineers, a widely-used and accepted reference manual. The rates are based on surveys of existing properties with similar land uses and represent vehicular trips at a site driveway.

The dwellings will be used by lessees who will work within the project site, but there will also be traffic generated by other family members, and these trips are accounted for by applying rates for detached dwellings to the 26 homes that are proposed within the site. Because trip rates for agricultural use are not listed in the manual, rates for a similar use were applied to obtain estimates of the upper range of the traffic that could be generated by the agricultural use. The rates for Nursery (Wholesale) {Land Use category 590} were used; this land use is described as follows:

> *A wholesale nursery is a free-standing building with an outside storage area for planting or landscape stock. The nurseries surveyed primarily serve contractors and suppliers. Some have large greenhouses and offer landscaping services.* [4]

[4] Institute of Transportation Engineers, *Trip Generation Manual, 9th Edition,* Washington, D.C. 2012. p. 1531

The home-to-work trip by the principal lessees (and the reverse) would occur within the project site, between the housing area and the agricultural lot. These internal trips, counted both at the origin and destination, are deducted from the total "driveway" trips to derive estimates of the net traffic generated by the entire site. Table 2 shows the trip rates and summarizes the trip generation computations.

Table 2 – Project Traffic Generation

	AM Peak Hour		PM Peak Hour	
Trip rates applied (Source: ITE, *Trip Generation Manual, 9th Edition)*	**Trip rate**	**% enter**	**Trip rate**	**% enter**
Dwelling trip factors (per unit)	0.75	25%	1.00	63%
Nursery trip factors (per acre)	0.26	n.a.	0.45	n.a.
Project traffic generated (vehicles per hour)	**enter**	**exit**	**enter**	**exit**
26 dwelling units ("project impact"*)	5	15	16	10
Internal to site (1/3 of peak direction)	0	(5)	(5)	0
140 acres, agricultural use	33	4	6	57
Internal to site (from above)	(5)	0	0	(5)
Net traffic generated – for use in evaluating proposed connection	**33**	**14**	**17**	**62**
* See text below for discussion				

The net project impact would be due to the traffic generated by the additional 26 dwelling units in the area; the acreage that will be in agricultural use is already in agricultural use. However, for the purpose of analyzing the new highway connection, the new agricultural use is assumed to generate some off-site traffic during peak hours (e.g., due to material deliveries, employees that live off-site, or service calls).

As shown in Table 2, the project is not expected to have significant traffic impacts, as the added traffic to the highway (20 vehicles per hour in the AM Peak Hour and 26 vehicles per hour in the PM Peak Hour) will be less than 100 vehicles per hour (further, the project impacts are expected both north and south of the site, thereby splitting the added traffic). The impacts to traffic volumes are 1.4% of the existing AM Peak Hour volume and 1.9% of the existing PM Peak Hour volumes, which are less than the 3% of existing traffic criteria for significant impact to traffic conditions.

Conditions at Proposed Connection to Kunia Road

The agricultural activities at the proposed project will primarily be small farms raising diversified crops. An agricultural study[5] for the project listed possible crops, among them lettuce, ong choi, bitter melon, various herbs, long beans, eggplant, taro, and various fruits. Expected traffic from these activities will consist primarily of small pickup trucks and single-unit trucks, and traffic in and out of the site will include residential traffic. However, larger vehicles may also require access; the intersection should be designed to accommodate vehicles as large as school buses and 30-foot single unit trucks.

Peak Hour traffic conditions at the proposed connection to Kunia Road were evaluated for peak hour volumes that are comprised of the net project traffic making turns in or out of the site access road, and through movements on Kunia Road equal to volumes 15% higher than the average peak hour volumes counted in 2009. This increase would be consistent with future traffic volumes for the year 2024, at an average annual increase in volume of 0.93%.[6]

Figure 4 shows the turning movements at the intersection of the site access road and Kunia Road with an estimated 10% of the net site traffic arriving from or destined to the north. Table 3 shows the results of the intersection analyses for each peak hour.

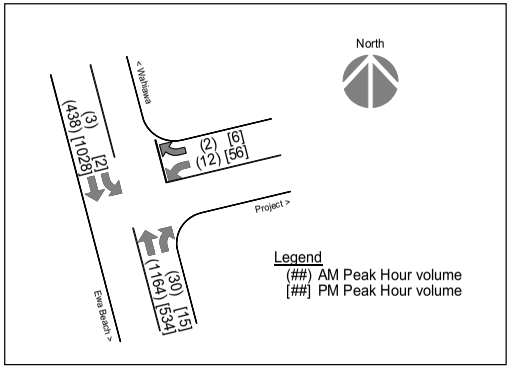


Figure 4 – 2024 Peak Hour Traffic

[5] Development Strategies, LLC. *Assessment: Non-Potable for Irrigation, Kunia Agricultural Park.*

[6] The projected increase in travel demand between 2007 and 2035 across the "Waipahu" screen line (an east-west line located north of the H-1 Freeway, stretching across Kunia Road, Kamehameha Highway, and the H-2 Freeway) would be 29.7%, according to forecasts made in the Oahu Regional Transportation Plan for 2035 {*ORTP 2035 Technical Report,* April 2011. Table 3-12}; an average increase of 0.93% per year would achieve the nearly 30% increase over 28 years.

The higher peak hour volume of 62 vehicles wishing to enter the main road is less than the 75 vehicles per hour that is needed on a minor-street approach to satisfy the one-hour warrant for the installation of traffic signals at the proposed connection. The peak hour volumes also indicate that the minimum volume of 60 vehicles per hour for each of four hours of a typical day that will be needed to satisfy the four-hour warrant, or 53 vehicles per hour for each of eight hours of a typical day, will also not be met. The proposed connection, therefore, will be an unsignalized intersection.

Unsignalized intersections require that traffic approaching on the minor street (in this case, the project access road) stop before entering or crossing the major street (Kunia Road). Stop signs should be installed and adequate sight distance provided to allow for safe entry into the major street traffic stream.

Table 3 – Results of Unsignalized Intersection Analyses
Site Access Road at Kunia Road – 2024 with Project

	AM Peak Hour	PM Peak Hour
Left Turns from Kunia Road		
Utilization (volume/capacity)	0.01	0.00
Average Delay per vehicle (seconds)	12.3	8.9
Level of Service	B	A
Shared Lane to undivided Kunia Road		
Utilization (volume/capacity)	0.17	0.70
Average Delay per vehicle (seconds)	53.5	102.3
Level of Service	F	F
Shared Lane to Kunia Road with median refuge lane		
Utilization (volume/capacity)	0.08	0.31
Average Delay per vehicle (seconds)	26.0	28.7
Level of Service	D	D

In addition, the analyses showedthe probability that a southbound through vehicle will not be impeded by (i.e., have to slow or stop behind) a vehicle waiting to make the left turn into the project road are greater than 98.5% in each peak hour. These probabilities compare with the threshold of (less than 98%) that had been proposed as a guideline[7] for considering a separate left turn lane on a two-lane highway with a posted speed limit of 45 miles per hour.

[7] This criteria was proposed in a research paper (M. D. Harmelink, "Volume Warrants for Left-Turn Storage Lanes at Unsignalized Grade Intersections," *Highway Research Record 211*, 1967) that provides the basis for Table 9-23 of *A Policy on Geometric Design of Highways and Streets* 6th Edition, 2011, by American Association of State Highway and Transportation Officials'.

The analyses, however, showed that left turns from the project access road onto an undivided Kunia Road would experience very long delays and have poor level of service. Provision of a refuge lane, which would allow for left turns to be made in two steps, would reduce the delays to acceptable levels. A median left turn refuge area should be provided (an appropriate acceleration distance based on roadway grade and available sight distance would be determined during the design of the intersection).

If a median lane is provided for the refuge lane, it should be extended north to provide a separate left turn lane for southbound traffic, even if such a lane is not warranted by the projected entering traffic volumes. The left turn lane should have a storage length for two vehicles, one of which is a truck, or a minimum storage length of 60 feet (40' + 5' + 15', which allows for 5 feet between the two queued vehicles). Adequate deceleration length should also be provided.

Conclusions and Recommendations

The hourly impacts of the proposed Kunia Agricultural Park to traffic volumes on Kunia Road have been estimated to be less than 100 vehicles per hour and less than 3% of existing peak hour volumes. The impact, therefore, is considered not significant.

The project will construct a new roadway for vehicular access. The new intersection formed by the roadway and Kunia Road was evaluated to determine appropriate intersection improvements. Traffic signals will not be warranted due to the low volume of traffic; "Stop" sign control is needed for traffic on the access road before those vehicles enter Kunia Road. The intersection should also be provided with a median refuge lane to minimize delays to, and assist drivers in making the left turns onto Kunia Road.

APPENDIX

LEVEL OF SERVICE CALCULATIONS

(4 PAGES OF
TWO-WAY STOP CONTROL SUMMARY SHEETS
FOLLOWS)

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	*JN*	Intersection	
Agency/Co.	*Julian Ng Incorporated*	Jurisdiction	*HDOT HWY*
Date Performed	*12/2/2012*	Analysis Year	*2024*
Analysis Time Period	*AM Peak Hour*		
Project Description	*Kunia Agricultural Park*		
East/West Street:	*Kunia Ag Park*	North/South Street:	*Kunia Road (SR750)*
Intersection Orientation:	*North-South*	Study Period (hrs):	*0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	*0*	*1164*	*30*	*3*	*438*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*0*	*1293*	*33*	*3*	*486*	*0*
Percent Heavy Vehicles	*0*	--	--	*10*	--	--
Median Type	*Undivided*					
RT Channelized			*0*			*0*
Lanes	*0*	*1*	*0*	*0*	*1*	*0*
Configuration			*TR*	*LT*		
Upstream Signal		*0*			*0*	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	*12*	*0*	*2*	*0*	*0*	*0*
Peak-Hour Factor, PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Hourly Flow Rate, HFR	*13*	*0*	*2*	*0*	*0*	*0*
Percent Heavy Vehicles	*10*	*0*	*10*	*0*	*0*	*0*
Percent Grade (%)		*3*			*0*	
Flared Approach		*N*			*N*	
Storage		*0*			*0*	
RT Channelized			*0*			*0*
Lanes	*0*	*0*	*0*	*0*	*0*	*0*
Configuration		*LR*				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		*LT*		*LR*				
v (vph)		*3*		*15*				
C (m) (vph)		*495*		*89*				
v/c		*0.01*		*0.17*				
95% queue length		*0.02*		*0.57*				
Control Delay		*12.3*		*53.5*				
LOS		*B*		*F*				
Approach Delay	--	--	*53.5*					
Approach LOS	--	--	*F*					

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	JN	Intersection	
Agency/Co.	Julian Ng Incorporated	Jurisdiction	HDOT HWY
Date Performed	12/2/2012	Analysis Year	2024
Analysis Time Period	AM Peak Hour		
Project Description	Kunia Agricultural Park		
East/West Street:	Kunia Ag Park	North/South Street:	Kunia Road (SR750)
Intersection Orientation:	North-South	Study Period (hrs):	0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	1164	30	3	438	0
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	0	1293	33	3	486	0
Percent Heavy Vehicles	0	--	--	10	--	--
Median Type	Two Way Left Turn Lane					
RT Channelized			0			0
Lanes	0	1	0	0	1	0
Configuration			TR	LT		
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	12	0	2	0	0	0
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	13	0	2	0	0	0
Percent Heavy Vehicles	10	0	10	0	0	0
Percent Grade (%)		3			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	0	0	0
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		LT		LR				
v (vph)		3		15				
C (m) (vph)		495		186				
v/c		0.01		0.08				
95% queue length		0.02		0.26				
Control Delay		12.3		26.0				
LOS		B		D				
Approach Delay	--	--	26.0					
Approach LOS	--	--	D					

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	JN	Intersection	
Agency/Co.	Julian Ng Incorporated	Jurisdiction	HDOT HWY
Date Performed	12/2/2012	Analysis Year	2024
Analysis Time Period	PM Peak Hour		
Project Description	Kunia Agricultural Park		
East/West Street:	Kunia Ag Park	North/South Street:	Kunia Road (SR750)
Intersection Orientation:	North-South	Study Period (hrs):	0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	534	15	2	1028	0
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	0	593	16	2	1142	0
Percent Heavy Vehicles	0	--	--	10	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	0	0	1	0
Configuration			TR	LT		
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	56	0	6	0	0	0
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	62	0	6	0	0	0
Percent Heavy Vehicles	10	0	10	0	0	0
Percent Grade (%)		3			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	0	0	0
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		LT		LR				
v (vph)		2		68				
C (m) (vph)		932		97				
v/c		0.00		0.70				
95% queue length		0.01		3.55				
Control Delay		8.9		102.3				
LOS		A		F				
Approach Delay	--	--	102.3					
Approach LOS	--	--	F					

Appendix D

Draft Archaeological Inventory Survey Report for the Kunia Agricultural Park Project

By Cultural Surveys Hawai'i, Inc.
January 2015

Draft

Archaeological Inventory Survey Report for the Kunia Agricultural Park Project Hōʻaeʻae Ahupuaʻa, ʻEwa District, Oʻahu TMK: [1] 9-4-002:080

Prepared for
R.M. Towill Corporation

Prepared by
Richard Stark, Ph.D.,
David W. Shideler, M.A.,
and
Hallett H. Hammatt, Ph.D.

Cultural Surveys Hawaiʻi, Inc.
Kailua, Hawaiʻi
(Job Code: HOAEAE 1)

January 2015

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Management Summary

Reference	Archaeological Inventory Survey Report for the Kunia Agricultural Park Project, Hōʻaeʻae Ahupuaʻa, ʻEwa District, Oʻahu TMK: [1] 9-4-002:080 (Stark et al. 2014)
Date	January 2015
Project Number(s)	Cultural Surveys Hawaiʻi, Inc. (CSH) Job Code: HOAEAE 1
Investigation Permit Number	CSH completed the archaeological inventory survey (AIS) fieldwork under archaeological permit numbers 14-04 and 15-03, issued by the Hawaiʻi State Historic Preservation Division (SHPD) per Hawaiʻi Administrative Rules (HAR) §13-13-282.
Agencies	State Historic Preservation Department (SHPD)
Land Jurisdiction	Hawaiʻi State Department of Agriculture
Project Proponent	R.M. Towill Corporation
Project Funding	Hawaiʻi State Department of Agriculture
Project Location	The project area is located immediately to the east of Kunia Road, surrounded by large agricultural lots managed by Waileke Farms, with the Royal Kunia residential community to the south and Kupehau Road to the north. The project area is depicted on a portion of the 1998 Schofield Barracks and 1998 Waipahu U.S. Geological Survey (USGS) 7.5-minute topographic quadrangles.
Project Description	The proposed development of the project area for the Kunia Agricultural Park includes slope-grading to create spaces for small farms with associated dwellings on lands that have been used for agricultural purposes for at least 100 years, excavation for the development of this project focusing on preparing internal roads, utilities, field infrastructure, and dwelling locations.
Project Acreage	The project area includes 150 acres (60.7 hectares).
Area of Potential Effect (APE)	The APE is defined as the entire 150-acre (60.7-hectare) project area.
Historic Preservation Regulatory Context	The project is subject to compliance with and review under Hawaiʻi historic preservation review legislation, Hawaiʻi Revised Statutes (HRS) §6E-8, HAR §13-13-275, as well as the project's environmental review under HRS §343. In consultation with the SHPD, this AIS report was prepared to fulfill the requirements of HAR §13-13-276 and evaluation and assessment of significance[1] for any cultural resources/historic properties[2] and is intended for review and acceptance by the SHPD. This report is also intended to support any project-related historic preservation consultation with stakeholders, such as State and County

Historic Preservation Regulatory Context (continued)	agencies and interested Native Hawaiian Organizations (NHOs) and community groups, if applicable.
Fieldwork Effort	Fieldwork was accomplished between 3 December 2014 and 12 December 2014 by CSH archaeologists Scott Belluomini, B.A., Layne Krause, B.A., Aaron Chang, B.A., Mica Cook, B.A., Estevan Gutierrez, B.A., and Richard Stark, Ph.D. under the general supervision of David Shideler, M.A. (project manager), and Hallett Hammatt, Ph.D. (principal investigator). This work required approximately 15 person-days to complete. In general, fieldwork included 100% pedestrian inspection of the project area, GPS data collection, and subsurface testing.
Historic Property Identified	State Inventory of Historic Properties (SIHP) # 50-80-08-7758 consists of five features of one site pertaining to agricultural activity, specifically related to the Oahu Sugar Company. Each feature (1–5) represents an activity area relating to contemporaneous agricultural activity. Feature 1 is a retaining wall (linear). Feature 2 and Feature 3 are portions of a historic irrigation ditch (linear). Feature 4 is the structural remnant of a headworks feature connecting Feature 2 and Feature 3. Feature 5 is a historic lithic workshop relating to the production of faced basalt boulders observed in Features 1–4.
Historic Property Significance	CSH recommends that SIHP # -7758 be considered significant under State of Hawai‘i historic property significance criteria “d” only (Has yielded, or may be likely to yield, information important in prehistory or history) per HAR §13-275-6. That said, the archaeological investigation conducted herein serves to mitigate this significance.
Effect Recommendation	In accordance with Hawai‘i State historic preservation review legislation, HAR §13-13-275-7, the project’s effect recommendation is “no historic property affected.” CSH observed no evidence of traditional Hawaiian culture and documented five historic properties relating primarily to water control within the agricultural complex of the Oahu Sugar Company. No adverse effect and no further archaeological work is recommended for these cultural resources. These significance recommendations are included in this AISR for the review and concurrence of the SHPD.
Mitigation Recommendations	No further historic preservation work is recommended for SIHP # -7758. It has been determined that the cultural resources documented here are not part of the main Waiāhole Ditch system, but were built at approximately the same time and for similar purposes of Oahu Sugar Company infrastructure. Sufficient information regarding the location, extent, function, and age of these historic properties has been obtained during the current archaeological inventory survey undertaken to mitigate any adverse effect caused by proposed development activities. The detailed documentation of the historic properties is recommended

Mitigation Recommendations (continued)	to be sufficient to satisfy the requirements to mitigate any adverse effect caused by the proposed development activities within the project area. However, if additional construction is anticipated outside the project area, CSH recommends AIS level documentation of any additional components of SIHP # -7758.

[1]In historic preservation parlance, cultural resources are the physical remains and/or geographic locations that reflect the activity, heritage, and/or beliefs of ethnic groups, local communities, states, and/or nations. Generally, they are at least 50 years old (although there are exceptions) and include buildings and structures; groupings of buildings or structures (historic districts); certain objects; archaeological artifacts, features, sites, and/or deposits; groupings of archaeological sites (archaeological districts); and, in some instances, natural landscape features and/or geographic locations of cultural significance.

Under Hawai‘i State historic preservation legislation, historic properties are defined as any cultural resources that are 50 years old, regardless of their historic/cultural significance under State law, and a project’s effect and potential mitigation measures are evaluated based on the project’s potential impact to “significant” historic properties (those historic properties evaluated significant under the five State of Hawai‘i historic property significance criteria).

[2]Historic property significance is evaluated and assessed based on the five Hawai‘i state historic property significance criteria. A cultural resource should possess integrity of location, design, setting, materials, workmanship, feeling, and/or association and meet one or more of the following broad cultural/historic significance criteria: “a” reflects major trends or events in the history of the state; “b” is associated with the lives of persons significant in our past; “c” is an excellent example of a site type/work of a master; “d” has yielded or may be likely to yield information important in prehistory or history; and “e” has traditional cultural significance to an ethnic group (includes religious structures, burials, and traditional cultural properties).

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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) has prepared this archaeological inventory survey report (AISR) for the Kunia Agricultural Park Project, Hō‘ae‘ae Ahupua‘a, ‘Ewa District, O‘ahu TMK: [1]9-4-002:080. The project area is located immediately to the east of Kunia Road, surrounded by large agricultural lots managed by Waileke Farms, with the Royal Kunia residential community to the south and Kupehau Road to the north. The 150-acre project is depicted on a portion of the 1998 Schofield and Waipahu U.S. Geological Survey (USGS) 7.5-minute topographic quadrangles (Figure 1), a tax map plat (Figure 2), and a 2013 aerial photograph (Figure 3).

The proposed development of the project area includes slope grading to create spaces for small farms with associated dwellings on lands that have been used for agricultural purposes for at least 100 years, excavation focusing on creating internal road, utilities, field infrastructure, and most significantly in mitigating the slope and drainage requirements for the 100-year flood zone along the ephemeral stream meandering through the eastern portion of the project area (Figure 4). Generally, “the proposed project is designed to fulfill the State of Hawai‘i’s legislative mandate to increase the supply of leased diversified agricultural land that is known to be highly suited to a variety of crops and has agricultural water available, Hawai‘i Revised Statutes (HRS), Chapter 166, Agricultural Parks” (Environmental Assessment 2013:2).

This AISR was prepared to support the proposed project’s historic preservation review under Hawai‘i Revised Statutes (HRS) §6E-8, Hawai‘i Administrative Rules (HAR) §13-13-275 governing procedures for historic preservation review for governmental projects, and HAR §13-13-276 governing archaeological inventory surveys and reports. Under Hawai‘i State historic preservation legislation, AIS investigations are designed to identify, document, and provide significance and mitigation recommendations for historic properties. Under this legislation, historic properties are defined as any “building, structure, object, district, area, or site, including *heiau* and underwater site, which is over 50-years-old.” A project’s effect and potential mitigation measures are evaluated based on the project’s potential impact to “significant” historic properties (those historic properties evaluated and assessed as significant based on the five State of Hawaii historic property significance criteria).

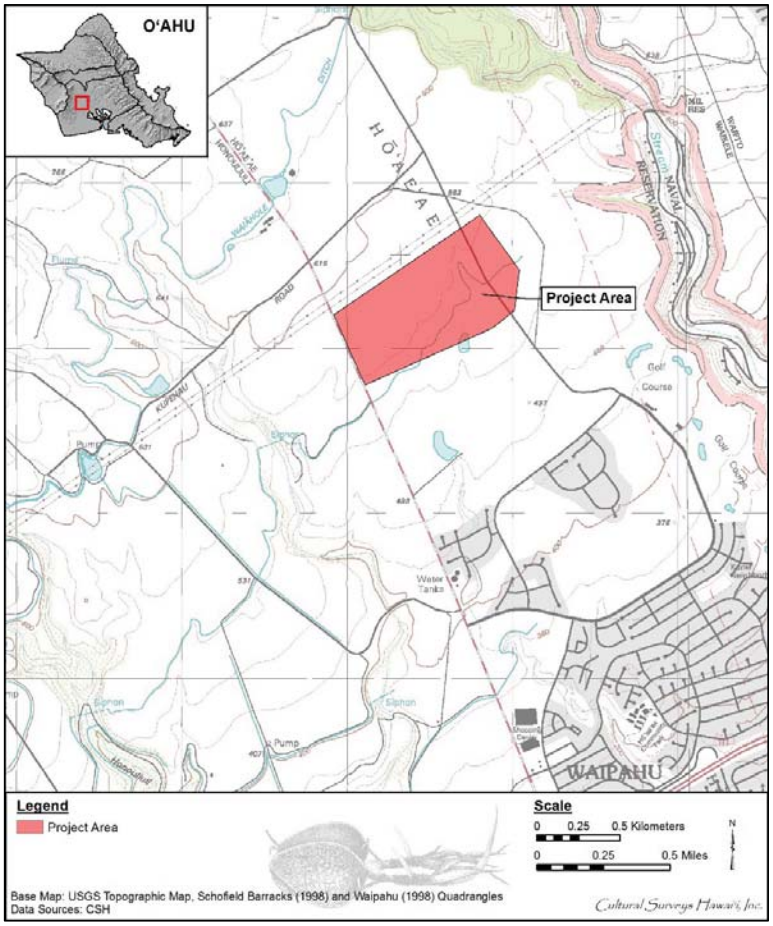

Figure 1. A portion of the 1998 Schofield Barracks and Waipahu USGS 7.5-minute topographic quadrangles indicating the project area

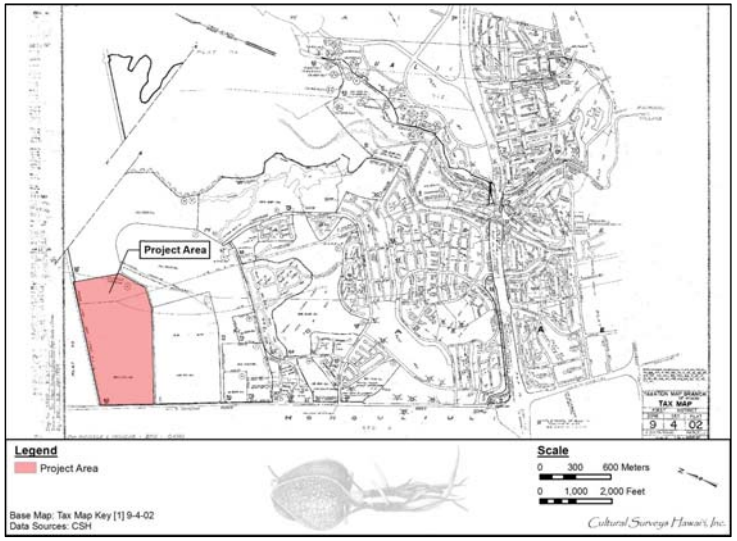

Figure 2. Tax Map Key (TMK): [1] 9-4-002 showing the project area (Hawai'i TMK Service 2014)

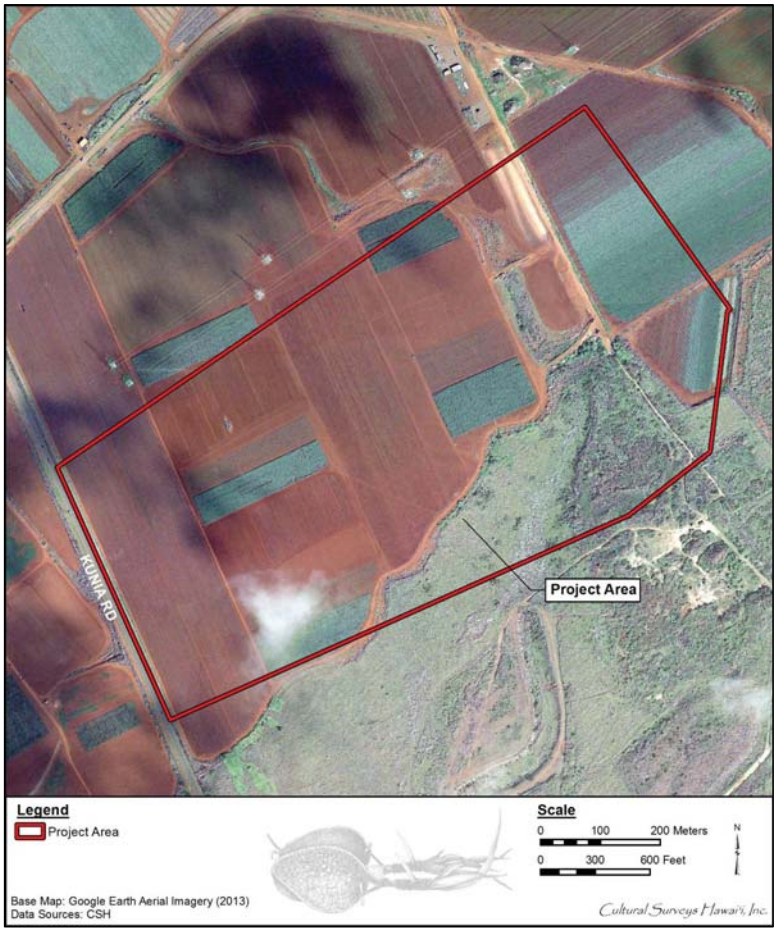

Figure 3. Aerial photograph indicating the project area (Google Earth 2013)

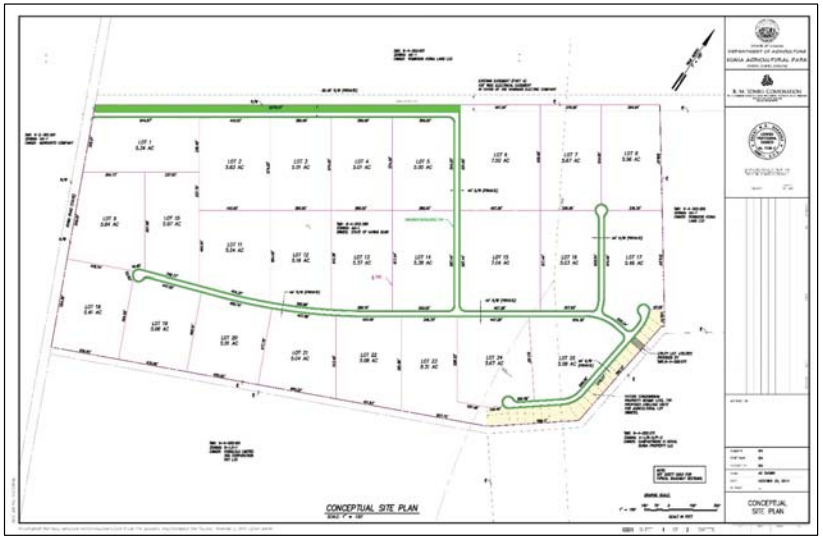

Figure 4. Conceptual site plan of the proposed Kunia Agricultural Park project (courtesy of client)

1.1 Historic Preservation Regulatory Context and Document Purpose

The project is subject to compliance with and review under Hawai‘i historic preservation review legislation, HRS §6E-8, HAR §13-13-275, as well as the project’s environmental review under HRS §343. In consultation with the SHPD, this AIS report was prepared to fulfill the requirements of HAR §13-13-276 and Hawai‘i state historic property significance recommendations for any cultural resources and/or historic properties and is intended for review and acceptance by the SHPD. This report is also intended to support any project-related historic preservation consultation with stakeholders, such as State and County agencies and interested Native Hawaiian Organizations (NHOs) and community groups, if applicable.

1.2 Environmental Setting

1.2.1 Natural Environment

The project area is in the lee of the Wai‘anae Mountain range, one of the driest areas of O‘ahu, with most of the area averaging about 18 inches of rainfall annually (Juvik and Juvik 1998:56). Temperatures range between 60 degrees to 90 degrees Fahrenheit through the year; the highest temperatures are in August and September (Armstrong 1973). Elevation in the project area ranges from 600 ft above mean sea level (AMSL) to 640 ft, or 183-195 m. The project area land is generally flat with the exception of the ephemeral stream, which is natural and yet has been mechanically manipulated and maintained as a drainage feature.

Pre-Contact Hawaiians recognized two distinct annual seasons. The first, known as *kau* (period of time, especially summer) lasts typically from May to October, a season marked by a high sun period corresponding to warmer temperatures and steady trade winds. The second season, *ho‘oilo* (winter, rainy season) continues through the end of the year from November to April, a much cooler period when trade winds are less frequent, and widespread storms and rainfall become more common (Giambelluca et al. 1986:17). Typically the maximum rainfall occurs in January and the minimum in June; this is particularly true for the leeward areas where the project area is located (Giambelluca et al. 1986:17). The mean annual rainfall is approximately 600 mm (23.62 inches) (Giambelluca et al. 1986:138).

In pre-Contact Hawai‘i, the project area would have been mostly lowland dry shrub and grassland, dominated by species such as *wiliwili* (*Erythrina sandwicensis*), *lama* (*Diospyros ferrea*), sandalwood (*Santalum* sp.), *‘a‘ali‘i* (*Dodonea eriocarpa*), scrub *‘ōhi‘a* (*Metrosideros collina*), and *pili* grass (*Heteropogon contortus*) (Frierson 1972). Natural vegetation patterns within the project area have been severely altered by at least 100 years of intensive sugar cane agriculture. Parcels of the project area are currently fallow, recently seeded, or under recently mulched tomatoes and corn. While all of the project area appears to have been under cultivation in the past, the southeast portion of the project area and especially the zone within the 100-year floodplain is thick with *Brachiaria mutica* grass up to 10 ft tall and scattered small *koa haole* (*Acacia* sp.).

The project area is within the 48-sq-mile (124.8-sq-km) Waikele Stream watershed. Waikele is a perennial stream with a length of 134.7 miles (216.8 km). Waikele translates to “muddy water.” A meander bend of a dry streambed moves through the eastern portion project area, flowing into the small reservoir in the south-central portion of the project area (Figure 5).

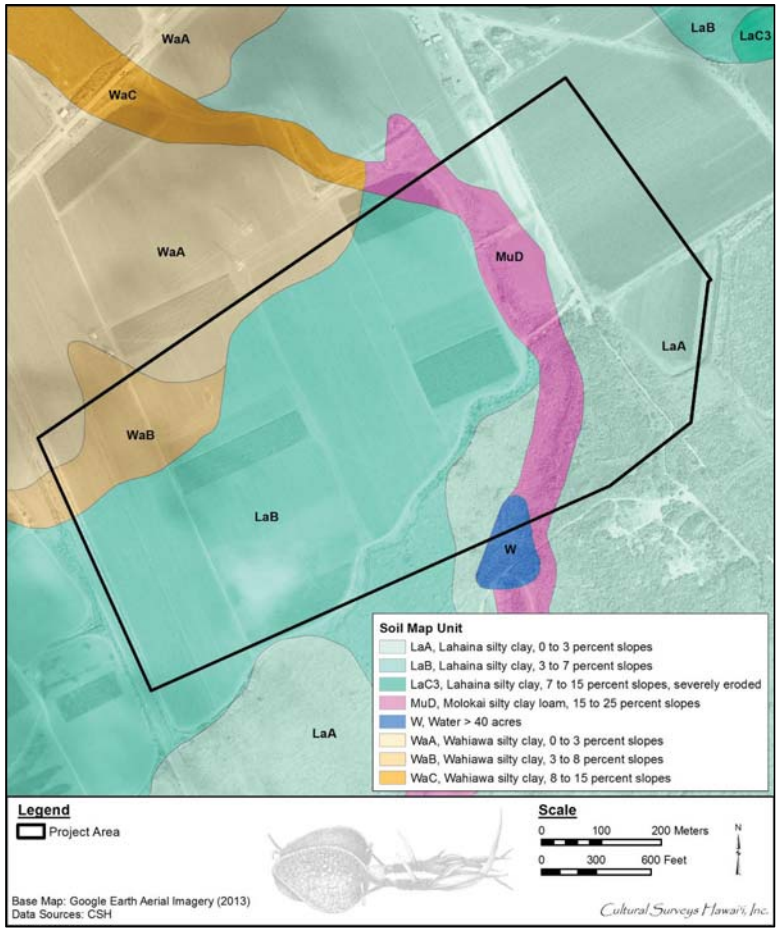

Figure 5. Overlay of *Soil Survey of the State of Hawaii* (Foote et al. 1972), indicating soil types within and surrounding the project area (USDA Soils Survey Geographic Database [SSURGO] 2001)

According to the U.S. Department of Agriculture (USDA) Soil Survey Geographic (SSURGO) database (2001) and soil survey data gathered by Foote et al. (1972), the project area's soils consist predominantly of Lahaina silty clays bisected by Molokai clays found within the stream portion of the project area and Wahiawa silty clays in the northeastern margins of the project area (see Figure 5). Specifically, the project area, east to west, includes Lahaina clay (LaA) at 0-3% slope, a swath of Molokai clay (MuD) associated with an ephemeral stream, more Lahaina clay (LaB) at 3-8% slope, Wahiawa silty clay (WaB) at 3-8% slope, followed by Wahiawa silty clay (WaA) at 0-3% slope.

Foote et al. (1972) describes the Lahaina series sediments, which in the project area make up approximately 70% of the encountered sediments.

> Lahaina series (LaA) . . . consists of well-drained soils on uplands on the islands of Lanai, Maui, Molokai, and Oahu. These soils developed in material weathered from basic igneous rock. They are nearly level to steep. Elevations range from 10 to 1,500 feet. The annual rainfall amounts to 20 to 35 inches, most of which occurs in fall and winter. The mean annual soil temperature is 72° F. Lahaina soils are geographically associated with Helemano, Hoolehua, Kahana, Molokai, Pamoa, and Wahiawa soils. These soils are used for sugarcane and pineapple. Small acreages are used for truck crops, pasture, home sites, and wildlife habitat. The natural vegetation consists of Bermuda grass, feather finger-grass, *ilima* [*Sida fallax*], *kiawe* [*Prosopis*], lantana, *oi [Verbena* litoralis*]*, and *uhaloa*. [*Waltheria* indica]. [Foote et al. 1972:78]

Foote et al. (1972) describe the Molokai soils, which in the project area are associated with an ephemeral stream creating a zone within the 100-year flood delineation.

> The Molokai series soils (MuD) consists of well-drained soils on uplands on the islands of Maui, Lanai, Molokai, and Oahu. These soils formed in material weathered from basic igneous rock. They are nearly level to moderately steep. Elevations range mainly from nearly sea level to 1,000 feet but are as much as 1,500 feet on Lanai. The annual rainfall amounts to 20 to 25 inches, most of which occurs between November and April. The summers are hot and dry. The mean annual soil temperature is 73° F. Molokai soils are geographically associated with Holomua, Keahua, Lahama, and Uwala soils. [Foote et al. 1972:96]

Foote et al. (1972) describe the Wahiawa series sediments (WaA), which are found in the far northeastern boundary of the project area.

> This series consists of well-drained soils on uplands on the island of Oahu. These soils developed m residuum and old alluvium derived from basic igneous rock. They are nearly level to moderately steep. Elevations range from 500 to 1,200 feet. Rainfall amounts to 40 to 60 inches annually; most of it occurs between November and April. The mean annual soil temperature is 71° F. Wahiawa soils are geographically associated with Kunia, Lahaina, Leilehua, and Manana soils. These soils are used for sugarcane, pineapple, pasture, and home sites. The natural vegetation consists of Bermuda grass, guava*, honohono, koa haole,* and lantana. [Foote 1972:124]

1.2.1 Built Environment

The project area is currently being used by Waikele Farms for cultivating corn and tomatoes. There is a significant portion in the southeast quadrant of the project area that is fallow. Some temporary modern infrastructure is still extant within and near the project area. Records and anecdotal information from the property manager for the past two decades, Larry Jefts, indicate that all portions of the project area have intensively maintained for large-scale agriculture within the last 50 years (8 December 2014, personal communication). During the post-Contact period, the project area was grazed by cattle to provide sufficient meat for sugar plantation workers (Frierson 1972:13). In the late 1890s, the lands were irrigated and cultivated in sugar cane by the Oahu Sugar Company. The Waiāhole Ditch, to the north of the project area, SIHP # 50-80-09-2268 (Goodman and Nees 1991) is connected via built irrigation ditch tributaries with the ancillary irrigation features encountered within the project area. The irrigation features encountered within the project area are filled in with sediment and according to Larry Jefts, these features have not been used nor maintained since before 1990 (8 December 2014, personal communication).

Section 2 Methods

2.1 Field Methods

CSH completed the fieldwork component of this AIS under archaeological permit numbers 14-04 and 15-03, issued by the SHPD pursuant to HAR §13-13-282. Fieldwork was accomplished between 3 December 2014 and 12 December 2014 by CSH archaeologists Scott Belluomini, B.A., Layne Krause, B.A., Aaron Chang, B.A., Mica Cook, B.A., and Richard Stark, Ph.D. under the general supervision of Project Manager David Shideler, M.A. and Principal Investigator, Hallett Hammatt, Ph.D. This work required approximately 15 person-days to complete. In general, fieldwork included 100% pedestrian inspection of the project area, GPS data collection and backhoe-assisted subsurface trench testing. Using the digital camera on a data collection tablet, photographs were taken systematically throughout the project area. Test trench excavations were measured using hand-held measuring tapes and the trenches were located using a Trimble global positing system.

2.1.1 Pedestrian Survey

The pedestrian survey consisted of two days of four to five CSH archaeologists examining the surfaces of all quadrants of the project area via transects with 10-m spacing (Figure 6). Two Garmin GPS devices were utilized to record transect boundaries, with two to three CSH archaeologists covering the remaining ground in-between. Figure 7 depicts walked transects of a hand-held GPS unit during the survey and indicates swaths of approximately 40 m covered by three to five archaeologists spaced at approximately10-m intervals.

2.1.1 Subsurface Testing

The subsurface archaeological investigation sought to further document sugar plantation infrastructure, locate any buried cultural deposits not recognized in the pedestrian survey and to facilitate a thorough examination of stratigraphy within the project area. Backhoe-assisted subsurface testing involved six test excavations, T-1 through T-6 (see Figure 7). In general, linear trenches measuring approximately 6.0 m (19.7 ft) long and 0.6 m (2.0 ft) wide were excavated within the project area. A stratigraphic profile of each test excavation was drawn and photographed. The observed sediments were described using standard USDA soil description observations/terminology. Sediment descriptions included Munsell color, texture, consistence, structure, plasticity, cementation, origin of sediments, descriptions of any inclusions such as cultural material and/or roots, lower boundary distinctiveness and topography, and other general observations. Where stratigraphic anomalies or potential cultural deposits were exposed, these were carefully represented on test excavation profile maps.

The test excavations were distributed throughout the project area to provide comprehensive testing coverage. T-1, T-2, T-3 and T-6 were excavated to document sugar plantation infrastructure irrigation ditches. T-1 was placed to test Feature 3, T-2 and T-3 to test Feature 2, and T-6 to test a mapped, possibly buried, irrigation ditch in the northwestern corner of the project area. Portions of the project area adjacent to the traditionally mapped boundaries of the traditional trail from Pearl Harbor to Pōhakea Pass (now Kunia Road,) were tested with two trenches, T-5 and T-6, while T-4 was placed to test for cultural resources buried in the terrace above a potential spring denoted by an ephemeral reservoir in the south-central portion of the project area.

Figure 6. CSH archaeologists conducting the 100% pedestrian survey with 10-m spacing, view to west

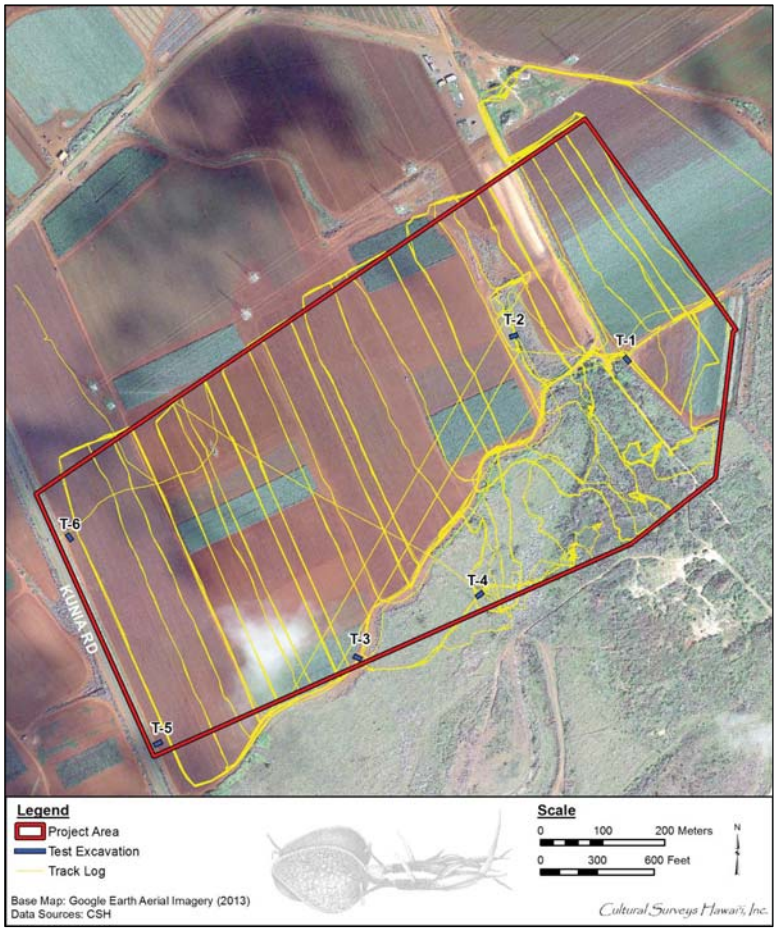

Figure 7. 2013 aerial photograph indicating the location of test excavations and the GPS tracks of the pedestrian survey of the project area

2.1.2 Artifact Analysis

No traditional Hawaiian artifacts were observed. Square-faced basalt boulders, averaging 30.0 cm by 30.0 cm (1.0 ft by 1.0 ft) were observed with some regularity, especially in association with Features 2 and 3, but no artifacts were collected. The square-faced basalt boulders were mapped, measured, described, photographed, and analyzed. Analyzed materials were documented and are presented in Section 5

2.1.3 Research Methods

Background research included a review of previous archaeological studies on file at the SHPD; review of documents at Hamilton Library of the University of Hawai‘i, the Hawai‘i State Archives, the Mission Houses Museum Library, the Hawai‘i Public Library, and the Bishop Museum Archives; study of historic photographs at the Hawai‘i State Archives and the Bishop Museum Archives; and study of historic maps at the Survey Office of the Department of Land and Natural Resources. Historic maps and photographs from the CSH library were also consulted. In addition, Māhele records were examined from the Waihona ‘Aina database (Waihona ‘Aina 2000). This research provided the environmental, cultural, historic, and archaeological background for the project area. The sources studied were used to formulate a predictive model regarding the expected types and locations of cultural resources in the project area.

Section 3 Background Research

3.1 Traditional and Historical Background

3.1.1 Mythological and Traditional Accounts

Place names, *wahi pana* or “legendary places” (Pukui and Elbert 1986:376) are an integral part of Hawaiian culture. Traditionally named places are found in *mo‘olelo*, or traditional Hawaiian stories, *mele* (songs), and *pule* (prayers) and concern the actions of gods or demi-gods such as Kāne, Kanaloa, Maui, Kamapua‘a, Kapo, the reptile deity Maunauna, the shark deity Ka‘ahupāhau, and the demigod hero Palila. The *wahi pana* were then passed on through language and the oral tradition, thus preserving the unique significance of the place.

Through time, Hawaiians have named all sorts of objects and places, points of interest which may have gone unnoticed by persons of other cultural backgrounds. Hawaiians named taro patches, rocks, and trees that represented deities and ancestors, sites of houses and *heiau* (places of worship), canoe landings, fishing stations in the sea, resting places in the forests, and the tiniest spots where miraculous or interesting events are believed to have taken place. *Place Names of Hawaii* (Pukui et al. 1974) is used here as the primary source for all place name translations. In some cases, where there were no known translations, a literal translation of the place name was made using the *Hawaiian Dictionary* (Pukui and Elbert 1986) or from another source. The intent here is to present the available information and let readers come to their own conclusions.

Relevant traditional and legendary accounts are presented below, with emphasis on accounts pertaining to the stream drainage and defined *ahupua‘a* surrounding the project area, beginning with Pearl Harbor and moving to the upper reaches of the leeward portion of the Wai‘anae mountain range. *Ahupua‘a* refers to a traditional unit of land in Hawai‘i, typically correlating to a stream catchment and extending from the uplands to the sea. This report pays particular attention to the traditional stories associated with the Leeward O‘ahu trails, and notably the trail to Pōhākea Pass. Thus, this discussion of traditional and mythic accounts deals with traditionally named places related to the ‘Ewa District, Pearl Harbor, and West Loch to the Wai‘anaes, including Hō‘ae‘ae Ahupua‘a, plus neighboring Honouliuli and Waikele Ahupua‘a.

3.1.1.1 Traditional Place Names and Mo‘olelo of ‘Ewa and Pearl Harbor

Pearl Harbor, a prominent feature of the ‘Ewa District, was called Pu‘uloa which translates literally as “long hill.” Pu‘uloa was also known as Keawalau-o-Pu‘uloa, “the many harbored-sea of Pu‘uloa” (Pukui 1983:182). An alternate name was Awawalei, or “garland (*lei*) of harbors” (Handy and Handy 1972:469). Pukui (1983:120) uses the name Awalau for Pearl Harbor, as in the saying “Huhui na ‘ōpua i Awalau; ‘The clouds met at Pearl Harbor’” which refers to the mating of two people. The harbor was named Pearl Harbor after the pearl oysters of the family *Pteriidae* (mainly *Pinctada radiata*), which were once abundant on the harbor reefs, but were later decimated by over-harvesting. This oyster was supposedly brought from Kahiki, the Hawaiian ancestral lands, by a *mo‘o* (lizard or water spirit) named Kānekua‘ana (Handy and Handy 1972:470). Emerson (1993:167) interprets Awalau as “leaf-shaped lagoon.” ‘Ewa literally translates as “crooked” or “unequal” (Pukui and Elbert 1986:42). An alternative interpretation of ‘Ewa is “strayed” in association with a story about the gods Kāne and Kanaloa, who threw a stone to determine the boundary of the district, as shown in the following excerpt:

> When Kane and Kanaloa were surveying the islands they came to Oahu and when they reached Red Hill saw below them the broad plains of what is now Ewa. To mark boundaries of the land they would throw a stone and where the stone fell would be the boundary line. When they saw the beautiful land lying below them, it was their thought to include as much of the flat level land as possible. They hurled the stone as far as the Waianae range and it landed somewhere in the Waimanalo section. When they went to find it, they could not locate the spot where it fell. So Ewa (strayed) became known by the name. The stone that strayed [Told to E. Sterling by Simeon Nawaa, 22 March 1954 in Sterling and Summers 1978:1]

Ho‘oumāhiehiemalie describes the goddess Hi‘iaka, sister of the volcano goddess Pele, as she passed through ‘Ewa and met women stringing *ma‘o* flowers to make *lei*. Hi‘iaka offered a chant, making known her wish for a lei around her own neck.

E lei ana ke kula o Ke‘ahumoa i ka ma‘o	The plains of Keahumoa are garlanded with *ma‘o*
‘Ohu‘ohu wale nā wāhine kui lei o ka nahele	The *lei*-stringing women of the forest are festively adorned.

[Ho‘oumāhiehiemalie 2006a:287; 2006b:268]

One story that suggests Waiawa was named for the *‘awa* plant is the legend of Maihea. Handy and Handy (1972:472) note that “it was here in ‘Ewa that Kāne and Kanaloa were invoked by a planter of sweet potatoes, taros, and *‘awa* named Maihea. This man, living in the upland of Wai‘awa, . . . when he had prepared his meal and his *‘awa*, would pray:

> O unknown gods of mine,
> Here are *‘awa*, taro greens and sweet potatoes
> Raised by me, Maihea, the great farmer.
> Grant health to me, to my wife and to my son.
> Grant us *mana*, knowledge and skill.
> *Amama*. It is freed. [Handy and Handy 1972:472]

Another more complete version of the story of Maihea is shared in the 3 June 1899 edition of *Ka Loea Kālai‘āina*. In this version, Maihea lived at Waimalu, cultivating sweet potatoes and taro. However, it was on a hill in the upland of Waiawa where he planted his *‘awa*. He prayed daily to the unknown gods with his offering of *‘awa*, taro greens, and sweet potatoes. In answer to his prayer, Kāne and Kanaloa sent a whale to Waimalu. All the people of the area came to marvel at the sight. The beached whale waited almost four weeks until the son of Maihea, Ula-a-Maihea, could resist no longer, and against the wishes of his parents, he went down to the shore to see the spectacle. Once there, he followed the children climbing on to the whale. The whale began to move and Ula-a-Maihea was taken to Kahiki where he was trained in the *kahuna* (priestly) arts under Kāne and Kanaloa.

The parents grieved for the boy, until two strangers came to the door. Maihea invited them to his house and offered them *‘awa*, saying his usual prayer to the unknown gods. At this time, Kāne and Kanaloa revealed that they were the unknown gods and that they had answered his prayer by sending their son to Kahiki to learn the arts of the *kahuna* :

> This was the beginning of the travels of these gods on earth and this was also the time when the boundaries of Ewa were made as I told you when I mentioned Pōhaku-pili. On their return after dividing the land, they came to the top of Haupuu, (that is the present site of the Kahikuonuolani Church at Waiawa) they turned to look at 'Ewa and when they saw the fish ponds at Waiawa, they said, 'May the fish ponds down at Waiawa be as the stars in the sky above. May there be mullets at Kuhia-loko, fine sea weed at Kuhia-waho, salt at Ninauele, the single fruited coconut at Hapenui, the taro greens at Mokaalika and the water of Kaaimalu, to remove the bitterness of the '*awa* of Kalahikuola.' [*Ka Loea Kālai'āina,* 3 June 1899:9, English summary in Sterling and Summers 1978:5]

Kānekua'ana was the *kia'i* (food guardian) for 'Ewa. When food was scarce, the descendants of Kua'ana built *waihau heiau* (a *heiau* for *mo'o*) for her and lit fires to plead for her blessings. For 'Ewa the chief *i'a* (marine food) blessing was the famous *pipi*, or pearl oyster. Samuel Kamakau describes the *pipi* of Honouliuli:

> That was the oyster that came in from deep water to the mussel beds near shore, from the channel entrance of Pu'uloa to the rocks along the edges of the fishponds. They grew right on the *nahawele* mussels and thus was this *i'a* obtained. Not six months after the *hau* (*Hibiscus brackenridgei*) branches [that placed a *kapu* on these waters until the *pipi* should come up] were set up, the *pipi* were found in abundance-enough for all 'Ewa-and fat with flesh. Within the oyster was a jewel (*daimana*) called a pearl (*momi*), beautiful as the eyeball of a fish, white and shining; white as the cuttle fish, and shining with the colors of the rainbow-reds and yellow and blues, and some pinkish white, ranging in size from small to large. They were of great bargaining value (*he waiwai kumuku'ai nui*) in the ancient days, but were just 'rubbish' (*'opala*) in 'Ewa. [Kamakau 1991b:83]

This oyster, the *pipi*, was sometimes called "the silent fish," or, *i'a hamau leo o 'Ewa*, 'Ewa's silent sea creature (Handy and Handy 1972:471). The *pipi* collectors were supposed to stay quiet while harvesting the shells, as in the sayings:

> *Ka i'a hāmau leo o 'Ewa* (The fish of 'Ewa that silences the voice, the pearl oyster, which has to be gathered in silence) [Pukui 1983:144]

> Also called '*Ka i'a kuhi lima o 'Ewa*, the gesturing fish of 'Ewa,' fishermen did not speak when fishing for them but gestured to each other [Pukui 1983:148]

When the people of 'Ewa went to gather the *pipi* (pearl oyster), they did so in silence, for if they spoke, a Moa'e breeze would suddenly blow across the water, rippling it, and the oysters would disappear (Pukui 1983:59).

> *E hāmau o makani mai auane'i.* Hush, lest the wind rise . . . Hold your silence or trouble will come to us. When the people went to gather pearl oysters at Pu'uloa, they did so in silence, for they believed that if they spoke, a gust of wind would ripple the water and the oysters would vanish. [Pukui 1983:34]

Sereno Bishop, an early resident of O'ahu, wrote of his time in the area around 1836, and of the pearl oyster, the *pipi*, and another edible clam, identified by Margaret Titcomb (1979:351) as probably *Lioconcha heiroglyphica*:

> The lochs or lagoons of Pearl River were not then as shoal as now. The subsequent occupation of the uplands by cattle denuded the country of herbage, and caused vast quantities of earth to be washed down by storms into the lagoons, shoaling the water for a long distance seaward. No doubt the area of deep water and anchorage has been greatly diminished. In the thirties, the small oyster was quite abundant, and common on our table. Small pearls were frequently found in them. No doubt the copious inflow of fresh water favored their presence. I think they have become almost entire extinct, drowned out by the mud. There was also at Pearl River a handsome speckled clam, of a delicate flavor which contained milk white pearls of exquisite luster and perfectly spherical. I think the clam is still found in the Ewa Lochs. [Bishop 1901:87]

Older Hawaiians believed that the *pipi* disappeared around the time of the smallpox epidemic of 1850-1853, because Kānekua'ana became displeased at the greed of some *konohiki* (overseers).

> The people of the place believe that the lizard was angry because the *konohikis* imposed *kapus* (taboo bans), were cross with the women and seized their catch of oysters. So this 'fish' was removed to Tahiti and other lands. When it vanished a white, toothed thing grew everywhere in the sea, of 'Ewa, which the natives of 'Ewa had named the *pahikaua* (sword). It is sharp edged and had come from Kauai-helanai, according to this legend. [Manu 1885 in Sterling and Summer 1978:50]

Pahikaua is the Hawaiian name for the mussel *Brachidontes crebristriatus* (*Mytilidae*), which was also a popular clam eaten by the residents of Pearl Harbor. A clarification of the story of Kānekua'ana and the pearl oysters of Pearl Harbor is given, in which it seems an overseer had set a ban on the *pipi* for several months of the year so that their numbers could increase. A poor widow, a relation of the *mo'o*, took some of the *pipi* and hid them in a basket. The *konohiki* found the hidden shells and took them from her, emptying them back into the sea, which was proper. However, after this he followed the woman home and also demanded that she pay a stiff fine in cash, which she did not have. The *mo'o* thought this was unjust and the next night she took possession of a neighbor, a medium:

> After the overseer had gone back to Palea the lizard goddess possessed her aged keeper [a woman of Ewa] and said to those in the house, 'I am taking the *pipi* back to Kahiki and they will not return until all the descendants of this man are dead. I go to sleep. Do not awaken my medium until she wakes of her own accord.' The command was obeyed and she slept four days and four nights before she awoke. During the time that she slept the pearl oysters vanished from the places where they were found in great numbers, as far as the shore. The few found today are merely nothing. [*Ka Loea Kālai'āina*, 3 June 1899, translation in Sterling and Summers 1978:]

Pearl Harbor, in legendary traditions, is closely associated with shark *'aumakua*, guardian spirits for specific Hawaiian families or clans. Pukui (1943:56) indicates the sharks of Pearl Harbor were so tame that people used to ride on their backs, and that their human relatives would feed them with *'awa*. The most famous guardian shark was Ka'ahupāhau, the queen shark of O'ahu, who lived in Pu'uloa (Pearl Harbor). Her name means "cloak well cared for" (Pukui 1943:56), or "well cared-for feather cloak"; the feather cloak was a symbol of royalty.

Ka‘ahupāhau and her brother, Kahi‘uka, had been born as humans and were turned into sharks (Mary Kawena Pukui, 29 March 1954 in Sterling and Summers 1978:56).

> The mother, who was a chiefess, of Ka‘ahupahau was gathering *limu* [seaweed] in the waters of Pearl Harbor when she had a miscarriage. Thinking the baby dead she left it in the water to be washed away. Later she went again to gather limu and was bitten by a shark. She went to a *kahuna* [priest] who told her that the shark was Ka‘ahupahau who was her own daughter, the baby she thought was dead. The *kahuna* advised her to go to the place and build an *ahu* (heap) of *hau* (*Hibiscus brackenridgei*) a sort of landing from which she could feed the shark and care for it. It was from that time by command of the mother that all people of Ewa were to be always be protected from sharks whether in Pearl Harbor or outside. [E.S. as told by Simeon Nawaa, 22 March 1954 in Sterling and Summers 1978:56]

This explains the meaning of the shark’s name Ka‘ahupāhau, “the mound (*ahu*) of *hau*” (*Hibiscus tiliaceus*). The grandmother of Ka‘ahupāhau and her brother, Koihala, lived in Honouliuli; one day she was making *lei* for her shark grandchildren. A young girl named Pāpio rudely begged for one of the *lei*, but Koihala refused. On her way to her favorite surfing spot at Keahi Point, Pāpio snatched up one of the *lei*, and laughingly went surfing. Koihala angrily told Ka‘ahupāhau about the stolen *lei*, and the shark killed the girl, grabbing her from a rock in the sea where she was resting:

> Ka‘ahupahau soon recovered from her anger and became very sorry. She declared that from hence forth all sharks in her domain should not destroy, but protect the people round about. As flowers were the cause of the trouble she forbade their being carried or worn on the water of Pu‘uloa. From that time all the people of that locality and the sharks in the lochs were the best of friends. [Pukui 1943:56]

In a second version of this story, the shark gods Kānehunamoku and Kamohoali‘i were the ones that had placed a *kanawai* (decree or law) against the attack of men by all sharks around O‘ahu. As a result of the attack of the chiefess Pāpio, Ka‘ahupāhau was put on trial and tried at *Uluka‘a*, the realm of the gods. She escaped the punishment of death, but was placed in confinement:

> After her confinement ended several years later Ka‘ahupahau was very weak. She went on a sightseeing trip, got into trouble, and was almost killed. But she received great help from Kupiapia and Laukahi‘u, sons of Kuhaimoana, when their enemies were all slain the *kanawai* was firmly established. This law-that no shark must bite or attempt to eat a person in Oahu waters-is well known from Pu‘uloa to the Ewa. Anyone who doubts my work must be a *malihini* (recent resident) there. Only in recent times have sharks been known to bite people in Oahu waters or to have devoured them; it was not so in old times. [Kamakau 1991b:73]

This information on the protective nature of Ka‘ahupāhau is somewhat contradicted by the writings of the Russian explorer Otto Von Kotzebue, who walked to Pearl Harbor in 1821, but was unable to actually sail on the waters. He was told that people were thrown into the water as sacrifices to the sharks. However, it is uncertain if the person who told him this was an actual resident of ‘Ewa, who would know the real truth. Kotzebue notes, “In the Pearl River there are sharks of remarkable size, and there have made on the banks an artificial pond of coral stones, in

which a large shark is kept, to which, I was told, they often threw grown-up people, but more frequently children, as victims” (Kotzebue 1821:338-348).

The protection of Ka‘ahupāhau is emphasized in many other Hawaiian traditions:

> One time, a man-eating shark called Mikololou from the Ka‘ū district of the island of Hawai‘i, came visiting at Pearl Harbor with other sharks, some man-eating, some not. Mikololou remarked ‘What fine, fat crabs you have here,’ from which Ka‘ahupāhau knew that some of the sharks were man-eaters, since sharks referred to fishermen as ‘fat crabs.’ She directed the fishermen to place a barrier of nets across the entrance to the harbor, and when the sharks left her home, they could not get back out to the ocean. The sharks of the lochs attacked the man-eaters from outside and beat them unmercifully. A shark from Ka‘u, Hawai‘i, who was not a man-eater, threw his weight over the nets and pressed them down. His sons changed themselves into *pao‘o* [blennies] fishes and leaped where the net was forced down, thus escaping from the place where the battle of shark was raging. Mikololou was caught fast in the nets and dragged ashore where his head was cut off and his body burned. [Pukui 1943:56]

In another version of this story, Mikololou is accompanied to Pearl Harbor with his shark friends Kua, Keali‘ikauaoka‘ū, Pākaiea, and Kalani; Mikololou was the only man-eater. To escape the nets:

> Keali‘ikauaoka‘ū changed himself into a pao‘o fish, which lives among the rocks, and leapt out of the net. Kua changed into a *lupe*, as the spotted stingray is called, and weighted down the net on one side, helping his son Kalani and nephew Pākaiea, who were half human, to escape [Pukui and Green 1995:40]

Only Mikololou was caught in the nets, and his body was tossed on shore to rot, until only the tongue was left. In some versions of this story, the tongue immediately jumps into the water and then becomes a shark again (Pukui and Green 1995:41). In other versions (Pukui 1943:56), the tongue is eaten by a dog, which then jumps into the water, turns into a shark, and escapes. In both versions, Mikololou returns to Ka‘ū, never to bother Ka‘ahupāhau again. The watchful eye of Ka‘ahupāhau led to these Hawaiian sayings:

Alahula Pu‘uloa, he alahele na Ka‘ahupāhau.	Everywhere in Pu‘uloa is the trail of Ka‘ahupāhau.

> Said of a person who goes everywhere, looking, peering, seeing all, or of a person familiar with every nook and corner of a place. Ka‘ahupāhau is the shark goddess of Pu‘uloa (Pearl Harbor) who guarded the people from being molested by sharks. She moved about, constantly watching. [Pukui 1983:14]

Ho‘ahewa na niuhi ia. Ka‘ahupāhau	The man-eating sharks blamed Ka‘ahupāhau.

> Evil-doers blame the person who safeguards the rights of others. Ka‘ahupāhau was the guardian shark goddess of Pu‘uloa (Pearl Harbor) who drove out or destroyed all the man-eating sharks. [Pukui 1983:108]

Mehameha wale no o Pu‘uloa,	Pu‘uloa became lonely when

i ka hele a Ka‘ahupāhau. Ka‘ahupāhau went away.

The home is lonely when a loved one has gone. Ka‘ahupāhau, guardian shark of Pu‘uloa (Pearl Harbor), was dearly loved by the people. [Pukui 1983:234]

There were other guardian sharks in Pearl Harbor, including a brother of Ka‘ahupāhau’s named Kahi‘ukā (the smiting tail), and a son named Kūpīpī (Pukui 1943:57), or, in some versions, twin sons, named Kūpīpī and Kūmaninini (Pukui and Green 1995:41). In one version of the Story of Pāpio, recounted above, it is said the Ka‘ahupāhau later turned into a stone, although the people of Pu‘uloa continued to feed her (Sterling and Summers 1978:56):

> Kahi‘ukā was the brother of Ka‘ahupahau. The name means ‘smiting tail.’ This shark was called by this name because it was his duty to warn the people of Ewa of the presence of strange and unfriendly sharks in these waters and he did so by nudging them or striking at them with his tail. Whenever anyone was fishing and felt a nudge they would know it was Kahi‘uka, warning them and they would leave the water immediately. [E.S. as told by Simeon Nawaa, 22 March 1954 in Sterling and Summers 1978:56]

There are two different accounts of the home of this shark brother. The above reference says that Kahi‘ukā lived at the site of the old dry dock. Mary Pukui disagrees, and says the site of the old dry dock was the home of the son, not the brother of Ka‘ahupāhau. Mary Pukui says Kahi‘ukā lived in a cavern underwater off Moku‘ume‘ume (Ford Island) near Keanapua‘a Point; he had a stone form in deep water some distance from the cave that could be seen from the surface (Mary Kawena Pukui, 29 March 1954 in Sterling and Summers 1978:56). Pukui also relates that the shark was named “smiting tail” because one side was longer than the other, and the shark would use his tail to smite unfriendly sharks:

> . . . Puuloa, Oahu, was the next objective. Reaching its entrance they visited the pit of Komoawa, where Kaahupahau’s watcher lived. Here the young shark made himself known, as usual; the object of the journey, and the desire to meet the famous queen-shark protector of Oahu‘s water . . . Welcome greetings were sent by the messenger, who was bid entertain the visitors in the outer cave, and on the morrow the party could come up the lochs to meet the queen . . . The company then repaired to the royal cave at Honouliuli, where the visitors were supplied with soft coconut and *awa*, their home food and beverage. [Thrum 1923:301-302]

The cave of Komoawa may be the Hawaiian words for “channel” or “harbor” entrance (Pukui and Elbert 1986:164). In another version of this story, the shark watcher himself is named Komoawa and the cave that he lives in is called Kea‘ali‘i. In 1912, dredging in Pearl Harbor was completed and a large dry-dock was completed, but collapsed the very next year.

According to an account in the Hawaiian newspaper *Ka Loea Kālai‘āina* (10 June 1899), several of the fishponds in the Pu‘uloa area were made by the brother gods, Kāne and Kanaloa. A fisherman living in Pu‘uloa, named Hanakahi, prayed to unknown gods, until one day two men came to his house. They revealed to him that they were the gods to whom he should pray. Kāne and Kanaloa then built fishponds at Ke‘anapua‘a, but were not satisfied. Then they built the fishpond, Kepo‘okala, but were still not satisfied. Finally they made the pond Kapākule, which they stocked with all manner of fish. They gifted all of these fishponds to Hanakahi and his descendants (Handy and Handy 1972:473; *Ka Loea Kālai‘āina*, 8 July 1899).

According to Mary Pukui (1943:56-57), who visited Kapākule fishpond when she was young, the pond was built by the legendary little people of Hawai‘i, the *menehune*, under the direction of the gods Kāne and Kanaloa. Pukui describes several unique aspects of this pond:

> On the left side of the pond stood the stone called Hina, which represented a goddess of the sea by that name. Each time the sea ebbed, the rock became gradually visible, vanishing again under water at high tide. Ku, another stone on the right, was never seen above sea level. This stone represented Ku‘ula, Red Ku, a god for fish and fishermen. From one side of the pond a long wall composed of driven stakes of hard wood, ran toward the island [Laulaunui] in the lochs. When the fish swam up the channel and then inside of this wall, they invariably found themselves in the pond. A short distance from the spot where the pond touched the shore was a small *koa* or altar composed of coral rock. It was here that the first fish caught in the pond was laid as an offering to the gods. [Pukui 1943:56]

The fishpond contained many fish, especially the *akule* (scad fish, *Trachurops crumenophthalmus*), thus its name, “the enclosure for *akule* fish” (Pukui 1943:56-57). The pond was destroyed when the channel to Pearl Harbor was dredged in the early twentieth century. The caretaker of the pond took the stones Kū and Hina to a deep place in the ocean and sunk them so “none would harm or defile them.” It was unusual for having walls made of coral. Samuel Kamakau adds more information on the pond Kapākule, and a second one called Kepo‘okala:

> At Pu‘uloa on O‘ahu were two unusual ponds [fish traps]—Kapakule and Kepoolala. Kapakule was the better one. The rocks of its walls, *kuapa*, could be seen protruding at high tide, but the interlocking stone walls (*pae niho pohaku*) of the other pond were still under water at high tide . . . It [Kapakule] was said to have been built by the *‘e’epa* people [mysterious people] at the command of Kane ma . . .
>
> This is how the fish entered the pond. At high tide many fish would go past the *mauka* side of the pond, and when they returned they would become frightened by the projecting shadows of the trunks, and would go into the opening. The fish that went along the edge of the sand reached the seaward wall, then turned back toward the middle and entered the *anapuna* (the arched portion of the trap) A man ran out and placed a ‘cut-off’ seine net (*‘omuku lau*) in the opening, and the fish shoved and crowded into it. The fish that were caught in the net were dumped out, and those not caught in the net were attacked with sharp sticks and tossed out, or were seized by those who were strong. [Kamakau 1976:88]

From the Legend of Maikohā (Fornander 1919):

> Kaihuopala‘ai saw a goodly man by the name of Kapapaapūhi who was living at Honouliuli, ‘Ewa; she fell in love with him and they were united, so Kaihuopala‘ai has remained in ‘Ewa to this day. She was changed into that fishpond in which mullet are kept and fattened, and that fish pond is used for that purpose to this day. [Fornander 1919:5(2):270]

The name of Maikohā’s sister, Kaihuopala‘ai, which means “the nose of Pala‘ai” (Pukui et al. 1974:68) is also the name the Hawaiians used for the west loch of Pearl Harbor. McAllister (1933) recorded that other Hawaiians say there never was a fishpond by that name. Beckwith (1918) says

Kaihuopala‘ai changed into the fishpond near the place called Kapapapūhi, which means “the eel flats.” This is identified on old maps as the peninsula that juts into the west side of West Loch (sometimes spelled Kapapa‘apūhi); early Hawaiian settlement was focused on this area.

There is also a famous *pōhaku*, or rock, associated with the traveling mullet of Pearl Harbor:

> I . . . asked the person sitting on my left, ‘What place is this?’ Answer—‘This is Pearl City.’ It was here that mullets were bred in the ancient times and that flat stone there was called Mullet Rock or Pōhaku Anae. It lies near the beach by Ewa mill. [*Ka Nūpepa Kū‘oko‘a*, 2 October 1908 in Sterling and Summers 1978:53]

3.1.1.2 Traditional Place Names and Mo‘olelo of Hō‘ae‘ae

Honouliuli and Hō‘ae‘ae Ahupua‘a consist of numerous peaks, streams, gulches, coastal points, and a number of ancient villages, all with specific place names (Figure 8). These place names are listed with their associated features, meanings, and locations in Table 1. Hō‘ae‘ae is bounded on the *makai,* or ocean side, by the north shore of Pearl Harbor’s West Loch, by a trail running along the eastern edge of Honouliuli Gulch on the west side, and by Waikele Gulch and a trail on the east side (Figure 9). Uncharacteristically, the *mauka*, or inland, edge of Hō‘ae‘ae Ahupua‘a does not extend to the mountains, but is “cut off” by Honouliuli to the west and Waikele to the east. Hō‘ae‘ae Ahupua‘a, ‘Ewa District is described by Handy in 1942: “This *ahupua‘a* had a moderate-sized area of terraces watered by springs inland from West Loch of Pearl Harbor” (Handy 1942:82). Pre-Contact and early post-Contact agriculture focused on the spring-fed floodplains adjacent to West Loch.

Hō‘ae‘ae means “to make soft or fine” according to *Place Names of Hawaii* (Pukui et al. 1974:47). Pukui et al. do not explain why the *ahupua‘a* is called this name, but do mention that there was a famous *pōhaku* (stone) called Pōhaku-Pili on the boundary between Hō‘ae‘ae and Waikele. Another source (Thrum 1922:632) says Hō‘ae‘ae s means “to pulverize.” Puki and Elbert’s *Hawaiian Dictionary* (1986) references various possible meanings of Hō‘ae‘ae as, “to rise the tide, to make fine, to pulverize, to refine, to soften. *‘Ae* can also mean to lend, to say yes, to consent, to approve or to denote fine mash or sap from seaweed or leaves of plants such as taro.”

3.1.1.3 Traditional Place Names and Mo‘olelo of Honouliuli

Honouliuli, neighboring Hō‘ae‘ae immediately to the west, is the largest and western-most *ahupua‘a* in ‘Ewa District. Honouliuli is defined as “dark water,” “dark bay,” or “blue harbor” and was named for the waters of Pearl Harbor (Jarrett 1930:22), which marks the eastern boundary of the *ahupua‘a.* Interestingly, in the “Mo‘olelo of Lepeamoa,” the chicken-girl of Pālama, Honouliuli is the name of the husband of the chiefess Kapālama and grandfather of Lepeamoa (Westervelt 1923:164-184).

The traditions of Honouliuli Ahupua‘a have been compiled by several authors, in studies by Sterling and Summers (1978), Hammatt and Folk (1981), Kelly (1991), Charvet-Pond and Davis (1992), Maly (1992), and Tuggle and Tomonari-Tuggle (1997). Some of the traditional themes associated with this area include connections with *Kahiki*, the traditional homeland of Hawaiians in central Polynesia. There are several versions of the chief Kaha‘i leaving from Kalaeloa for a trip to *Kahiki*; (Tahiti) on his return to the Hawaiian Islands he brought back the first breadfruit (Kamakau 1991a:110) and planted it at Pu‘uloa, near Pearl Harbor in ‘Ewa (Beckwith 1940:97). Several stories associate places in Honouliuli to the gods Kāne and Kanaloa, with the Hawaiian

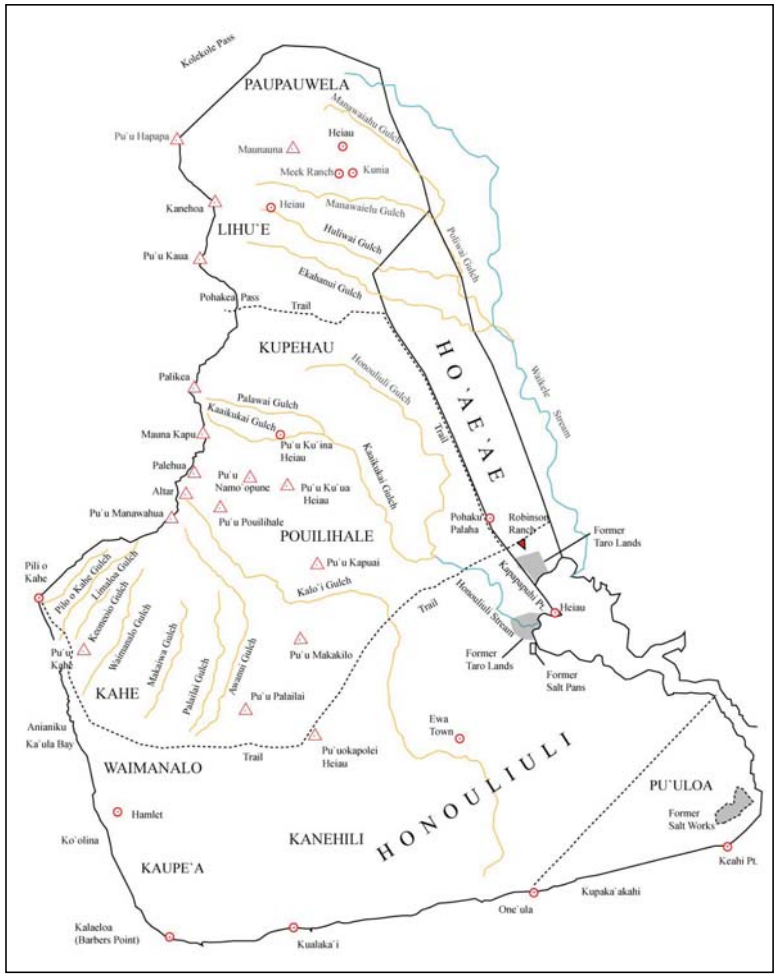

Figure 8. Place names of Honouliuli (base map 1998 USGS map); note modern Farrington Highway and Kunia Road generally follow the ancient trails

Table 1. Honouliuli Traditional Place Names and Meanings

Place Name	Meaning
Akupu Spring	--
Anianikū Cove	--
Awanui Gulch	---
‘Ēkahanui Gulch	Large bird’s nest fern
Hāpapa, Pu‘u	Rock stratum hill; a shallow soil (Thrum 1922:643)
Honouliuli Stream/Gulch	Dark bay; blue harbor (Thrum 1922:643)
Huliwai Gulch	--
Ka‘aikukui Gulch	The candlenut root
Ka‘aumakua (peak)	The family god
Kahe Point	Flow
Kahe, Pu‘u	Flow
Kaihuopala‘ai (West Loch)	The nose of Pala‘ai
Kalaeloa Point	The long point
Kalo‘i Gulch	The taro patch
Kānehili Plain	--
Kānehoa, Pu‘u	Named for native shrubs; Kāne’s friend (Thrum 1922:643)
Kapapapuhi (Kapapuhi) Point	The numerous eels (Thrum 1922:645)
Kapolei, Pu‘u o (hill, *heiau*)	Beloved Kapo, a sister of Pele
Kapuai (peak)	Footstep (Thrum 1922:645)
Kaua, Pu‘u	War hill or fort hill
Kaula Bay	--
Kaupe‘a Plain	--
Keon‘ō‘io Gulch	The sandy place with bone *(‘ō‘io*) fish
Kolekole Pass	Raw, scarred
Ko‘olina (village)	--
Kualaka‘i (village)	*Tethys* (a sea creature)

Place Name	Meaning
Ku‘ina, Pu‘u (peak; *heiau*)	--
Kupaka‘akahi (beach)	--
Ku‘ua, Pu‘u (peak; *heiau*)	Relinquished hill
Laulaunui Island	Large leaf package
Limaloa Gulch	Long arm
Makaīwa Gulch	Mother of pearl eyes
Makakilo, Pu‘u	Observing eyes
Manawahua, Pu‘u	Great grief hill or nausea hill
Manawaiahu Gulch	--
Manawaielu Gulch	--
Maunakapu (peak)	Sacred mountain
Maunauna (peak)	Mountain sent on errands
Mo‘opune, Pu‘u	Grandchild hill
One‘ula (village)	Red sand
Pālailai Gulch	Young *lai* fish
Pālailai, Pu‘u	Young *lai* fish hill
Pālehua (peak)	*Lehua* flower enclosure
Palikea (peak)	White cliff
Pili o Kahe Point	Clinging to Kahe
Pōhākea Pass	White stone
Pōhaku Palaha	Broad rock (Thrum 1922:666)
Poliwai Gulch	Water bosom
Pouilihale, Pu‘u	Dark house hill
Wai‘eli Gulch	Dug water
Waimānalo Gulch	Potable water

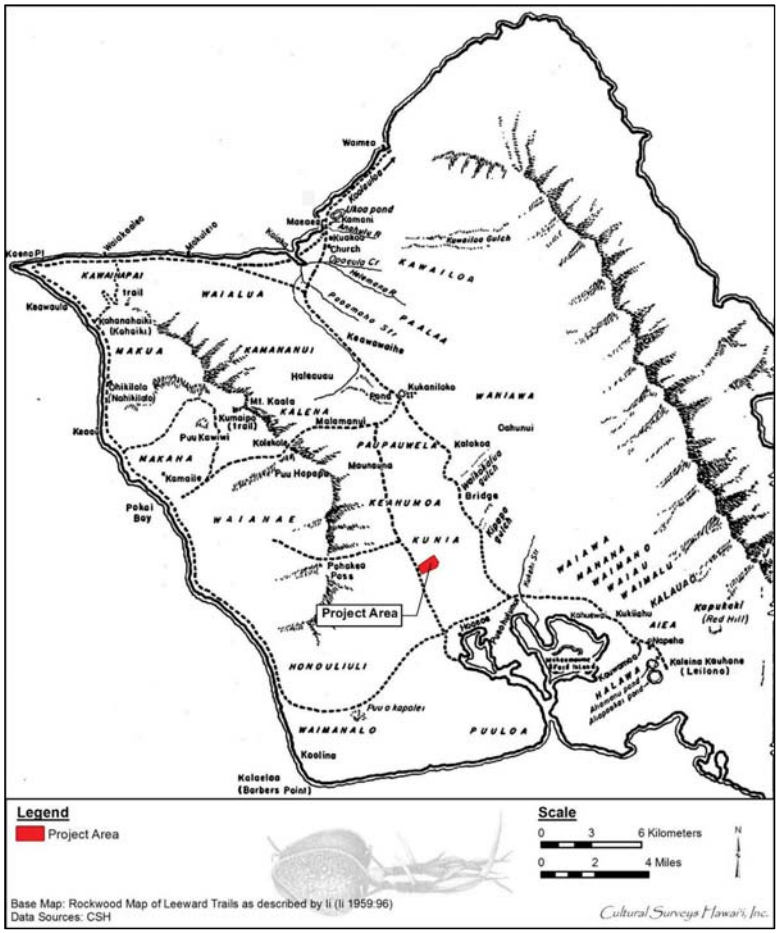

Figure 9. Portion of the Paul Rockwood map of traditional trails of Leeward O‘ahu, indicating the project area (‘Ī‘ī 1959:96)

pig god Kamapua‘a and the Hina family, and with the sisters of Pele, the Hawaiian volcano goddess, all of whom have strong connections with Kahiki (Kamakau 1991a:111; Pukui et al. 1974:200).

Honouliuli is the largest *ahupua‘a* in the *moku* (district) of ‘Ewa. One translation of the name for this district is given as “unequal” (*Saturday Press*, 11 August 1883). Others translate the word as “strayed” and associate it with the legends of the gods Kāne and Kanaloa:

> When Kane and Kanaloa were surveying the islands they came to O‘ahu and when they reached Red Hill saw below them the broad plains of what is now Ewa. To mark boundaries of the land they would throw a stone and where the stone fell would be the boundary line. When they saw the beautiful land lying below them, it was their thought to include as much of the flat level land as possible. They hurled the stone as far as the Waianae range and it landed somewhere, in the Waimanalo section. When they went to find it, they could not locate the spot where it fell. So Ewa (strayed) became known by the name. The stone that strayed. [Told to E.S. by Simeon Nawaa, 22 March 1954 in Sterling and Summers 1978:1]

Honouliuli means “dark water,” “dark bay,” or “blue harbor,” and was named for the waters of Pearl Harbor (Jarrett 1930:22), which marks the eastern boundary of the *ahupua‘a*. The Hawaiians called Pearl Harbor Pu‘uloa (*lit*. long hill). Another explanation for the names comes from the “Legend of Lepeamoa,” the chicken-girl of Pālama. In this legend, Honouliuli is the name of the husband of the chiefess Kapālama and grandfather of Lepeamoa. The land of Honouliuli was named for the grandfather of Lepeamoa (Westervelt 1923:164-184).

It is likely the boundaries of the westernmost *ahupua‘a* of ‘Ewa were often contested with people of the neighboring Wai‘anae District. The ‘Ewa people could cite divine sanction that the dividing point was between two hills at Pili o Kahe:

> This is a spot where two small hills of the Waianae range come down parallel on the boundary between Honouliuli and Nanakuli (Ewa and Waianae). The ancient Hawaiians said the hill on the Ewa side was the male and the hill on the Waianae side was female. The stone was found on the Waianae side hill and the place is known as Pili o Kahe (*Pili* = to cling to, *Kahe* = to flow). The name refers, therefore, to the female or Waianae side hill. And that is where the boundary between the two districts runs. [Told to E.S. by Simeon Nawaa, 22 March 1954 in Sterling and Summers 1978:1]

The story of Kaihuopala‘ai, or Ihuopala‘ai, is also associated with the tradition of the *anae-holo,* the traveling mullet of Pearl Harbor (Nakuina 1998:270-272):

> The home of the *‘anae-holo* is at Honouliuli, Pearl Harbor, at a place called Ihuopala‘ai. They make periodical journeys around to the opposite side of the island, starting from Pu‘uloa and going to windward, passing successively Kumumanu, Kalihi, Kou, Kālia, Waikīkī, Ka‘alāwai, and so on, around to the Ko‘olau side, ending at Lā‘ie, and then returning by the same course to their starting point. [Nakuina 1998:271]

In Nakuina’s account, Ihupala‘ai is a male who possesses a Kū‘ula or fish god that supplied the large mullet known as *anae.* His sister lived in Lā‘ie, and there came a time when there were no

fish to be had. She sent her husband to visit Ihupala‘ai, who was kind enough to send the fish following his brother-in-law on his trip back to Lā‘ie. This story is associated with a proverb or poetical saying identified with Honouliuli:

> The fish fetched by the wind. *Ka i‘a hali a ka makani*
>
> The *‘anaeholo*, a fish that travels from Honouliuli, where it breeds, to Kaipāpa‘u, on the windward side of O‘ahu. It then turns about and returns to its original home. It is driven closer to shore when the wind is strong. [Pukui 1983:145]

Pukui et al. (1974:68) give the name of the husband in this story as Lā‘ie and the name of the wife as Pala‘ai, which ties into the name of the west loch of Pearl Harbor, called Kaihu o Pala‘ai, “the nose of Pala‘ai.” Another version has a woman named Awawalei (an alternate version for the name of Pearl Harbor), who had a brother named Laniloa (the point on Lā‘ie at which the mullet stops its migration and makes its way back to Pearl Harbor), and another brother (a mullet) who lived with an eel named Papapūhi, which relates to the name of the fishpond in the tale called Kapapapūhi (*Ka Loea Kālai‘āina*, 21 October 1899).

3.1.1.4 Traditional Place Names and Mo‘olelo of Waikele

Waikele Ahupua‘a, immediately to the east of Hō‘ae‘ae, extends from the northeastern shores of West Loch to a boundary point between the District of Wahiawā and the *ahupua‘a* of Waipi‘o on the *mauka* side. It is at this boundary point that Sterling and Summers (1978:137) believe was the former location of a famous *pōhaku* called O‘ahunui, a stone shaped like the island of O‘ahu. Waikele is watered by Waikele Stream; the ridge on the east side of the stream marks the boundary with Waipi‘o. In upper Waikele, the stream is fed by two tributary streams, from the west Wai‘eli (possibly “dug water”) and from the east Waikakalaua (“water [rough] in rain”). Waikele means “muddy water,” probably a reference to this long stream. There were other names for the lower part of the stream, shown as Kapakahi (“crooked”) Stream on some maps, and referred to as Poniohua, “anointed on the night of Hua Stream in some legends (Mauricio 1997:9; Thrum 1922:667).

The most famous location in Waikele is Waipahu Spring (“bursting water”). The waters of this spring were used to irrigate many of the ancient taro patches on the Waikele flood plain and later the rice and sugar cane crops. As a town and sugar mill expanded around it, the entire *makai* area of Hō‘ae‘ae and Waikele became known as Waipahu, and the older names were no longer used. A resident clarified this change in names:

> Waipahu . . . is not a tract of land, but only a spring located in Waikele. The Oahu Railway Company is the culprit responsible for misuse and confusion, when it built its station at Kaohai and called [it] ‘Waipahu Station’ The Oahu [Sugar Company] Mill is situated on the plateau of ‘Keonekuilimalaulaoewa’ (the arm-in-arm-plateau of Ewa), Waikele [Simeon Nawaa, *Honolulu Star-Bulletin,* 16 October 1956 in Sterling and Summers 1978:1]

Above the spring was a rock face called Pōhaku-pili (clinging stone), which was said to have been placed there by the Hawaiian pig-god, Kamapua‘a (Mauricio 1997:7). There were four *heiau* in Waikele, two in the lowland area, just north of the present H-1 Interstate Highway, and two in the uplands, near the head of Kīpapa Gulch. The two lower *heiau*, Mokoula and Hapupu, had been completely destroyed by the early twentieth century, but McAllister (1933) documents remnants

of the two upper *heiau*, Moaula and the Heiau of ‘Umi, during his survey of prominent O‘ahu archaeological sites.

3.1.1.5 Traditional Place Names and Mo‘olelo of Pōhākea Pass and Other Leeward O‘ahu Trails

There were several pre-Contact/early historic trails across ‘Ewa: a cross-*ahupua‘a* trail that traversed ‘Ewa and connected Honolulu to Wai‘anae; a *mauka-makai* trail that branched off from the cross-*ahupua‘a* trail and followed the boundary between Honouliuli and Hō‘ae‘ae to the Pōhākea Pass and Kolekole Pass to Wai‘anae; and a second branching *mauka-makai* trail that generally followed the path of Waikele Stream in Waikele Ahupua‘a to Wahiawā in central O‘ahu (see Figure 9). ‘Ī‘ī (1959:97) noted the first *mauka-makai* trail, “from Kunia the trail went to the plain of Keahumoa, on to Maunauna, and along Paupauwela, which met with the trails from Wahiawā and Waialua.” ‘Ī‘ī places the area called Kunia east of Pōhākea Pass in the *ahupua‘a* of Honouliuli and Hō‘ae‘ae, *makai* of the modern town of Kunia, and places the plain of Keahumoa between Kunia and Paupauwela, in the most *mauka* portion of Honouliuli. The trail passed near the peak called Maunauna in upper Honouliuli. To the east of Honouliuli, this trail was just *mauka* of the floodplains near Pearl Harbor, skirting the inland edges of the productive taro fields. In western Honouliuli, the trail dipped down toward the coast in the direction of a prominent hill and landmark, Pu‘uokapolei. The trail then crossed into Wai‘anae at the coast near Pili o Kahe, the stone that marked the boundary between the ‘Ewa and Wai‘anae districts (see Figure 9).

Kapolei, specifically the 166-ft high cone approximately 12 km southwest of the project area, is understood to have been named in reference to the volcano goddess Pele’s sister Kapo (Pukui et al. 1974:89). Pu‘uokapolei was the primary landmark for travelers on a historical lateral trail that ran from Pearl Harbor in the east to Wai‘ānae in the west through Honouliuli (‘Ī‘ī 1959:27, 29; Nakuina 1992:54; E.M. Nakuina 1904 in Sterling and Summers 1978:34). The plain southwest of the hill was called Kaupe‘a. These two names appear in many *mo‘olelo* of Honouliuli.

Pōhākea Pass is understood as one of the resting places of Pele’s sister Hi‘iaka as she was returning from Kaua‘i with Pele’s lover Lohiau (Fornander 1919:5:188, note 6). A considerable number of *mele* (songs) and *pule* (prayers) are ascribed to Hi‘iaka as she stood at the summit of Pōhākea (*Aluna au a Pōhākea, Kū au, nānā ia Puna*) (Emerson 1915:162-168). From this vantage point Hi‘iaka could see, through her special powers of vision, that her beloved *lehua* groves and friend Hopoe at Puna, Hawai‘i Island had been blasted by her jealous sister Pele. She could also see that in her canoe, off the coast of Wai‘anae, Lohiau was seducing her traveling companion Wahine‘ōma‘o! A spring located at Kualaka‘i near Barber’s Point was named Hoaka-lei (*lei* reflection) because Hi‘iaka picked *lehua* flowers here to make a *lei* and saw her reflection in the water.

One of the most popular legends of O‘ahu is that of Kahalaopuna (or Kaha) a young woman of Mānoa who is slandered by others and is then killed by her betrothed, Kauhi, a chief from Ko‘olau, O‘ahu. While the numerous accounts (Day 1906:1–11; Fornander 1919:5:188–193; Kalākaua 1888:511–522; Nakuina 1904:41–45; Patton 1932:41–49; Skinner 1900:220–223; Thrum 1907:118–132; Westervelt 1915a:127–137; Westervelt 1915b:84–93) vary in details, generally speaking, they have Kahalaopuna slain by Kauhi and then revived repeatedly (at least three times) with the aid of a protective owl spirit. Kauhi forces her to hike west from Mānoa through the uplands until they get to Pōhākea Pass through the southern Wai‘anae Range in north Honouliuli. The trajectory of this mythic journey passes directly through Hō‘ae‘ae Ahupua‘a and very near or

through the western margin of the project area. At Pōhākea Pass, Kauhi beats Kaha with a stick until she is “very dead” (“*Ia hahau ana a Kauhi i ka lā‘au, make loa o Kahalaopuna*”). Her spirit (*‘uhane*) flies up into a *lehua* tree and chants for someone to notify her parents of her fate: *E ha‘i aku ‘oukou ua make o Kahalaopuna*, Go tell them Kahalaopuna is dead. *Aia la i ka uka o Pōhākea*, There in the uplands of Pōhākea *i ke kumu lehua la o lalo iho*, beneath a lehua tree. Upon hearing the news, her parents fetch Kahalaopuna back to Mānoa and she is restored to life.

John Papa ‘Ī‘ī describes a network of Leeward O‘ahu trails (see Figure 9) that in early historic times encircled and crossed the Wai‘anae Range, allowing passage from West Loch to the Honouliuli lowlands, past Pu‘u Kapolei and Waimānalo Gulch to the Wai‘anae coast and onward along the shoreline of O‘ahu (‘Ī‘ī, 1959:96-98). This trail system crossed the Wai‘anae Range, allowing passage from Wai‘anae to Honouliuli via Pōhākea Pass (‘Ī‘ī 1959:96-98). The Kunia Highway, State Highway 750, which divides Hō‘ae‘ae and Honouliuli Ahupua‘a, follows the traditional trail north from West Loch and adjacent to the project area before a trail spur bends westward to Pōhākea Pass within 2 km of the project area. An account of the use of the trail through Pōhākea Pass is described in ‘Ī‘ī’s *Fragments of Hawaiian History*:

> It was at this time that the king, chiefs, and court members left Honolulu and sailed by canoe to Waianae. Liholiho, the heir to the kingdom, went overland with Papa and others from Honolulu and spent the night at Kumelewai in ‘Ewa . . . The travelers stopped only one night and spent the following night on the other (Wai‘anae) side of Pōhākea. The elders and the children who went with them slept above Kunia, on the other side of Pōhākea. [‘Ī‘ī 1959:23]

In the Legend of Māui’s Flying Expedition (Thrum 1923:252-259) Maui-kupua looks toward Pōhākea Pass and sees his wife, Kumulama, being carried away by chief Pe‘ape‘amakawalu. After failing to recover her, Māui returns and tells his problems to his mother, Hina. Hina instructs her son to go to Keahumoa and visit his grandfather Kuolokele who lives there in a large hut. The hump-backed Kuolokele returns home with a load of potato leaves and Māui cures him by striking him in the back with a stone (which Kuolokele throws to Waipahu where it remains). Kuolokele has Māui gather *kī* leaves, ‘*ie‘ie* vines, and bird feathers from which the old man fabricates a “bird-ship” (*moku-mamu*) which Māui uses to defeat Pe‘ape‘amakawalu and recover his wife. They return to Kuolokele’s house where they feast and Māui eats Pe‘ape‘amakawalu’s eyeballs.

3.1.2 Pre-Contact and Early Post-Contact ‘Ewa

The rich resources of the Pearl Harbor lochs, the shoreline fishponds, the numerous springs, and the irrigated lands along the streams made central ‘Ewa a prize for competing chiefs. Battles were fought for and on ‘Ewa lands, sometimes between competing O‘ahu chiefs, and sometimes by invading chiefs from other islands.

By ca. AD 1320, ‘Ewa, along with Kona and Ko‘olaupoko, were the dominant political districts, ruled by the sons of a chief named Māweke (Cordy 2002:21). Around AD 1400, the entire island was ruled by La‘akona. Chiefs within his line, the Māweke-Kumuhonua line, reigned until about AD 1520-1540, with their major royal center in Līhu‘e in ‘Ewa. (Cordy 2002:24). Haka was the last chief of the Māweke-Kumuhonua line. He was slain by his men at the fortress of Waewae near Līhu‘e (Kamakau 1991a:54). Power shifted among the chiefs of different districts from the 1500s until the early 1700s, when Kūali‘i achieved control of all of O‘ahu by defeating the Kona chiefs, then the ‘Ewa chiefs, and then expanding his control to windward Kaua‘i. Peleiholani, the heir of

Kūali‘i, gained control of O‘ahu ca. 1740, and later conquered parts of Moloka‘i. He was ruler of O‘ahu until his death in ca. 1778 when Kahahana of the ‘Ewa line of chiefs was selected as the ruler of O‘ahu (Cordy 2002:24-41).

An early account speaks of the reign of Mā‘ilikūkahi, an *ali‘i kapu* who was born at Kūkaniloko in Wahiawā (Pukui et al. 1974:113). Upon consenting to become *mō‘ī* (king) at the age of 29, he was taken to Kapukapuākea Heiau (temple) at Pa‘la‘akai in Waialua to be consecrated. Soon after becoming *mō‘ī*, Mā‘ilikūkahi was taken by the chiefs to live at Waikīkī. The story tells us that he was probably one of the first chiefs to live there. Up until this time the chiefs had always lived at Waialua and ‘Ewa. Under his reign, the land divisions were reorganized and redefined.

In reference to the productivity of the land and the population during Mā‘ilikūkahi’s reign, Kamakau writes the following:

> In the time of Mā‘ili-kūkahi, the land was full of people. From the brow, of Kulihemo to the brow of Maunauna in ‘Ewa, from the brow of Maunauna to the brow of Pu‘ukea [Pu‘u Ku‘ua] the land was full of chiefs and people. From Kānewai to Halemano in Wai‘alua, from Halemano to Paupali, from Paupali to Hālawa in ‘Ewa the land was filled with chiefs and people. [Kamakau 1991a:55]

Mā‘ilikūkahi became *mō‘ī* of O‘ahu around AD 1520 to 1540 (Cordy 2002:19). Mā‘ilikūkahi was popular during his reign and was remembered for initiating land reforms, which brought about peace, and for encouraging agricultural production, which brought about prosperity. He also prohibited the chiefs from plundering the *maka‘āinana*, with punishment of death (Kamakau 1991a:55).

Mā‘ilikūkahi’s peaceful reign was interrupted by an invasion which would change Waipi‘o ‘Uka forever. The following is Fornander’s description of the Battle of Kīpapa, likely taking place within 6 km to the west/northwest of the project area:

> I have before referred to the expedition by some Hawaii chiefs, Hilo-a-Lakapu, Hilo-a-Hilo-Kapuhi, and Punaluu, joined by Luakoa of Maui, which invaded Oahu during the reign of Mailikukahi. It cannot be considered as a war between the two islands, but rather as a raid by some restless and turbulent Hawaii chiefs . . . The invading force landed at first at Waikiki, but for reasons not stated in the legend, altered their mind, and proceeded up the Ewa lagoon and marched inland. At Waikakalaua they met Mailikukahi with his forces, and a sanguinary battle ensued. The fight continued from there to the Kīpapa gulch. The invaders were thoroughly defeated, and the gulch is said to have been literally paved with the corpses of the slain, and received its name ‘Kīpapa,’ from this circumstance. Punaluu was slain on the plain which bears his name, the fugitives were pursued as far as Waimano, and the head of Hilo was cut off and carried in triumph to Honouliuli, and stuck up at a place still called Poo-Hilo. [Fornander 1996:89-90]

Apparently, Kīpapa Gulch in Waipi‘o was named after this particular battle, or more likely renamed. In old Hawai‘i, places were often given names based on historic events. The literal translation of the word *kīpapa* is “to be paved,” as in “paved with the corpses of the slain.”

Around AD 1600-1620, the entire island of O‘ahu was united under the rule of one woman, an *ali‘i* named Kala‘imanuia (Cordy 2002:30). Before her death, she divided her kingdom between

four of her children, giving the districts of Kona and Ko‘olaupoko to Kū; the *ahupua‘a* of Kalauao, ‘Aiea, Moanalua, and Hālawa to Ka‘ihikapu; the districts of ‘Ewa and Wai‘anae to Ha‘o; and the districts of Waialua and Ko‘olauloa to her daughter Kekela. To Kū she passed on her title of *mō‘ī*, or king, so that the other three were still subject to their eldest brother. Kū, however, was greedy and began to try to take the lands allotted to his siblings away from them. Ha‘o joined with this brother Ka‘ihikapu in a battle defending against an attack by Kū, a battle in which Kū was slain. Ka‘ihikapu then became *mō‘ī* and was a good king, taking care of his subjects and making frequent tours around the island to observe the people. On one of these circuits, he visited his brother Ha‘o at his court in Waikele and grew jealous of the riches at his brother’s home. Ka‘ihikapu sent a large man-eating shark that had been caught near his court in Waikīkī to his brother as a gift so that Ha‘o could use it as a sacrifice to dedicate to the gods at his *heiau* in Waikele. Ka‘ihikapu’s forces then attacked Ha‘o and his priests at the temple as they were unarmed and busy with the dedication ceremonies. Two versions of this more elaborate story are presented below. There is a saying concerning this rivalry between the two brothers: “*Ke one kuilima laula o ‘Ewa*. The sand on which there was a linking of arms [*kuilima*] on the breadth of ‘Ewa.” This saying is in reference to how Ka‘ihikapu took Ha‘o’s lands from him.

> The chiefs of Waikīkī and Waikele were brothers. The former wished to destroy the latter and laid his plot. He went fishing and caught a large *niuhi* [man-eating shark], whose skin he stretched over a framework. Then he sent a messenger to ask his brother if he would keep a fish for him. Having gained his consent, the chief left Waikīkī hidden with his best warriors in the ‘fish.’ Other warriors joined them along the way until there was a large army. They surrounded the residence of the chief of Waikele and linked arms [*kuilima*] to form a wall, while the Waikīkī warriors poured out of the ‘fish’ and destroyed those of Waikele. [Pukui 1983:191]

In a different version of this story (Kamakau 1991a:61-67), Ka‘ihikapu, cut open the shark captured from the Waikīkī waters, removed all the meat, but left the skin and bones. He sent a messenger to his brother, Ha‘o, chief of Waikele, offering the shark to him. Ha‘o quickly agreed, and waited for the shark to be delivered to Waikele, where he planned to place it at his *heiau* as an offering to the gods. When the shark was placed on the altar, Ka‘ihikapu and his men jumped out and slaughtered his brother and all of the priests. The slain men were then put into the shark and offered as a sacrifice at the former *heiau* of Waikele. Kamakau (1991a:67) says that the name of this place of slaughter in Waikele was called Paumakua. Thrum (1922:665) translates this place name as “all fiery eyed.” McAllister (1933:106) located this destroyed *heiau*, called Hapupu, at the site then occupied by the Waipahu plantation stables.

Thomas Thrum (1907:203-214) translates the legend of the *kahuna*, or priest, Ka‘ōpulupulu, who lived in Waimea. Kahekili, the king of Maui sent his foster son Kahahana to rule O‘ahu, around the year AD 1779 (Cordy 2002:42). Kahahana set up his royal compound in Waikīkī, and commanded the priest Ka‘ōpulupulu to attend him there. At first Kahahana valued the wisdom of this wise priest, but after several years, Kahahana began to be cruel to the people, and in protest Ka‘ōpulupulu left Waikīkī to return to his home in Waimea. This angered the king, who sent messengers to order Ka‘ōpulupulu and his son Kahulupue to come to Wai‘anae, where Kahahana then resided.

At Wai‘anae, the two men were placed into a special grass hut, one tied to the end post and one tied to the corner post of the house. The next day, Kahahana ordered his men to torture the son,

stabbing his eyes and stoning him while his father watched. When Ka‘ōpulupulu saw this, he commanded his son to flee into the sea, saying the following words, which contained a prophecy.

E nui ke aho, e ku‘u keiki,	Take a deep breath, my son, and lay
a moe i ke kai, no ke kai la	yourself in the sea, for then the land
ho‘i ka ‘āina.	shall belong to the sea. [Pukui 1983:44]

When Kahekili heard of this outrage, he sent an army to O‘ahu to depose Kahahana. The O‘ahu force was defeated around 1795 (Cordy 2002:19), and Kahahana, his wife Kekuapoi, and his friend Alapai fled westward, hiding at many places in ‘Ewa.

Upon the arrival here at O‘ahu of Kahekili, Kahahana fled, and with his wife Kekuapoi and friend Alapai, hid in the shrubbery of the hills. They went to Aliomanu, Moanalua, to a place called Kinimakalehua; then moved along to Keanapua‘a and Kepo‘okala, at the lochs of Pu‘uloa, and then from there to upper Waipi‘o; thence to Wahiawā, Helemano, and on to Līhu‘e [upper plain of Honouliuli, Hō‘ae‘ae, and Waipi‘o]; thence they came to Pō‘ohilo, at Honouliuli, where they first showed themselves to the people and submitted themselves to their care. Through treachery, Kahahana was induced to leave Pō‘ohilo, Honouliuli and was killed on the plains of Hō‘ae‘ae (Thrum 1998:213-214).

> . . . report thereof was made to Kahekili, the king, who thereupon sent Kekuamanoha, elder brother of Kekuapoi, the wife of Kahahana, with men in double canoes from Waikiki, landing first at Kupahu, Hanapouli, Waipio, and had instructions to capture and put to death Kahahana, as also his friend Alapai, but to save alive Kekuapoi. When the canoes touched at Hanapouli, they proceeded thence to Waikele and Hoaeae, and from there to Poohilo, Honouliuli, where they met with Kahahana and party in conference. At the close of the day Kekuamanoha sought by enticing words to induce his brother-in-law to go with him and see the father king and be assured of no death condemnation, and by skilled flattery he induced Kahahana to consent to his proposition, whereupon preparation was made for the return. On the following morning, coming along and reaching the plains of Hoaeae, they fell upon and slew Kahahana and Alapai there, and bore their lifeless bodies to Halaulani, Waipio, where they were placed in the canoes and brought up to Waikiki and placed up in the coconut trees by King Kahekili and his priests from Maui, as Kaopulupulu had been. Thus was fulfilled the famous saying of the Oahu priest in ‘all its truthfulness.’ According to the writings of S.M. Kamakau and David Malo, recognized authorities, the thought of Kaopulupulu as expressed to his son Kahulupue, ‘This land is the sea’s,’ was in keeping with the famous prophetic vision of Kekiopilo that ‘the foreigners possess the land,’ as the people of Hawaii now realize. [Manu 1903:112-113]

In the first half of the eighteenth century, the island of O‘ahu was ruled by a chief named Kūali‘i, who consolidated his supreme power over the entire island by defeating the chiefs of ‘Ewa (Cordy 2002:32). Kūali‘i met the competing army on the plains of Keahumoa, but the ‘Ewa chiefs surrendered when they saw Kūali‘i’s overwhelming forces, and they ceded the lands of Ko‘olauloa, Ko‘olaupoko, Waialua, and Wai‘anae to him (Fornander 1917:4(2):366, 400).

During the second half of the eighteenth century, Waipi‘o again became a focus of political intrigue and warfare. In 1783, the forces of the Maui chief Kahekili gained control of the island of O‘ahu by defeating the *mō‘ī*, Kahahana, “from the powerful ‘Ewa chiefs’ line” (Cordy 1981:207). Kahekili set up his friend Hu‘eu to rule over the districts of ‘Ewa, Wai‘anae, and Ko‘olauloa. The defeated O‘ahu chiefs plotted to kill the Maui chiefs, and succeeded in killing Hu‘eu, but Kahekili escaped.

The murderers of Hu‘eu were found in Waipi‘o, “therefore Ewa became famed as a land of deadly plots” (*Ka Nūpepa Kū‘oko‘a,* 5 December 1868; HEN:1:2734 in Sterling and Summers 1978:3). Waipi‘o was given the name “*Waipi‘o kīmopō*,” or “Waipi‘o of secret rebellion” (Pukui 1983:319). Following the plan’s failure, Kahekili took revenge on the ‘Ewa and Kona districts:

> . . . and when Ka-hekili learned that Elani of ‘Ewa was one of the plotters, the districts of Kona and ‘Ewa were attacked and men, women, and children were massacred, until the streams of Makaho and Niuhelewai in Kona and of Kahoa‘ai‘ai in ‘Ewa were choked with the bodies of the dead, and their waters became bitter to the taste, as eyewitnesses say, from the brains that turned the water bitter. All the O‘ahu chiefs were killed and the chiefesses tortured. [Kamakau 1992:138]

If Kamakau is correct, the population of Waipi‘o would have been decimated during the 1780s. Kahekili and the Maui chiefs retained control of O‘ahu until the 1790s. In 1794, Kahekili died at Waikīkī. His son, Kalanikūpule, was defeated the following year at the battle of Nu‘uanu by Kamehameha, who distributed the O‘ahu lands—including Waipi‘o Ahupua‘a—among his favorite followers which resulted in the displacement of many families. “Land belonging to the old chiefs was given to strange chiefs and that of old residents on the land to their companies of soldiers, leaving the old settled families destitute” (Kamakau 1992:376-377).

3.1.3 Early Historic Period

In a study of the resources and population of the *ahupua‘a* in ‘Ewa, Ross Cordy (1996:12) wrote a correlation study of three factors: floodplain size, fishery size, and population size. Hō‘ae‘ae had a small floodplain area, directly adjacent to the north shore of Pearl Harbor’s West Loch, and a fairly small fishery, which took up only a small portion of West Loch. Waiawa had a medium-sized floodplain, shared with the neighboring *ahupua‘a* of Mānana, and a small fishery, again shared with Mānana, on the north shore of Middle Loch. Waikele had a large floodplain and had irrigated fields along the lower Waikele Stream and the inland Waikakalaua Stream, but only a medium-sized fishery along the west shore of West Loch. Waipi‘o had a large floodplain, irrigated fields along Kīpapa Stream, and a large fishery, encompassing most of Middle Loch and the fringes of West Loch along Waipi‘o Peninsula. Cordy found that the first two factors were good predictors for pre-Contact and early post-Contact population. Waipi‘o had the largest population, Waikele and Waiawa had medium-sized populations, and Hō‘ae‘ae had the smallest population of the four.

Of the four *ahupua‘a* in central ‘Ewa, Waipi‘o was the main focus of Hawaiian settlement and activity during the centuries preceding Western Contact. “The populous dwelling place of the *ali‘i* (chiefly class) was formerly located on an east point of Waipi‘o Peninsula known as Lēpau” (McAllister 1933:106). The *ali‘i* at Waipi‘o were no doubt attracted to the great abundance of resources the region offered.

The picture presented here is that the whole *moku* (district) of ‘Ewa was one of prosperity and productivity and the land was heavily populated. ‘Ewa continued to be a political center until the eighteenth century when Kahahana, a Maui chief, was chosen by the O‘ahu chiefs to rule over the whole island. As described above, Kahahana’s rule was ended by Kahekili; after Kahekili’s own death it was his son Kalanikūpule who was defeated by Kamehameha.

It was during this time that the O‘ahu chiefly lines were nearly exterminated. It is said that one of the Maui chiefs, Kalaikoa, used the bones of the slain to build a wall around his house at Lapakea in Moanalua. Even though Waikīkī was a favorite playground for the chiefs of Kona, as with ‘Ewa chiefs, there were no deep harbors where large ships could enter port. With the introduction of trade and foreign goods, along with Kamehameha’s unification of the Islands, attention shifted to Kou (old name for Honolulu until about 1800) (Pukui et al. 1974:117), which had a deep enough harbor for ships to pull in and anchor. Kou became the center of activity as royalty moved away from the outer districts toward the center of commerce. The general populace also moved away from the rural areas, as they too became dependent on a cash economy. Archibald Campbell writes about O‘ahu in 1809:

> Although only of secondary size, it [O‘ahu] has become the most important island in the group, both on account of its superior fertility, and because it possesses the only secure harbour to be met with in the Sandwich Islands. In consequence of this, and of the facility with which fresh provisions can be procured, almost every vessel that navigates the North Pacific puts in here to refit. This is probably the principal reason why the king has chosen it as his place of residence. [Campbell 1967:109-110]

‘Ewa is depicted as an abundant and populated land where chiefs of distinguished lineages were born and resided. The land was fertile and well fed by mountain streams that helped sustain the agricultural lifestyle needed to support the chiefs, their households, and their people. An examination of the place names reveals that water was a very important factor in this district. Six of the 12 *ahupua‘a* names begin with *wai*, the Hawaiian word for water: Waikele, Waipi‘o, Waiawa, Waimano, Waiau, and Waimalu. The fact that there were so many fishponds in the ‘Ewa District and in the Pu‘uloa area, more than any other district on O‘ahu, indicates agricultural/aquacultural intensification was a direct link to the chiefs who resided there, and also to the increasing needs of the population. Thus, ‘Ewa’s part in the politics and history of O‘ahu is of noteworthy importance.

3.1.3.1 Late Eighteenth to Mid-Nineteenth Centuries

In 1795, 17 years after Captain James Cook made the first Western Contact with the Hawaiian Islands, the great Hawaiian warrior Kamehameha completed his conquest of the island of O‘ahu and then went on to consolidate his rule over all of the Hawaiian Islands. He gave the *ahupua‘a* of Honouliuli to Kalanimōkū, an early supporter, as part of the *panalā‘au*, or conquered lands, with the right to pass the land on to his heirs rather than having it revert to Kamehameha (Kame‘eleihiwa 1992:58, 112). Kalanimōkū subsequently gave the *ahupua‘a* to his sister, Wahinepi‘o.

Early historical accounts indicate the *ahupua‘a* of Honouliuli was once widely inhabited by pre-Contact populations. This probably can also be said of Hō‘ae‘ae, although much less is documented regarding this *ahupua‘a.* Thriving human habitation here is attributable for the most

part to the plentiful marine and estuarine resources available at the coast. Other subsistence-related features of this area include irrigated lowlands suitable for wetland taro cultivation (Hammatt and Shideler 1990), as well as the lower forest area of the mountain slopes for the procurement of forest resources. Exploitation of the forest resources along the slopes of the Wai‘anae Range—as suggested by E.S. and E.G. Handy—probably acted as a viable subsistence alternative during times of famine:

> The length or depth of the valleys and the gradual slope of the ridges made the inhabited lowlands much more distant from the *wao*, or upland jungle, than was the case on the windward coast. Yet the *wao* here was more extensive, giving greater opportunity to forage for wild foods during famine time. [Handy and Handy 1972:469-470]

These upper valley slopes may have also been a significant resource for sporadic quarrying of basalt for the manufacturing of stone tools. This is evidenced in part by the existence of a probable quarrying site (SIHP # 50-80-12-4322) in Makaiwa Gulch at 152 m (500 ft) (Hammatt et al. 1991). The lowlands, bisected by ample streams, were ideal terrain for the cultivation of irrigated taro. The hinterland consisted of deep valleys running far back into the Ko‘olau range. Between the valleys were ridges with steep sides but a very gradual increase of altitude. The lower part of the valley sides were excellent for the cultivation of yams and bananas. Farther inland grew the *‘awa* for which the area was famous.

In addition, breadfruit, coconuts, *wauke* (paper mulberry, *Broussonetia papyrifera,* used to make *kapa* for clothing), bananas, *olonā* (*Touchardia latifoli*, used to make cordage), and other plants were grown in the interior. ‘Ewa was known as one of the best areas to grow gourds and was famous for its *māmaki* (*Pipterus* spp.; used to make *kapa* for clothing). It was also famous for a rare taro called the *kāī o ‘Ewa*, which was grown in mounds in marshy locations (Handy and Handy 1972:471). The cultivation of this prized and delicious taro led to the saying:

> *Ua ‘ai i ke kāī-koi o ‘Ewa*. He has eaten the Kāī-koi taro of ‘Ewa.
>
> Kāī is O‘ahu’s best eating taro; one who has eaten it will always like it. Said of a youth of a maiden of ‘Ewa, who, like the Kāī taro, is not easily forgotten. [Pukui 1983:305]

The lochs of Pearl Harbor were ideal for the construction of fishponds and fish traps. Forest resources along the slopes of the Wai‘anae Range probably acted as a viable subsistence alternative during times of famine and/or low rainfall (Handy 1940:211; Handy and Handy 1972:469-470). Accounts indicate that during the late 1890s, there was a Hawaiian population remaining in and around the upland Hō‘ae‘ae and Honouliuli area, which had traditional knowledge of the locations of springs and other resources necessary for survival in the area. However, the smallpox epidemic of 1840 had drastically reduced the formerly thriving settlements.

Captain Vancouver sailed by Kalaeloa (Barbers Point) in 1792, and recorded his impression of the small coastal village of Kualaka‘i and the arid Honouliuli coast:

> The point is low flat land, with a reef round it . . . Not far from the S.W. point is a small grove of shabby cocoa-nut trees, and along these shores are a few struggling fishermen’s huts. [Vancouver 1798:1:167]

> . . . from the commencement of the high land to the westward of Opooroah [Pu‘uloa], was composed of one very barren rocky waste, nearly destitute of verdure, cultivation or inhabitants, with little variation all the way to the west point of the island . . . [Vancouver 1798:2:217]
>
> This tract of land was of some extent but did not seem to be populous, nor to possess any great degree of fertility; although we were told that at a little distance from the sea, the soil is rich, and all necessaries of life are abundantly produced . . . [Vancouver 1798:3:361–363]

Subsequent to Western Contact in the area, the landscape of the ‘Ewa plains and Wai‘anae slopes was adversely affected by the removal of the sandalwood forest, and the introduction of domesticated animals and new vegetation species. Domesticated animals, including goats, sheep and cattle, were brought to the Hawaiian Islands by Vancouver in the early 1790s, and were allowed to graze freely about the land for some time after. L.A. Henke reports the existence of a longhorn cattle ranch in Wai‘anae by at least 1840 (Frierson 1972:10). During this same time, perhaps as early as 1790, exotic vegetation species were introduced to the area. These typically included vegetation best suited to a terrain disturbed by the logging of sandalwood forest and eroded by animal grazing. The following dates of specific vegetation introduced to Hawai‘i are given by R. Smith and outlined by Frierson (1972):

1) “early”, c. 1790: Prickly pear cactus, *Opuntia tuna*, Haole koa, *Leucaena glauca* and Guava, *Psidium guajava*
2) 1835-1840: Burmuda [*sic*] grass, *Cynodon dactylon*, Wire grass, *Eleusine indica*
3) 1858: Lantana, *Lantana camara*, *kiawe* tree (1828 or 1837). [Frierson 1972:11]

At Contact, the most populous *ahupua‘a* on the island was Honouliuli, with the majority of the population centered on Pearl Harbor. In 1832, a missionary census of Honouliuli recorded the population as 1,026. Within four years, the population was down to 870 (Schmitt 1973:19, 22). In 1835, there were eight to ten deaths for every birth (Kelly 1991:157-158). Between 1848 and 1853, there was a series of epidemics of measles, influenza, and whooping cough that often wiped out whole villages. In 1853, the population of ‘Ewa and Wai‘anae combined was 2,451 people. In 1872, it was 1,671 (Schmitt 1968:71). The inland area of ‘Ewa was probably abandoned by the mid-nineteenth century due to population decline and consolidation of the remaining people in the town of Honouliuli, near Kapapapūhi Point.

Other early historical accounts of the general region typically refer to the more populated areas of the ‘Ewa district, nearest Pearl Harbor, where missions and schools were established and subsistence resources were perceived to be greater. However, the presence of archaeological sites along the barren coral plains and coast of southwest Honouliuli Ahupua‘a indicates pre-Contact and early historic populations adapted to less inviting areas, despite the environmental hardships.

Barber’s Point is named after Captain Henry Barber whose vessel ran aground on 31 October 1796.

3.1.4 The Māhele and the Kuleana Act

The Organic Acts of 1845 and 1846 initiated the process of the Māhele, the division of Hawaiian lands, which introduced private property into Hawaiian society. In 1848, the crown, the Hawaiian

government, and the *ali‘i* (royalty) received their land titles. The common people (*maka‘āinana*) received their *kuleana* awards (individual land parcels) in 1850. It is through records for Land Commission Awards (LCA) generated during the Māhele that the first specific documentation of life in ‘Ewa, as it had evolved up to the mid-nineteenth century, comes to light.

By the time of the Māhele, many of the chiefs had run up huge debts to American merchants throughout the early historic period and continuing up into the mid-1800s. A common practice at the time was to lease (or mortgage) large portions of unused land to other high chiefs and foreigners to generate income and pay off these earlier debts. Until the passage of the Act of 3 January 1865, which made Crown Lands inalienable, Kamehameha III and his successors did as they pleased with the Crown Lands, selling, leasing, and mortgaging them at will (Chinen 1958:27).

In 1850, the Privy Council passed resolutions that affirmed the rights of commoners or native tenants. To apply for fee-simple title to their lands, native tenants were required to file their claims with the Land Commission within the specified time period of February 1846 to 14 February 1848. Under the Kuleana Act of 1850, the claimant was required to have two witnesses who could testify they knew the claimant and the boundaries of the land, knew the claimant had lived on the land for a minimum of two years, and knew no one had challenged the claim. The land also had to be surveyed.

Not everyone who was eligible to apply for *kuleana* lands did so and, likewise, not all claims were awarded. Some claimants failed to follow through and come before the Land Commission, some did not produce two witnesses, and some did not get their land surveyed. For whatever reason, out of the potential 2,500,000 acres of Crown and Government lands, “less than 30,000 acres of land were awarded to the native tenants” (Chinen 1958:31).

A total of 23 land claims were made in Hō‘ae‘ae Ahupua‘a, with 19 claims awarded to commoners (Table 2). The bulk of these claims deal with Hō‘ae‘ae Fisheries around West Loch to the south of the project area. The project area is within the 3453 acres of Māhele Award 193 (Figure 10), surveyed by Metcalf in 1848 and awarded to Lewis Rees, the servant of Manuia. All unclaimed lands in the *ahupua‘a* were awarded to Nueku Nāmau‘u as Māhele Award 63 (LCA 10474). Nāmau‘u was a descendant of Hawai‘i Island chieftains and a cousin (or nephew) to Mataio Kekūanao‘a, the father of two Hawaiian monarchs, Alexander Liholiho (Kamehameha IV) and Lot Kapuāiwa (Kamehameha V) (Day 1984:69).

3.1.5 Mid- to Late 1800s

3.1.5.1 Explorer, Missionary and Military Surveys

The first foreign attempt to survey Pearl Harbor was made in 1840 during the U.S. Exploring Expedition, led by Charles Wilkes.

> In this district is a large inlet of the sea, into which the river Ewa empties; at the entrance of this inlet is the village of Laeloa (at Kalaeloa Pont): the shore is known by the name of Pearl River or harbour, from the circumstance that the pearl oyster is found here; and it is the only place in these islands where it occurs. The inlet has somewhat the appearance of a lagoon that has been partly filled up by alluvial deposits. At the request of the king, we made a survey of it: the depth of water at its mouth was found to be only fifteen feet; but after passing this coral bar, which is four hundred feet wide, the depth of water becomes ample for large ships, and

Table 2. Land Commission Awards in Hō‘ae‘ae Ahupua‘a

LCA	Awardee	*‘Ili*
193	Rees, Lewis	
750	Mokumakuaole	Koipu, Kalokoloa
887	Kaihikapu	Kalaikea, Kapapapuhi, Kuainihi, Kalokoeli, Pakai
889	Puko	Waiihi
899	Kahooweliweli	Amakeahilalo
909	Kaneiahuea	Paniu, Kalahale, Lihue, Kumuhau
1533	Kealaiki	Muki, Waihi, Kalokoeli
1561	Kaumanu	Amakeahiluna, Kamalokala
1562	Kapili	Kaaiiole, Koipuu
1571	Kalihue	Kamalokala
1578	Kaihumai	Laekea
1582	Kukahoe	Koipu
1583	Kekapa	Waihi
1601	Kekoamiki	Keahupuaa, Kaaiiiole, Holokoeli
1605	Kaualei	Koipuiki, Koipu
1660	Ewa	Kahuu
1707	I	Kalokoeli
1721	Hinawale	Kuainiho, Kaaiiole
5634	Kaiwi	Kalokoeli, Koipuu
10474	Namauu	Ahupua‘a

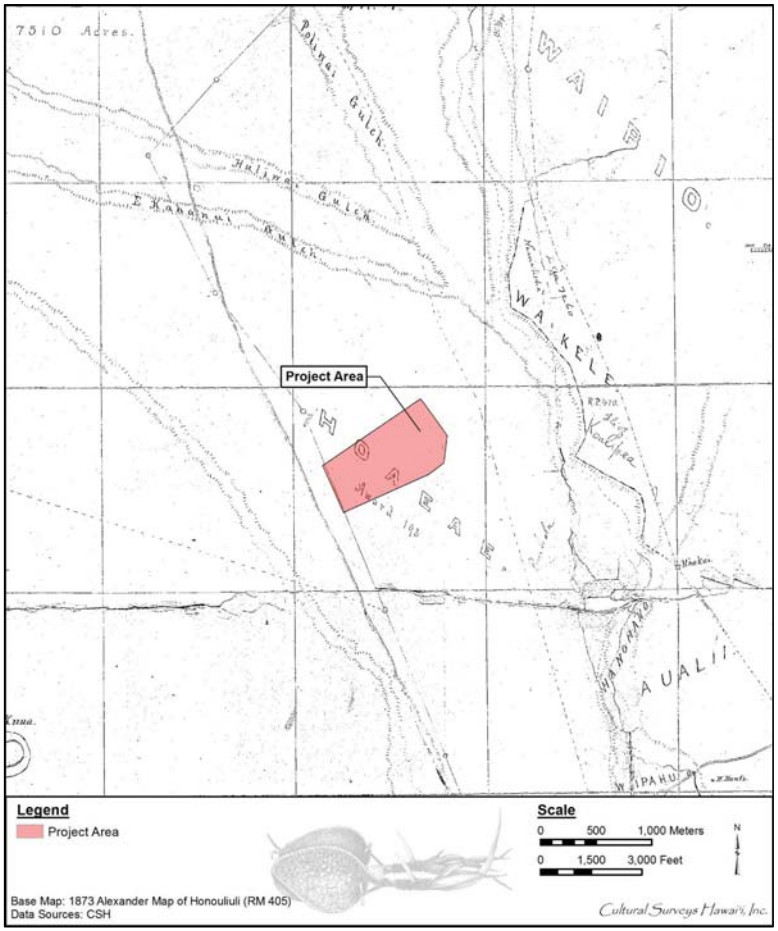

Figure 10. Portion of the 1873 Alexander map of Honouliuli showing the project area within LCA 193

> the basin is sufficiently extensive to accommodate any number of vessels. If the water upon the bar should be deepened, which I doubt not can be effected, it would afford the best and most capacious harbour in the Pacific. [Wilkes 1970:79]

Although Wilkes was impressed by the harbor, he was not at this time thinking of how this survey could benefit the American government in the future. In fact, Wilkes (1970:79) concluded, "As yet there is no necessity for such an operation, for the port of Honolulu is sufficient for all the present wants of the islands, and the trade that frequents them." This changed in less than 30 years, however. The U.S. military tried to make a coaling station on Midway Island in 1869 by blasting through the coral reef to make a harbor, but the plan failed. In 1873, General Schofield presented a confidential report to the U.S. Secretary of War, recommending that Pearl Harbor should be available to the U.S. Navy. Schofield wrote the following:

> In case it should become the policy of the Government of the United States to obtain the possession of this harbor for naval purposes, jurisdiction over all the waters of Pearl River with the adjacent shores to the distance of 4 miles from any anchorage should be ceded to the United States by the Hawaiian Government . . .
>
> The cession of Pearl River could probably be obtained by the United States in consideration of the repeal of the duty of Sandwich Island sugar. Indeed, the sugar-planters are so anxious for a reciprocity treaty, or so anxious rather for free trade in sugar with the United States, that many of them openly proclaim themselves in favor of annexation of these islands of the United States. [Sen. Ex. Docs, 52nd Cong. 2nd Sess. No. 77:150-154, reproduced in Judd 1971:Appendix 3]

This reciprocity treaty was concluded in 1876, with the provision that Hawai'i would not "lease or relinquish sovereignty to another country or any harbor, etc." In 1887, the treaty was renewed and amended and allowed the United States the "exclusive right to enter the harbor of Pearl River, in the Island of Oahu, at to establish and to maintain there a coaling and repair station for the use of vessels of the United States." [Judd 1971:128]

The early missionary Levi Chamberlain was able to take an outrigger canoe trip to Pearl River:

> Kawaa took passage in our canoe to go down the harbor to a place where oysters are abundant to give orders to his people to gather a mess. The sail down the harbor was delightful . . . The passage down the creek for a number of miles was very pleasant till we got down near the reef and our course altered. We then could sail no longer as the wind was against us. The sail was lowered the mast taken down and secured across the outrigger and the rowers plied their paddles. [Journal of Levi Chamberlain 1822-1849, Hawaiian Mission Schools, Storage Case 4:899 in Sterling and Summers 1978:51]

In 1891, Russian explorer Otto Von Kotzebue tried to observe Pearl River, but his group could not obtain a canoe. What he was told led him to speculate on the possible importance of Pearl Harbor to the future:

> In the mouth of this river are several islands; it is so deep, that the greatest ship of the line can lie at anchor a few fathoms from the shore; and so broad, that a hundred vessels can conveniently find room in it. The entrance into the Pearl Rivers is in the same situation as the harbor of Hana-rura; but the windings between the reefs are,

> however, said to render a passage more difficult. If this place were in the hands of the Europeans, they would certainly employ means to make this harbour the finest in the world. [Kotzebue 1821:338-348]

3.1.5.2 Plantation Ranching, Agriculture, Irrigation and the Railroad in the Late 1800s

In 1889, the first year that sugar was harvested on O‘ahu, Campbell leased his property to Benjamin Dillingham, who subsequently formed the Oahu Railway & Land Company (OR&L) in 1890. The railroad connected the outlying areas of O‘ahu to Honolulu. By 1890, the railroad reached from Honolulu to Pearl City and continued on to Waianae in 1895, to Waialua in 1898, and to Kahuku in 1899 (Kuykendall 1967:100).

To attract business to his new railroad system, Dillingham subleased all land below 200 ft elevation to William Castle who in turn sublet the area to the Ewa Plantation Company for sugar cane cultivation (Frierson 1972:15). Dillingham’s lands above 200 ft elevation that were suitable for sugar cane cultivation, including the project area, were sublet to the Oahu Sugar Company. Ewa Plantation Company was incorporated in 1890 and continued in full operation up into modern times. The plantations grew quickly with the abundant artesian water. As a means to generate soil deposition on the coral plain and increase arable land in the lowlands, they installed irrigation ditches running from the lower slopes of the mountain range to the lowlands and then plowed the slopes vertically just before the rainy season to induce erosion (Frierson 1972:17).

The Oahu Sugar Company was incorporated in 1897, and included lands in the foothills above the ‘Ewa plain and Pearl Harbor, on 12,000 acres of land leased from the estates of John Papa ‘Ī‘ī, Bishop, and Robinson and had over 900 field workers composed of 44 Hawaiians, 473 Japanese, 399 Chinese, and 57 Portuguese. The sprawling plantation “covered some 20 square miles . . . ranging in elevation from 10 feet at the Waipio Peninsula . . . to 700 feet at the Waiāhole Ditch” (Condé and Best 1973:313). Prior to commercial sugar cultivation, the lands occupied by the Oahu Sugar Company were described as being “of near desert proportion until water was supplied from drilled artesian wells and the Waiāhole Water project” (Condé and Best 1973:313).

From 1890 to 1892 the Ranch Department of the OR&L desperately sought water for their herds of cattle by tapping plantation irrigation flumes and searching for alternative sources of water. Water to irrigate the *mauka* (upland) cane fields was initially pumped to elevations of 500 ft by some of the “largest steam pumps ever manufactured” (Dorrance and Morgan 2000:49). The expense of pumping water to the high elevations of the plantation led to the proposal to transport water from the windward side of the Ko‘olau Mountains.

Ida von Holt leaves this account of her husband Harry’s (Superintendent of the OR&L Ranch Department) search for water in the foothills of the Wai‘anae Range:

> One of those places is on the old trail to Pālehua, and had evidently been a place of which the Hawaiians had known, for its name is Kaloi (the taro patch), and even in dry weather water would be standing in the holes made by the cattle, as they tried to get a drop or two. [Von Holt 1985:136]

A second account is given of the discovery of spring water in an area over the ridge on the north side of Kalo‘i Gulch:

> Shouting to the men to come over with their picks and shovels, he [Harry von Holt] soon got them busy clearing away lots of small stones and earth. Almost at once they could see that there were evidences of a paved well, and at about three feet down they came upon a huge flat rock, as large around as two men could span with their arms. Digging the rock loose and lifting it to one side, what was their astonishment to find a clear bubbling spring! [Von Holt 1985:138]

Following the discovery, two old Hawaiians began to ask Von Holt about the spring:

> Finally he [Harry von Holt] got them to explain that the spring, called ‘Waihuna’ (Hidden Spring) had been one of the principal sources of water for all that country, which was quite heavily populated before the smallpox epidemic of 1840 . . . A powerful *Kahuna* living at the spring had hidden it before he died of the smallpox, and had put a curse on the one who disturbed the stone, that he or she would surely die before a year was out. [Von Holt 1985:138-140]
>
> Harry Von Holt subsequently went through an extensive ritual to lift the curse: . . . and partaking of their fears and superstitions, won for Harry the love and confidence of the natives, and he had consequently much help in finding the water which was so necessary to the work of the ranches, and for the starting of the forest planting all over the Waianae range, which Harry did for many years . . . Harry had such success in general with the water that the Hawaiians regarded him as a water *kahuna.* [Von Holt 1985:141]

Dillingham had successfully promoted the Ewa Plantation Company in 1890; the sprawling sugar company was just south of and adjacent to the Oahu Sugar Company. Artesian wells had converted those arid ‘Ewa lands into a thriving plantation, and Dillingham recognized the same potential in the northern area.

The Oahu Railway and Land Company was another Dillingham development. Established in 1886, the railway was the means to transport sugar from both the Oahu Sugar Company and the Ewa Plantation Company to Honolulu’s docks. The Oahu Sugar Company, located near the spur line of the Oahu Railway, had approximately 64 miles of railroad tracks for transporting sugar cane to the plantation’s mill in Waipahu. The plantation owned locomotives and used both permanent and portable tracks for harvesting (Condé and Best 1973; Oahu Sugar Company 1948; Smith 1924).

In the late 1800’s the Hawaiian Islands were well-positioned for rice cultivation. A market for rice in California had developed as increasing numbers of Chinese laborers immigrated there since the mid-nineteenth century. Similarly, as Chinese immigration to the Islands also accelerated, a domestic market opened. During the late 1800s, the taro fields of central ‘Ewa were converted to rice fields as Chinese immigrants began to lease and purchase ‘Ewa lands. By 1892, there were 333 acres of land devoted to rice farming in Waikele and Waipi‘o *ahupua‘a* (Coulter 1933). By the early decades of the twentieth century, rice farming in the Hawaiian Islands was in decline, beset by crop diseases and cheaper prices for mainland-grown rice.

3.1.6 1900s

Figure 11 shows the project area in 1919 containing built irrigation ditches and the Waiāhole Ditch, approximately 1.6 km (1.0 mile) northeast of the project area. A pipeline entering the project area in the northeast quadrant and exiting the project area in the southwest quadrant to a small

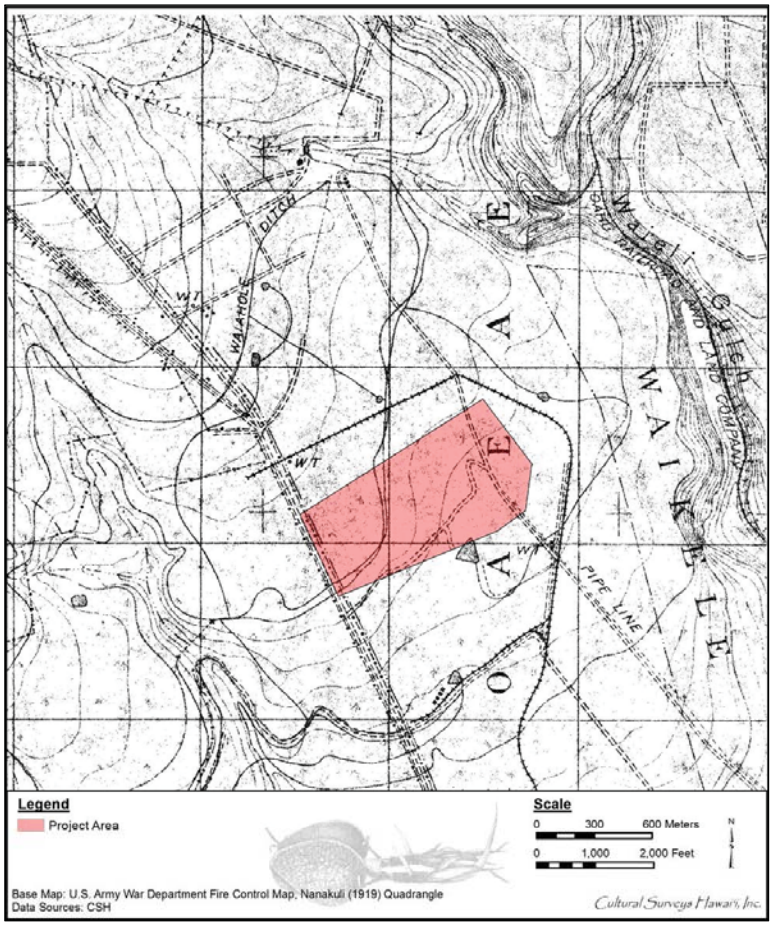

Figure 11. 1919 U.S. Army fire control map indicating the project area within the Nanakuli Quadrangle

reservoir in the south-central margin of the project area in this 1919 map. Figure 12 shows the project area in 1925 within fields 50, 55, and 24 of the Oahu Sugar Company.

The Figure 13 map shows that by 1935 an irrigation ditch has been built through the northwestern corner of the project area. This irrigation ditch crosses the Ekahanui Gulch, a tributary of the Waikele Stream approximately 1.6 km (1 mile) to the north at an elevation of 600 ft and through the northwest portion of the project area, with a slight slope to the southwest at an elevation of approximately 590 ft. Figure 13 also shows that by 1935 another irrigation ditch and a plantation road have been built through the northeast and south-central portions of the project area. The road is likely associated with the plantation infrastructure improvements noted as Feature 1 and the irrigation ditch is assuredly the feature observed here as Feature 2. In Figure 13, the Feature 2 irrigation ditch maintains a 540-550 ft elevation throughout the project area, terminating approximately 400 m east of the project area at an elevation of approximately 540 ft. An additional irrigation ditch feature that connects the two features described above in a northwest-southeast line in the central portion of the project area is noted in this 1935 map. Figure 13 also depicts the built development of a portion of the plantation railroad owned by the Oahu Railroad and Land Company just outside the boundaries of the project area.

Figure 14, Figure 15, and Figure 16 show the continued development and maintenance of these plantation infrastructure irrigation ditch, road, and reservoir features through 1969, in addition to further pipeline development in the northwestern and central portion of the project area. For example, Figure 15 indicates that by 1953 the terminal points of this irrigation ditch system 400 to 800 m to the northwest of the project area have been connected into two loops. This activity served to irrigate the entire terrace between the project area and the Waikele Stream. The elevations of these features are noteworthy, with minimal slope allowing for pumped water to flow throughout the system. The Feature 2 and Feature 3 irrigation ditch maintains a slight slope to the southwest at around 550 ft elevation. Larry Jefts indicates these irrigation ditches were referred to internally within plantation operations by their elevation (8 December 2014, personal communication). That is, the project area may have been referred to within the Oahu Sugar Company as portions of fields 50, 55, and 24 containing portions of the 550 (ft elevation) irrigation ditches.

Maps from 1919 (Figure 11), 1935/1936 (Figure 13) to the 1998 topographic maps (see Figure 1) indicate the gradual and eventual transition of the region surrounding the project area from primarily agriculture to becoming increasingly residential, as indicated by the development of Waipau and Village Park housing sub-divisions, commercial centers, and golf courses. The current project, Kunia Agricultural Park, represents a blending of these two patterns.

As discussed further in Section 4.1, the pedestrian survey also observed several mechanically pushed and dumped piles of asphalt, concrete and very large basalt boulders in the southeastern portion of the project area. This is noted above in 1.2.1, Natural Environment, as the portion of the project area that is fallow, southwest of the ephemeral stream meander scar identified by the MuD soil type seen in Figure 5. As qualitatively measured by the incredible thickness of grasses in this portion of the project area experienced during the pedestrian survey, this area appears to have been left fallow and unused for a significant period of time. Anecdotal evidence from the current property manager, Larry Jefts (8 December 2014, personal communication), indicates these berms and bulldozed piles were built at least 20 years ago to dissuade motorcycle and all-terrain vehicles from illegally entering the property.

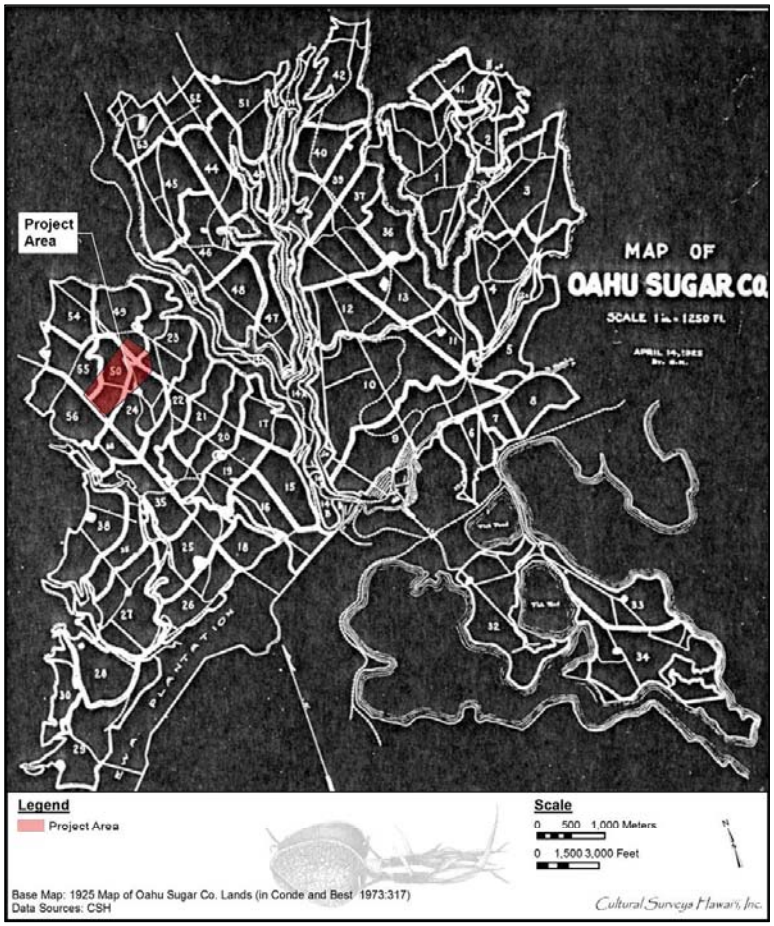

Figure 12. 1925 map of Oahu Sugar Company Lands indicating the project area (Condé and Best 1973:317)

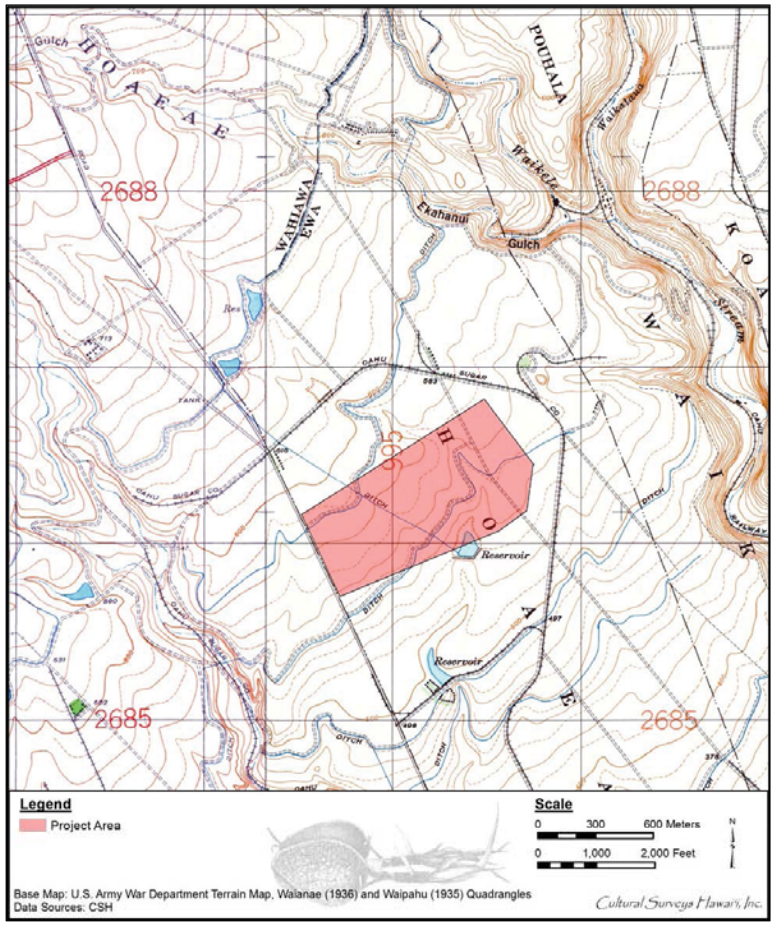

Figure 13. Portion of U.S Army War Department terrain map, Waipahu (1935) and Waianae (1936) Quadrangles, indicating the project area

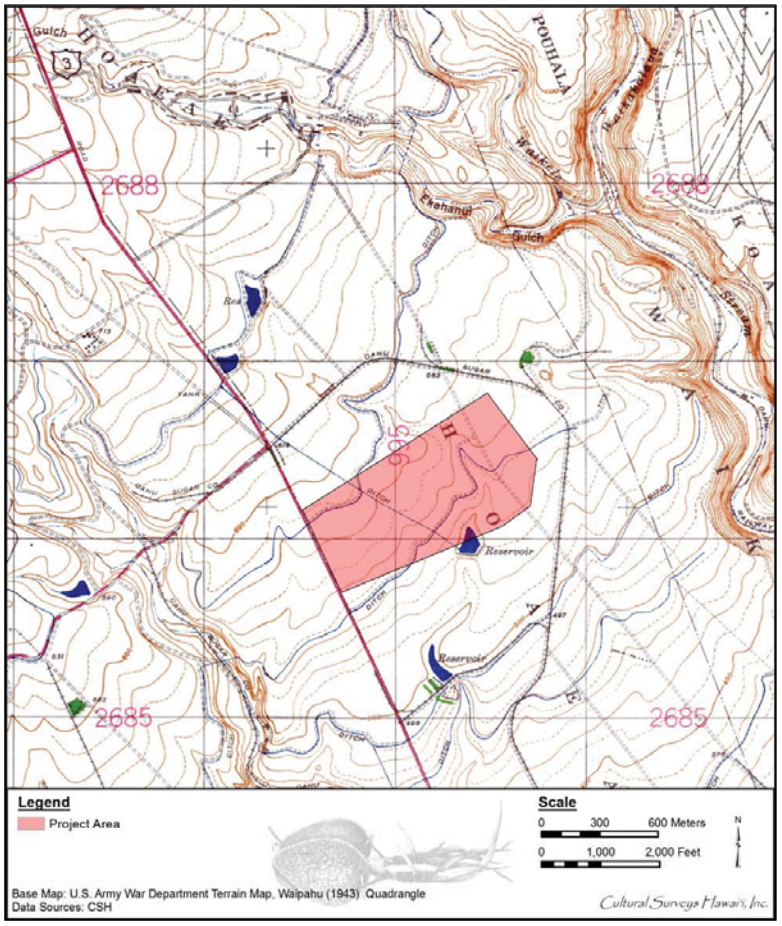

Figure 14. Portion of U.S Army War Department terrain map, Waipahu (1943) Quadrangle, indicating the project area

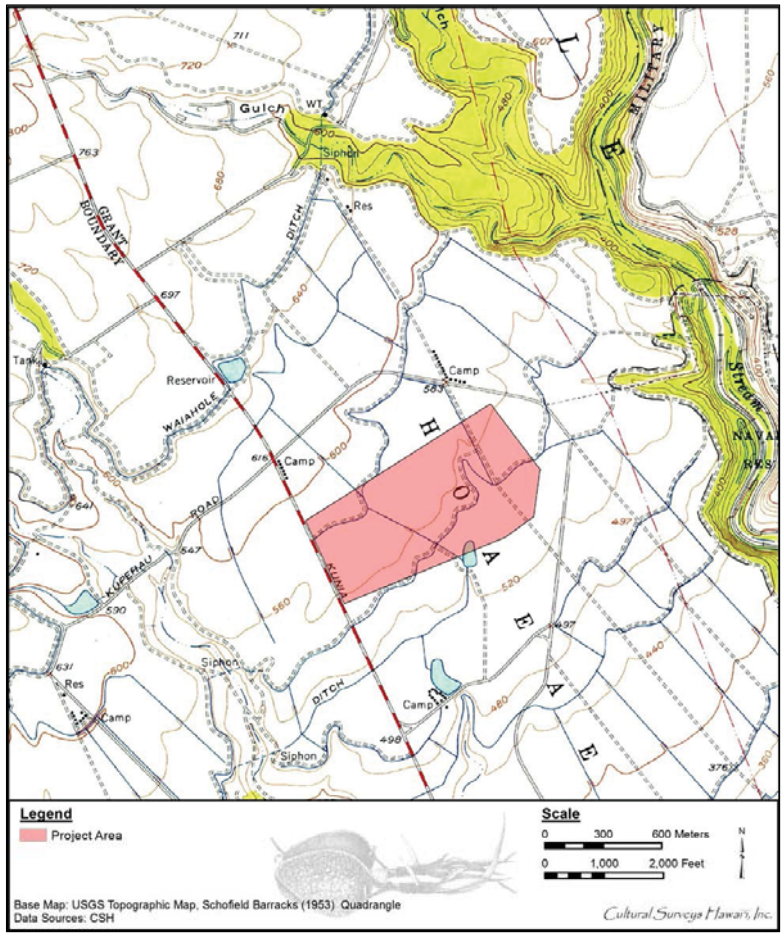

Figure 15. Portion of 1953 Schofield Barracks USGS topographic quadrangle indicating the project area

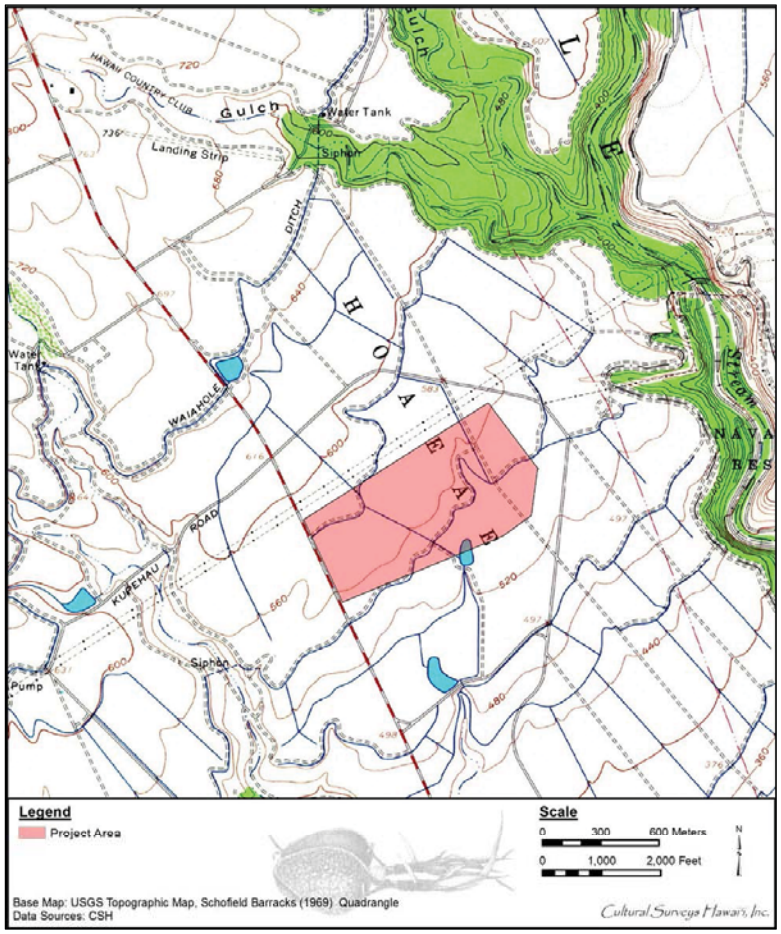

Figure 16. Portion of 1969 Schofield Barracks USGS topographic quadrangle indicating the project area

Historic maps indicate a gradual transition from strictly agriculture and ranching to residential and commercial development of Hō'ae'ae and Honouliuli. On the 1919 War Department map residential areas were limited to a cluster near the old taro lands adjacent to West Loch, and the Ewa Plantation Village *makai* of Honouliuli, while little to no residential development is found along Kunia Road to the north toward the project area (see Figure 11). By the 1950s, residential subdivisions spread to the shore of Pearl Harbor and eventually north along Kunia Road from Waipahu (see Figure 15).

After annexation of the Hawaiian Islands to the United States in 1899, development began to create a Pacific military base that could be used as a staging area for the Spanish-American war. Dredging of the harbor began in 1901, and additional dredging to deepen and widen the channel was conducted in 1908 and again in the 1920s. Money for the funding of the construction of dry docks and other support facilities was approved in 1908. By the 1920s, the lands of Hō'ae'ae and Honouliuli were used primarily for commercial sugar cane and pineapple cultivation and ranching (Frierson 1972:18). The main residential communities were at the northeast edge of the 'Ewa Plain. The largest community was still at Honouliuli village. 'Ewa was primarily a plantation town focused around the sugar mill with a public school as well as a Japanese School. Additional settlement was in Waipahu, centered on the Waipahu sugar mill, operated by the Oahu Sugar Company. Much of the *mauka* land in western Honouliuli, including ridges and deep gulches, remained pasture land for grazing livestock.

In Hō'ae'ae and Honouliuli, the cultivation of sisal (*Agavacea*) for high quality rope fiber was attempted on arid lands, although no evidence suggests this enterprise nor similar efforts to grow pineapple affected the project area in any way. Thrum's *Hawaiian Almanac and Annual* speaks of the prospect of sisal cultivation glowingly from 1904 to 1913, but the greater profits to be made from sugar cane cultivation eventually led to the decline of this industry. Upper Hō'ae'ae seems to have been the focus of sisal cultivation in central 'Ewa, as shown in excerpts from Thurm's 1909 and 1913 annuals.

Further, a 1908 lease from the John 'Ī'ī Estate, Ltd. to Yoshisuke Tanimoto and Kintaro Izumi led to the formation of the Waipio Pineapple Company, which cleared and cultivated approximately 223 acres in portions of Kīpapa Gulch. In 1909, the government appropriated Waipi'o Peninsula from the 'Ī'ī estate. The land was valued at $10,000 for purposes of fair compensation (Department of Land and Natural Resources Land Record Books 1909:228-235). In 1915, Libby, McNeill & Libby took over Waipio Pineapple Company's leases and continued to cultivate pineapple in the area. By the late 1920s, James Dole's Hawaiian Pineapple Company, incorporated in 1901, was cultivating pineapple on thousands of acres leased from the 'Ī'ī estate in the *mauka* area of Waipi'o.

Besides sisal, cotton, and pineapple, other crops were grown in central 'Ewa such as macadamia nuts:

> At Hoaeae, in the Ewa district, is another tract of about six acres on the Robinson estate, reported to be in fine condition . . . Mr. Grant Bailey, manager of the Hoaeae Ranch, kindly furnishes the following data on the infant industry . . . 'Our planting is about six acres. Apparently one would have to wait about ten years before expecting commercial results on the planting. Our oldest trees are seven years old and they are just now beginning to bear.' [Thrum 1927:96]

Water to irrigate the upper cane fields was initially pumped to levels of 500 ft (150 m) by some of the “largest steam pumps ever manufactured” (Dorrance and Morgan 2000:49). The Waiahole Water Company was formally incorporated in 1913, and was originally a subsidiary of the Oahu Sugar Company. The Waiāhole Ditch was designed by engineer Jorgen Jorgensen, with recommendations by engineer J.B. Lippencott, and assisted by W.A. Wall. Oahu Sugar Company’s innovations to utilize the arid ‘Ewa Plains and increase production within the plantation were so successful that the improvements were incorporated throughout the sugar cane industry. The Oahu Sugar company constructed Hawai‘i’s first 12-roller mill in 1907, and P.A. Messchaert, the plantation’s chemist, invented a mechanized grooving method in 1913 that maintained pressure on the processing cane while allowing the cane juice to flow (Dorrance and Morgan 2000:49).

The Waiāhole Ditch was built to pass through Hō‘ae‘ae, to the north and west of the project area, bringing water to the project area via an interconnected network of irrigation flumes. Figure 17 and Figure 18 show workers at the Waiāhole Tunnel and the Oahu Sugar Company ca. 1916. When completed, the original Waiāhole Ditch system included 27 tunnels connecting with 37 stream intakes on the north side of the Ko‘olau; the main bore through Waiāhole Valley; 14 tunnels on the southern side of the Ko‘olau at Waiawa; and an irrigation ditch extending westward to Honouliuli (Condé and Best 1973:37). Upon its completion in 1916, the Waiāhole Ditch was 21.9 miles long (35 km) and cost $2.3 million to construct. Related ditches, including that of the Kīpapa Gulch, continued to be be expanded through the 1930s (Figure 19). The additional water enabled the Oahu Sugar Company to grow to “some 20 square miles . . . ranging in elevation from 10 feet at the Waipio Peninsula . . . to 700 feet at the Waiāhole Ditch” (Condé and Best 1973:313). The irrigation ditch system encompassed much of central O‘ahu (Figure 20), and the Waiāhole Ditch is estimated to have carried 28 million gallons of water a day (Wilcox 1996:106). Tvedt (2006:42) comments on how water diversions such as these for plantation agriculture, particularly sugar, fundamentally changed the social socio-economic landscape in Hawai‘i:

> Many irrigated crops were grown for export markets—pineapple, coffee and macadamia nuts among them—but sugar become the king of crops. Fields of sugar cane dominated the landscapes of Hawai‘i from the 1880s through the 1980s, and for much of that century sugar was the single greatest force at work in Hawai‘i—no only economically and politically but socially and environmentally . . . sugar is a thirsty crop. It took 4,000 tons of water on average to produce one ton of sugar . . . (that is) one million gallons of water a day is required to irrigate 100 acres of sugar cane field. [Tvedt 2006:42-43]

Figure 21 is a photograph of the Kahana tunnel on a portion of the upper reaches of the leeward irrigation ditch system as it is currently found on the Kahana Ditch Trail (Wai‘anae Crider 2014). Similarities in the square-faced basalt boulder artifacts and irrigation ditch feature are noted between the cultural resources photographed in Figure 21 and those encountered in the project area:

> West of Waikakalaua Gulch, through Hoaeae and to the upper boundary of Oahu Plantation in Honouliuli, the conduit consists of 12,650 feet of cement-lined ditches, and three redwood pipes 5 feet in diameter, having an aggregate length of 2,830 feet. [Kluegel 1917:96]

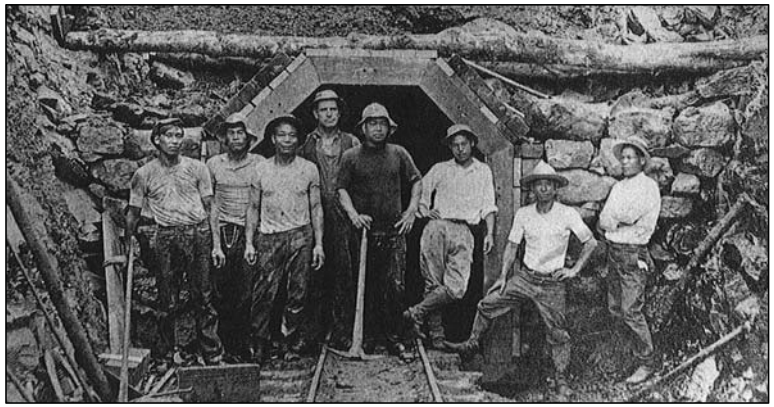

Figure 17. Workers at the Waiāhole Tunnel, ca. 1916 (Wilcox 1996:107)

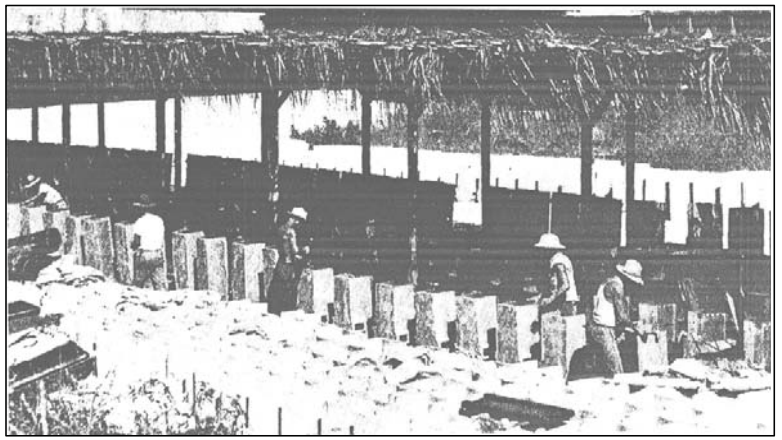

Figure 18. Workers pre-forming irrigation ditch square-faced boulders with steel hammers at the Oahu Sugar Company (Oahu Sugar Company1948:13)

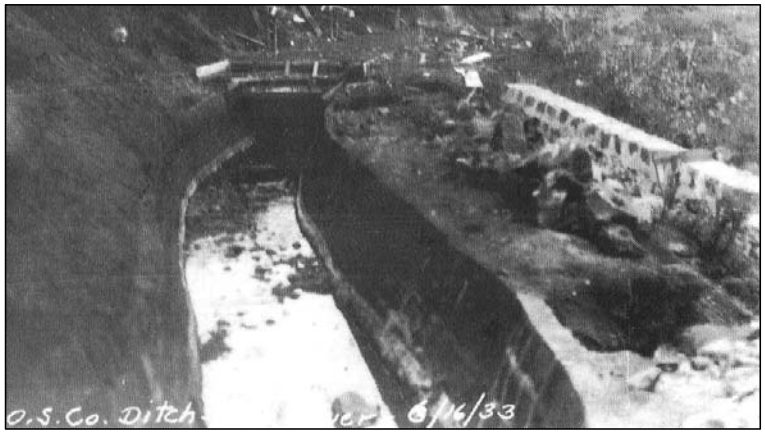

Figure 19. Oahu Sugar Company irrigation ditch under construction in 1933 at Kīpapa Gulch (Bishop Museum)

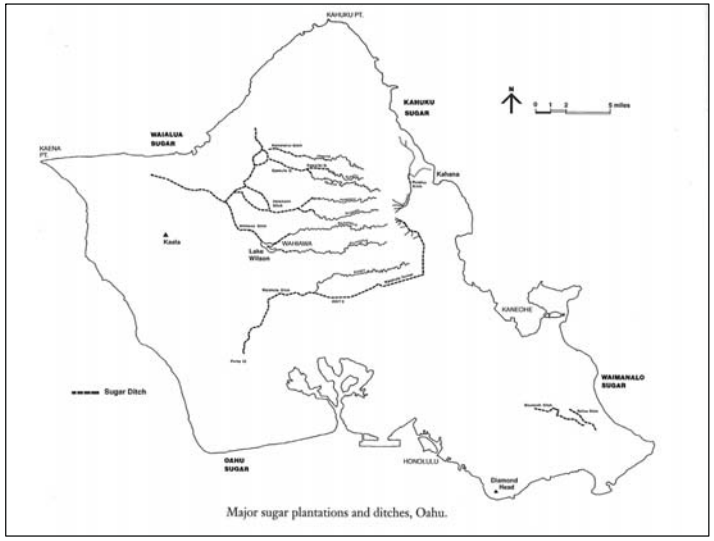

Figure 20. Major sugar plantation irrigation ditches in Oahu (Wilcox 1996:106)

Figure 21. Inside the Kahana tunnel, upper Waiāhole Ditch, built 1929-1931 (Wai‘anae Crider 2014)

> The Waiahole Water Co. has taken over from the Oahu Sugar Co. the Ahrens Ditch in Waiawa, the Kipapa Ditch, the Waikakalaua Ditch in Waipio, and the Hoaeae Ditch. Two redwood pipes having a total length of 1,223 feet have been laid across two gulches on the line of Hoaeae Ditch, cutting out 2 ¼ miles of ditch. The water delivered by the Waiahole System is chiefly used on newly planted cane on land above the lift of the pumps. [Kluegel 1917:107]

Figure 22 and Figure 23 indicate the project area and surrounding lands remained almost exclusively under commercial sugar cane cultivation from 1909 until at least 1977. That these irrigation ditches were connected with tunnels through wet windward portions of the island and lowland pumping stations ensured that “the distribution of water is especially flexible: the ditches are so interconnected that nearly all the water can be sent to any given place” (Wilcox 1996:109). As discussed further in Section 4.2, Subsurface Testing Results, the excavated floor in the irrigation ditch encountered in T-2 was almost level, indicating the water could be moved from either direction, by gravity flow from the uplands during wet times or from artesian wells associated with pumping stations:

> By 1931, Ewa Plantation had seventy artesian and four surface wells with eighteen pumps. Its total pumping capacity in the summer of 1931 was 118 million gallons a day—one and a half times the amount used by the entire city of Boston. [Wilcox 1996:107]

3.1.7 Contemporary Land Use

The 150-acre project area has been used for intensive agriculture for over 100 years and is currently being used by Waikele Farms for cultivating corn and tomatoes. There is a significant portion of the southeast quadrant of the project area that is fallow. Some temporary modern infrastructure is still extant within and near the project area. Records and anecdotal information from the property manager for the past two decades, Larry Jefts, indicates that all portions of the project area have intensively maintained for large-scale agriculture within the last 50 years (8 December 2014, personal communication). The project area is currently zoned for agriculture and is in an area with surrounding large agricultural parcels, along Kunia Road between the Royal Kunia residential community to the south and Wilikina Drive in Wahiawa to the north. Parcels of the project area are currently fallow, recently seeded, or under recently mulched tomatoes and recently seeded corn.

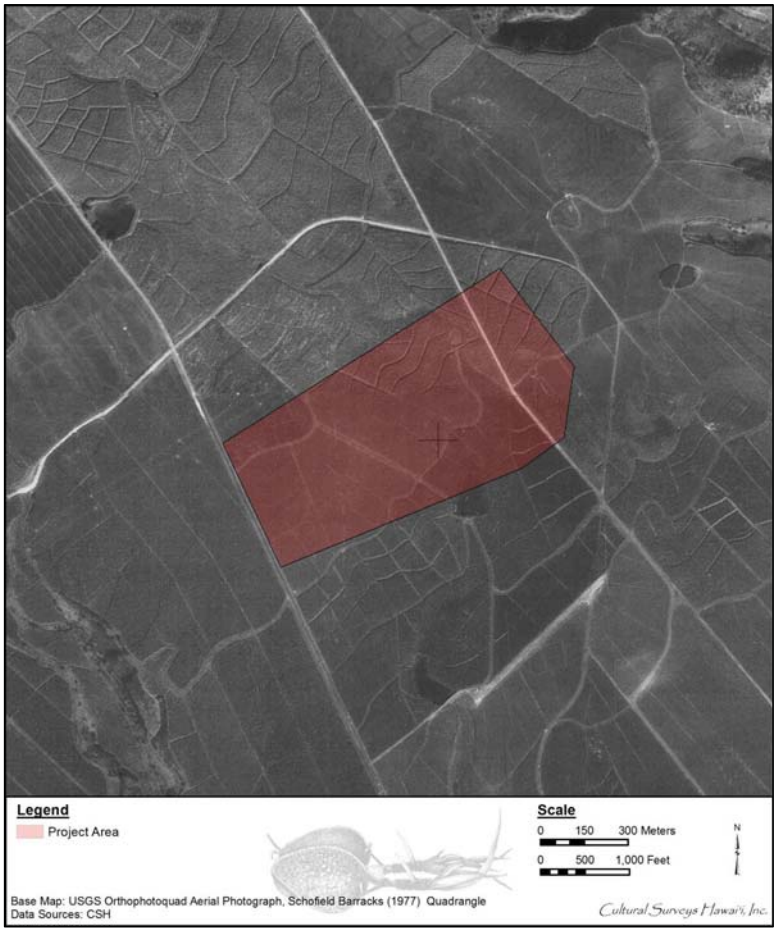

Figure 22. 1977 aerial photograph of the project area (USGS 1977)

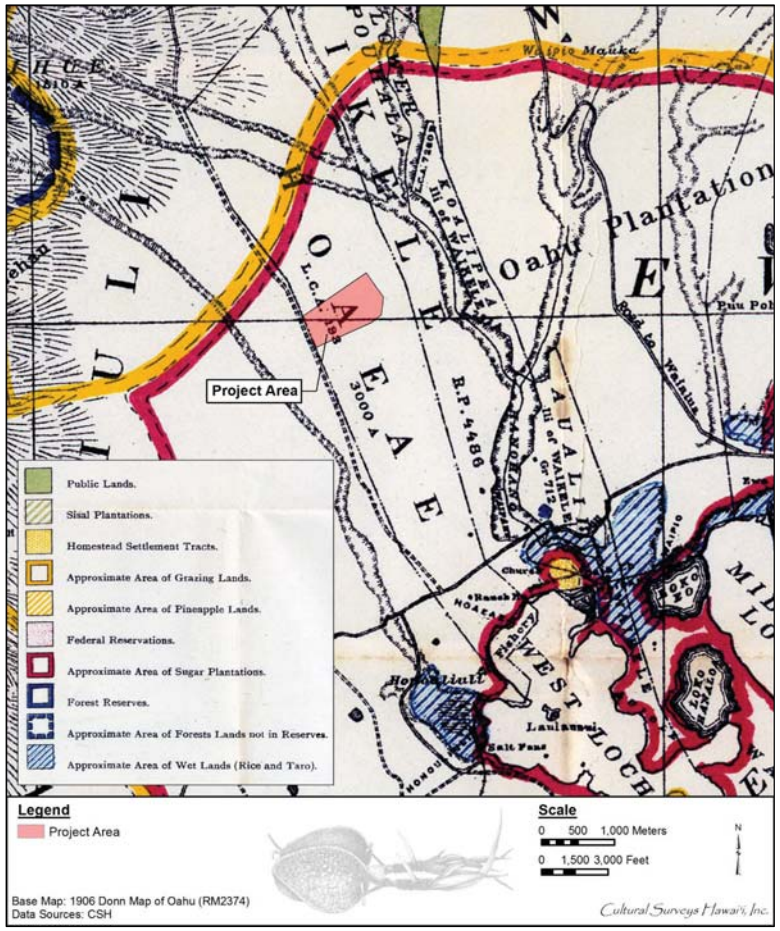

Figure 23. 1906 Donn map of O‘ahu showing the project area within the Oahu Sugar Company plantation

3.2 Previous Archaeological Research

While the southwest corner of the island of O‘ahu has been subjected to many archaeological studies, the Kunia Agricultural Park project area is environmentally distant from the focus of most of this previous work (particularly the Barbers Point or Kalaeloa area). An investigation has not been completed within Hō‘ae‘ae Ahupua‘a, however, in neighboring Honouliuli, Waikele, and Waipio Ahupua‘a previous archaeological studies have been conducted. The following discussion focuses on previous archaeological projects that are in the vicinity of the project area (Figure 24 and Table 3).

3.2.1 Early Archaeological Studies

Two archaeological features, a boundary *pōhaku* or rock and a *hōlua*, or sledding site, are recorded only in the Boundary Commission Reports establishing the division lines between the *ahupua‘a* of Honouliuli and Hō‘ae‘ae (to the east). The surveyor wrote of the southern point of this boundary:

> In regard to Hoaeae . . . the point of commencement is Pōhaku Palahalaha, a well-known rock, now marked by an arrow and the name ‘Honouliuli’ on one side and ‘Hoaeae’ on the other, which I have made the initial point of the survey. [Commission on Boundaries 1862-1935:1:243]

This rock, shown on the Sterling and Summer map as Pōhaku Palaha, is a large flat rock, which may indicate the origin of the name from the Hawaiian word *pālaha*, which means “flattened, wide” (Pukui and Elbert 1986:307). As the surveyor continued to walk the Honouliuli/Hō‘ae‘ae boundary, he marked the northern point of the division: “The Kamaaaina took me to the corner of Pauhala (?)—Hoaeae and Honouliuli—there is an ancient *holua* or sleding [*sic*] place near this — which is agreed for the ancient corner. . .” (Commission on Boundaries 1862-1935:1:243).

Thrum (1917) refers to a *heiau* located on Pu‘uokapolei, southwest of the present project area, as *heiau* Palole‘i (Kapolei). Emory mapped and photographed these structures in 1933 (field notes), but they were dismantled and destroyed sometime before McAllister’s survey of the Islands in the 1930s. According to legend, Pu‘uokapolei was the location where Kamapua‘a, the pig-god, resided with his grandmother, Kamaunuahihio (McAllister 1933:108).

In his surface survey of 1930, archaeologist J. Gilbert McAllister recorded the specific locations of important sites, and the general locations of less important sites (at least at Honouliuli). Archaeological investigations by McAllister along the slopes of the Wai‘anae Range identified three sites to the west and southwest of the current project area (Figure 25). Although the sites are well outside the bounds of the project area, they are described here for the purposes of supplementing the archaeological context for the Kunia Agricultural Park project.

McAllister’s Site 133 is the nearest of his sites to the current project area. Site 133 is described as a small enclosure reported to be a *heiau.* The site is within Huliwai Gulch, below Pu‘u Kānehoa, southwest of the current project area. McAllister records the following:

> My informant, Reiney, recalls the respect the old Hawaiians had for the place when he was punching cattle with them in his youth. It is a walled inclosure 25 by 30 feet. On the inside the walls are between 2 and 3 feet high, and on the outside they range from 2 to 5 feet, depending upon the slope of the land. On three sides the walls are

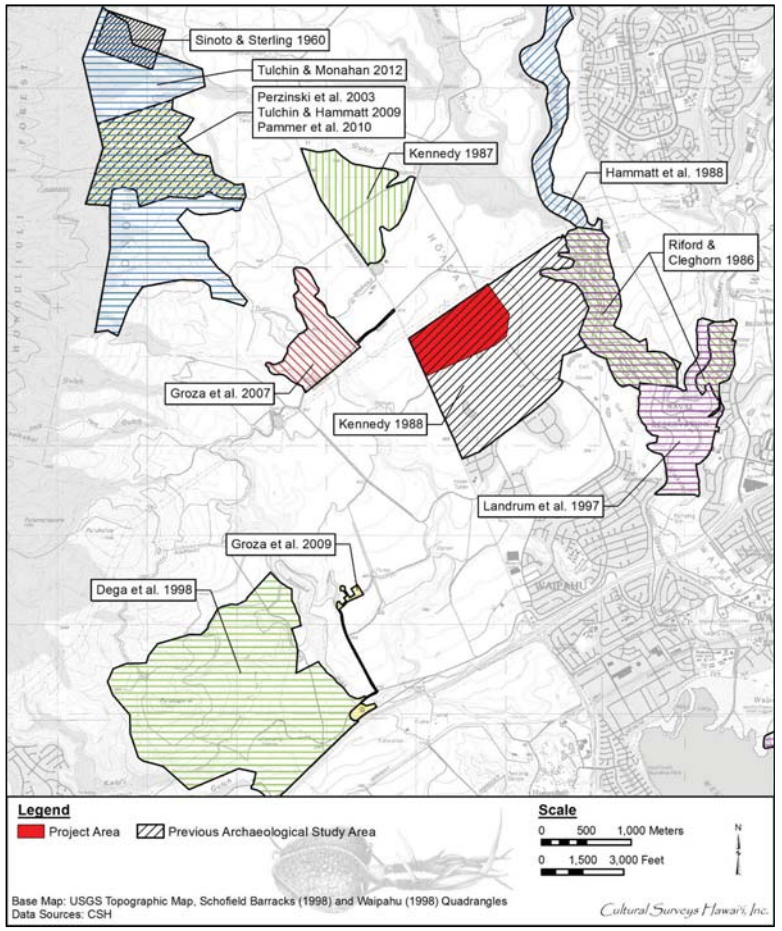

Figure 24. Map showing the locations of previous archaeological studies within the vicinity of the project area

Table 3. Previous Archaeological Studies in the Vicinity of the Project Area

Reference	Type of Study	Location	Results
Thrum 1917	Archaeological Survey	Island of O‘ahu	Listing of *heiau* and other sites of O‘ahu, including Palole‘i Kapolei.
McAllister 1933	Archaeological survey	Island of O‘ahu	McAllister Sites 134, 135, and 137
Sinoto and Sterling 1960 (in Sterling and Summers 1978:37)	Archaeological survey	‘Ēkaha Nui Gulch area	Documented agricultural terraces, house sites, paving, a burial platform and a possible *heiau* platform measuring 9 by 15 ft; no SIHP numbers assigned
Riford and Cleghorn 1986	Archaeological survey	Lualualei Naval Magazine, Waikele Branch	Archaeological sites identified: SIHP # 50-80-08-2919 through -2923.
Kennedy 1987	Archaeological survey	TMK: [1] 9-4-004, Hō‘ae‘ae	No above ground archaeological features noted, “and little chance for subsurface recovery” (Kennedy 1987:2)
Hammatt and Borthwick 1988	Archaeological survey	Kipapa Military Reservation	Archaeological sites identified: SIHP # 50-80-09-9529, labor camp associated with construction of Waiāhole Ditch; SIHP # -9530 “is the intake for a dressed stone ditch constructed in the 1930’s”; and SIHP # -9534, considered a mechanically created pile of stones related to Oahu Sugar Company
Kennedy 1988	Archaeological pedestrian survey	Royal Kunia, Phase II, TMK: [1] 9-4-002:001	No archaeological features noted
Dega et al. 1988	Archaeological inventory survey	AIS of University of Hawai‘i West O‘ahu Campus, TMKs: [1] 9-2-002:001, 003, 005	No traditional sites found; archaeological sites identified with historical features: SIHP #s 50-80-08-5593, -0968; Waiāhole Ditch System SIHP # 50-80-09-2268 crosses project parcel

Reference	Type of Study	Location	Results
Landrum et al. 1997	Cultural resources survey	U.S. Naval Facilities on Island of O‘ahu, including Naval Magazine, Lualualei Headquarters Branch, West Loch Branch, and Waikele Branch	Archaeological sites identified: SIHP #s 50-80-08-4936 and -4935
Perzinski et al. 2003	Archaeological inventory survey	Kunia Landfill, Honouliuli, TMK: [1] 9-2-004:por 5	Archaeological sites identified: SIHP #s 50-80-12-6456, -6457, -6458, -6459, -6460, -6461
Groza et al. 2007	Pedestrian survey	143-acre Mauka Detention Basin located west of Kunia Road, TMK: [1] 9-2-001:001	Archaeological sites identified: SHPD #s 50-80-06-2268, -6892, -6893, and -6894
Groza et al. 2009	Archaeological inventory survey	Waiāhole Ditch (north and west boundary), Kupehau Road (south boundary), TMK: [1] 9-2-001:001	Archaeological sites identified: SIHP #s 50-80-06-6892, -6893, and -6894
Tulchin and Hammatt 2009	Site relocation	Proposed Kunia Loa Ridge Farmlands project, TMK: [1] 9-2-004:005 por.	No new historic properties identified; SIHP #50-80-12-6457, -6458, and -6461 identified and new features associated with -6461 documented
Pammer et al. 2010	Archaeological inventory survey	Approx. 294-acre parcel for proposed Kunia Loa Ridge Farmlands project, TMK: [1] 9-2-004:005 por.	Archaeological sites identified: SIHP #s 50-80-12-6456, -6457, -6458, -6459, -6460, -6461, -7125, and -7126
Tulchin and Monahan 2012	Archaeological reconnaissance survey	162-acre project area on eastern side of the Wai‘anae Mountain Range, approx. 1.5 km east Hawai‘i Country Club, TMK: [1] 9-2-004:013 por.	Archaeological sites identified: SIHP #s 50-80-12-7125, -7126, -7323, -7324, -7325, -7326, -7327, -7328, -7335, -7336, -7337,-7338, -7339, -7340, -7341, -7343, -7344, -7345, -7446, -7347, -7448, -7349, -7350, and -7351

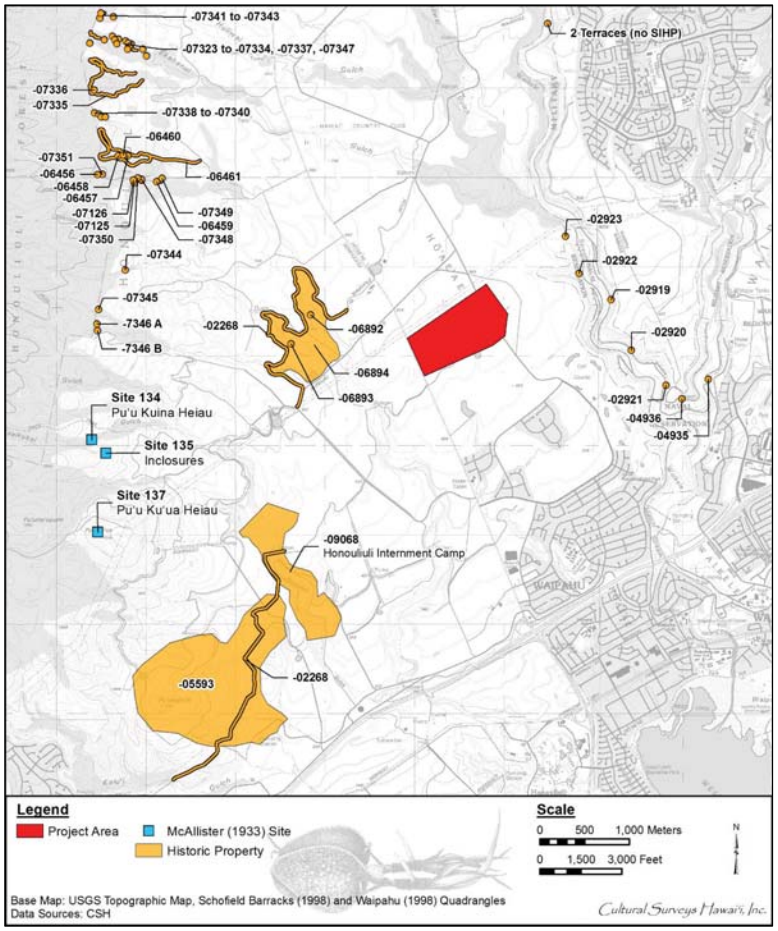

Figure 25. Previous archaeological sites located within the vicinity of the project area

> 2 feet wide, but the fourth is 3 feet wide. The walls are evenly faced with a fill of smaller stones. At present the site is surrounded with a heavy growth of Lantana; but only a thick growth of grass and two small guava bushes are in the interior, which is most unusual unless human hands keep the interior clear. Possibly this is not a heiau but a small inclosure considered sacred for some reason. [McAllister 1933:107]

McAllister's Site 134 is in Ka'aikukui Gulch, below Mauna Kapu, less than 5 km south of the of the current project area. The site is described as Pu'u Kunia Heiau and was apparently destroyed prior to McAllister's visit to the site. McAllister explains "the suggestion of a terrace is about all that remains, and no idea of the size of the heiau or the number of terraces can be obtained" (McAllister 1933:107).

McAllister's Site 135 is described as a series of enclosures in the Kukuilua area near Site 134. The site was described as leveled areas with low enclosing walls, with the largest measuring 100 by 85 ft, and suggested the features were "probably kuleana sites" (McAllister 1933:107).

In 1933 McAllister recorded Site 137 at Pu'u Ku'ua, a prominent landmark approximately 5 km southwest of the current project area. Pu'u Ku'ua Heiau is described by McAllister:

> The heiau was located on the ridge overlooking Nanakuli, as well as Honouliuli, at the approximate height of 1800 feet. Most of the stones of the heiau were used for a cattle pen located on the sea side of the site. That portion of the heiau which has not been cleared for pineapples has been planted in ironwoods. [McAllister 1933:108]

Interestingly, an 1899 article in the Hawaiian language newspaper *Ka Loea Kālai'āina* relates a story of Pu'u Ku'ua as "a place where chiefs lived in ancient times" and a "battle field," "thickly populated." The article summarizes,

> 1) This place was entirely deserted and left uninhabited and it seems that this happened before the coming of righteousness to Hawai'i Nei. Not an inhabitant is left.
>
> 2) The descendants of the people of this place were so mixed that they were all of one class. Here the gods became tired and returned to Kahiki. [Sterling and Summers 1978:33]

3.2.2 Modern Archaeological Studies

In 1960, Sinoto and Sterling (Sterling and Summers 1978:37) report traditional Hawaiian agricultural and habitation sites in the 'Ēkaha Nui Gulch area, over 1 km northwest of the Kunia Agriculture Park project area boundary. At approximately 1,200 ft elevation, the remains of agricultural terraces and house sites were located along the sides of the stream. Additional features included paving, platforms, and a burial platform. Also described is a platform measuring 9 by 15 ft, interpreted to be a possible *heiau* (Sinoto and Sterling 1960 in Sterling and Summers 1978:37). Cordy (2002) states that on the opposite side of the Wai'anae Range along the trail to Pōhākea Pass "Kākuhihewa was said to have built (or rebuilt) Nīoi'ula, a po'okanaka heiau (1,300 sq. m) in Hālona in upper Lualualei, along the trail to Pōhākea Pass leading into 'Ewa, ca. AD 1640-1660" (Cordy 2002:36). There is no direct archaeological evidence that intensive

Hawaiian settlement occurred along the Pōhākea Pass trail but it is considered as a place of higher probability for traditional Hawaiian sites, based on the above indications. John Papa (‘Ī‘ī 1959) described a journey that Liholiho took which led him and an entourage through inland Honouliuli and over Pōhākea Pass. In 1960, Sinoto and Sterling (Sterling and Summers 1978) reported on traditional Hawaiian agricultural and habitation sites in the ‘Ēkaha Nui Gulch area, approximately 2 km southwest of the project area. It was noted that at approximately 1,200 ft elevation, the remains of agricultural terraces and house sites were along the sides of the stream. Additional features included paving, platforms, and a burial platform. Also described is a platform measuring 9 by 15 ft, interpreted to be a possible *heiau* (Sinoto and Sterling 1960 in Sterling and Summers 1978:37).

Approximately 1 km to the west of the project area on the Waikele Stream, Riford and Cleghorn (1986) document “a total of five archaeological sites, composed of nine features: SIHP # 50-80-08-2919 to -2923”. These include,

> probable prehistoric, temporary habitation caves, crawl spaces, and one rock shelter. Two sites are historic, one a probable quarry and one a quarried rock wall. Other historic features were identified, including boulder mounds, stream facings, abandoned roadbeds and railroad berms, and construction tailings. [Riford and Cleghorn 1986:190]

Kennedy (1987:2) reports that “no above ground archaeological features (with) little chance of subsurface recovery” for a 20-acre parcel approximately 1 km northeast of the project area. The survey coincided with the cultivation of a sugar cane field which overlaid the project area, thus there was no ground vegetation to inhibit the archaeological survey. Similarly, in 1988 Kennedy surveyed the land associated with the Royal Kunia Phase II subdivision and found no archaeological features in the only previous archaeological work to include the current project area.

Hammatt et al. (1988) records three historic archaeological sites approximately 1,500 m northwest of the project area. SIHP # 50-80-09-9529 is a labor camp associated with the construction of the Waiāhole Ditch, SIHP # -9530 “is the intake for a dressed stone ditch constructed in the 1930’s, and SIHP # -9534 is considered a mechanically created pile of stones related to the Oahu Sugar Company.

In 1988, Kennedy conducted a 670-acre *Archaeological Walk through Survey of the Proposed Royal Kunia, Phase II.* This survey was conducted by “a two man survey team covered(ing) the area by automobile along the network of cane haul roads and by foot in the few areas where this was necessary. Visibility was limited by the dense stands of sugarcane”; no archaeological sites were recorded (Kennedy 1988).

The Dega et al. (1998) report, *Archaeology Inventory Survey of the University of Hawai‘i West O‘ahu Campus*, documents historic features associated with sugar cane production in the Waiāhole Ditch, SIHP #s 50-80-09-2268 and 50-80-08-0968. This report (Dega et al. 1998:22) also documents SIHP # -5593, “a complex, inter-connecting system of irrigation features representing extensive sugarcane production,” and further discusses the significance of the Waiāhole Ditch System.

The Landrum et al. 1997 overview cultural resources survey of the U.S. naval facilities on the island of O‘ahu includes the Oahu Naval Magazine, Lualualei Headquarters Branch, West Loch Branch, and Waikele Branch. This report (Landrum et al. 1997:156) documents several archaeological sites: SIHP #s 50-80-08-4936 and -4935, 50-80-09-2919, -2920, and -2921, a series of seven rock shelter/cave habitations in Waiakalaua Gulch, and # -2923 a historic rock wall built with dressed basalt. SIHP # -2922 is a historic basalt quarry. Landrum et al. (1997) surmise this quarry may be the source for stone in the construction of SIHP # -2923.

In 2003, CSH conducted an AIS on approximately 250 acres for a proposed landfill project in Kunia (Perzinski et al. 2003). The project was located in western O‘ahu on the southeastern flank of the Wai‘anae Range, including the ridges and gulches from 800-1,200 ft elevation in the vicinity of Pōhākea Pass. The archaeological inventory survey included a complete surface survey, site identification, mapping, and limited subsurface testing of select archaeological sites. Six archaeological sites were discovered in this area as a result of the survey. Of the six, two were recommended to undergo a process for data recovery, SIHP #s 50-80-09-6458 and -6461. SIHP -6458 consisted of filled crevices, and SIHP # -6461 consisted of a series of historic roads and bunkers. SIHP # 50-80-12-6456 is a terrace, mound, and trail, -6459 a U-shaped structure and alignment, and -6460 a leveled cobble pavement. One site was recommended for preservation, SIHP # -6457, a possible *heiau* located in the central gulch directly down slope from Pōhākea Pass. The site consisted of an enclosure with a three tiered retaining terraces and ramp leading into the interior of the enclosure. The walls of the structure were documented to have been up to 2 m in thickness and were well built with chinking, facing, and core-filling, typical construction for traditionally built houses.

In 2007, at the request of PBR Hawai‘i, Inc., CSH completed an inventory survey for the Ho‘opili project, Mauka Detention Basin, Honouliuli Ahupua‘a, TMK: [1] 9-2-001:001. The project area is bordered on the north and west by the Waiāhole Ditch, on the south by Kupehau Road, and is west of Kunia Road. During the project, the entirety of the 143-acre Mauka Detention Basin was surveyed on foot. The pedestrian survey revealed several sites, one of which consisted of 31 features. All sites identified were associated with water control, the Waiāhole Ditch, and the Oahu Sugar Company (Groza et al. 2007): SHPD #s 50-80-06-2268, -6892, -6893, and -6894. Two concrete slab bridges with four to six courses of dressed, faced, rectangular stone were also found. One of the bridges was inscribed with the date 9.27.1929 and the other bridge was similar in appearance. The other sites are identified with the Waiāhole Ditch and consisted of scattered plantation infrastructure features.

In an archaeological inventory survey, Groza et al. (2009) document sugar plantation infrastructure related to the Waiāhole Ditch as SIHP #s 50-80-06-6892 (bridge), -6893 (bridge), and -6894 (plantation infrastructure) at the proposed development of the Ho‘opili project lands:

> The (Waiāhole) ditch formed the *mauka* boundary of the plantation, and its waters were utilized throughout lands within elevations higher than 575 ft. Lands throughout the OSC were plowed and planted every eight to ten years since multiple crops, called ratoon crops, grew after the first crop was cut. Ground preparation required plowing to a depth of 50.8 to 63.5 cm, or 20 to 24 inches, with very heavy machinery since it was necessary to crumple the soil sufficiently so that it would hold more water. A length of cane stalk was then planted in furrows laid out either

> in the contour system or the long line system; both systems were likely used within the project area due to the configuration of flat and steep land. Concrete flumes and connecting ditches were used for irrigation and the concrete segments were formed at the plantation's cement plant. [Groza et al. 2009:26]

In 2009, Tulchin and Hammatt conducted a GPS relocation project at the Kunia Loa Ridge Farmlands project to further document SIHP #s 50-80-12-6457, -6458, and -6461. No new historic properties were identified, while SIHP #s -6457, -6458, and -6461 were located and new features associated with -6461 were documented.

In 2010, an archaeological inventory survey was conducted on an approximately 294-acre parcel for a proposed agricultural subdivision including the ridges and gulches from 800-1,200 ft elevation in the vicinity of Pōhākea Pass, approximately 3 km southwest of the project area. (Pammer et al. 2010). Several historic properties were identified, with functional types including temporary habitation, agriculture, and transportation: SIHP #s 50-80-12-6456 terrace, mound, and trail; -6457 *heiau* enclosure and associated terraces; -6458 cobble filled crevices; -6459 U-shaped structure and alignment; -6460 leveled cobbles; -6461 historic road improvements; -7125 petroglyph; -7126 mound, and -7351. Radiocarbon dating from samples recovered from the site yielded date ranges of AD 1290-1420 and AD 1510-1810. It was also noted that, with the exception of SIHP #s -6459, -7125 and -7126, all sites were within the gulches in the upslope portion of the study area (Pammer et al. 2010).

In 2012, at the request of C&C Farmlands, LLC, Tulchin and Monahan of CSH conducted an archaeological reconnaissance survey for the Kunia Mauka Loa Ridge Farmlands project. The project area was on the eastern side of the Wai‘anae Mountain Range and abutted the eastern edge of the Honouliuli Forest Reserve. Kunia Road is roughly parallel to the project area's eastern boundary. Most of the identified archaeological sites were in the northern portion of the project area within and between ‘Ēkaha Nui and Huliwai gulches. The relative absence of sites south of ‘Ēkaha Nui Gulch was attributed to pineapple cultivation which involved extensive grading of ridge tops. A majority of the historic properties identified within ‘Ēkaha Nui Gulch were of historic ranching origin. Archaeological sites identified included SIHP #s 50-80-12-7125, -7126, -7323, -7324, -7325, -7326, -7327, -7328, -7335, -7336, -7337, -7338, -7339, -7340, -7341, -7343, -7344, -7345, -7446, -7347, -7448, -7349, -7350, and -7351:

> Identified archaeological features representing distinct periods of land use were observed, including: pre-Contact traditional Hawaiian habitation and agriculture, as well as post-Contact agriculture, ranching, and military activities. Observed site types were stacked-stone walls, platforms, terraces, enclosures, and mounds, modified outcrops, petroglyphs, sugarcane infrastructure (i.e., siphon, earthen ditches, etc.), and a military road with stone and mortar culverts and cut earthen storage bays. Interpreted site functions included the following: possible burial, ceremonial, habitation, agriculture, transportation, water control, animal husbandry, and land division boundary. [Tulchin and Monahan 2012:ii]

3.3 Background Summary and Predictive Model

Based on research of the traditional and historical background and an analysis of historical maps and archaeological summary of areas of Hō‘ae‘ae and Honouliuli, the following general summary

considerations are made to place the Kunia Agricultural Park project area in the context of known patterns. The main area of early Hawaiian settlement in the area involves the rich cultivated lands of Hō‘ae‘ae and Honouliuli, nearest the marine resources of Pearl Harbor's West Loch, which were used for extensive wetland taro and were clearly the population center of the area. The uplands around Pu‘u Ku‘ua and in the vicinity of Pōhākea Pass were utilized for forest resource procurement and possibly lithics. The richest forest land for foraging for wood, birds, feathers, etc. would have been the east slope of the Wai‘anae Range. The *mauka/makai* route would have been up Honouliuli Gulch or up the Makakilo Ridge, paralleling the coast from Honouliuli Gulch to Kahe. The most convenient route to *mauka* lands, even from the western end of the coast near Kahe Point, would have been *mauka* along known trails and then either up the Makakilo Ridge or northeast to a trail to Pu‘u Ku‘ua and the trail to Pōhākea Pass.

Traditional sites including *heiau,* terraces, enclosures, and structures have been found in the vicinity of the project area (Perzinski et al. 2003; Riford and Cleghorn 1986:190; Sinoto and Sterling 1960 in Sterling and Summers 1978:37; Tulchin and Monahan 2012), dating to as early as AD 1290 (Pammer et al. 2010). More commonly within the vicinity of the project area, archaeologists document historical artifacts associated with agriculture (Groza et al. 2007; Hammatt et al. 1988; Tulchin and Monahan 2012). Specifically, the previous archaeology of locations nearest the current project area primarily document infrastructure relating to the Oahu Sugar Company (Groza et al 2009). The one archaeological report relating directly to the current project area (Kennedy 1987:2) observed no above ground archaeological features, "and little chance for subsurface recovery."

The dearth of observed traditional sites in the immediate vicinity of the project area as opposed to the history of agriculture and especially sugar production in and around the project area make agricultural infrastructure the most likely cultural resource to be encountered. The project area was the site of activities managed by the Oahu Sugar Company and facilitated tributaries to the Waiāhole Ditch System. This historically constructed irrigation ditch, with faced basalt stones and concrete creates a durable and noteworthy archaeological signature that can be expected when conducting archaeological investigations in this area.

Section 4 Results of Fieldwork

The fieldwork component of this archaeological investigation was conducted between 3 December 2014 and 12 December 2014. CSH archaeological field personnel consisted of Scott Belluomini, B.A., Layne Krause B.A., Aaron Chang, B.A., Mica Cook, B.A., Estevan Gutierrez, B.A., and Richard Stark, Ph.D. under the general supervision of Project Manager David Shideler, M.A., and Principal Investigator, Hallett Hammatt, Ph.D. This work required approximately 15 person-days to complete. In general, fieldwork included a pedestrian inspection of the project area, GPS data collection, and subsurface testing.

Fieldwork consisted of an initial 100% coverage pedestrian inspection followed by subsurface, backhoe-assisted trench tests. The pedestrian survey identified five surface historic properties within the project area, all relating to sugar plantation infrastructure. Subsequent archaeological investigation focused on systematic subsurface testing to further document plantation infrastructure, locate any buried cultural deposits not recognized in the pedestrian survey, and to facilitate a thorough examination of stratigraphy within the project area. All five cultural features encountered during fieldwork are historic, relate to plantation infrastructure, and are considered as activity areas within one site, assigned as SIHP # 50-80-08-7758 (Figure 26).

4.1 Pedestrian Inspection Results and Site Descriptions

SIHP # -7758 (see Figure 26) is considered to be part of one site complex of five features built for the same general purpose of agricultural infrastructure. Feature 1 is comprised of dry-stacked, faced basalt boulders built as a retaining wall between 1.5 and 3 m tall (Figure 27, Figure 28, and Table 4). Feature 1 is associated with one of the plantation-era dirt roads still extant and in use. The wall bisects a natural meander of the ephemeral stream in the northeast portion of the project area and may have been constructed with dual purpose as a sediment trap and road buttress. Three size and preparation categories are noted for the stones used in this feature: 1) three to four courses of large prepared boulders averaging 30 by 30 cm which make up the bulk of the wall face; 2) similarly large boulders and yet unprepared, rounded boulders averaging 30 cm by 20 cm used as the final uppermost course/cap of the feature; and 3) angular basalt flakes averaging 5 to10 cm in length used as wedges to support and stabilize the larger boulders. Stone preparation here is a reference to flake scars driven from the faces of these stones to shape them. The small wedge-shaped stones appear to be the large percussion flakes created during the process of preparing and shaping the larger stones. The wall is positioned with a 120 degree angle in reference to the dry stream bed for strength, in reference to stream and sediment flow and in support of the overlaying road. As discussed above in 1.2.1, Built Environment (see Figure 13), Feature 1 was built by 1935 and is maintained as an active road buttress.

SIHP # -7758 Feature 2 is a mostly buried and/or secondarily redeposited irrigation ditch associated with plantation-era water control and irrigation systems, built, maintained, and utilized by the Oahu Sugar Company (Figure 29, Figure 30, Figure 31). The observed portion of this irrigation ditch runs roughly north to south, however, maps indicate (see Figure 13) that once it navigates the stream discussed in Section 1.2.1, Natural Environment, its trajectory continues northeast to southwest toward and beyond the project area at an elevation of approximately 545 ft

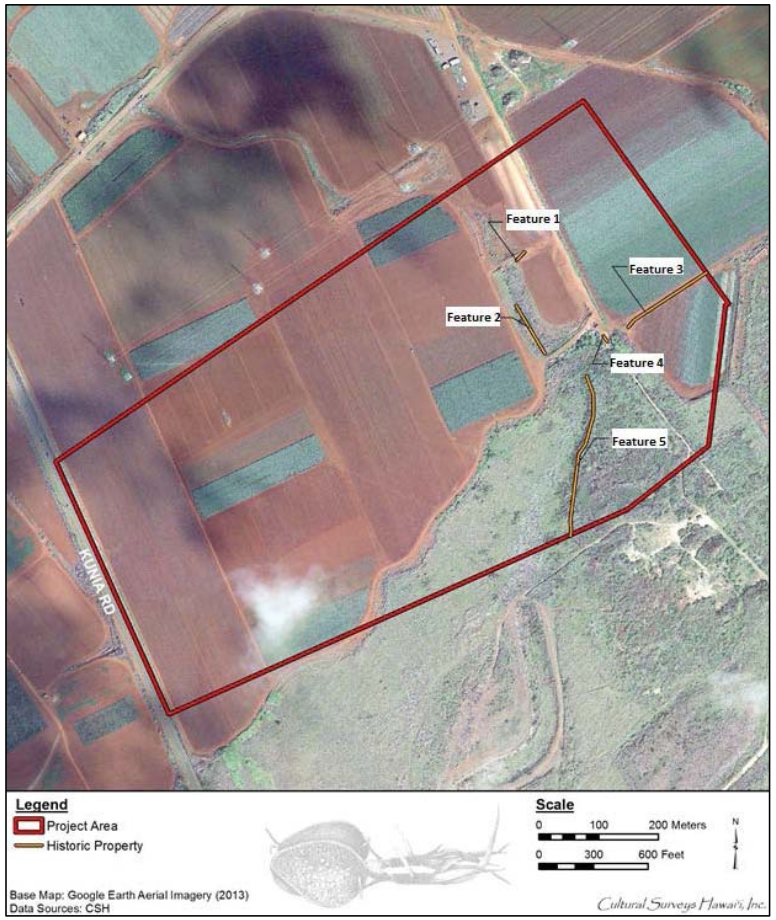

Figure 26. SIHP # -7758 with the locations of Features 1–5 indicated within the project area

Table 4. Summary of Historic Plantation Infrastructure Features within the Project Area

Feature ID #	Formal Type	Description
Feature 1	Buttress wall for road and sediment trap	Dry-stacked, faced basalt retaining (buttress) walls between 1.5 and 3 m tall, utilized as a sediment trap and road buttress wall
Feature 2	Irrigation ditch	Shaped basalt blocks averaging 30 cm x 30 cm and 10 cm thick, mortared together with white mortar to create long low walls running parallel to each other about 2 m apart and at a 120 degree angle to the white mortar and essentially level floor of the irrigation ditch
Feature 3	Irrigation ditch	Eastern portion Feature 2, heavily disturbed and stretching over 200 m and continuing beyond the project area to the northeast
Feature 4	Two attached concrete and stone walls and cistern features	Irrigation headworks, concrete wall 9.4 m long x 0.8 m high x 0.2 m wide attached to a similar wall (2.6 m long x 1.8 m high x 0.25 m wide) made of shaped basalt boulders and white mortar; two cisterns (1.8 m high) built into this wall feature
Feature 5	Quarry piles and basalt stone reduction workshop	Basalt boulder and reduction debitage pile approximately 300 m long by 2 to 3 m high with prominences up to 8 m high; includes large basalt boulders at the base (over 50 cm) and at the top smaller (less than 50 cm) reduced basalt rubble, large thinning flakes relating to shaping stones for lining irrigation ditch walls

Figure 27. SIHP # -7758 Feature 1, view to northwest with 2 m tape visible and Pōhākea Pass in the distance

Figure 28. SIHP # -7758 Feature 1, road buttress and sediment trap, view to northwest

Figure 29. SIHP # -7758 Feature 2, irrigation ditch, view to north-northwest

Figure 30. SIHP # -7758 Feature 2, irrigation ditch with square-faced basalt boulders, view to south

Figure 31. SIHP # -7758 Feature 2, irrigation ditch with square-faced basalt boulders, view to southeast

elevation. Feature 2 is characterized by fairly uniform square-faced basalt boulders, flaked into blocks averaging 30 cm by 30 cm and 10 cm thick. These square-faced basalt boulders are mortared together with white mortar to create long low walls running parallel to each other about 2 m apart. The irrigation ditch utilizes the broad faces of square-faced basalt boulders parallel with irrigation ditch center, resting at a 120 degree angle to the white mortar concrete floor, three courses of stones high. The white mortar has some coarse particulate matter included, possibly indicating procurement in a local lime kiln. The portion of this irrigation ditch that is not buried is approximately100 m in length. Similar irrigation basalt stones with adhering remnant mortar were found throughout the project area, suggesting secondary deposition and that the bulk of the irrigation ditches within the project area have been removed, redeposited or remain buried throughout the project area. As discussed above in 1.2.1, Built Environment (see Figure 13), Feature 2 was built by 1935 and maintained through at least 1980.

SIHP # -7758 Feature 3 is a heavily disturbed portion of Feature 2, stretching over 200 m and continuing beyond the project area to the northeast (Figure 32, Figure 33, Figure 34). Feature 3 is the eastern extension of Feature 2, east of Feature 4 and beyond the irrigation ditch’s navigation of a topographic contour meander, relating to the ephemeral stream bed discussed in Section 1.2, Environmental Setting. Feature 3 is in poor condition, partially demolished and partially buried, with square-faced basalt boulders actively being secondarily deposited by ongoing farming activities (see Figure 32, Figure 33, and Figure 34) and being used as prop stones for an active above ground pipeline being used by the ongoing agricultural operations of Waikele Farms. It is noteworthy that Feature 3 indicates the technological transition of the means to move water within the project area, from irrigation ditch to PVC pipe.

SIHP # -7758 Feature 4 includes a concrete wall feature, 9.4 m long by 0.8 m high by 0.2 m wide attached to a similar wall (2.6 m long by 0.8 m high by 0.25 m high) made of shaped basalt boulders and white mortar (Figure 35 and Figure 36). Together these appear as one wall of similar height (Figure 37), built 56 years apart. Perhaps upon completion of the concrete portion of the wall in 1980, the basalt and mortar portion of the wall was re-capped with a thin layer of concrete to match the height and an inscription in the concrete that reads “1924-1980” (Figure 38). The southwest side of the basalt and mortar portion of the wall drops 1.8 m into a stone-lined square cistern, while the southeast side of the concrete portion of the wall is similar in function, yet is a circular cistern in plan view with a steel lid (Figure 39).

Associated with SIHP # -7758 Feature 5, in the southeast portion of the project area, are numerous piles of basalt, earth, asphalt, and concrete less than 50 years old. Anecdotal reference from the property manager, Larry Jefts (8 December 2014, personal communication), indicates that in the 1980s-1990s this area was heavily worked into mechanically pushed berms and boulder barricades within approximately 7.5 acres (3.0 hectares) to dissuade renegade motorcyclists from entering and damaging the 6,000 acres of built agriculture landscape created by and currently maintained by Waikele Farms. Evidence from the pedestrian survey suggests the western boundary of these piles extends for at least 300 m, with a slightly meandering trajectory, southwest by northeast, and may continue in this general trajectory beyond the project area toward Kunia Road. Field observations indicate the piles are arranged sequentially, with the oldest piles creating a western boundary of a created landscape overlooking the small reservoir noted in the south-central portion of the project area in Figure 13 through Figure 16. That is, the meandering linear pile on the eastern boundary that makes up Feature 5 contains quarried basalt bounders, flakes and

Figure 32. SIHP # -7758 Feature 3, square-faced basalt boulders, view to southeast

Figure 33. SIHP # -7758 Feature 3, square-faced basalt boulders secondarily deposited, view to north

Figure 34. SIHP # -7758 Feature 3, squared-faced boulders repurposed as a prop stone for contemporary irrigation line, view to west

Figure 35. SIHP # -7758 Feature 4, general oblique view to northwest

Figure 36. SIHP # -7758 Feature 4, square-faced basalt boulders and mortar portion of the wall

Figure 37. SIHP # -7758 Feature, contact between square-faced basalt boulders and concrete portions of the wall

Figure 38. SIHP # -7758 Feature 4, inscription reads “1924–1980”

Figure 39. SIHP # -7758 Feature 4, wall with attached cistern, view to southeast

debitage from reduction greater than 50 years ago, while the piles to the east contain white mortar, concrete, and asphalt likely pushed there in the 1980s. Feature 5 is a 2 to 3-m wall-like feature with periodic basalt pile prominences extending 6 to 8 m above ground level. The basalt is both fine-grained and vesicular or apparently from different sources. The base of this feature is a piled accumulation of basalt boulders ranging from 0.5 m by 0.5 m to 1.0 m by 1.0 m (Figure 40). The prominences, such as that photographed in Figure 41, include basalt stones of 0.5 m or less, creating a summit-like structure of basalt rubble, large reduction flakes and debitage (Figure 41, Figure 42, Figure 43). From atop these conical prominences one views the portion of the project area that is now the in-filled portion of the small reservoir referenced above (Figure 44). Interpretively, the eastern boundary pile that is Feature 5 appears to have been created as an early twentieth century basalt quarry cache and lithic workshop for creating the square-faced basalt boulders encountered throughout the project area. Subsequently, when the irrigation ditch system was abandoned, the approximately 7.5-acre (3.0-hectare) triangle of land to the east of this feature was filled with various piles of mechanically pushed debris. These more recent debris piles and berms are noted but are interpreted as less than 50 years old and thus are not given individual feature designations.

4.2 Subsurface Testing Results

A total of six backhoe-assisted test excavations (T-1 through T-6) were distributed throughout the project area to provide comprehensive testing coverage (see Figure 7). Specifically, T-1 was placed to test Feature 3; T-2 and T-3 to test Feature 2; T-4 to test the terrace above a potential spring denoted by an ephemeral reservoir in the south-central portion of the project area as well as a probe for the irrigation ditch connected to the small, now buried, reservoir; T-5 to test subsurface sediments in the western portion of the project boundary along the traditional Hawaiian trail from Pearl Harbor to Pōhakea Pass; and T-6 to test subsurface sediments in the western portion of the project boundary along the traditional Hawaiian trail from Pearl Harbor to Pōhakea Pass as well as a probe for a portion of the irrigation ditch indicated in Figure 13 in the far northeastern quadrant of the project area. For access and structural integrity of the trenches, one portion of each trench was excavated to create a step approximately 1.0 m below surface with the other half of the excavation and extending deeper, typically to 2.0 m below surface.

In each of the six trenches excavated, CSH archaeologists observed a similar stratigraphic sequence of a disturbed plow zone indicated by plastic mulching and rootlets, over silty loam sediments representing terrigenous erosion of the Waianae Mountains. Decomposition and leaching of sediments increases gradually with depth. In T-1, a portion of an irrigation ditch wall of square-faced basalt boulders is found secondarily deposited on its side, overlaying and parallel with the concrete ditch floor, overlaying the silty loam sediments into which the ditch was originally excavated. In T-2, the terrigenous silty loam is also found redeposited to completely in-fill and overlay Feature 2, an irrigation ditch. Two test excavations, T-3 and T-6, were designed to test the plantation ditch irrigation infrastructure, but did not encounter the expected irrigation ditch. Noting the mortared square-faced basalt boulder and irrigation ditch finds referenced in Section 5, Artifact Analysis, no significant cultural materials nor any other archaeological features were observed during the subsurface excavation within the project area.

Figure 40. SIHP # -7758 Feature 5, base of a pile of basalt boulders

Figure 41. SIHP # -7758 Feature 5, summit of the pile of basalt boulders in the previous figure, view to north

Figure 42. SIHP # -7758 Feature 5 basalt flake at the summit of the basalt pile photographed in the previous figures

Figure 43. SIHP # -7758 Feature 5, close up, ventral face of a large basalt flake

Figure 44. View from atop SIHP # -7758 Feature 5, overlooking the location of the reservoir noted in Section 1.2, Environmental Setting, view to west with the Waianae Mountains in the background

4.2.1 Test Excavation 1 (T-1)

T-1 is located in the southeast quadrant of the project area, near the intersection of Features 3 and 4. Designed to test Feature 3, T-1 measures 6.5 m long by 0.8 m wide with a northwest-southeast orientation. The excavation bisected a portion of Feature 3 mid-trench and the illustrated profile is of the northwest sidewall (Figure 45). No water table nor utility lines were encountered.

In the stratigraphic profile of T-1 (Table 5), Stratum 1 includes Feature 3, a portion of an irrigation wall as indicated by two square-faced basalt boulders, a thin layer of sorted sand and a 10 cm layer of concrete composed of white mortar mixed with angular basalt gravels. Stratum II is interpreted as a cultural unconformity, perhaps representing a scar from the excavation of the base of the irrigation ditch or possibly a previous earthen *'auwai* (traditional Hawaiian irrigation) ditch. Stratum II is subtle and thin but noteworthy, as it may have preceded the sugar plantation era irrigation ditch documented in Stratum 1 (Figure 46). No cultural resources were observed in association with Stratum II and the interpretation remains inconclusive. Stratum III appears as a naturally deposited silt loam into which at least one, and perhaps two, irrigation ditches were built.

To further investigate the context of Feature 3, 1 by 5 m of the ground surface to the northeast of T-1 was cleaned to reveal the west irrigation ditch wall resting on its side and a portion of the east side of the irrigation ditch wall partially buried and with at least the first course of square-faced basalt boulders above the white mortared concrete irrigation ditch floor intact (Figure 47).Two square-faced basalt boulders were recovered during the excavation and photographed and are discussed further in Section 5, Artifact Analysis. It is unknown whether these two square-faced basalt boulders, which came out of the trench during backhoe excavation, are from the east side of the irrigation ditch or perhaps the fallen eastern portion of the irrigation ditch wall. The 10 cm layer of white mortar mix appears to have been the floor of the irrigation ditch. An approximately 50 by 50 cm piece of this concrete in the profile was fractured and was moved out of place during excavation, but remains in the photo documentation of T-1 (Figure 47, Figure 45, Figure 48, Figure 49). Perhaps the wall fell, or was pushed over intentionally and now, on its side, the sands of its mortar mix are dissolving to create a small zone of sorted sand, stratigraphically in-between the fallen eastern irrigation ditch wall and the irrigation ditch floor.

Figure 45. T-1, northwest sidewall, noting Feature 3 in the background, view to northeast

Table 5. T-1 Stratigraphic Description

Stratum	Depth (cmbs)	Description of Sediment
I	0–48	Fill; 2.5YR 2.5/3; dark reddish brown, silt loam, granular structure, firm, very fine, strong cementation, plastic, few fine roots, discontinuous lower boundary; irrigation ditch debris including square-faced basalt boulders, white mortar concrete and related fill
II	48–50	2.5Y 4/3, olive brown, silty loam, firm, fine, granular structure, plastic, terrigenous origin, no roots, discontinuous boundary; cultural unconformity, base of the excavated irrigation ditch or possibly previous earthen *‘auwai* ditch
III	50–180 (BOE)	Natural, 2.5YR 3/4, dark reddish brown, silt loam, firm, very fine, strong cementation, plastic, terigenous origin, no roots, lower stratum boundary not visible

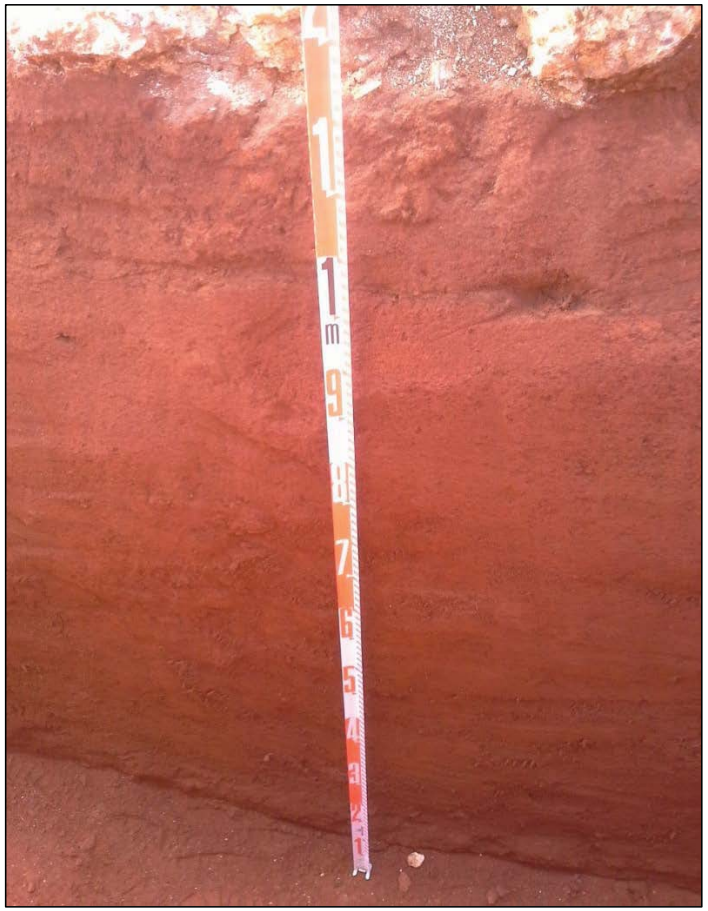

Figure 46. T-1, close up view of northwest wall profile, noting lower boundary of Stratum I at approximately 1 m above base of excavation, view to northwest

Figure 47. T-1, general view to the southwest noting Feature 3 in foreground

Figure 48. T-1, noting mid-trench intersection with debris from Feature 3, view to east

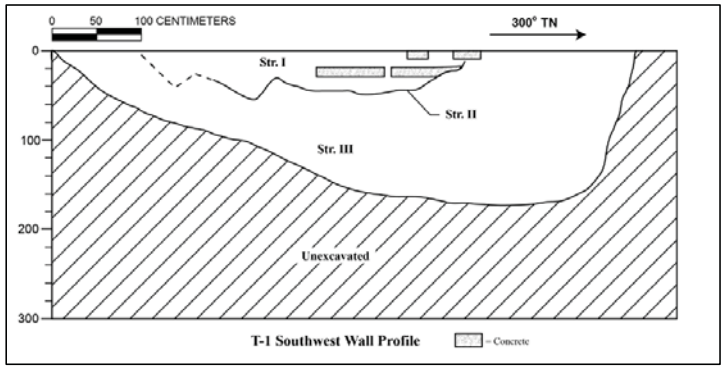

Figure 49. T-1 northwest wall profile drawing

4.2.2 Test Excavation 2 (T-2)

T-2 is located in the northeast portion of the project area, northwest of Feature 4 and the assumed eventual intersection of Features 2 and 3 near or at Feature 4. Designed to test Feature 2, T-2 measures 6.0 m long and 0.8 m wide (Figure 50, Figure 51, Figure 52). The excavation bisected a portion of Feature 2 mid-trench, illustrated in the profile of the northeast sidewall (Figure 53). No water table nor utility lines were encountered.

In the stratigraphic profile of T-2 (Table 6), Feature 2, an irrigation ditch, interrupts Stratum I, the natural silty loam deposits into which the irrigation ditch was originally excavated, and Stratum II, which are these same natural sediments only redepositied as fill within the irrigation ditch. The primary difference between Stratum I and Stratum II is the presence of more abundant rootlets within Stratum II, as the sediments are composed of the same, only secondarily deposited sediments. Three square-faced boulders were recovered from the backhoe during excavation, representing the portion of the irrigation ditch damaged by the backhoe in T-2. These stones were not collected but were photographed and are discussed further in Section 5, Artifact Analysis. Two prop stones were observed in association with the top layer of cut basalt stones, one encountered on either side of the irrigation ditch. These are interpreted as stones that would have supported the wall in construction, as the mortar mix dried. A basalt flake recovered from immediately outside the southwest wall of the irrigation trench (Figure 51) is photo documented and discussed further in Section 5, Artifact Analysis. It is noteworthy that for the portion of Feature 2 encountered in T-2, the concrete irrigation floor is observed as level, indicating this portion of the irrigation ditch may be designed to move water in either direction (Figure 54).

Figure 50. T-2, view to northeast of the outer portion of Feature 2 irrigation ditch

Figure 51. T-2, bisecting Feature 2, view to northeast, noting basalt flake in situ, immediately southwest of irrigation ditch

Figure 52. T-2, bisecting Feature 2, view to southwest

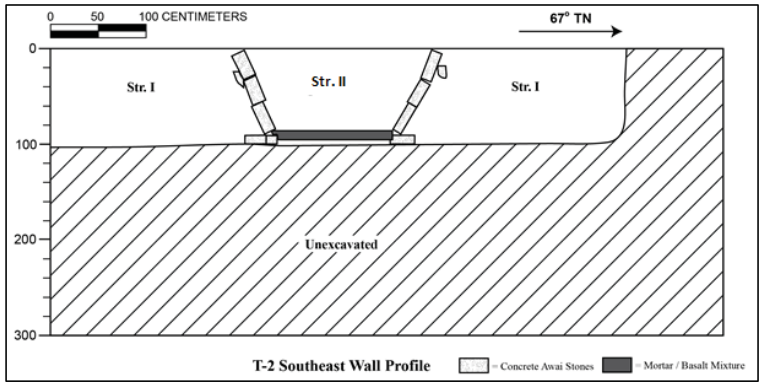

Figure 53. T-2 northwest wall profile drawing

Table 6. T-2 Stratigraphic Description

Stratum	Depth (cmbs)	Description of Sediment
I	0–100 (BOE)	Natural; 2.5YR 2.5/3; dark reddish brown, silt loam,firm, granular structure, very fine, strong cementation, plastic, few rootlets, lower stratum boundary not visible
II	0–100 (BOE)	Natural sediments and fill; 2.5YR 2.5/3; dark reddish brown, silt loam, firm, granular structure, very fine, strong cementation, plastic, more rootlets present; historic irrigation ditch feature

Figure 54. T-2, general overview to southwest, noting the level irrigation ditch floor

4.2.3 Test Excavation 3 (T-3)

T-3 is located in the south-central portion of the project area, on the project boundary line, approximately 200 m west-southwest of T-3 and approximately 350 m east-northeast of T-5. Designed to test Feature 3, T-3 measures 6 m long and 0.8 m wide (Figure 55, Figure 56). The excavation did not encounter Feature 3 nor any other cultural resources except those categorized as agro-trash. The illustrated profile is of the northeast sidewall (Figure 57). No water table nor utility lines were encountered.

In the strategraphic profile of T-3 (Table 7), Stratum I includes a mixed zone of repeatedly plowed sediments containing mulched shreds of black plastic sheets, averaging 5.0 by 5.0 cm and small frequent rootlets. This zone has likely been heavily reworked over at least the last 100 years. Stratum II appears natural, weathering in place, continuing into the base of excavations.

Figure 55. T-3, view to east of the southeast wall profile

Figure 56. T-3, view facing west of the trench terminus, noting agro-plastic debris to the BOE

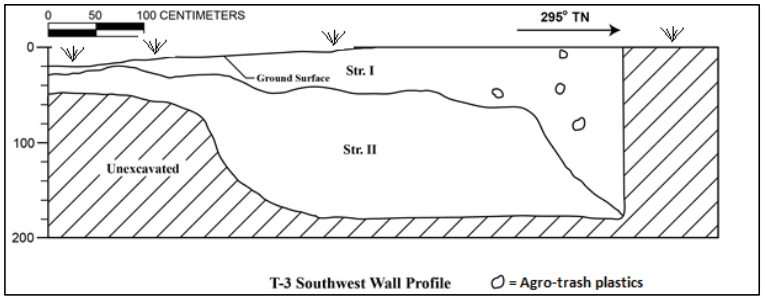

Figure 57. T-3 southwest wall profile drawing

Table 7. T-3 Stratigraphic Description

Stratum	Depth (cmbs)	Description of Sediment
I	0–180	Natural, 2.5YR 43/6; dark red, silt loam, granular, firm, very fine, very plastic, with rootlets and agro-plastic shreds abundant, wavy lower boundary; plow zone
II	30–180 (BOE)	Natural, 2.5YR 4/6, red, silt loam, granular, firm, very fine, and very plastic, no rootlets nor agro-plastic debris, gradual and diffuse lower boundary; terrigenous origin

4.2.4 Test Excavation 4 (T-4)

T-4 is located in the south-central portion of the project area, approximately 15 m north of the project boundary line, approximately 200 m east-northeast of T-3 (see Figure 7). Designed to test the terrace above a potentially buried spring, T-4 measures 6 m long and 0.8 m wide (Figure 58, Figure 59, and Figure 60). The excavation did not encounter any cultural resources except those categorized as agro-trash. The illustrated profile is of the northeast sidewall (Figure 61), described in Table 8. No water table nor utility lines were encountered. The profile of T-4, Stratum I includes a mixed zone of repeatedly plowed sediments containing mulched shreds of black plastic sheets and small rootlets. This zone has likely been heavily reworked over at least the last 100 years. Stratum II appears naturally deposited, weathering in-place, to create a gradual and diffuse boundary into Stratum III, continuing below the base of excavations.

Figure 58. T-4 view to east of the southwestern wall profile to the trench terminus

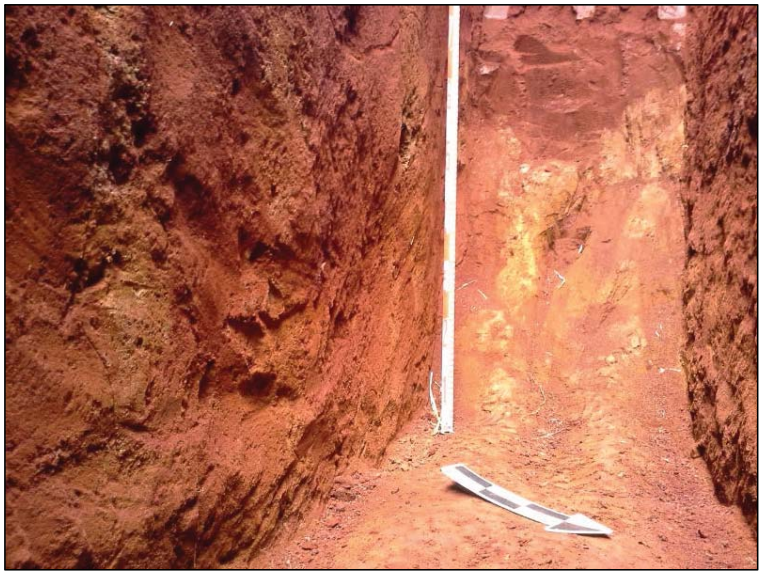

Figure 59. T-4, basal close-up view to west of the southwestern wall profile to trench terminus

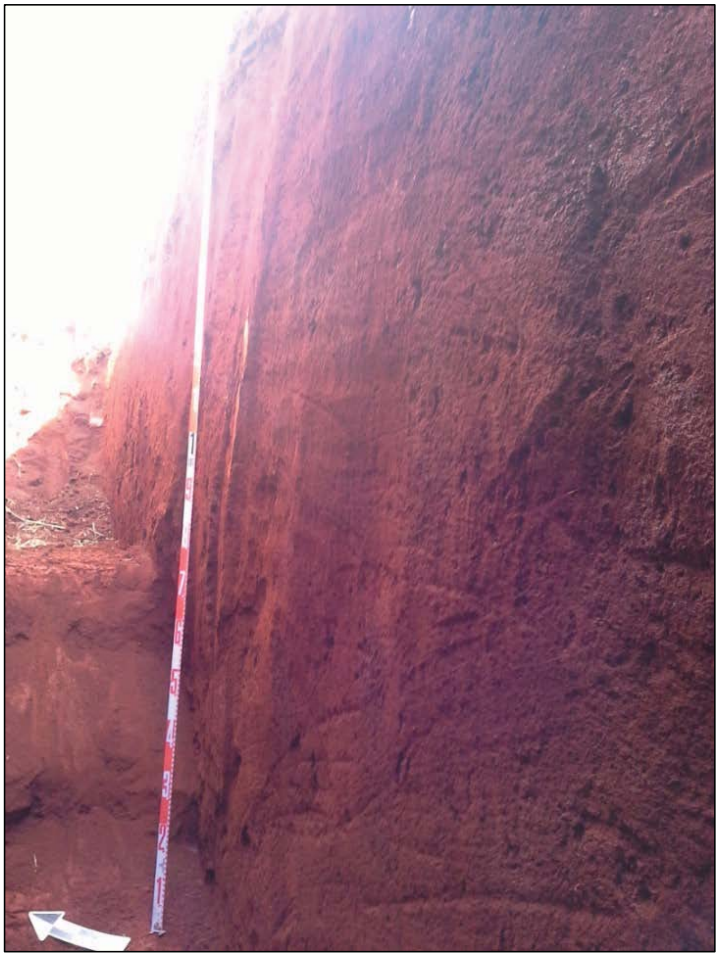

Figure 60. T-4 oblique view to east

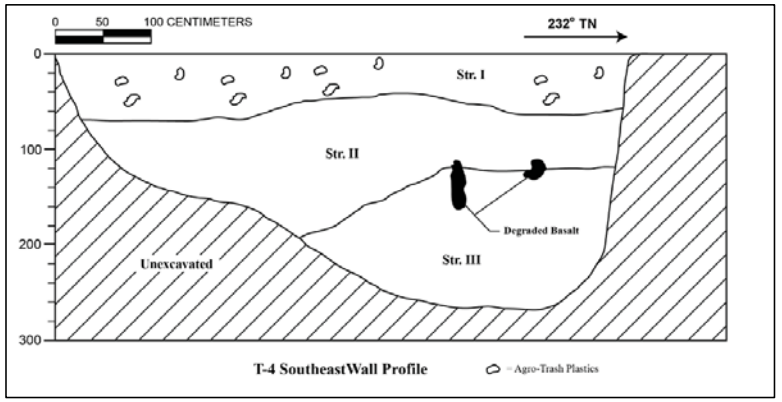

Figure 61. T-4 southeast profile drawing

Table 8. T-4 Stratigraphic Description

Stratum	Depth (cmbs)	Description of Sediment
I	0–60	Natural, 2.5Y 4/3; olive brown, silt loam, granular, fine, slightly plastic, with rootlets and agro-plastic shreds abundant, wavey lower boundary; plow zone
II	45–190	Natural, 2.5Y 4/3, olive brown, silt loam, granular, fine, and plastic, with a couple basalt cobbles weathering in place, no rootlets nor agro-plastic debris, gradual and diffuse lower boundary
III	120–270 (BOE)	Natural, 5Y 4/4, olive, silt loam, granular, slightly plastic with no rootlets nor agro-plastic debris, lower stratum boundary not visible

4.2.5 Test Excavation 5 (T-5)

T-5 is located in the southwest corner of the project area, approximately 10 m east of Kunia Road, approximately 400 m southwest of T-3 (see Figure 7). Designed to test the subsurface for cultural resources near a traditional trail, T-5 measures 5.8 m long and 0.8 m wide (Figure 62, Figure 63, and Figure 64). The excavation did not encounter any cultural resources, except those categorized as agro-trash. Neither water table nor utility lines were encountered. The illustrated profile is of the northeast sidewall (Figure 65). The profile of T-5, described in Table 9, includes a repeatedly disturbed plow zone (Stratum I) as indicated by frequent rootlets and mulched shreds of black plastic sheets, averaging 5.0 by 5.0 cm. Stratum II appears naturally deposited, weathering in-place, to create a gradual and diffuse boundary into Stratum III, continuing below the base of excavations.

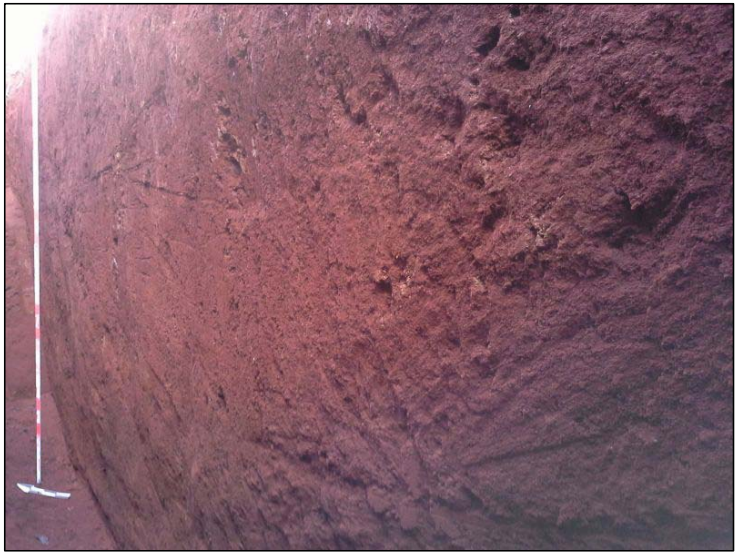

Figure 62. T-5, close up oblique view to east

Figure 63. T-5, view to east, noting agro-plastic debris in Stratum I

Figure 64. T-5 view to west

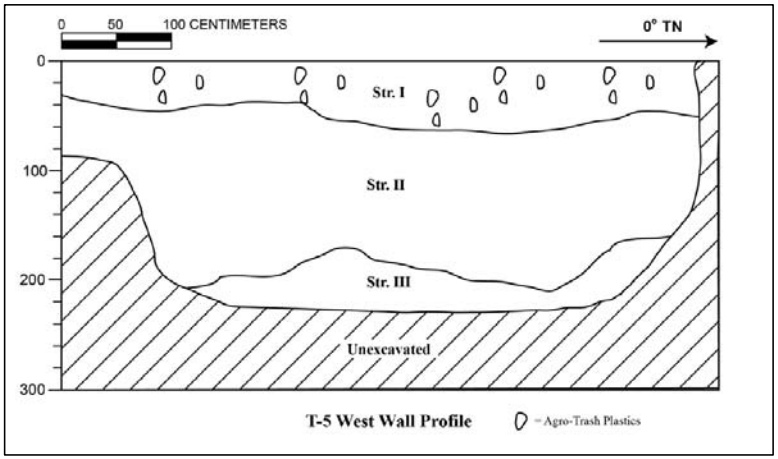

Figure 65. T-5 stratigraphic profile drawing

Table 9. T-5 Stratigraphic Description

Stratum	Depth (cmbs)	Description of Sediment
I	0–50	Natural, 2.5Y 4/3; olive brown, silt loam, granular, firm, fine, slightly plastic, with rootlets and agro-plastic shreds abundant, wavey lower boundary; plow zone
II	30–210	Natural, 2.5YR3/6, dark red, silt loam, granular, firm, fine, and plastic, with no rootlets nor agro-plastic debris, gradual and diffuse/gradual lower boundary
III	160–230	Natural, 5Y 4/4, olive, silt loam, granular, firm, slightly plastic with no rootlets nor agro-plastic debris, lower stratum boundary not visible

4.2.6 Test Excavation 6 (T-6)

T-6 is located in the northeastern corner of the project area, approximately 20 m east of Kunia Road, approximately 500 m northwest of T-5 (Figure 66). Designed to test the subsurface for cultural resources near a traditional trail, T-6 measures 7 m long and 0.8 m wide (Figure 67). The excavation did not encounter any cultural respources except those categorized as agro-trash (Figure 68, Figure 69). Neither water table nor utility lines were encountered. The illustrated profile is of the northeast sidewall (Figure 70).

The profile of T-6, described in Table 10, includes a repeatedly distubed plow zone (Stratum I) as indicated by frequent rootlets and mulched shreds of black plastic sheets, averaging 5.0 by 5.0 cm. Stratum II appears naturally deposited, weathering in-place, to create a gradual and diffuse boundary into Stratum III, which appears further weathered and also includes small columns of organic material averaging 5.0 by 5.0 cm. These anomolus columns are GLEY 2 2.5/PB and could be either basalt stones weathering in place but more likely are phytolithic concretions casting former mudcracks or insect burrows.

Figure 66. T-6 general overview facing east

Figure 67. T-6, plan view facing north-northeast

Figure 68. T-6, view to northwest, noting agro-plastic debris 2 m above the BOE

Figure 69. T-6, mid-trench view to southeast, noting mid-trench bench excavated for trench access and stability

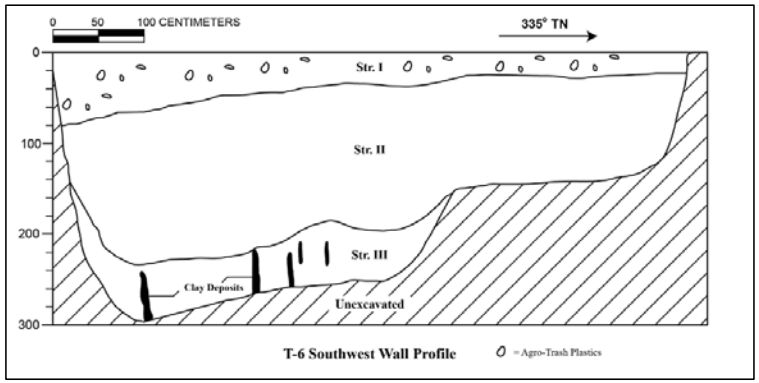

Figure 70. T-6 stratigraphic drawing

Table 10. T-6 Stratigraphic Description

Stratum	Depth (cmbs)	Description of Sediment
I	0–50	Natural, 2.5YR 3/6; dark red, silt loam, granular, fine, slightly plastic, with rootlets and agro-plastic shreds abundant, wavy lower boundary; plow zone
II	50–240	Natural, 2.5YR3/6, dark red, silt loam, granular, fine, and plastic, with no rootlets nor agro-plastic debris, gradual and diffuse/gradual lower boundary
III	230–294 (BOE)	Natural, 5Y 4/4, olive, silt loam, granular, slightly plastic with no rootlets nor agro-plastic debris, lower stratum boundary no visible

Section 5 Artifact Analysis

All of the artifacts encountered within the project area are historic, relating to agricultural infrastructure, and none of them are deemed traditional. No artifacts are noted as significant enough to collect, however, square-faced boulders and related debris are found at multiple locations throughout the project area. That said, what follows are descriptions of encountered square-faced boulders, as well as basalt flake debitage related to the construction of these square-faced boulders and construction of the irrigation ditches observed within the project area.

The square-faced boulders encountered within the project area are fairly uniform and roughly square, averaging 30 cm by 30 cm by 10 cm (1 sq ft by 4 inches) (Figure 71 through Figure 77). The square-faced boulders appear to have been faced with hard hammer percussion to drive off flakes, creating flake scars, the square shape of the boulder, and flake debitage. Secondarily deposited square-faced boulder isolates were encountered with coarse grained white mortar still adhering (Figure 72). With the exception of a portion of Feature 2, the irrigation ditches within the project area appear heavily disturbed, and many individual square-faced boulders show evidence of heavy machine trauma, exhibiting linear tractor, bulldozer, and backhoe scars (Figure 74). Feature 2 incurred some backhoe induced damage during excavation (see Figure 51, Figure 50). Figure 75, Figure 76, and Figure 77 are the square-faced boulders recovered from the excavation of T-2, damaging Feature 2 during excavation. Several basalt percussion flakes were found within the project area, indicating flaking to improve the face of the square-faced boulders for placement or to create wedges or props to better set the square-faced boulders (Figure 78 and Figure 79).

Figure 71. Feature 3 square-faced boulders, 33 cm diameter, excavated from T-1

Figure 72. Feature 3 square-faced boulder, note flake scars and adhering white mortar

Figure 73. Feature 3 square-faced boulder, cross-section measuring 10 cm (4 inches)

Figure 74. Feature 3 square-faced boulder with machine scar

Figure 75. Square-faced boulders recovered from Stratum I of T-2

Figure 76. Square-faced boulder recovered from Stratum I of T-2

Figure 77. Square-faced boulder recovered from Stratum I of T-2

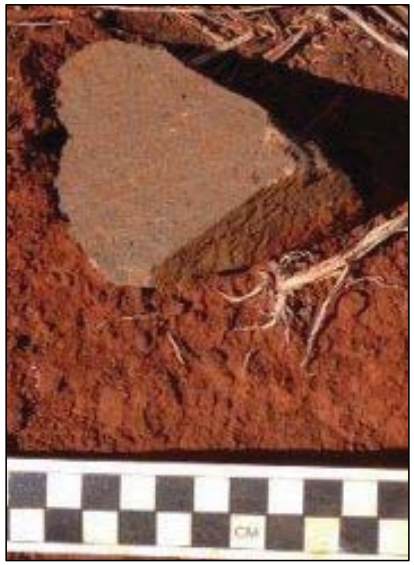

Figure 78. Basalt flake wedge from Feature 3

Figure 79. Basalt flake found in T-2, Feature 2

Section 6 SIHP # 50-80-08-7758

Five feature designations related to activity areas encountered in the field may all be considered to be part of one site complex of features built for the same general purpose category of agricultural infrastructure, referred to as SIHP # 50-80-08-7758.

Feature 1 is comprised of dry-stacked, faced basalt boulders built as a retaining wall between 1.5 and 3.0 m tall. Feature 1 is associated with one of the plantation era dirt roads still extant and in use. The wall bisects a natural meander of the ephemeral stream in the northeast portion of the project area and may have been constructed with dual purpose as a sediment trap and road buttress.

Feature 2 is a mostly buried, and or secondarily redeposited, irrigation ditch associated with plantation era water control and irrigation systems, built, maintained, and utilized by the Oahu Sugar Company. Feature 2 is characterized by fairly uniform square-faced basalt boulders, flaked into blocks averaging 30 cm by 30 cm and 10 cm thick. These square-faced basalt boulders are mortared together with white mortar to create long low walls running parallel to each other about 2 m apart. The irrigation ditch utilizes the broad faces of square-faced basalt boulders parallel with irrigation ditch center, resting at a 120 degree angle to the white mortar concrete floor, three courses of stones high.

Feature 3 is a heavily disturbed portion of Feature 2, an irrigation ditch, extending over 200 m and continuing beyond the project area to the northeast. Visible and tested portions of Feature 3 indicated this portion of the irrigation ditch east of Feature 4 is not in situ and has been redeposited and in some cases repurposed in the general vicinity of its original location.

Feature 4 includes a concrete wall feature, 9.4 m long by 0.8 m high by 0.2 m wide attached to a similar wall (2.6 m long by 0.8 m high by 0.25 m high) made of square-shaped basalt boulders and white mortar. Together these appear as one wall of similar height with an inscription in the concrete that reads “1924–1980.” The southwest side of Feature 4 drops 1.8 m into a stone-lined square cistern, while the southeast side of the concrete portion of the wall includes a similar yet circular cistern in plan view, with a steel lid.

Feature 5 is a 2.0 to 3.0-m basalt boulder wall-like feature with periodic basalt boulder pile prominences extending 6.0 to 8.0 m above ground level. The basalt boulders are both fine-grained and vesicular or apparently different sources. The prominences include basalt flakes and smaller boulders of 50 cm or less, creating a summit-like structure of basalt rubble, large reduction flakes and debitage. Interpretively, the eastern boundary pile that is Feature 5 appears to have been created as an early twentieth century basalt quarry cache and lithic workshop for creating the square-faced basalt boulders encountered throughout the project area.

The most ubiquitous artifact encountered at SIHP # -7758 is the square-faced boulder, relating to a network of irrigation ditches and the early twentieth century movement of water within the project area to facilitate the growth of planted sugar cane and the ultimate production of granular sugar by the Oahu Sugar Company. The artifact analysis in Section 5 indicates the square-faced boulders are fairly uniform in size and shaped squarely through a hard hammer percussion reduction process. The uniformity in stone shape and dimension is striking and indicates a centralized production process within the Oahu Sugar Company, maintained by understood expectation in the square-faced boulder product. At Feature 5 within SIHP # -7758 square-faced

boulders masons worked to shape the square blocks atop extensive piles of dumped basalt boulders.

Once shaped, faced basalt boulders were used to build the features of SIHP # -7758. Specifically, the square-faced basalt boulder walls for a network of irrigation ditches were observed to cross the project area at Feature 2 and Feature 3 and maps indicate a portion of another irrigation ditch once existed in the northeast quadrant of the project area. White mortar concrete, probably locally produced from crushed coral, was used to form the base of the irrigation ditch, atop which the square-faced boulders were stacked in three courses at a 120 degree angle. The irrigation ditches are designed to follow topographic contour lines, approximately 550 ft to 540 ft throughout the project area. The slight slope of the ditch floor maintained flexibility in the irrigation system in that the water could flow in either direction. Transportation within the project area was and continues to be facilitated by a network of plantation era roads, as indicated by Feature 1, a dry-stacked, unifacially shaped, basalt boulder road terrace buttress created with the double-intention of sediment trap.

Section 7 Summary and Interpretation

CSH completed the work for this project, including a relevant literature review, field inspection including pedestrian survey, and six subsurface backhoe-assisted trench tests for the 150-acre project area, Kunia Agricultural Park, Honouliuli Ahupua‘a, ‘Ewa District, O‘ahu TMK: [1] 9-4-002:080. This work was accomplished between 3 December and 12 December 2014. No significant finds were made during the pedestrian survey nor during subsurface testing, and no artifacts were collected, however, the agricultural infrastructure of 50 years and greater antiquity was thoroughly documented. Generally, “the proposed project is designed to fulfill the State of Hawai‘i’s legislative mandate to increase the supply of leased diversified agricultural land that is known to be highly suited to a variety of crops and has agricultural water available. Hawai‘i Revised Statutes (HRS), Chapter 166, Agricultural Parks” (Environmental Assessment 2013:2).

Traditional sites including *heiau,* terraces, enclosures, and structures have been found in the vicinity of the project area (Perzinski et al. 2003; Riford and Cleghorn 1986:190; Sinoto and Sterling 1960 in Sterling and Summers 1978:37; Tulchin and Monahan 2012), dating to as early as AD 1290 (Pammer et al. 2010). More commonly within the vicinity of the project area, archaeologists document historical artifacts associated with agriculture (Groza et al. 2007; Hammatt et al. 1988; Tulchin and Monahan 2012). Specifically, the previous archaeology of locations nearest the current project area primarily document the infrastructure relating to the Oahu Sugar Company (Groza et al 2009). The one archaeological report relating to the current project area (Kennedy 1987:2) observed no above ground archaeological features, “and little chance for subsurface recovery.” CSH recorded SIHP # -7758, considered to be part of one site complex composed of five features built for the same general purpose category of historic agricultural infrastructure.

Section 8 Significance Assessments

Historic property significance for SIHP # -7758 is evaluated and expressed according to the broad criteria established in accordance with Hawai‘i State historic preservation review legislation, HAR §13-13-275-6. The five criteria for significance are

a. Be associated with events that have made an important contribution to the broad patterns of our history;

b. Be associated with the lives of persons significant in our past;

c. Embody the distinctive characteristics of a type, period, or method of construction, represent the work of a master, or possess high artistic value;

d. Have yielded, or may be likely to yield, information important for research on prehistory or history; or

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 accounts—these associations being important to the group’s history and cultural identity.

SIHP # -7758, with five features representing cultural resource human activity areas, is identified within the current project area. Feature 1 is a linear road buttress retaining wall. Features 2 and 3 are linear portions of a historic irrigation ditch. Feature 4 is the structural remnant of a headworks feature connecting Features 2 and 3. Feature 5 is a linear historic lithic workshop relating to the production of faced basalt boulders observed in Features 1, 2, 3, and 4. While these cultural resources represent five distinct activity areas within the project area, they are considered as one site (SIHP # -7758) pertaining to agricultural activity of the Oahu Sugar Company. Table 11 lists the cultural resources along with their significance/eligibility assessments and mitigation recommendations.

CSH recommends the identified cultural resources within the project area be considered significant under criteria “d” only: “Have yielded, or may be likely to yield, information important for research on prehistory or history.” That said, the archaeological investigation conducted herein serves to mitigate this significance. No adverse effect and no further archaeological work is recommended for these cultural resources. These significance recommendations are included in this AISR for the review and concurrence of the SHPD.

Table 11. Archaeological Cultural Resource Integrity, Significance/Eligibility, and Mitigation Recommendations

SIHP #	Test Excavation	Formal Type/ Description	Integrity							Significance	Mitigation Recommendation
			Location	Design	Setting	Materials	Workmanship	Feeling	Association		
Feature 1	NA	Historic retaining wall	Y	Y	Y	Y	Y	Y	Y	d	No adverse effect and no further archaeological work recommended
Feature 2	T-2, T-3	Historic irrigation ditch	Y	Y	Y	Y	Y	Y	Y	d	No adverse effect and no further archaeological work recommended
Feature 3	T-1	Historic irrigation ditch	N	N	N	Y	N	N	N	d	No adverse effect and no further archaeological work recommended
Feature 4	NA	Historic irrigation cisterns	Y	Y	Y	Y	Y	N	N	d	No adverse effect and no further archaeological work recommended
Feature 5	NA	Historic lithic workshop	Y	N	N	Y	N	N	N	d	No adverse effect and no further archaeological work recommended

Section 9 Project Effect and Mitigation Recommendations

9.1 Project Effect

In accordance with Hawai‘i State historic preservation review legislation, HAR §13-13-275-7, the project’s effect recommendation is “no historic property effected.” CSH observed no evidence of traditional Hawaiian culture and documented SIHP # -7758 with five historic features relating to the agricultural complex of the Oahu Sugar Company. No adverse effect and no further archaeological work is recommended for these cultural resources. These significance recommendations are included in this AISR for the review and concurrence of the SHPD.

The present study concludes that modifications to SIHP # -7758: Features 1, 2, 3, 4, and 5 would have no adverse effect, as mitigated by the information collected within this report. If modifications to these features are of the nature of development of the project area, then a “no effect” determination may be warranted.

9.2 Mitigation Recommendations

This AISR indicates the project area contains SIHP # -7758, which includes a dry-stacked basalt boulder linear road buttress retaining wall, linear portions of a historic irrigation ditch, a structural remnant of a headworks feature connecting the irrigation ditch and a linear historic lithic workshop relating to the production of faced basalt boulders. That said, no further archaeological work is recommended for the five identified cultural features documented as SIHP # -7758 in the present study, on the basis that sufficient information now has been documented. Sufficient information regarding the location, extent, function, and age of SIHP # -7758 has been obtained during this AISR which was undertaken to mitigate any adverse effect caused by proposed development activities. The detailed documentation of the historic properties are recommended to be sufficient to satisfy the requirements to mitigate any adverse effect caused by the proposed development activities within the project area. However, CSH recommends AIS level documentation of any additional encountered components of SIHP # -7758 and consultation with the SHPD is recommended for their determination on the project’s effect and mitigation recommendations.

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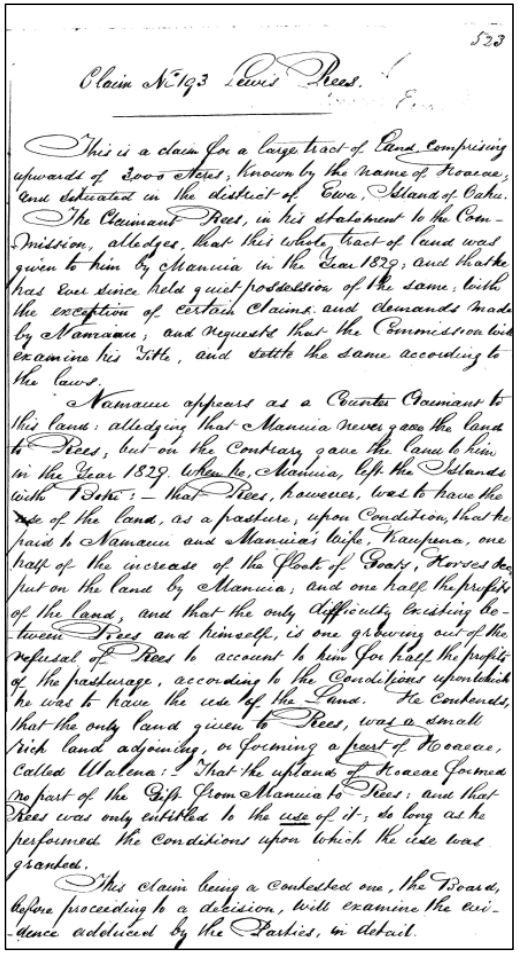
Appendix A LCA Claim 193



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Claim № 193 Lewis Rees.

This is a claim for a large tract of Land comprising upwards of 3000 Acres, known by the name of Koaeae, and Situated in the district of Ewa, Island of Oahu.

The Claimant Rees, in his statement to the Commission, alledges, that this whole tract of Land was given to him by Manuia in the Year 1829; and that he has ever since held quiet possession of the same; with the exception of certain claims and demands made by Namauu; and requests that the Commission will examine his Title, and settle the same according to the laws.

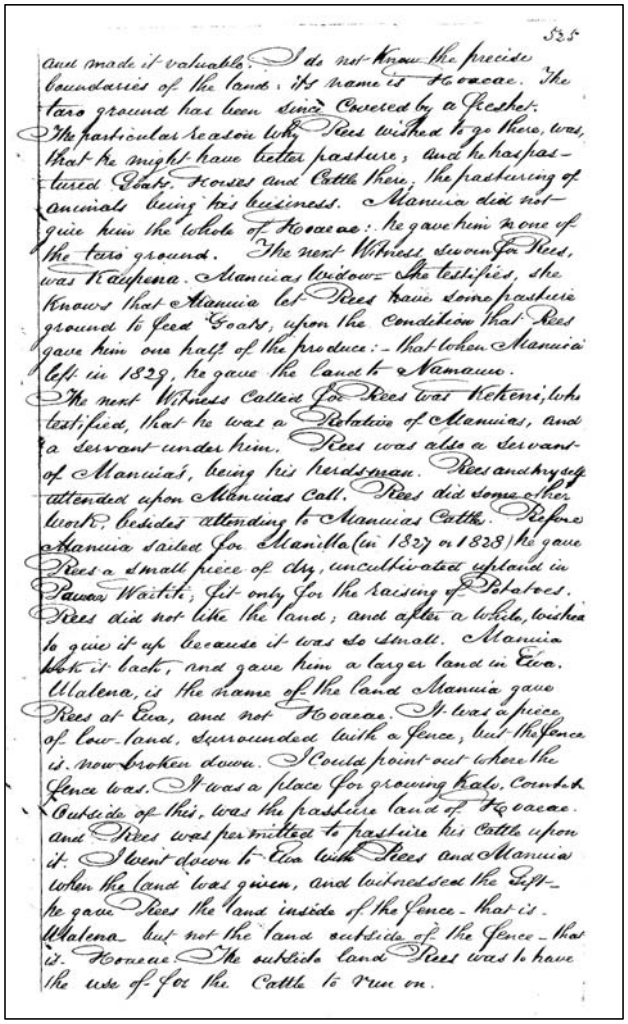
Namauu appears as a Counter Claimant to this Land: alledging that Manuia never gave the Land to Rees, but on the Contrary gave the Care to him in the Year 1829. When he, Manuia, left the Islands with Vancouver:- That Rees, however, was to have the use of the Land, as a pasture, upon Condition, that he paid to Namauu and Manuia's Wife, Kaupuna, one half of the increase of the Stock of Goats, Horses &c put on the Land by Manuia; and one half the profits of the Land, and that the only difficulty existing between Rees and himself, is one growing out of the refusal of Rees to account to him for half the profits of the pasturage, according to the Conditions upon which he was to have the use of the Land. He contends, that the only Land given to Rees, was a small rich Land adjoining, or forming a part of Koaeae, called Waiena: That the uplands of Koaeae formed no part of the Gift from Manuia to Rees: and that Rees was only entitled to the use of it, so long as he performed the Conditions upon which the use was granted.

This claim being a contested one, the Board, before proceeding to a decision, will examine the evidence adduced by the Parties, in detail.

The first Witness called on the part of the Claimant Rees, is Mr John G. Munn, who testifies, that he has known Mr Rees at the Islands about 20 Years: that he recollects Manuia came into a House where he was in the Year 1829, and said to Rees. "Rees- I shall give You that Land instead of another." but he does not know what Lands Manuia referred to:- That Rees has lived on the Land a number of Years:- That Rees was living there in 1837; and that he never heard of any other persons claiming the Land.

James Walker- the next Witness sworn for Rees, states, that Manuia gave Rees the Land where he lives about 1828 or 1829.- Rees was Manuias servant:- that he did not know of any one living on the Land at the time: Rees has lived on it from that time till the present:- that he knows of no one interfering with him about the Land except Namauu:- that Rees gave Manuia half the Stock raised on the Land, from the beginning to the present time. The same Witness testified on the 17th of May 1848, that when Manuia was leaving the Islands in 1829, he told Witness he had given Rees a large place at Pearl River, but did not state the Extent. Manuia said he had given him the Lands to raise Stock upon:- that he, Witness, never saw the Land:- that the Cattle on the Land belonged to Manuia; and Rees was to give Manuia half the Increase of the herd.

Kanui: the next Witness sworn for Rees, states, Mr Rees and I were together, and did business for Manuia with the Foreigners:- Manuia first gave him a Land named Pana in Waialeia, but that Land being so much exposed to inroads of Animals, Manuia gave him another at Ewa instead of it. Rees has from that time (1829) lived undisturbed in the place then given. When Rees received the Lands, it was dry, and without value, but by labor, he prepared a taro patch,



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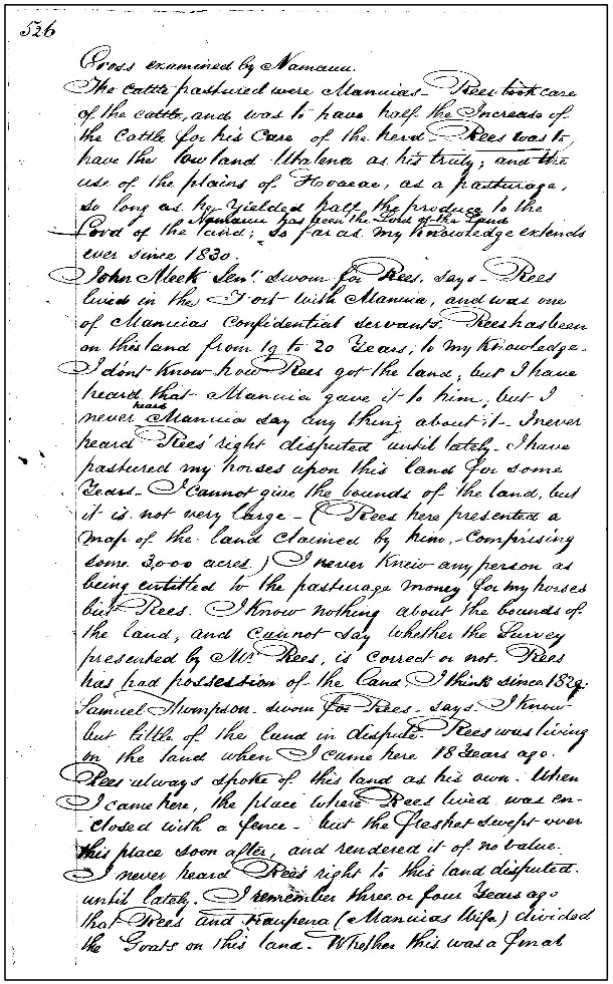
and made it valuable. I do not know the precise boundaries of the land; its name is Hoaeae. The taro ground has been since Covered by a Reshet. The particular Reason why Rees wished to go there, was, that he might have better pasture; and he has pastured Goats, Horses and Cattle there, the pasturing of animals being his business. Manuia did not give him the whole of Hoaeae: he gave him none of the taro ground. The next Witness, Sworn for Rees, was Kaupena. Manuias Widow. She testified, she knows that Manuia let Rees have some pasture ground to feed Goats, upon the Condition that Rees gave him one half of the produce: - that when Manuia left in 1829, he gave the Land to Namauu.

The next Witness Called for Rees was Keheni, who testified, that he was a Relative of Manuias, and a Servant under him. Rees was also a Servant of Manuias, being his herdsman. Rees and myself attended upon Manuias Call. Rees did some other work, besides attending to Manuias Cattle. Before Manuia sailed for Manilla (in 1827 or 1828) he gave Rees a small piece of dry, uncultivated upland in Pauoa Waikiki; let only for the raising of Potatoes. Rees did not like the land; and after a while, wished to give it up because it was so small. Manuia took it back, and gave him a larger land in Ewa. Ulalena, is the name of the land Manuia gave Rees at Ewa, and not Hoaeae. It was a piece of low-land, Surrounded with a fence, but the fence is now broken down. I Could point out where the fence was. It was a place for growing Kalo. Outside of this, was the pasture land of Hoaeae. and Rees was permitted to pasture his Cattle upon it. I went down to Ewa with Rees and Manuia when the land was given, and witnessed the Gift - he gave Rees the land inside of the fence - that is. Ulalena but not the land outside of the fence - that is. Hoaeae. The outside land Rees was to have the use of for the Cattle to run on.



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Cross examined by Namauu.

The Cattle pastured were Manuias. Rees took care of the cattle, and was to have half the Increase of the Cattle for his Care of the herd. Rees was to have the low land Ulalena as his truly; and the use of the plains of Hoaeae, as a pasturage, so long as he yielded half the produce to the Lord of the Land; Namauu [illegible] the Lord of the Land. So far as my knowledge extends ever since 1830.

John Meek Sen^r sworn for Rees. Says - Rees lived in the Fort with Manuia, and was one of Manuias Confidential servants. Rees has been on this land from 19 to 20 Years, to my knowledge. I dont know how Rees got the land, but I have heard that Manuia gave it to him, but I never heard Manuia say any thing about it. I never heard Rees right disputed until lately. I have pastured my horses upon this Land for some Years. I Cannot give the bounds of the land, but it is not very large - (Rees here presented a Map of the Land Claimed by him, Comprissing some 3000 acres.) I never Knew any person as being entitled to the pasturage money for my horses but Rees. I know nothing about the bounds of the land, and Cannot say whether the Survey presented by Mr Rees, is Correct or not. Rees has had possession of the Land I think since 1829.

Samuel Thompson sworn for Rees. says I know but little of the Land in dispute. Rees was living on the land when I came here 18 Years ago. Rees always spoke of this land as his own. When I came here, the place where Rees lived was enclosed with a fence - but the Reshet swept over this place soon after, and rendered it of no value. I never heard Rees right to this land disputed until lately. I remember three or four Years ago that Rees and Kaupena (Manuias Wife) divided the Goats on this land. Whether this was a final

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division or no. I cannot say. I never heard Manuia say any thing in reference to this land. I cannot give the boundaries of the land, they are not known to me. I have rode over the land, but I don't know the bounds, it is not fenced.

Cross examined by Namauu.

I never understood that this land was given to Rees except from the old man Rees himself. I heard this from him lately, and in former years.

J. C. B. Rooke sworn for Rees, says. When I came here in March 1829 the day the King arrived here from Maui. Kaupena, the wife of Manuia, had charge of the Fort. Manuia was then absent at Manilla. I, with others, visited the King in the Fort, and then saw Rees. He appeared to be a servant about the Fort: but I cannot say what his duties were. I saw Manuia afterwards when he returned from Manilla. Shortly after in 1830, I visited Rees down at Ewa, where he was then living he was then pasturing Goats there, perhaps some Horses also. From that time up to the present, I have almost always had horses feeding on this land. I always paid Rees for the pasturage of these horses. I heard that part of the Goats on this land belonged to Kaupena. I understood he pastured the Goats on condition of having half the Increase. I heard this from Rees, and also that the land was given him by Manuia. I never heard until lately, that Namauu had any Right in this land. I know nothing about the bounds of the land. I have rode over it. The lower part is of little or no value. The upland is only valuable, and the lowland being swept by a freshet, is only valuable, on account of its water.

Cross examined by Namauu.

I never knew any thing about Manuias Gift of this land except what I have gathered from hearsay. I never heard Manuia say any thing about it.

Kahanoe sworn for Rees, says. I knew Rees

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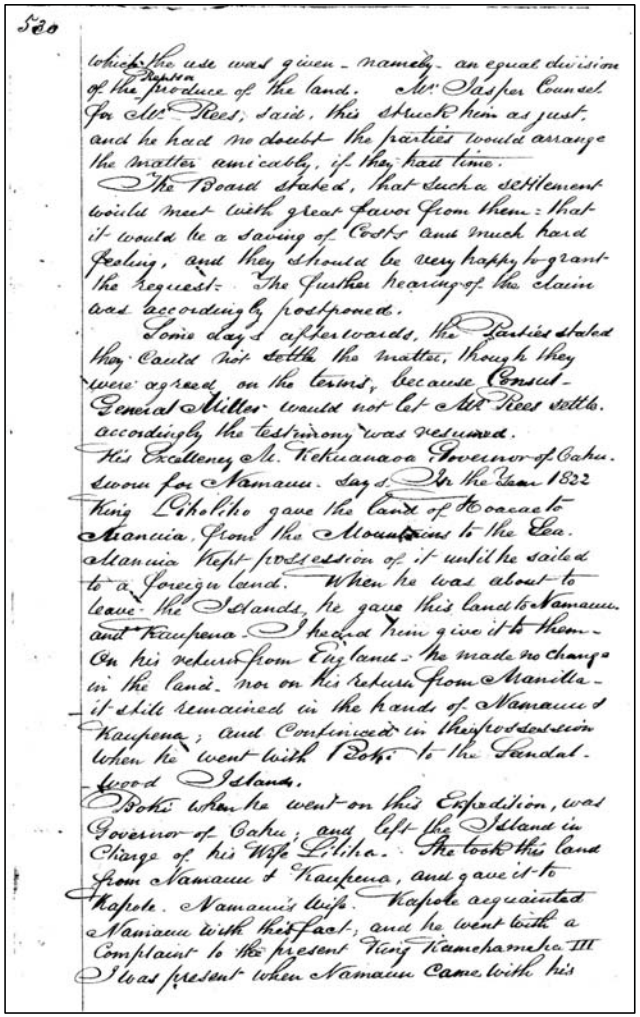
by Captain Lewis. It was not pleasant for him to live on the ship, and he came on shore; he was a kind of Steward or Waiter, under Mahuia in feasts, where foreigners were present. Sometime before Manuia sailed for Manilla, I know Manuia gave him a piece of land at Pawaa. After this a piece of land was given to Rees as I heard, at Ewa. I always understood the Gift to have been as stated by the Witness Kekeni.

When Manuia went away in 1829 on the Sandal-wood expedition in which he was lost, he had Goats feeding on the Kula land (upland) above Rees land. And he gave this land to his wife Kaupena & Namauu. This Kula land (upland) is called Hoaeae; and is bounded on the Waianae side by Honouliuli on the Honolulu side by Waikele; and mauka it extends to where the two vallies meet. In 1841 I was at this place and the fence surrounding the land given to Rees, was fallen down. I then saw that the cattle of Rees were running far inland on the Kula land (upland). I always understood that the lowland belonged to Rees, and the upland to Namauu and Kaupena. In 1841 or 1842 there was a difficulty between Rees and Namauu on account of the alledged appropriation by Rees of all the profits of this land to himself. Namauu complained, and objected to Rees pasturing any Cattle on this upland but his own. Namauu complained that Rees did not pay over his share of the Increase and profits. Rees and Namauu mutually complained to me concerning their difficulty; and I told Rees, I thought he ought to pay over half the profits of this land; and then, all would be quiet & right. Mr Rees, I believe did not do so.

At this stage of the Testimony, both parties requested, that the claim might be postponed, as they thought, they could settle the same amicably.

Namauu said, he had no objection to Mr Rees having the Land, if he only kept the Condition on



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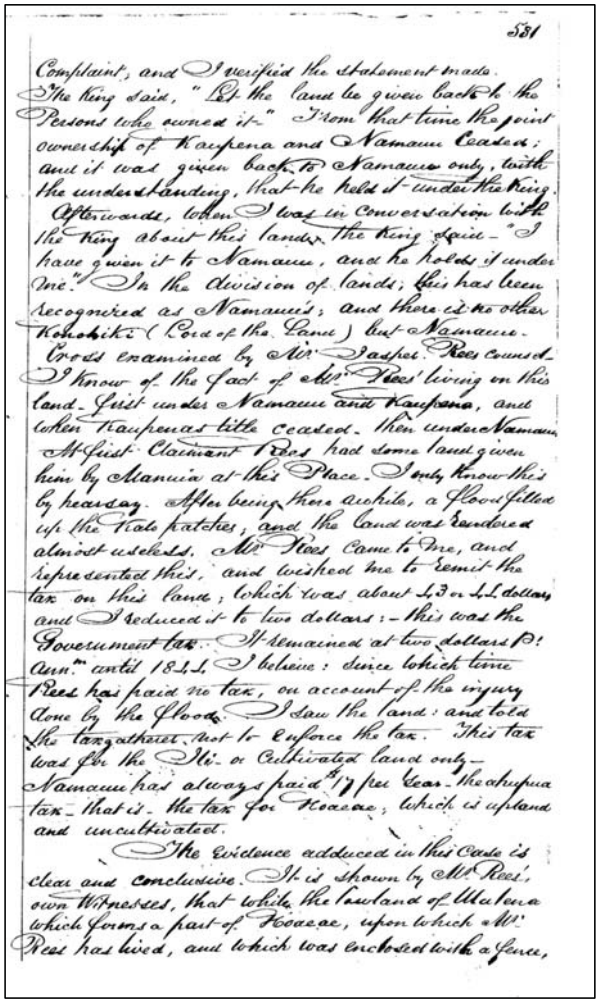
which the use was given - namely - an equal division of the produce of the land. Mr Jasper Counsel for Mr Rees, said, this struck him as just, and he had no doubt the parties would arrange the matter amicably, if they had time.

The Board stated, that such a settlement would meet with great favor from them: that it would be a saving of Costs and much hard feeling, and they should be very happy to grant the request. The further hearing of the claim was accordingly postponed.

Some days afterwards, the Parties stated they could not settle the matter, though they were agreed on the terms, because Consul-General Miller would not let Mr Rees settle. accordingly the testimony was resumed.

His Excellency M. Kekuanaoa Governor of Oahu. sworn for Namauu. says. In the year 1822 King Liholiho gave the land of Koaeae to Manuia from the Mountains to the Sea. Manuia kept possession of it until he sailed to a foreign land. When he was about to leave the Islands, he gave this land to Namauu and Kaupena. I heard him give it to them. On his return from England he made no change in the land. nor on his return from Manilla - it still remained in the hands of Namauu & Kaupena; and continued in their possession when he went with Boki to the Sandal-wood Islands.

Boki when he went on this Expedition, was Governor of Oahu; and left the Island in Charge of his Wife Liliha. She took this land from Namauu & Kaupena, and gave it to Kapole. Namauu's wife. Kapole acquainted Namauu with this fact; and he went with a Complaint to the present King Kamehameha III I was present when Namauu came with his



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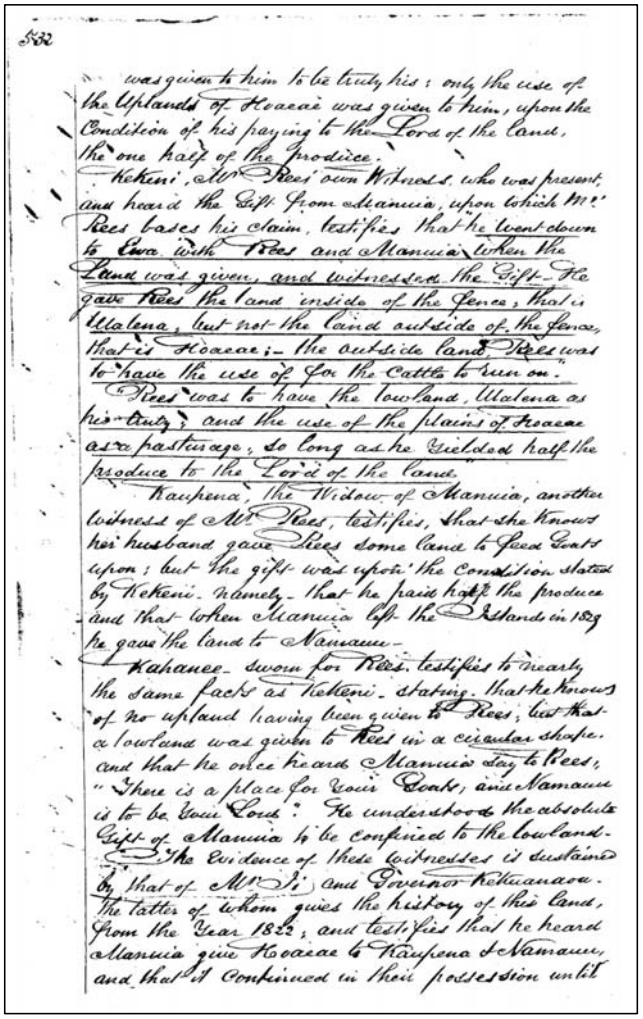
Complaint, and I verified the statement made. The King said, "Let the land be given back to the Persons who owned it." From that time the joint ownership of Kaupena and Namauu Ceased; and it was given back to Namauu only, with the understanding, that he held it under the King.

Afterwards, when I was in Conversation with the King about this land. the King said - "I have given it to Namauu, and he holds it under me." In the division of lands, this has been recognized as Namauu's; and there is no other Kuleana (Piece of the Land) but Namauu.

Cross examined by Mr Jasper. Rees counsel. I know of the fact of Mr Rees' living on this land - Just under Namauu and Kaupena, and when Kaupena's title ceased. then under Namauu. At first Claimant Rees had some land given him by Manuia at this Place. I only know this by hearsay. After being there awhile, a flood filled up the Taro patches, and the land was rendered almost useless. Mr Rees came to me, and represented this, and wished me to remit the tax on this land; which was about $3 or $4 dollars, and I reduced it to two dollars: - this was the Government tax. It remained at two dollars P! Ann.m until 1845. I believe: since which time Rees has paid no tax, on account of the injury done by the flood. I saw the land: and told the tax gatherer not to enforce the tax. This tax was for the Ili or Cultivated land only - Namauu has always paid $1 per Year. The Ahupua tax - that is. the tax for Koaeae; which is upland and uncultivated.

The Evidence adduced in this Case is clear and conclusive. It is shown by Mr Rees' own Witnesses, that while the Kuleana of Ulukuna which forms a part of Koaeae, upon which Mr Rees has lived, and which was enclosed with a fence,



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was given to him to be truly his; only the use of the Uplands of Koaeae was given to him, upon the Condition of his paying to the Lord of the Land, the one half of the produce.

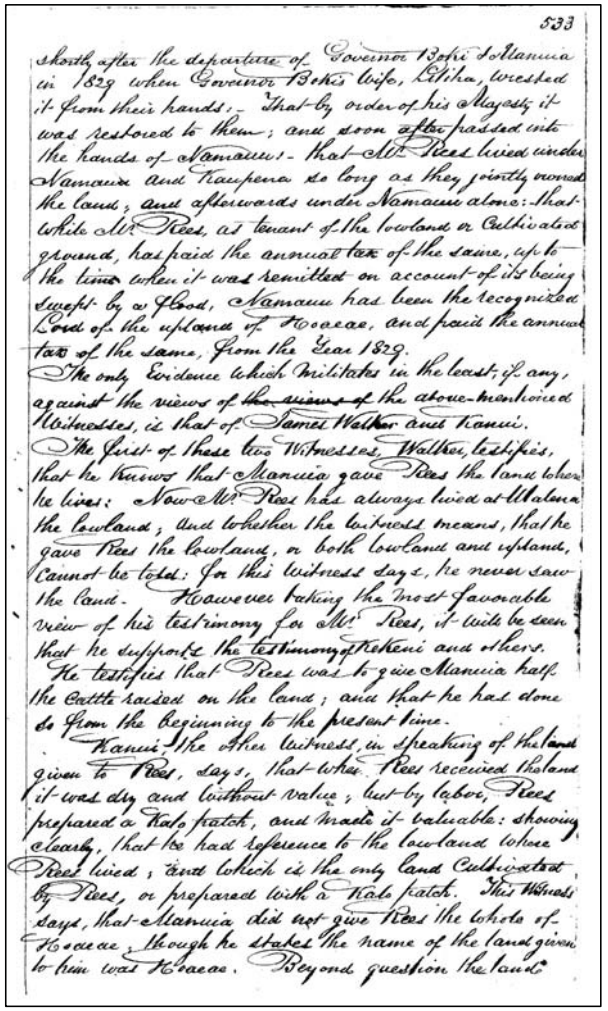
Kekeni, Mr Rees' own Witness, who was present, and heard the Gift from Manuia, upon which Mr Rees bases his claim, testifies that he went down to Ewa with Rees and Manuia when the Land was given, and witnessed the Gift. He gave Rees the Land inside of the Fence, that is Ulalena, but not the Land outside of the Fence, that is Koaeae; the outside Land Rees was to have the use of for the Cattle to run on.

Rees was to have the lowland, Ulalena as his duty; and the use of the plains of Koaeae as a pasturage, so long as he yielded half the produce to the Lord of the Land.

Kaupena, the Widow of Manuia, another witness of Mr Rees, testifies, that she knows her husband gave Rees some Land to feed Goats upon; but the gift was upon the Condition stated by Kekeni. Namely - that he paid half the produce and that when Manuia left the Islands in 1829 he gave the land to Namaunu -

Kahanee - sworn for Rees, testifies to nearly the same facts as Kekeni - stating, that he knows of no upland having been given to Rees; but that a lowland was given to Rees in a circular shape, and that he once heard Manuia say to Rees, "There is a place for your Goats, and Namaunu is to be your Lord." He understood the absolute Gift of Manuia to be confined to the lowland.

The Evidence of these witnesses is sustained by that of Mr Ii and Governor Kekuanaoa. The latter of whom gives the history of this Land, from the Year 1832, and testifies that he heard Manuia give Koaeae to Kaupena & Namaunu, and that it continued in their possession until



533

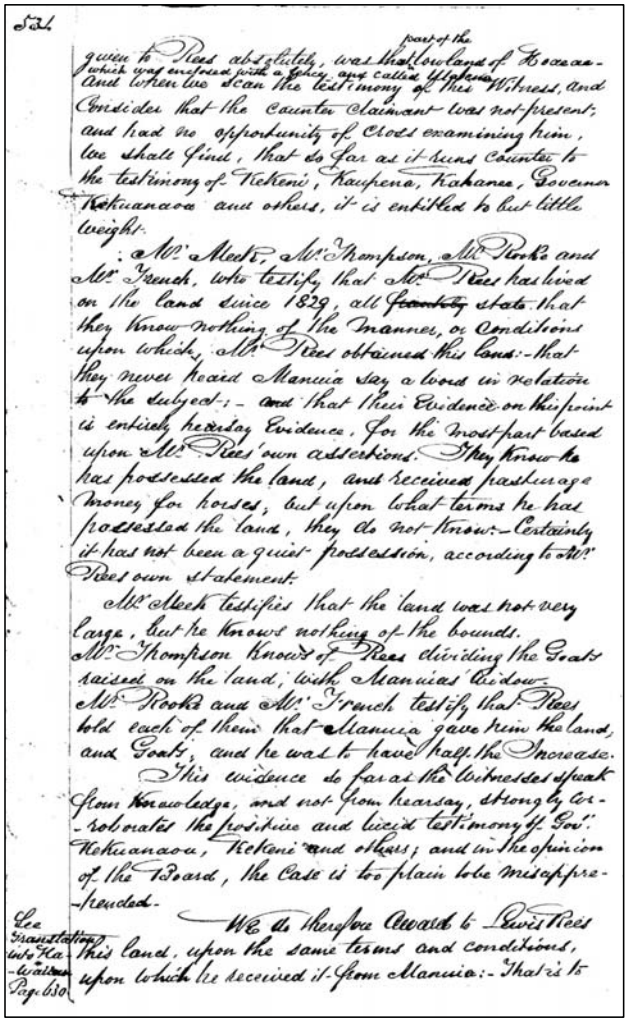
shortly after the departure of Governor Boki & Manuia in 1829 when Governor Boki's wife, Liliha, wrested it from their hands; - That by order of his Majesty it was restored to them; and soon after passed into the hands of Namaunu. - That Mr Rees lived under Namaunu and Kaupena so long as they jointly owned the Land; and afterwards under Namaunu alone: That while Mr Rees, as tenant of the lowland or Cultivated ground, has paid the annual tax of the same, up to the time when it was remitted on account of its being swept by a flood, Namaunu has been the recognized Lord of the uplands of Koaeae, and paid the annual tax of the same, from the Year 1829.

The only Evidence which militates in the least; if any, against the views of the above-mentioned Witnesses, is that of James Walker and Kanui.

The first of these two Witnesses, Walker, testifies, that he knows that Manuia gave Rees the Land where he lives: Now Mr Rees has always lived at Ulalena the Lowland; and whether the witness means, that he gave Rees the lowland, or both lowland and upland, cannot be told: for this witness says, he never saw the Land. However taking the most favorable view of his testimony for Mr Rees, it will be seen that he supports the testimony of Kekeni and others.

He testifies that Rees was to give Manuia half the Cattle raised on the Land; and that he has done so from the Beginning to the present time.

Kanui the other witness, in speaking of the Land given to Rees, says, that when Rees received the land it was dry and without value; but by labor, Rees prepared a Kalo patch, and made it valuable: showing clearly, that he had reference to the lowland where Rees lived, and which is the only Land Cultivated by Rees, or prepared with a Kalo patch. This Witness says, that Manuia did not give Rees the whole of Koaeae, though he states the name of the land given to him was Koaeae. Beyond question the land



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part of the
given to Rees absolutely, was the lowlands of Hoaeae-
which was enclosed with a fence, and called Ulupena
And when we scan the testimony of Rees Witness, and
Consider that the Counter Claimant was not present;
and had no opportunity of Cross examining him,
we shall find, that so far as it runs counter to
the testimony of Kekeni, Kaupena, Kahanea, Governor
Kekuanaoa and others, it is entitled to but little
weight.

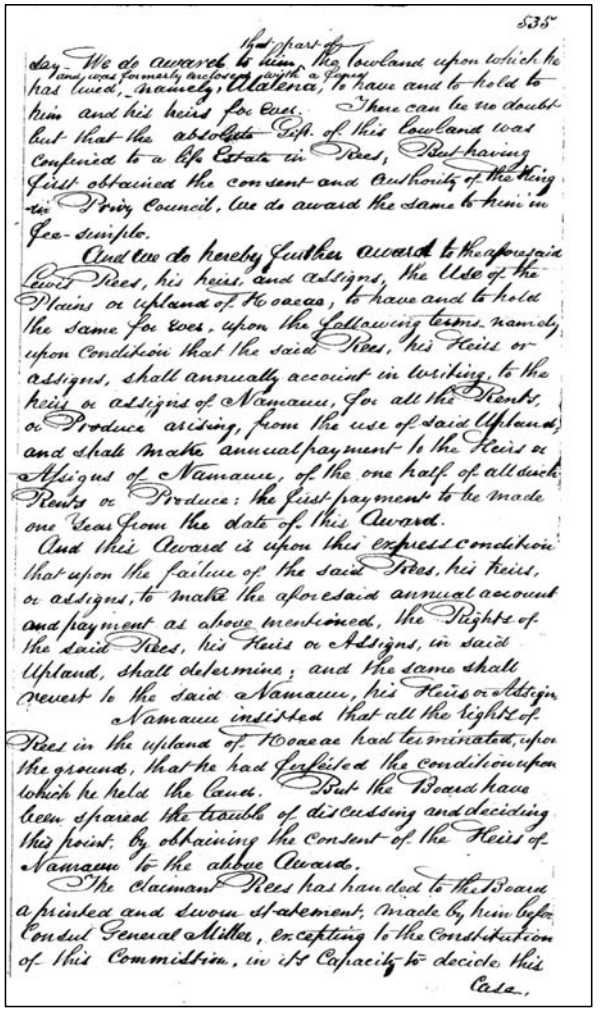
Mr. Meek, Mr. Thompson, Mr. Rooke and
Mr. French, who testify that Mr. Rees has lived
on the Land since 1829, all ~~Country~~ state that
they know nothing of the Manner, or Conditions
upon which, Mr. Rees obtained this Land:- that
they never heard Manuia say a word in relation
to the subject;- and that their Evidence on this point
is entirely hearsay Evidence, for the most part based
upon Mr. Rees own assertions. They know he
has possessed the land, and received pasturage
money for horses, but upon what terms he has
possessed the land, they do not know:- Certainly
it has not been a quiet possession, according to Mr.
Rees own statement.

Mr. Meek testifies that the land was not very
large, but he knows nothing of the bounds.
Mr. Thompson knows of Rees dividing the Goats
raised on the land, with Manuias Widow-
Mr. Rooke and Mr. French testify that Rees
told each of them that Manuia gave him the land,
and Goats, and he was to have half the Increase.

This evidence so far as the Witnesses speak
from Knowledge, and not from hearsay, strongly Cor-
-roborates the positive and lucid testimony of Gov.
Kekuanaoa, Kekeni and others; and in the opinion
of the Board, the Case is too plain to be misappre-
-hended.

We do therefore Award to Lewis Rees
this Land, upon the same terms and conditions,
upon which he received it from Manuia:- That is to

See
Translation
into Ha-
-waiian
Page 530



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that part of
day- We do award to him the lowland upon which he
has lived, namely, Alalena, to have and to hold to
him and his heirs for ever. There can be no doubt
but that the absolute Fee of this lowland was
confined to a life Estate in Rees, But having
first obtained the consent and authority of the King
in Privy Council, we do award the same to him in
Fee-simple.

And we do hereby further award to the aforesaid
Lewis Rees, his heirs and assigns, the Use of the
Plains or upland of Hoaeae, to have and to hold
the same for ever, upon the following terms- namely
upon Condition that the said Rees, his Heirs or
assigns, shall annually account in writing, to the
heirs or assigns of Namauu, for all the Rents,
or Produce arising, from the use of said Upland,
and shall make annual payment to the Heirs or
Assigns of Namauu, of the one half of all such
Rents or Produce: the first payment to be made
one Year from the date of this Award.

And this Award is upon this express condition
that upon the failure of the said Rees, his heirs,
or assigns, to make the aforesaid annual account
and payment as above mentioned, the Rights of
the said Rees, his Heirs or Assigns, in said
Upland, shall determine; and the same shall
revert to the said Namauu, his Heirs or Assigns.

Namauu insisted that all the rights of
Rees in the upland of Hoaeae had terminated, upon
the grounds, that he had violated the condition upon
which he held the Land. But the Board have
been spared the trouble of discussing and deciding
this point, by obtaining the Consent of the Heirs of
Namauu to the above Award.

The Claimant Rees has handed to the Board
a printed and Sworn statement, made by him before
Consul General Miller, excepting to the Constitution
of this Commission, in its Capacity to decide this
Case.

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from the Circumstance of Namauu's being one of the Members of this Board, and he expresses his fears, that he will be able to deceive the Board:- or in other words - that the Board are so deficient in purity of motive or judgment, that they are capable of being warped in their decisions, by the influence of one of its members.

Without regarding such insinuations we would simply remark that Namauu died and another Commissioner was appointed to fill his place in this Board, some months previous to the making of this Award.

The following Survey will shew the correct bounds of Hoaeae; and includes, though it does not particularly define, the bounds of that portion of ~~the land~~ of Ulalena, awarded in Fee-simple.

The law requires existing possessory rights of tenants to be respected.

"Notes of Survey of Hoaeae in Ewa Oahu"

Commencing at pile of stones by Sea (Kalahina bay) at Makai S.E. corner of this Land, joining Waikele, and running S. 18°45' W. 15 Ch. 6 1/2 ft. along Sea to stake, near end of wall on top of Pali by Sea at Namauu's land - Then following along wall seperating this from Namauu's land to Mauka N.E. Corner of wall - Thence N. 29°15' W 1 Ch. 20 1/2 ft. to stake by path at the N.E. corner of Namauu's land (where wall formerly was) Thence S. 70° W. 6 Ch. 7 1/2 ft. across Ravine or flats to Rock on makai edge of new Gulch about 4 Ch. easterly of L. Rees' dwelling house - Thence S. 50°15' W. 3 Ch. 14 1/2 ft. to large Rock at head (at present) of new Gulch. Thence S. 45°30' W. 5 1/2 Ch. to W. corner of old stone pig pen. Thence S. 55°15' W. 12 Ch 3 1/2 ft. always along where old wall stood to wall again. Then following along around wall and Sea Pali to stake at

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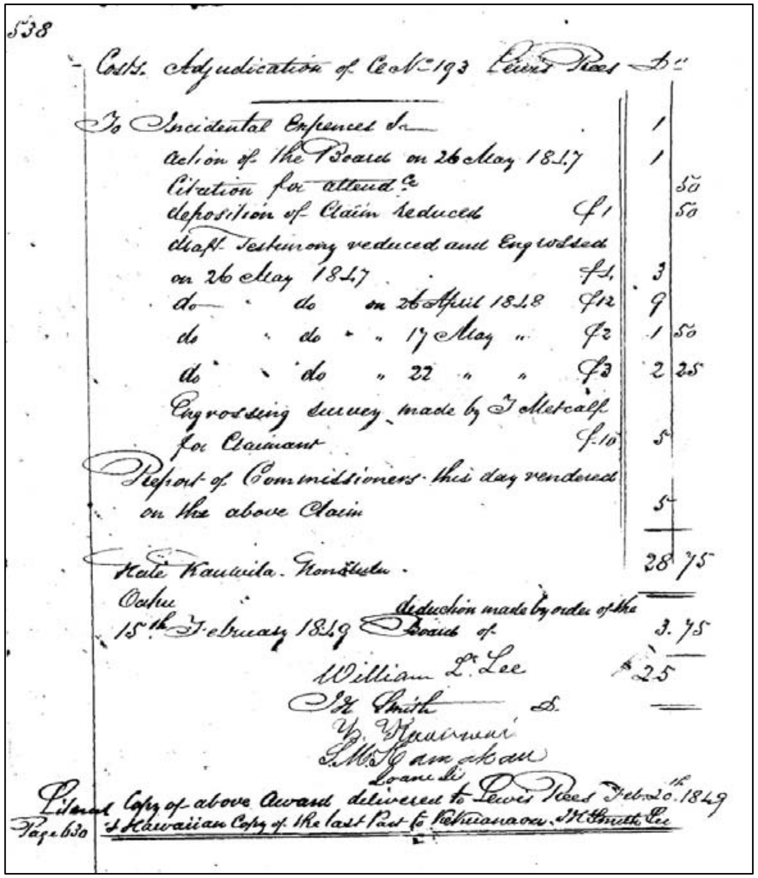
Makai S.W. corner of this land at or in place Called Kaulu (the Kula land ends here, but the Sea of this land extends down to point marked P on Map.) Thence N. 45°30' W. 54 Ch. 13 1/2 ft. to point in old Road on mauka side of Gulch. near Mauka N.W. corner of Namauu's land - along land Called Honouliuli leased by Jno Meek Jr. Thence N. 47°15' W. 42 Ch. 59 1/2 ft. to Rock by Road Called Pohaku Palahalaha - Thence N. 29°45' W. 29 Ch. 20 ft. to stone marked + by Road - Thence N. 51° 15' W. 71 Ch to Rock marked + by Road - Thence N. 33°15' W. 97 Ch. 20 ft. to large Wili wili tree - Thence N. 44°45' W. 57 ch. 26 ft. to old Kukui tree - angle. Thence N. 29°30' W. 64 Ch. 13 ft. always along Honouliuli to pile stones on N upper bank of Ekahanui Gulch at Mauka N.W. corner of this land - Thence N. 32°15' E. 45 Ch. 20 ft. to Kukui tree marked A in clump of Kukui's - Thence N. 36°15' E. 55 Ch. 20 ft. always along land Called Lihui in Honouliuli to large Kukui tree marked B on bottom W. edge of Waikele Gulch at Mauka N.W. corner of this land - Thence S. 76°15' E. 12 Ch. 6 1/2 ft. along bottom Gulch to small single Kukui tree - Thence S. 38°15' E. 17 Ch 26 1/2 ft. along bottom Gulch to point - angle. Thence S. 37°45 E. 40 1/2 ch. along bottom Gulch to Rock marked + angle Thence S. 26° E. 46 3/4 ch. along bottom Gulch and up Pali to small Koa tree marked + on right upper edge - Thence S. 26°30' E. 22 Ch. across dry Gulch to high peaked Rock marked + N. of Ekahanui Gulch - Thence S. 24° E. 19 Ch. 46 ft. across Ekahanui Gulch to stake - Thence S. 31 1/2 E. 43 1/2 Ch to stake on Ridge - angle - Thence S. 25° E. 226 1/2 Ch always along Waikele to Place of Commencement Including an area of Acres 3453

Sept 3. 1848. J. Metcalf Sur.

See diagram Page 539.



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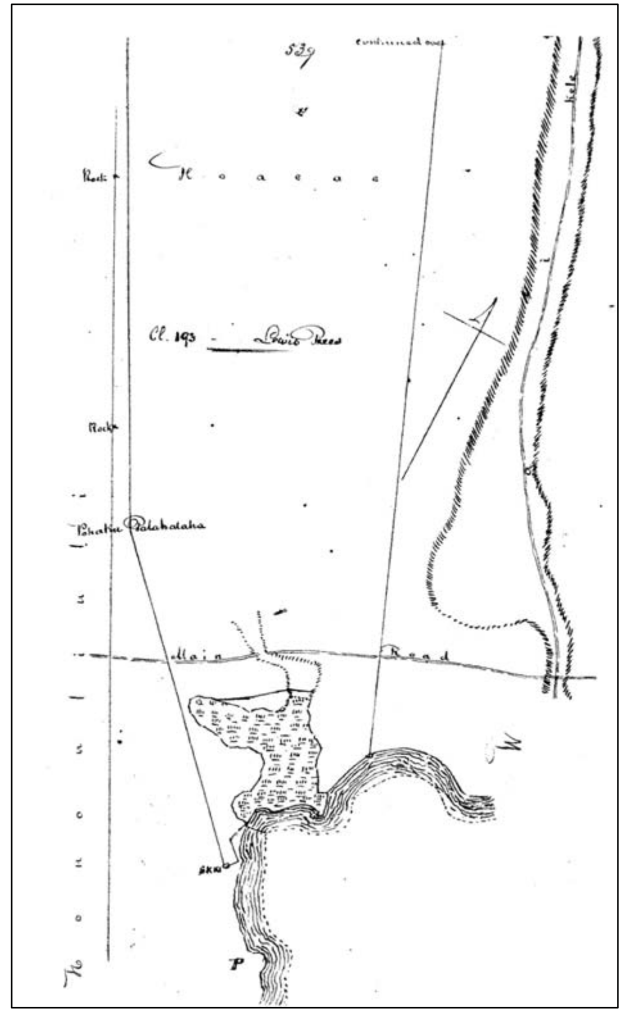
Costs. Adjudication of Cl. No. 193 Lewis Rees Dr.

To Incidental Expences &c	1	
Action of the Board on 26 May 1847	1	
Citation for attend.ce		50
deposition of Claim reduced f 1		50
draft Testimony reduced and Engrossed on 26 May 1847 f 1	3	
do do on 26 April 1848 f 12	9	
do do " 17 May " f 2	1	50
do do " 22 " " f 3	2	25
Engrossing survey made by T. Metcalf for Claimant f 10	5	
Report of Commissioners this day rendered on the above Claim	5	
	28	75

Hale Kauwila. Honolulu.
Oahu
15th February 1849 — deduction made by order of the Board of 3.75

William L. Lee 25
J. H. Smith S.
Z. Kaauwai
S. M. Kamakau
Ioane Ii

Patent Copy of above Award delivered to Lewis Rees Feb 20th 1849
Page 630 & Hawaiian Copy of the last Part to Kekuanaoa. J.H. Smith Sec



Appendix E

Draft Environmental Assessment
Comment and Response Letters

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

LORETTA J. FUDDY, A.C.S.W., M.P.H.
DIRECTOR OF HEALTH

In reply, please refer to:
File:
13-079
Kunia Ag Park

April 2, 2013

Mr. Brian Takeda, AICP, LEED AP
Senior Planner
R.M. Towill Corporation
2024 N. King Street, Suite 200
Honolulu, Hawaii 96819-3494

Dear Mr. Takeda:

SUBJECT: Public Review of Draft Environmental Assessment for Proposed Kunia Agricultural Park, Island of Oahu, Hawaii

The Department of Health (DOH), Environmental Planning Office (EPO), acknowledges receipt of your letter dated March 22, 2013. Thank you for allowing us to review and comment on your document. The letter was routed to the Clean Water, Wastewater, and Indoor and Radiological Health Branches in our Department of Health. They will provide specific comments to you if necessary. EPO recommends that you review the Standard Comments (www.hawaii.gov/health/epo under the land use tab). You are required to adhere to all Standard Comments specifically applicable to this application.

EPO suggests that you examine the many sources available on strategies to support the sustainable design of communities, including the:
U.S. Environmental Protection Agency's sustainability programs: www.epa.gov/sustainability
U.S. Green Building Council's LEED program: www.new.usgbc.org/leed

The DOH encourages everyone to apply these sustainability strategies and principles early in the planning and review of projects. We also request that for future projects you consider conducting a Health Impact Assessment (HIA). More information is available at www.cdc.gov/healthyplaces/hia.htm. We request you share all of this information with others to increase community awareness on sustainable, innovative, inspirational, and healthy community design.

We request a written response confirming receipt of this letter and any other letters you receive from DOH in regards to this submission. You may mail your response to 919 Ala Moana Blvd., Ste. 312, Honolulu, Hawaii 96814. However, we would prefer an email submission to epo@doh.hawaii.gov. We anticipate that our letter(s) and your response(s) will be included in the final document. If you have any questions, please contact me at (808) 586-4337.

Mahalo,

Laura Leialoha Phillips McIntyre, AICP
Manager, Environmental Planning Office

2024 N. King Street
Suite 200
Honolulu, Hawaii 96819-3494
Telephone 808 842 1133
Fax 808 842 1937
eMail: rmtowill@rmtowill.com

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Surveying
Construction Management

August 28, 2015

Ms. Laura Leialoha Phillips McIntyre, AICP, Manager
Environmental Planning Office
Department of Health
State of Hawai'i
919 Ala Moana Blvd, Ste 312
Honolulu, Hawai'i 96814

Dear Ms. McIntyre:

Kunia Agricultural Park
Draft Environmental Assessment (DEA) Comments
Kunia, O'ahu, Hawai'i

On behalf of the State of Hawai'i Department of Agriculture (DOA), thank you for your letter dated April 2, 2013 concerning the subject DEA (DOH Reference: 13-079 Kunia Ag Park). We have prepared the following in response to your comments (italicized herein for reference).

1. *EPO recommends that you review the Standard Comments (www.hawaii.gov/health/epo under the land use tab). You are required to adhere to all Standard Comments specifically applicable to this application.*

We accessed the tab indicated and did not find the a tab marked "land use." However, we understand the relevant requirements applicable to the subject project under jurisdiction of the Department of Health to include the Clean Water Act (CWA), Section 402, National Pollutant Discharge Elimination System, and other related sections. We confirm that the DOA will adhere to the requirements of the CWA as administered by the DOA.

2. *EPO suggests that you examine the many sources available on strategies to support the sustainable design of communities, including the:*
   U.S. Environmental Protection Agency's sustainability programs: www.epa.gov/sustainability
   U.S. Green Building Council's LEED program: www.new.usgbc.org/leed

   The DOH encourages everyone to apply these sustainability strategies and principles early in the planning and review of projects. We also request that for future projects you consider conducting a Health Impact Assessment (HIA). More information is available at www.cdc.gov/healthyplaces/hia.htm. We request you share all of this information with others to increase community awareness on sustainable, innovative, inspirational, and healthy community design.

We acknowledge DOH's suggestions for improving sustainability and undertaking early consultation. Your request for future HIAs is duly noted. However, we note that the development of an agricultural park is in itself an important component towards advancing agricultural sustainability on O'ahu.

3. *We request a written response confirming receipt of this letter and any other letters you receive from DOH in regards to this submission.*

This response to comments will serve as the written reply to the DOH.

We appreciate your review of the subject DEA. Your comments together with this response will be included with the forthcoming Final EA/Finding of No Significant Impact. Should you have any further questions, please contact me at (808) 842-1133.

Sincerely,

Brian Takeda
Planning Project Coordinator

BT/RL
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cc: Mr. Scott E. Enright, Chairperson, Board of Agriculture

NEIL ABERCROMBIE
GOVERNOR

KATHRYN S. MATAYOSHI
SUPERINTENDENT

STATE OF HAWAI`I
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAI`I 96804

OFFICE OF SCHOOL FACILITIES AND SUPPORT SERVICES

April 9, 2013

Mr. Brian Takeda, Senior Planner
R. M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawai`i 96819-3494

Subject: Draft Environmental Assessment, Kunia Agricultural Park, Kunia, O`ahu

The Department of Education (DOE) has reviewed the Draft Environmental Assessment (EA) for the proposed Kunia Agricultural Park.

The DOE notes that the EA indicates that Hawaii Department of Agriculture has the option to develop up to fifty farm dwellings or farm employee housing units with the state agricultural park. The Kunia Agricultural Park is within the boundaries of the Leeward Oahu School Impact Fee District that was adopted by the Board of Education on January 17, 2012. If housing units are developed within this project, they will be expected to contribute school impact fees.

Thank you for the opportunity to provide comment. If you have any questions, please call Jeremy Kwock of the Facilities Development Branch at 377-8301.

Respectfully,

Kenneth G. Masden II
Public Works Manager
Planning Section

KGM:jmb

c: The Honorable Donald G. Horner, Chairperson, BOE
Kathryn Matayoshi, Superintendent, DOE
Raymond L'Heureux, Assistant Superintendent, OSFSS

AN AFFIRMATIVE ACTION AND EQUAL OPPORTUNITY EMPLOYER

2024 N. King Street
Suite 200
Honolulu, Hawaii 96819-3494
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eMail: rmtowill@rmtowill.com

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Surveying
Construction Management

August 28, 2015

Mr. Kenneth G. Masden, Public Works Manager
Planning Section
Office of School Facilities and Support Services
Department of Education
State of Hawai'i
P.O. Box 2360
Honolulu, Hawai'i 96804

Dear Mr. Masden:

Kunia Agricultural Park
Draft Environmental Assessment (DEA) Comments
Kunia, O'ahu, Hawai'i

On behalf of the State of Hawai'i Department of Agriculture (DOA), thank you for your letter dated April 9, 2013 concerning the subject DEA. DOA acknowledges that the project is located within the Leeward Oahu School Impact Fee District and that they will be subject to school impact fees for the residential portion of the project.

We appreciate your review and comment on the subject DEA. Your comments together with this response will be included in the forthcoming Final EA/Finding of No Significant Impact. Should you have any further questions, please contact me at (808) 842-1133.

Sincerely,

Brian Takeda
Planning Project Coordinator

BT/RL
K:\plan\22438-00 Kunia Ag Park Rev EA\Narrative\FEA\2 DEA Responses to Comments\Draft\Draft DOE comment responses.docx

cc: Mr. Scott E. Enright, Chairperson, Board of Agriculture

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

LORETTA J. FUDDY, A.C.S.W., M.P.H.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
EMD/CWB

04038PST.13

April 11, 2013

Mr. Brian Takeda, AICP, LEED AP
Senior Planner
R. M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawaii 96819-3494

Dear Mr. Takeda:

SUBJECT: Comments on the Draft Environmental Assessment for the Proposed Kunia Agricultural Park Kunia, Island of Oahu, Hawaii

The Department of Health (DOH), Clean Water Branch (CWB), acknowledges receipt of your letter, dated March 22, 2013, requesting comments on your project. The DOH-CWB has reviewed the subject document and offers these comments. Please note that our review is based solely on the information provided in the subject document and its compliance with the Hawaii Administrative Rules (HAR), Chapters 11-54 and 11-55. You may be responsible for fulfilling additional requirements related to our program. We recommend that you also read our standard comments on our website at: http://www.hawaii.gov/health/environmental/env-planning/landuse/CWB-standardcomment.pdf.

1. Any project and its potential impacts to State waters must meet the following criteria:

   a. Antidegradation policy (HAR, Section 11-54-1.1), which requires that the existing uses and the level of water quality necessary to protect the existing uses of the receiving State water be maintained and protected.

   b. Designated uses (HAR, Section 11-54-3), as determined by the classification of the receiving State waters.

   c. Water quality criteria (HAR, Sections 11-54-4 through 11-54-8).

2. You may be required to obtain a National Pollutant Discharge Elimination System (NPDES) permit for discharges of wastewater, including storm water runoff, into State surface waters (HAR, Chapter 11-55). An application for an NPDES individual permit must be submitted at least 180 calendar days before the commencement of the discharge. To request NPDES permit coverage, you must submit the CWB Individual NPDES Form through the e-Permitting Portal and the hard copy certification statement

with $1,000 filing fee. Please open the e-Permitting Portal website at: https://eha cloud.doh.hawaii.gov/epermit/View/home.aspx. You will be asked to do a one-time registration to obtain your login and password. After you register, click on the Application Finder tool and locate the "CWB Individual NPDES Form." Follow the instructions to complete and submit this form.

3. If your project involves work in, over, or under waters of the United States, it is highly recommend that you contact the Army Corp of Engineers, Regulatory Branch (Tel: 438-9258) regarding their permitting requirements.

   Pursuant to Federal Water Pollution Control Act [commonly known as the "Clean Water Act" (CWA)], Paragraph 401(a)(1), a Section 401 Water Quality Certification (WQC) is required for "[a]ny applicant for Federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may **result** in any discharge into the navigable waters..." (emphasis added). The term "discharge" is defined in CWA, Subsections 502(16), 502(12), and 502(6); Title 40 of the Code of Federal Regulations, Section 122.2; and Hawaii Administrative Rules (HAR), Chapter 11-54.

4. Please note that all discharges related to the project construction or operation activities, whether or not NPDES permit coverage and/or Section 401 WQC are required, must comply with the State's Water Quality Standards. Noncompliance with water quality requirements contained in HAR, Chapter 11-54, and/or permitting requirements, specified in HAR, Chapter 11-55, may be subject to penalties of $25,000 per day per violation.

If you have any questions, please visit our website at: http://www.hawaii.gov/health/environmental/water/cleanwater/index.html, or contact the Engineering Section, CWB, at (808) 586-4309.

Sincerely,

ALEC WONG, P.E., CHIEF
Clean Water Branch

ST:rh

c: DOH-EPO #13-079 [via email only]

2024 N. King Street
Suite 200
Honolulu, Hawaii 96819-3494
Telephone 808 842 1133
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eMail: rmtowill@rmtowill.com

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Surveying
Construction Management

August 28, 2015

Mr. Alec Wong, P.E., Chief
Clean Water Branch
Department of Health
State of Hawai'i
P. O. Box 3378
Honolulu, Hawai'i 96801-3378

Dear Mr. Wong:

Kunia Agricultural Park
Draft Environmental Assessment (DEA) Comments
Kunia, O'ahu, Hawai'i

On behalf of the State of Hawai'i Department of Agriculture (DOA), thank you for your letter dated April 11, 2013 concerning the subject DEA (DOH Reference: EMD/CWB 04038PST.13). We have prepared the following responses to your comments (italicized herein for reference).

A. *Paragraph 1, Last Sentence: We recommend that you also read our standard comments on our website at: http://www.hawaii.gov/health/environmental/env-planning/landuse/CWB-standardcomment.pdf.*

We accessed the website indicated and did not find the "standard comments". Subsequently, with the assistance from Clean Water Branch (CWB) staff, we were guided to the website location. We confirm that DOA will develop the proposed project in compliance with CWB Standard Comments dated December 19, 2014.

B. *Item 1: Any project and its potential impacts to State waters must meet the following criteria:*
   a. *Antidegradation policy (HAR, Section 11-54-1.1), which requires that the existing uses and the level of water quality necessary to protect the existing uses of the receiving State water be maintained and protected.*
   b. *Designated uses (HAR, Section 11-54-3), as determined by the classification of the receiving State waters.*
   c. *Water quality criteria (HAR, Sections 11-54-4 through 11-54-8).*

The project will comply with the criteria established in HAR, Sections 11-54-1.1, 11-54-3, and 11-54-4 through 11-54-8.

C. *Item 2: You may be required to obtain a National Pollutant Discharge Elimination System (NPDES) permit for discharges of wastewater, including storm water runoff, into State surface waters (HAR, Chapter 11-55). An application for an NPDES individual permit must be submitted at least 180 calendar days before the commencement of the discharge. To request NPDES permit coverage, you must submit the CWB Individual NPDES Form through the e-Permitting Portal and the hard copy certification statement with $1,000 filing fee. Please open the e-Permitting Portal website at: https://eha cloud.doh.hawaii.gov/epermitNiew/home.aspx. You will be asked to do a one-time registration to obtain your login and password. After you register, click on the Application Finder tool and locate the "CWB Individual NPDES Form." Follow the instructions to complete and submit this form.*

DOA is aware that the National Pollutant Elimination Discharge System (NPDES) Individual Permit must be submitted at least 180 days before the start of any discharge or construction activities. However, the project will obtain a NPDES General Permit for which an application will be submitted at least 30 days before the start of any discharge or construction activities.

D. *Item 3: If your project involves work in, over, or under waters of the United States, it is highly recommend that you contact the Army Corp of Engineers, Regulatory Branch (Tel: 438-9258) regarding their permitting requirements.*

   Pursuant to Federal Water Pollution Control Act [commonly known as the "Clean Water Act" (CWA)], Paragraph 401 (a)(1), a Section 401 Water Quality Certification (WQC) is required for "[a]ny applicant for Federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may ***result*** *in any discharge into the navigable waters ... " (emphasis added). The term "discharge" is defined in CWA, Subsections 502(16), 502(12), and 502(6); Title 40 of the Code of Federal Regulations, Section 122.2; and Hawaii Administrative Rules (HAR), Chapter 11-54.*

The proposed project will not involve work in, over, or under waters of the United States.

E. *Item 4: Please note that all discharges related to the project construction or operation activities, whether or not NPDES permit coverage and/or Section 401 WQC are required, must comply with the State's Water Quality Standards. Noncompliance with water quality requirements contained in HAR, Chapter 11-54, and/or permitting requirements, specified in HAR, Chapter 11-55, may be subject to penalties of $25,000 per day per violation.*

The project construction or operation activities will comply with the State's Water Quality Standards pursuant to HAR Chapter 11-54.

We appreciate your review and comments on the subject DEA. Your comments together with this response will be included in the forthcoming Final EA/Finding of No Significant Impact. Should you have any further questions, please contact met at (808) 842-1133.

Sincerely,

Brian Takeda
Planning Project Coordinator

BT/RL
K:\plan\22438-00 Kunia Ag Park Rev EA\Narrative\FEA\2 DEA Responses to Comments\Draft\Draft DOH CWB comment responses.docx

cc: Mr. Scott E. Enright, Chairperson, Board of Agriculture
Ms. Laura McIntyre, AICP, Department of Health Environmental Planning Office

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

LORETTA J. FUDDY, A.C.S.W., M.P.H.
DIRECTOR OF HEALTH

In reply, please refer to:
File:

LUD-1 9 4 002 080-ID1267
Kunia Ag Park Dvlpmnt

April 16, 2013

Mr. Brian Takeda, AICP, LEED, AP
Senior Planner
R.M. Towill Corporation
2024 North King Street Suite 200
Honolulu, Hawaii 96819-3494

Dear Mr. Takeda:

Subject: Public Review of Draft Environmental Assessment (DEA) for Proposed Kunia Agricultural Park, 94-761 Kupuna Loop, Waipahu, HI 96797, Island of Oahu TMK (1) 9-4-002: 080 approximately 150 acres

Thank you for the opportunity to provide comments on the subject project. It is our understanding that the project will be served by the City and County of Honolulu's Honouliuli Wastewater Treatment Plant's sewer collection system; therefore, we have no comments to offer at this time.

Should you have any questions, please contact the Planning & Design Section of our branch at phone 586-4294 or fax to 586-4300.

Sincerely,

MARSHALL LUM, P.E., ACTING CHIEF
Wastewater Branch

LM:mt

c: DOH-Environmental Planning Office (13-079), Ms. Laura McIntyre
City & County of Honolulu, Planning & Permitting Office, Mr. Jiro A. Sumada

2024 N. King Street
Suite 200
Honolulu, Hawaii 96819-3494
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R. M. TOWILL CORPORATION
SINCE 1930

Planning
Engineering
Environmental Services
Photogrammetry
Surveying
Construction Management

August 28, 2015

Ms. Sina Pruder, P.E., Chief
Wastewater Branch
Department of Health
State of Hawai'i
Post Office Box 3378
Honolulu, Hawai'i 96801-3378

Dear Ms. Pruder:

Kunia Agricultural Park
Draft Environmental Assessment (DEA) Comments
Kunia, O'ahu, Hawai'i

On behalf of the State of Hawai'i Department of Agriculture, thank you for your letter dated April 16, 2013 indicating that you have no comments on the subject DEA (DOH Reference: LUD-1 9 4 002 080-ID1267).

We appreciate your review of the subject DEA and will include your comment letter along with this response with the forthcoming Final EA/Finding of No Significant Impact. Should you have any further questions, please contact me at (808) 842-1133.

Sincerely,

Brian Takeda
Planning Project Coordinator

BT/RL
K:\plan\22438-00 Kunia Ag Park Rev EA\Narrative\FEA\2 DEA Responses to Comments\Draft\Draft DOH WWB comment responses.docx

cc: Mr. Scott E. Enright, Chairperson, Board of Agriculture
Ms. Laura McIntyre, Department of Health Environmental Planning Office

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

April 18, 2013

R. M. Towill Corporation
Attention: Brian Takeda
2024 N. King Street, Suite 200
Honolulu, HI 96819-3494

via email: briant@rmtowill.com

Dear Mr. Takeda,

SUBJECT: Public Review of Draft Environmental Assessment (DEA) for proposed Kunia Agricultural Park, Island of O`ahu, Hawai`i

Thank you for the opportunity to review and comment on the subject matter. The Department of Land and Natural Resources' (DLNR) Land Division distributed or made available a copy of your report pertaining to the subject matter to DLNR Divisions for their review and comments.

At this time, enclosed are comments from Land Division – Oahu District. No other comments were received as of our suspense date. Should you have any questions, please feel free to call Supervising Land Agent Steve Molmen at 587-0439. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosure(s)

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

March 28, 2013

MEMORANDUM

TO:
DLNR Agencies:
__ Div. of Aquatic Resources
__ Div. of Boating & Ocean Recreation
X Engineering Division
__ Div. of Forestry & Wildlife
__ Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division Oahu District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Public Review of Draft Environmental Assessment (DEA) for proposed Kunia Agricultural Park
LOCATION: Island of O'ahu, TMK (1) 9-4-002:080
APPLICANT: State of Hawai'i, Department of Agriculture by its agent, R. M. Towill Corporation

Transmitted for your review and comment on the above-referenced document. We would appreciate your comments on this document.

The applicant has provided a limited number of CD-ROMs for distribution. If we have not provided you with a CD-ROM, the document is available for download from the Office of Environmental Quality Control (OEQC) website at the address provided in the attached cover letter.

Please submit any comments by April 17, 2013. If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Attachments

( ) We have no objections.
(√) We have no comments.
( ) Comments are attached.

Signed:
Print Name:
Date: 4/8/2013

c: Central Files

2024 N. King Street
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Honolulu, Hawaii 96819-3494
Telephone 808 842 1133
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eMail: rmtowill@rmtowill.com

R. M. TOWILL CORPORATION
SINCE 1930

Planning
Engineering
Environmental Services
Photogrammetry
Surveying
Construction Management

August 28 2015

Mr. Russell Y. Tsuji, Land Administrator
Land Division
Department of Land and Natural Resources
State of Hawai'i
P. O. Box 621
Honolulu, Hawai'i 96809

Attention: Mr. Steve Molmen, Supervising Land Agent

Dear Mr. Tsuji:

Kunia Agricultural Park
Draft Environmental Assessment (DEA) Comments
Kunia, O'ahu, Hawai'i

On behalf of the State of Hawai'i Department of Agriculture, thank you for your letter dated April 18, 2013 indicating that you have no comments on the subject DEA.

We appreciate your review of the subject DEA and will include your comment letter together with this response with the forthcoming Final EA/Finding of No Significant Impact. Should you have any further questions, please contact me at (808) 842-1133.

Sincerely,

Brian Takeda
Planning Project Coordinator

BT/RL
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cc: Mr. Scott E. Enright, Chairperson, Board of Agriculture

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

April 22, 2013

REF: Kunia Ag Park DEA

R.M Towill Corporations
Attention: Brian Takeda
2024 N. King Street, Suite 200
Honolulu, HI 96819-3494

Dear Mr. Takeda:

SUBJECT: DEA for proposed Kunia Agricultural Park, Island of O'ahu, Hawai'i

FILE NO.: N/A
TMK NO.: N/A

Thank you for the opportunity to review the subject document. The Commission on Water Resource Management (CWRM) is the agency responsible for administering the State Water Code (Code). Under the Code, all waters of the State are held in trust for the benefit of the citizens of the State, therefore, all water use is subject to legally protected water rights. CWRM strongly promotes the efficient use of Hawaii's water resources through conservation measures and appropriate resource management. For more information, please refer to the State Water Code, Chapter 174C, Hawaii Revised Statutes, and Hawaii Administrative Rules, Chapters 13-167 to 13-171. These documents are available via the Internet at http://www.hawaii.gov/dlnr/cwrm.

Our comments related to water resources are checked off below.

☒ 1. We recommend coordination with the county to incorporate this project into the county's Water Use and Development Plan. Please contact the respective Planning Department and/or Department of Water Supply for further information.

☒ 2. We recommend coordination with the Engineering Division of the State Department of Land and Natural Resources to incorporate this project into the State Water Projects Plan.

☐ 3. We recommend coordination with the Hawaii Department of Agriculture (HDOA) to incorporate the reclassification of agricultural zoned land and the redistribution of agricultural resources into the State's Agricultural Water Use and Development Plan (AWUDP). Please contact the HDOA for more information.

☐ 4. We recommend that water efficient fixtures be installed and water efficient practices implemented throughout the development to reduce the increased demand on the area's freshwater resources. Reducing the water usage of a home or building may earn credit towards Leadership in Energy and Environmental Design (LEED) certification. More information on LEED certification is available at http://www.usgbc.org/leed. A listing of fixtures certified by the EPA as having high water efficiency can be found at http://www.epa.gov/watersense/.

☒ 5. We recommend the use of best management practices (BMP) for stormwater management to minimize the impact of the project to the existing area's hydrology while maintaining on-site infiltration and preventing polluted runoff from storm events. Stormwater management BMPs may earn credit toward LEED certification. More information on stormwater BMPs can be found at http://hawaii.gov/dbedt/czm/initiative/lid.php.

☒ 6. We recommend the use of alternative water sources, wherever practicable.

☒ 7. There may be the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.

Permits required by CWRM:
Additional information and forms are available at http://hawaii.gov/dlnr/cwrm/info_permits.htm.

☒ 8. The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit is required prior to use of water. The Water Use Permit may be conditioned on the requirement to use dual line water supply systems for new industrial and commercial developments.

☐ 9. A Well Construction Permit(s) is (are) required before the commencement of any well construction work.

☐ 10. A Pump Installation Permit(s) is (are) required before ground water is developed as a source of supply for the project.

☐ 11. There is (are) well(s) located on or adjacent to this project. If wells are not planned to be used and will be affected by any new construction, they must be properly abandoned and sealed. A permit for well abandonment must be obtained.

☐ 12. Ground-water withdrawals from this project may affect streamflows, which may require an instream flow standard amendment.

☐ 13. A Stream Channel Alteration Permit(s) is (are) required before any alteration can be made to the bed and/or banks of a stream channel.

☐ 14. A Stream Diversion Works Permit(s) is (are) required before any stream diversion works is constructed or altered.

☐ 15. A Petition to Amend the Interim Instream Flow Standard is required for any new or expanded diversion(s) of surface water.

☐ 16. The planned source of water for this project has not been identified in this report. Therefore, we cannot determine what permits or petitions are required from our office, or whether there are potential impacts to water resources.

☒ OTHER:
Page 14 of the DEA refers to the Kunia Wells that should be better identified with existing state well numbers.

Table 5 is a good preliminary analysis for reasonable irrigation needs. The Commission irrigation estimation model discussed in the DEA from College of Tropical Agriculture and Human Resources at the University of Hawaii at Manoa ("CATHR") is IWREDSS (ver 1). The Commission is currently updating this model to IWREDSS (ver.2) to assess the reasonable and beneficial allocation for the water use permit pending from HDOA. The Commission will use this publically available tool to also assess irrigation needs for the Commission's consideration. At this time HDOA's water use permit request is for 422,000 gpd while the DEA now shows 459,000 pgd and should be reconciled.

Under the ground water discussion, the DEA should refer to the Commission's latest update of its Water Resource Protection Plan (WRPP, 2008), which further defines aquifer system areas and corresponding sustainable yields and current water use permit allocations and availability within the pearl harbor area. This will help to preliminarily substantiate that adverse affects to sustainable yield are not anticipated. The DEA should also acknowledge that Waiahole Ditch, though often considered surface water because it is open ditch, is really a ground water source with its own allocation management of available water under the Commission's purview. Also, impacts to ground water quality from agricultural operations come under the review of the State Departments of Agriculture and Health and we defer to their comments regarding quality impacts.

We recommend that water conservation best management practices for agricultural irrigation systems and end users be implemented. Agricultural BMPs are identified in a newly-released report *Hawaii Water Conservation Plan*, available for viewing or downloading at: http://hawaii.gov/dlnr/cwrm/planning/hwcp2013.pdf

If there are any questions, please contact Roy Hardy at (808) 587-0274.

Sincerely,

WILLIAM M. TAM
Deputy Director

DRF-GN 03/20/2013

2024 N. King Street
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Honolulu, Hawaii 96819-3494
Telephone 808 842 1133
Fax 808 842 1937
eMail: rmtowill@rmtowill.com

R. M. TOWILL CORPORATION
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Planning
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Environmental Services
Photogrammetry
Surveying
Construction Management

August 28, 2015

Mr. Jeffrey T. Pearson, Deputy Director
Commission on Water Resources Management
Department of Land and Natural Resources
State of Hawai'i
P.O. Box 621
Honolulu, Hawai'i 96809

Dear Mr. Pearson:

Kunia Agricultural Park
Draft Environmental Assessment (DEA) Comments
Kunia, O'ahu, Hawai'i

On behalf of the State of Hawai'i Department of Agriculture (DOA), thank you for your letter dated April 22, 2013 concerning the subject DEA (CWRM Reference: Kunia Ag Park DEA). We have prepared the following responses to your comments (italicized herein for reference).

1. *We recommend coordination with the county to incorporate this project into the county's Water Use and Development Plan. Please contact the respective Planning Department and/or Department of Water Supply for further information.*

Copies of the DEA were provided to both the Department of Planning and Permitting (DPP) and the Board of Water Supply. Comments were received by both agencies.

2. *We recommend coordination with the Engineering Division of the State Department of Land and Natural*

A copy of the DEA was routed to the Department of Land and Natural Resources (DLNR) Engineering Division through DLNR's Land Division. They did not provide comments on the DEA.

3. *We recommend the use of best management practices (BMP) for stormwater management to minimize the impact of the project to the existing area's hydrology while maintaining on-site infiltration and preventing polluted runoff from storm events. Stormwater management BMPs may earn credit toward LEED certification. More information on stormwater BMPs can be found at http://hawaiLgov/dbedt/czm/initiative/lid.php.*

BMP's will be utilized during project construction. On-site drainage improvements will comply with Rules Relating to Storm Drainage Standards adopted by DPP. In addition the project will be subject to a National Pollutant Discharge Elimination System (NPDES) permit from the State of Hawaii Department of Health for stormwater discharge associated with construction activities as required by Hawai'i Administrative Rules (HAR) 11-55. A Best Management Practices (BMP) plan will be submitted in conjunction with the NPDES permit application. Furthermore, the project will comply with State Water Quality Standards pursuant to HAR 11-54.

4. *We recommend the use of alternative water sources, wherever practicable.*

DOA anticipates using Waiahole Ditch water to irrigate the agricultural lots. Pursuant to a Memorandum of Understanding (MOU) dated March 31, 1993 and amended and revised on March 2, 2007 between the DOA and Halekua Development Corporation, Halekua will be responsible for the design and construction of off-site potable water and irrigation lines up to the boundary of the agricultural park. In addition, DOA will continue to work with Halekua to obtain and construct necessary potable water system improvements for the residential portion of the project.

5. *There may be the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.*

As previously mentioned in Item 3, the project will be subject to DOH review pursuant to HAR 11-54 and -55 regarding State Water Quality Standards and NPDES requirements, respectively.

Further, the DOA will require each agricultural lot awardee to develop a Conservation Plan with the U. S. Department of Agriculture Natural Resources Conservation Service. This Conservation Plan will incorporate a best management practices (BMP) plan for the use and application of herbicides, pesticides, and fertilizers.

6. *The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit is required prior to use of water. The Water Use Permit may be conditioned on the requirement to use dual line water supply systems for new industrial and commercial developments.*

DOA acknowledges that a Water Use Permit will be required as the proposed source of water is located in designated groundwater management area. No industrial or commercial development is proposed within the agricultural park.

7. *Page 14 of the DEA refers to the Kunia Wells that should be better identified with existing state well numbers.*

The forthcoming Final EA will include information regarding the Kunia Wells including their respective State numbers and location.

8. *Table 5 is a good preliminary analysis for reasonable irrigation needs. The Commission irrigation estimation model discussed in the DEA from College of Tropical Agriculture and Human Resources at the University of Hawaii at Manoa ("CATHR") is IWREDSS (ver 1). The Commission is currently updating this model to IWREDSS (ver.2) to assess the reasonable and beneficial allocation for the water use permit pending from HDOA. The Commission will use this publically available tool to also assess irrigation needs for the Commission's consideration. At this time HDOA's water use permit request is for 422,000 gpd while the DEA now shows 459,000 gpd and should be reconciled*

The DOA water use permit request for 422,000 gpd is the correct amount and Tables 4 and 5 will be revised accordingly in the forthcoming Final EA.

9. *Under the ground water discussion, the DEA should refer to the Commission's latest update of its Water Resource Protection Plan (WRPP, 2008), which further defines aquifer system areas and corresponding sustainable yields and current water use permit allocations and availability within the pearl harbor area. This will help to preliminarily substantiate that adverse affects to sustainable yield are not anticipated. The DEA should also acknowledge that Waiahole Ditch, though often considered surface water because it is open ditch, is really a ground water source with its own allocation management of available water under the Commission's purview. Also, impacts to ground water quality from agricultural operations come under the review of the State Departments of Agriculture and Health and we defer to their comments regarding quality impacts.*

Section 3.3 Groundwater, will be revised to note that the project lies above the Pearl Harbor Aquifer, Ewa-Kunia Sector with a sustainable yield of 16 million gallons per day (mgd). As of 2005, 15,457 mgd from the Ewa-Kunia Aquifer Sector was allocated with 11,092 mgd being used. This section will also note that Waiahole Ditch is a ground water resource managed by the Commission on Water Resources Management (CWRM).

As mentioned in Item 5, the DOA will require each agricultural lot awardee to develop a Conservation Plan with the U. S. Department of Agriculture Natural Resources Conservation

Service. This Conservation Plan will incorporate BMP's for the use and application of herbicides, pesticides, and fertilizers.

10. *We recommend that water conservation best management practices for agricultural irrigation systems and end users be implemented. Agricultural BMPs are identified in a newly-released report Hawaii Water Conservation Plan, available for viewing or downloading at:* http://hawaiLgov/dlnr/cwrm/planninglhwcp2013.pdf

The water conservation BMP's for agricultural irrigation systems are noted.

Additionally, the required Conservation Plan mentioned in Items 5 and 9 will include BMP's for water conservation.

We appreciate your review and comments on the subject DEA. Your comments together with this response will be included in the forthcoming Final EA/Finding of No Significant Impact. Should you have any further questions, please contact me at (808) 842-1133.

Sincerely,

Brian Takeda
Planning Project Coordinator

BT/RL
K:\plan\22438-00 Kunia Ag Park Rev EA\Narrative\FEA\2 DEA Responses to Comments\Prefinal to Client\Final for Signature\150828 Kunia Ag Pk-DLNR CWRM Final.docx

cc: Mr. Scott E. Enright, Chairperson, Board of Agriculture

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ESTHER KIA'AINA
FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

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

HISTORIC PRESERVATION DIVISION
DEPARTMENT OF LAND AND NATURAL RESOURCES

601 Kamokila Boulevard, Suite 555
Kapolei, HI 96806

April 23, 2013

Mr. Brian Takeda
R.M. Towill Corporation
2024 N. King Street, Suite 200
Honolulu, HI 96819-3494
briant@rmtowill.com

LOG NO: 2013.2562
DOC NO: 1304SL21
Archaeology

Dear Mr. Takeda:

SUBJECT: Chapter 6E-8 Historic Preservation Review –
Draft Environmental Assessment (EA) for Kunia Agricultural Park
Hoʻaeʻae Ahupuaʻa, ʻEwa District, Island of Oʻahu
TMK: (1) 9-4-002:080

Thank you for the opportunity to comment on the draft document titled *Draft Environmental Assessment per HRS, Chapter 343, Kunia, Oahu, Hawaii* (State of Hawai'i Department of Agriculture, March 2013). Our office received this submittal on March 27, 2013.

The proposed Kunia Agricultural Park lies along Kunia Road between the Royal Kunia residential community to the south and Wilikina Drive in Wahiawa to the north. The project area consists of about 150 acres. The State of Hawai'i Department of Agriculture (HDOA) plans for the Kunia Agricultural Park to provide agricultural land for small-scale farms. HDOA will develop and maintain agricultural infrastructure, including irrigation water. The plan for Kunia Agricultural Park also provides for lessees to live near their field lots through lease of farm dwelling lots.

About 70% of the subject property is presently leased for diversified agriculture under a Revocable Permit with a one-year, renewable term, to Waikele Farms, Inc. The unused southern area has similar farm potential. The irrigation water source is the Waiāhole Ditch. Water is transported by piping (on grade) from Reservoir 225 on Kunia Road.

The draft EA states that an archaeological reconnaissance conducted in 1988 identified no surface archaeological or historical resources and recommended no further work. Based on these findings, HDOA states that "No adverse effects to archaeological or historical resources are expected from the project." The 1988 study conducted by Archaeological Consultants of Hawai'i (ACP), investigated 670 acres of former sugarcane agricultural property. The 3-page report titled *Archaeological Walk-Through Survey of the Proposed Royal Kunia, Phase II, (TMKP 9-4-02: portion 1 & 9), Ahupuaa of Hoaeae, Ewa, Island of Oahu* (Kennedy 1988) indicates the survey consisted of a windshield reconnaissance covered "by automobile along the network of cane haul roads and by foot in the few areas where this was necessary. Visibility was limited by the dense stands of sugarcane."

The Kennedy (1988) reconnaissance study reveals the following: (1) a 100% pedestrian survey was not conducted for the property; (2) visibility was low and thus hampered the two-man survey team from adequately assessing the presence/absence or nature of any surface historic properties (e.g., shell midden, lithic scatters, or stone alignments) within the dense sugarcane; (3) no subsurface testing was conducted to investigate the depth of agricultural disturbance and the potential of buried historic properties below the agricultural zone; and (4) that sugarcane-related historic properties, such as the cane haul roads, were not identified and assessed as historic properties.

The property description and photographs provided in the draft EA indicate that portions of the proposed Kunia Agricultural Park property may be less extensively disturbed by prior agricultural activities, including the southern

area. The gullies present in this area, and potentially elsewhere, have potential to yield evidence of historic properties.

A review of our records indicates that no archaeological inventory survey has been completed for the project area. We believe potential exists for historic properties to be affected by the proposed Kunia Agricultural Park project. Both traditional Hawaiian and sugarcane agricultural historic properties have been identified in former sugarcane plantation agricultural properties elsewhere in Kunia (e.g., Kunia Mauka Loa Ridge, TMK: (1) 9-2-004).

SHPD **requests an archaeological inventory survey, including 100% pedestrian survey of all former fields and gullies, and representative subsurface testing to document possible historic properties below the agricultural zone,** be conducted within the proposed project area. In addition, we request you consult with SHPD prior to commencement of the fieldwork to determine an appropriate subsurface testing strategy. Appropriate mitigation measures will be agreed upon following our review and approval of the report, pursuant to Hawaii Administrative Rules (HAR) §13-276.

Please contact me at (808) 692-8019 or at Susan.A.Lebo@hawaii.gov if you have any questions regarding this letter.

Aloha,

Susan A. Lebo

Susan A. Lebo, PhD
Oʻahu Lead Archaeologist

2024 N. King Street
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Telephone 808 842 1133
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eMail: rmtowill@rmtowill.com

R. M. TOWILL CORPORATION
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Surveying
Construction Management

August 28, 2015

Mr. Alan Downer, Administrator
Historic Preservation Division
Department of Land and Natural Resources
State of Hawai'i
601 Kamokila Boulevard, Suite 555
Kapolei, Hawai'i 96707

Attention: Ms. Susan Lebo, Ph.D., O'ahu-Lead Archaeologist

Dear Mr. Downer:

Kunia Agricultural Park
Draft Environmental Assessment (DEA) Comments
Kunia, O'ahu, Hawai'i

On behalf of the State of Hawai'i Department of Agriculture (DOA), thank you for your letter dated April 23, 2013 concerning the subject DEA (SHPD Reference Log No: 2013.2562, Doc No: 1304SL21, Archaeology). An archaeological inventory survey (AIS) with a 100% pedestrian survey and representative subsurface testing has been conducted.

By letter dated February 9, 2015, Cultural Surveys Hawaii (CSH), Inc. submitted *Archaeological Inventory Survey Report for the Kunia Agricultural Park Project Hō'ae'ae Ahupua'a, 'Ewa District, O'ahu TMK: [1] 9-4-002:080 (Stark et al. January 2015)* to the State Historic Preservation Division (SHPD) for review. The following is a summary of the AIS findings and recommendations.

The AIS recorded one (1) historic site identified as State Inventory of Historic Properties (SIHP) # 50-80-08-7758. This site is comprised of five (5) features specific to water control for Oahu Sugar Company's agricultural activities. Feature 1 is a retaining wall (linear). Feature 2 and Feature 3 are portions of a historic irrigation ditch (linear). Feature 4 is the structural remnant of a headwork's feature connecting Features 2 and 3. Feature 5 is a historic lithic workshop relating to the production of faced basalt boulders observed in Features 1–4.

The recommended determination of effect for SIHP -7758 is "no historic property affected" as no evidence of traditional Hawaiian culture was encountered and the five (five) features have been documented. The AIS recommends no further archaeological work.

We appreciate your review and comments on the subject DEA. Your comments together with this response will be included in the forthcoming Final EA/Finding of No Significant Impact. Should you have any further questions, please contact me at (808) 842-1133.

Sincerely,

Brian Takeda
Planning Project Coordinator

BT/RL
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cc: Mr. Scott E. Enright, Chairperson, Board of Agriculture

DAVID Y. IGE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

FORD N. FUCHIGAMI
DIRECTOR

DEPUTY DIRECTORS
JADE T. BUTAY
ROSS M. HIGASHI
EDWIN H. SNIFFEN
DARRELL T. YOUNG

IN REPLY REFER TO:
HWY-PS 2.9963

June 2, 2015

Ms. Robyn Loudermilk
R.M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawaii 96819

Dear Ms. Loudermilk:

Subject: Draft Environmental Assessment and Traffic Assessment
Kunia Agricultural Park, Waipahu, Ewa, Oahu
TMK: (1) 9-4-002:080

Thank you for the opportunity to review the subject Draft Environmental Assessment (DEA) dated March 2013, and the Traffic Assessment (TA) dated November 2012. The Department of Transportation (DOT) understands that the DEA was published in the April 23, 2013 issue of the Office of Environmental Quality Control's Environmental Notice and is resuming the environmental review process at this time.

The project site lies on the eastern side of Kunia Road, a two lane State highway, and north of the Royal Kunia development, Phase II. The proposed 150-acre agricultural park will be owned, developed, and maintained by the State Department of Agriculture (DOA). The park will be subdivided into 25 lots and will be leased to individual farm tenants. The development known as the Royal Kunia was required to widen Kunia Road to be compatible to a four-lane road by a condition of the State Land Use Commission and to provide for the design and construction of the roadway and off-site infrastructure improvements for the agricultural park under the specific terms of a Memorandum of Understanding.

A meeting was held on March 19, 2015, where the DOT provided comments to the DEA and TA as follows:

1. Based on the TA analysis, the project does not appear to significantly impact Kunia Road. However, should the use be intensified or expanded, the DOA shall implement all necessary traffic mitigation measures as approved by and at no cost to the DOT.

2. Prior to receiving Final Subdivision approval from the City and County of Honolulu, the project shall set aside adequate road widening setbacks abutting Kunia Road for the purpose of a planned road improvement to be coordinated with and approved by the DOT.

3. Based on a pending review of the planned Kunia Road improvements, the DOT is assessing the potential necessity for a left-turn lane with storage into and out of the agricultural park or at a minimum, a refuge lane for left turns from Kunia Road for traffic safety.

4. The DOA should coordinate with the adjoining Royal Kunia development for the design and construction of Kunia Road improvements, which shall be compatible to a future four-lane Kunia Road. A design conceptual plan should be submitted to the DOT for review and approval.

5. The revised TA should evaluate and explain whether a right-turn deceleration and acceleration lane into and out of the agricultural park should be considered as previously discussed in a January 2011 meeting.

6. The north end of Plantation Road, which connects to Kunia Road will be solely designated as the primary access point for the agricultural park.

7. Vehicular activities on the site shall be monitored to prevent debris such as gravel/dirt/mud etc., from being tracked onto Kunia Road.

8. This project should not result in additional discharge of surface water run-off onto Kunia Road.

9. All improvements on the State right-of-way shall be designed to follow Federal and State standards and shall be approved by the DOT.

We look forward to the submittal of an updated Traffic Assessment and the upcoming review of the Final Environmental Assessment. If you have any questions, please contact Jenny Lee, Planner, Highways Division, Planning Branch, at (808) 587-1832. Please reference file review number PS 2015-016 in all contacts and correspondence regarding these comments.

Sincerely,

FORD N. FUCHIGAMI
Director of Transportation

2024 N. King Street
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R. M. TOWILL CORPORATION
SINCE 1930

Planning
Engineering
Environmental Services
Photogrammetry
Surveying
Construction Management

August 28, 2015

Mr. Ford Fuchigami, Director
Department of Transportation
State of Hawai'i
869 Punchbowl Street
Honolulu, Hawai'i 96813-5097

Dear Mr. Fuchigami:

Kunia Agricultural Park
Draft Environmental Assessment (DEA) Comments
Kunia, O'ahu, Hawai'i

On behalf of the State of Hawai'i Department of Agriculture (DOA), thank you for your letter dated June 2, 2015 concerning the subject DEA (DOH Reference: HWY-PS 2.9963). We have prepared the following responses to your comments (italicized herein for reference).

1. *Based on the TA analysis, the project does not appear to significantly impact Kunia Road. However, should the use be intensified or expanded, the DOA shall implement all necessary traffic mitigation measures as approved by and at no cost to the DOT.*

Your comment is duly noted.

2. *Prior to receiving Final Subdivision approval from the City and County of Honolulu, the project shall set aside adequate road widening setbacks abutting Kunia Road for the purpose of a planned road improvement to be coordinated with and approved by the DOT.*

Required road setbacks have been incorporated in the proposed design.

3. *Based on a pending review of the planned Kunia Road improvements, the DOT is assessing the potential necessity for a left-turn lane with storage into and out of the agricultural park or at a minimum, a refuge lane for left turns from Kunia Road for traffic safety.*

Your comment is duly noted.

4. *The DOA should coordinate with the adjoining Royal Kunia development for the design and construction of Kunia Road improvements, which shall be compatible to a future four-land Kunia Road. A design conceptual plan should be submitted to the DOT for review and approval.*

DOA will coordinate with Halekua Development Corporation, the developer of Royal Kunia Phase II on the Kunia Road improvements, and a conceptual design plan will be submitted for DOT's review and approval at the appropriate time.

5. *The revised TA should evaluate and explain whether a right-turn deceleration and acceleration lane into and out of the agricultural park should be considered as previously discussed in a January 2011 meeting.*

The need for a right-turn deceleration and acceleration lane for the agricultural park will be considered in a revised TA, if required in the future.

6. *The north end of Plantation Road, which connects to Kunia Road will be solely designed as the primary access point for the agricultural park.*

The DOA will develop and maintain a separate access road to the project from Kunia Road. Plantation Road is a privately owned and maintained road that is located adjacent to the project.

7. *Vehicular activities on the site shall be monitored to prevent debris such as gravel/dirt/mud etc., from being tracked onto Kunia Road.*

And

8. *This project should not result in additional discharge of surface water run-off onto Kunia Road.*

The project will comply with the City and County of Honolulu Rules Relating to Soil Erosion Standards and Guidelines, and Hawai'i Administrative Rules (HAR) Chapters 11-54 and 11-55 concerning water quality standards and water pollution control. The project will be subject to a National Pollutant Discharge Elimination System (NPDES) General Permit for storm water discharges associated with construction activities, for which a Notice of Intent (NOI) will be submitted at least 30 days before the start of any discharge or construction activities. A site-specific best management practices (BMP) plan will be submitted in conjunction with the NOI application.

There will be no additional discharge of surface water run-off onto Kunia Road. The project will not change the existing drainage pattern of the property.

9. *All improvements on the State right-of-way shall be designed to follow Federal and State standards and shall be approved by the DOT.*

Your comment is duly noted.

We appreciate your review and comments on the subject DEA. Your comments together with this response will be included in the forthcoming Final EA/Finding of No Significant Impact. Should you have any further questions, please contact me at (808) 842-1133.

Sincerely,

Brian Takeda
Planning Project Coordinator

BT/RL
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cc: Mr. Scott E. Enright, Chairperson, Board of Agriculture

DEPARTMENT OF PARKS & RECREATION
CITY AND COUNTY OF HONOLULU
1000 Uluohia Street, Suite 309, Kapolei, Hawaii 96707
Phone: (808) 768-3003 • Fax: (808) 768-3053
Website: www.honolulu.gov

KIRK CALDWELL
MAYOR

TONI P. ROBINSON
DIRECTOR

JEANNE C. ISHIKAWA
DEPUTY DIRECTOR

April 1, 2013

Mr. Brian Takeda, AICP, LEED AP
R. M. Towill Corporation
2024 N. King Street, Suite 200
Honolulu, Hawaii 96819-3494

Dear Mr. Takeda:

Subject: Public Review of Draft Environmental Assessment (DEA) for Proposed Kunia Agricultural Park, Island of Oahu, Hawaii

Thank you for the opportunity to review and comment on the Draft Environmental Assessment for the proposed State of Hawaii sponsored Kunia Agricultural Park.

The Department of Parks and Recreation has no comment. As the proposed project will have no impact on any program or facility of the Department, you may remove us as a consulted party to the balance of the EIS process.

Should you have any questions please contact Mr. John Reid, Planner at 768-3017.

Sincerely,

Toni P. Robinson

Toni P. Robinson
Director

TPR:jr
(507999)

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Planning
Engineering
Environmental Services
Photogrammetry
Surveying
Project and Construction Management

August 28, 2015

Ms. Michele K. Nekota, Director
Department of Parks and Recreation
City and County of Honolulu
1000 Uluohia Street, Suite 309
Kapolei, Hawai'i 96707

Attention: Mr. John Reid, Planner

Dear Ms. Nekota:

Kunia Agricultural Park
Draft Environmental Assessment (DEA) Comments
Kunia, O'ahu, Hawai'i

On behalf of the State of Hawai'i Department of Agriculture, thank you for your letter dated April 1, 2013 concerning the subject DEA. We acknowledge that you have no comments and that the project will not impact programs or facilities under your jurisdiction. As requested, your department will be removed as a consulted party for the remainder of the EA process.

We appreciate your review of the subject DEA and will include your comment letter along with this response with the forthcoming Final EA/Finding of No Significant Impact. Should you have any further questions, please contact me at (808) 842-1133

Sincerely,

Brian Takeda
Planning Project Coordinator

BT/RL
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cc: Mr. Scott E. Enright, Chairperson, Board of Agriculture

DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU
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KIRK CALDWELL
MAYOR

GEORGE I. ATTA, FAICP
DIRECTOR

ARTHUR D. CHALLACOMBE
DEPUTY DIRECTOR

2013/ELOG-638 (TH)

May 10, 2013

R. M. Towill Corporation
Attn: Brian Takeda
2024 N. King Street, Suite 200
Honolulu, Hawaii 96819-3494

Dear Mr. Takeda:

SUBJECT: Public Review of Draft Environmental Assessment (DEA)
for Proposed Kunia Agricultural Park, Oahu, Hawaii,
Tax Map Key: (1) 9-4-002:080

We have reviewed the subject DEA and offer the following comments.

1. The last row, (Permits Which May Be Required), in the table on Page 1 needs to be corrected to state that the Agricultural Park Plan would be approved by the City Council per Section 166-4 (3), Hawaii Revised Statutes (HRS), and not the Department of Planning and Permitting (DPP). This approval should also be listed in Section 7.3 of the Final Environmental Assessment (FEA).

2. Section 3.4 of the DEA states that the proposed project's drainage system will be designed for the 100-year flood boundary.

   Though flood hazards are discussed in Section 3.9 of the DEA, Section 3.4 of the FEA should include technical data such as the appropriate Flood Insurance Rate Map panel showing the 100-year flood delineation, or a recent technical study to validate the applicant's use of the 100-year delineation. Section 3.4 should also discuss how off-site drainage contributes to the project site. Furthermore, the applicant will have to meet the criteria of priority A1 projects in the recently adopted storm water management practices contained in the DPP's "Rules Relating to Storm Drainage Standards" adopted in December 2012. Reference to these Rules should be noted in Section 3.4 as well as Section 11.0 (References). For additional information related to the Rules Relating to Storm Drainage Standards, please contact DPP's Civil Engineering Branch at 768-8103.

   The second to last paragraph in Section 3.4 located near the top of page 28 should be reworded to clarify the intent of the information in this paragraph.

   If the applicant has not done so already, a copy of the DEA should be routed to the City's Department of Facility Maintenance for their review and comment.

3. Section 6.8 of the DEA states that the current version of the General Plan was approved in 2006. The last version of the City's General Plan that was approved was in 1992 and was last amended in October 2002 via Resolution 02-205, CD1. Therefore, Section 6.8 of the FEA needs to reflect this.

4. Table 2 on Page 7 of the DEA states:

   "**County Plans** – The Kunia Agricultural Park will be consistent with current plans. Specifically, the General Plan of the City and County of Honolulu (CCH, 2006) supports the continued use of prime agricultural lands, specifically identified in Kunia, and the further development of diversified agriculture on Oahu. The regional *Central Oahu Sustainable Communities Plan* identifies the subject parcel as agricultural, situated outside the Urban District Boundary, providing open space, and preserving present viewplanes."

   Although policies in the Central Oahu Sustainable Communities Plan (SCP) support protection of over 10,000 acres of land in Central Oahu for diversified agriculture and open space, the Central Oahu SCP's maps do not identify the subject parcel as "agricultural" or show it as being outside of the Urban Growth Boundary.

   Table 7 needs to be corrected to state that the project site is located within the Central Oahu SCP Urban Growth Boundary in an area identified as "Residential and Low Density Apartment" according to the Central Oahu SCP's Open Space (A1), Land Use (A2), Public Facilities (A3), and Phasing (A4) Maps.

   However, the Central Oahu SCP's land use policy that calls for urbanization of the project site does not preclude development of an agricultural park on the project site because development of a site is dictated by the underlying zoning rather than the land use policy. Exhibit 2.3 of the Central Oahu SCP identifies the project site as a "Non-Urban Area" regarding the location of existing and proposed master planned communities in Central Oahu.

   We recommend that Section 6.9 of the FEA include an exhibit showing the location of the proposed project as it relates to the Central Oahu SCP Land Use Map.

   Development of the project site for an agricultural park will help retain approximately 150 acres of existing agricultural land along Kunia Road for diversified agriculture, which is consistent with the City's long-range vision for Central Oahu.

   The layout of the proposed agricultural farm dwellings shown in Figure 9 of the DEA is consistent with the Central Oahu SCP. Section 3.1.4.4 (Agricultural Areas) calls for farm dwellings to be sited and clustered to avoid using more productive agricultural land and to reduce infrastructure costs.

   We recommend that the caption for #5 in Figure 9 have an arrow pointing to the location of the proposed farm dwellings.

The DPP supports the prohibition of commercial livestock and aquaculture as mentioned in Section 2.4, Paragraph C (Memorandum of Understanding) of the DEA because the proposed agricultural park's proximity to a residential community. Additionally, the location of the proposed farm dwelling lots on the border between the agricultural park and Royal Kunia Phase II would provide a buffer between the residential uses in Royal Kunia Phase II and the agricultural activities in the agricultural park.

The vision and policies of the Central Oahu SCP and research and analysis done in our on-going review of the Central Oahu SCP support physical connectivity within and between subdivisions to minimize automobile travel and encourage walking, biking, and transit use.

The DPP understands that the developer of the Royal Kunia Phase II project is required to provide off-site infrastructure improvements for the agricultural park up to the property boundary. To optimize connectivity, between the project site and Royal Kunia Phase II, we strongly encourage the State Department of Agriculture (DOA) to coordinate with the developer on the details of the connector road between the two subdivisions, and include it in the design of the agricultural park's improvements.

Section 6.9 of the DEA states that the "most recently-approved" Central Oahu SCP became effective in February 2003. This reference is erroneous and should be corrected to state that the current Central Oahu SCP became effective in December 2002.

5. Based on our records, we confirm that the subject parcel is currently zoned AG-1 Restricted Agricultural District and is in the State's Agricultural District. Diversified agriculture is consistent with uses in the AG-1 District and the State's Agricultural District.

6. It is noted on Page 56 of the DEA that HRS 166-4 exempts state agricultural parks from "all statutes, ordinances, charter provisions, and rules of any governmental agency relating to planning, zoning, construction standards for subdivisions, development and improvement of land, and the construction of buildings thereon…." This is at the option of the Board of Agriculture provided some conditions are met, including one stating, "the legislative body of the county in which the agricultural park is to be situated shall have approved the agricultural park."

   Please correct Page 56 to state that the legislative body for the City and County of Honolulu is the City Council, not the DPP as noted in comment #1 above.

   The FEA should expand its discussion regarding HRS 166-4 to address two possible scenarios:

   a. If the intent is to seek exemptions pursuant to HRS 166-4, describe how the project proposes to comply with the requirements stipulated in Section 166-4(1), (2), and (3). Specifically, explain the mechanism which DOA will employ to meet Section 166-4(3) and list the applicable sections of the pertinent provisions (including, but not limited to, the Land Use Ordinance (LUO) and Subdivision Rules and Regulations from which it seeks exemptions.

   b. If the DOA decides to build to City standards so that DOA has the ability to turn the internal roads over to the City at some time in the future as mentioned on Page 56 of the DEA, then it appears that subdivision permits from the City would be required. Under this scenario, the Applicant should specify whether the internal streets will be subdivided as a separate roadway lot and dedicated to the City. Also, unless an exemption is approved pursuant to Section 166-4 HRS, it would appear that an agricultural cluster permit from the City would be required for the proposed 24 farm dwelling lots. If so, the FEA should discuss how the proposed farm dwelling lots would comply with the LUO agricultural cluster site standards. Accordingly, Section 7.0 of the DEA relating to permits and approvals may need to be revised.

7. The DEA notes that on-site and off-site infrastructure requirements are limited to the area designated for cluster farm dwellings. Generally, adequacy of infrastructure is determined at the construction plan review and building permit application stage. If instead, the project is to be developed with exemptions pursuant to Section 166-4, HRS, the FEA should describe what constitutes "minimum requirements for health and safety" as stipulated in Section 166-4(1), HRS. The FEA should disclose if the farm dwellings will still need to meet all applicable building and fire code requirements.

8. The project site was included in the 2002 Royal Kunia Revised Sewer Master Plan. Construction of the Royal Kunia Phase II sewer lines is required. The applicant needs to submit construction plans to the DPP for review and approval. The applicant will also need to submit a Site Development Plan Master Application for sewer connection to the DPP for review and approval.

9. Section 7.3 of the FEA should include the need for a grading permit from the City and County of Honolulu.

Thank you for the opportunity to comment on this matter. Should you have any questions, please contact Tim Hata of our staff at 768-8043.

Very truly yours,

George I. Atta, FAICP, Director
Department of Planning and Permitting

GIA:js

cc: Bob Stanfield, DPZCB

EA-EISelog-638

2024 N. King Street
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Planning
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Environmental Services
Photogrammetry
Surveying
Construction Management

August 28, 2015

Mr. George I. Atta, FAICP, Director
Department of Planning and Permitting
City and County of Honolulu
650 South King Street, 7th Floor
Honolulu, Hawai'i 96813

Attention: Mr. Tim Hata

Dear Mr. Atta:

Kunia Agricultural Park
Draft Environmental Assessment (DEA) Comments
Kunia, O'ahu, Hawai'i

On behalf of the State of Hawai'i Department of Agriculture (DOA), thank you for your letter dated May 10, 2013 concerning the subject DEA (DPP Reference: 2013/ELOG-638 [TH]). We have prepared the following in response to your comments (italicized herein for reference).

1. *The last row, (Permits Which May Be Required), in the table on Page 1 needs to be corrected to state that the Agricultural Park Plan would be approved by the City Council per Section 166-4 (3), Hawaii Revised Statutes (HRS), and not the Department of Planning and Permitting (DPP). This approval should also be listed in Section 7.3 of the Final Environmental Assessment (FEA).*

DOA acknowledges the requirements of Hawai'i Revised Statutes (HRS) Section 166-4(3) that the DOA in participation with the City and County of Honolulu (CCH) shall be exempt from certain regulatory requirements provided that the legislative body of the county in which the agricultural park is situated shall provide its approval. Accordingly, the approval of the project by the Honolulu City Council will be appropriately referenced in the Final EA in the Project Summary and in Section 7.3, Permits and Approvals Which May Be required.

2. *Section 3.4 of the DEA states that the proposed project's drainage system will be designed for the 100-year flood boundary.*

   Though flood hazards are discussed in Section 3.9 of the DEA, Section 3.4 of the FEA should include technical data such as the appropriate Flood Insurance Rate Map panel showing the 100-year flood delineation, or a recent technical study to validate the

applicant's use of the 100-year delineation. Section 3.4 should also discuss how off-site drainage contributes to the project site. Furthermore, the applicant will have to meet the criteria of priority A1 projects in the recently adopted storm water management practices contained in the DPP's "Rules Relating to Storm Drainage Standards" adopted in December 2012. Reference to these Rules should be noted in Section 3.4 as well as Section 11.0 (References). For additional information related to the Rules Relating to Storm Drainage Standards, please contact DPP's Civil Engineering Branch at 768-8103.

Section 3.4, Drainage, will be revised in the forthcoming Final EA to include:

- FIRM Panel No. 15003C0220F showing the project in relation to the 100-year flood boundary;
- Discussion of off-site drainage sheet flows through the property;
- Reference to infiltration basins to be used as a permanent storm water quality measure to meet the criteria of priority A1 projects. Infiltration basins are proposed to treat runoff from the new roadways and residential home lots, and is in compliance with the City's Storm Water BMP guide; and
- Rules Relating to Storm Drainage Standards will be appropriately referenced in the Final EA in Section 3.4, Drainage and Section 11.0, References.

The second to last paragraph in Section 3.4 located near the top of page 28 should be reworded to clarify the intent of the information in this paragraph.

The information in the identified paragraph will be clarified and incorporated into the revised Section 3.4, Drainage.

If the applicant has not done so already, a copy of the DEA should be routed to the City's Department of Facility Maintenance for their review and comment.

A copy the DEA has been provided to the Department of Facility Maintenance for their review and comment.

3. *Section 6.8 of the DEA states that the current version of the General Plan was approved in 2006. The last version of the City's General Plan that was approved was in 1992 and was last amended in October 2002 via Resolution 02-205, CD1. Therefore, Section 6.8 of the FEA needs to reflect this.*

Section 6.8, City and County of Honolulu General Plan will be revised in the forthcoming Final EA to reflect that the 1992 General Plan was approved in 1992 and amended in October 2002.

4. *Table 2 on Page 7 of the DEA states:*

> ***"County Plans** - The Kunia Agricultural Park will be consistent with current plans. Specifically, the General Plan of the City and County of Honolulu (CCH, 2006) supports the continued use of prime agricultural lands, specifically identified in Kunia, and the further development of diversified agriculture on O'ahu. The regional Central O'ahu Sustainable Communities Plan identifies the subject parcel as agricultural, situated outside the Urban District Boundary, providing open space, and preserving present viewplanes."*

Your comment is duly noted.

> *Although policies in the Central O'ahu Sustainable Communities Plan (SCP) support protection of over 10,000 acres of land in Central O'ahu for diversified agriculture and open space, the Central O'ahu SCP's maps do not identify the subject parcel as "agricultural" or show it as being outside of the Urban Growth Boundary.*

Your comment is duly noted.

> *Table 2 needs to be corrected to state that the project site is located within the Central O'ahu SCP Urban Growth Boundary in an area identified as "Residential and Low Density Apartment" according to the Central O'ahu SCP's Open Space (A1), Land Use (A2), Public Facilities (A3), and Phasing (A4) Maps.*

Table 2, Item 5, County Plan will be corrected in the Final EA.

> *However, the Central O'ahu SCP's land use policy that calls for urbanization of the project site does not preclude development of an agricultural park on the project site because development of a site is dictated by the underlying zoning rather than the land use policy. Exhibit 2.3 of the Central O'ahu SCP identifies the project site as a "Non-Urban Area" regarding the location of existing and proposed master planned communities in Central O'ahu.*

Your comment is duly noted.

> *We recommend that Section 6.9 of the FEA include an exhibit showing the location of the proposed project as it relates to the Central O'ahu SCP Land Use Map.*

Section 6.9, Central O'ahu Sustainable Communities Plan will include a map showing the proposed project in relation to the Central O'ahu SCP Land Use Map in the Final EA.

> *Development of the project site for an agricultural park will help retain approximately 150 acres of existing agricultural land along Kunia Road for diversified agriculture, which is consistent with the City's long-range vision for Central O'ahu.*

Your comment is duly noted.

> *The layout of the proposed agricultural farm dwellings shown in Figure 9 of the DEA is consistent with the Central O'ahu SCP Section 3.1.4.4 (Agricultural Areas) calls for farm dwellings to be sited and clustered to avoid using more productive agricultural land and to reduce infrastructure costs.*

Your comment is duly noted.

> *We recommend that the caption for #5 in Figure 9 have an arrow pointing to the location of the proposed farm dwellings.*

Figure 9, Infrastructure, will be revised to identify the location of the proposed farm dwellings.

> *The DPP supports the prohibition of commercial livestock and aquaculture as mentioned in Section 2.4, Paragraph C (Memorandum of Understanding) of the DEA because the proposed agricultural park's proximity to a residential community. Additionally, the location of the proposed farm dwelling lots on the border between the agricultural park and Royal Kunia Phase II would provide a buffer between the residential uses in Royal Kunia Phase II and the agricultural activities in the agricultural park.*

Your comment is duly noted.

> *The DPP understands that the developer of the Royal Kunia Phase II project is required to provide off-site infrastructure improvements for the agricultural park up to the property boundary. To optimize connectivity, between the project site and Royal Kunia Phase II, we strongly encourage the State Department of Agriculture (DOA) to coordinate with the developer on the details of the connector road between the two subdivisions, and include it in the design of the agricultural park's improvements.*

DOA will continue to coordinate with Halekua Development Corporation, the developer of Royal Kunia Phase II on the details of the connector road between the two subdivisions.

> *The vision and policies of the Central O'ahu SCP and research and analysis done in our on-going review of the Central O'ahu SCP support physical connectivity within and*

between subdivisions to minimize automobile travel and encourage walking, biking, and transit use.

Your comment is duly noted.

Section 6.9 of the DEA states that the "most recently-approved" Central O'ahu SCP became effective in February 2003. This reference is erroneous and should be corrected to state that the current Central O'ahu SCP became effective in December 2002.

Section 6.9 of the forthcoming Final EA will state that the existing Central O'ahu SCP became effective in December 2002.

5. *Based on our records, we confirm that the subject parcel is currently zoned AG-1 Restricted Agricultural District and is in the State's Agricultural District. Diversified agriculture is consistent with uses in the AG-1 District and the State's Agricultural District.*

Your comment is duly noted.

6. *It is noted on Page 56 of the DEA that HRS 166-4 exempts state agricultural parks from "all statutes, ordinances, charter provisions, and rules of any governmental agency relating to planning, zoning, construction standards for subdivisions, development and improvement of land, and the construction of buildings thereon ..... This is at the option of the Board of Agriculture provided some conditions are met, including one stating, "the legislative body of the county in which the agricultural park is to be situated shall have approved the agricultural park."*

   Please correct Page 56 to state that the legislative body for the City and County of Honolulu is the City Council, not the DPP as noted in comment #1 above.

Page 56 of the forthcoming Final EA will appropriately reference the Honolulu City Council as the legislative body for the City and County of Honolulu.

The FEA should expand its discussion regarding HRS 166-4 to address two possible scenarios:

a. If the intent is to seek exemptions pursuant to HRS 166-4, describe how the project proposes to comply with the requirements stipulated in Section 166-4(1), (2), and (3). Specifically, explain the mechanism which DOA will employ to meet Section 166-4(3) and list the applicable sections of the pertinent provisions (including, but not limited to,

the Land Use Ordinance (LUO) and Subdivision Rules and Regulations from which it seeks exemptions.

b. If the DOA decides to build to City standards so that DOA has the ability to turn the internal roads over to the City at some time in the future as mentioned on Page 56 of the DEA, then it appears that subdivision permits from the City would be required. Under this scenario, the Applicant should specify whether the internal streets will be subdivided as a separate roadway lot and dedicated to the City. Also, unless an exemption is approved pursuant to Section 166-4 HRS, it would appear that an agricultural cluster permit from the City would be required for the proposed 24 farm dwelling lots. If so, the FEA should discuss how the proposed farm dwelling lots would comply with the LUO agricultural cluster site standards. Accordingly, Section 7.0 of the DEA relating to permits and approvals may need to be revised.

DOA acknowledges the potential for two (2) development scenarios, however, DOA intends to submit an agricultural cluster permit pursuant application to the LUO. A discussion on how the proposed farm dwelling lots will comply with the LUO agricultural cluster site standards will be in the Final EA. Also, Section 7, Permits That May Be Required will be revised to include the agricultural cluster permit.

7. *The DEA notes that on-site and off-site infrastructure requirements are limited to the area designated for cluster farm dwellings. Generally, adequacy of infrastructure is determined at the construction plan review and building permit application stage. If instead, the project is to be developed with exemptions pursuant to Section 166-4, HRS, the FEA should describe what constitutes "minimum requirements for health and safety" as stipulated in Section 166-4(1), HRS. The FEA should disclose if the farm dwellings will still need to meet all applicable building and fire code requirements.*

DOA will process an agricultural cluster permit and not seek exemptions pursuant to Section 166-4, HRS. The Final EA will disclose that the proposed farm dwellings will meet required CCH building and fire code requirements.

8. *The project site was included in the 2002 Royal Kunia Revised Sewer Master Plan. Construction of the Royal Kunia Phase II sewer lines is required. The applicant needs to submit construction plans to the DPP for review and approval. The applicant will also need to submit a Site Development Plan Master Application for sewer connection to the DPP for review and approval.*

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

June 10, 2013

Mr. Brian Takeda, AICP, LEED AP
R. M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawaii 96819-3494

Dear Mr. Takeda:

Subject: Your Letter Dated March 22, 2013, Requesting Comments on the Draft Environmental Assessment for Kunia Agricultural Park - Tax Map Key: 9-4-002: 080

Thank you for the opportunity to comment on the proposed Kunia Agricultural Park.

The existing water system is not adequate to accommodate the proposed residential portion of the proposed agricultural park. The proposed residential portion of the development is located approximately 3500 linear feet from the Board of Water Supply (BWS) water system. The developer will be required to install the necessary water system improvements to provide adequate fire protection and peak hour pressures in accordance with BWS Water System Standards. The construction drawings should be submitted for approval. Please be advised that this information is based upon current data, and therefore, the BWS reserves the right to change any position or information stated herein up until the final approval of the building permit application. The final decision on the availability of water will be confirmed when the building permit application is submitted for approval.

Water service cannot be made available to the agricultural lots of the proposed development. The agricultural lots are located above the 540-foot service limit for this area, and the water requirements were not included in the approved water master plan for Royal Kunia. Water service to these lots will require the installation of a complete water system including a source, booster pumps, transmission mains and a reservoir. Therefore, the water requirements for the proposed agricultural park should be provided by a private water system and coordinated through the City Department of Planning and Permitting. The subdivision of the agricultural lots will be required to include a statement in the deeds notifying the purchasers of the parcels that water service will not be made available from the BWS water system.

The developer will be required to obtain a potable water allocation from Halekua Development Corporation.

The proposed agricultural park is located upgradient of the BWS Kunia Wells I, Kunia Wells II, Kunia Wells III and Ewa Shaft. Thus, at a minimum, care and the recognition of best management practices should be used in the application of herbicides, pesticides, and fertilizers. Should contamination of these sources be encountered, compensation shall be pursued from the responsible parties.

The on-site fire protection requirements should be coordinated with the Fire Prevention Bureau of the Honolulu Fire Department.

If you have any questions, please contact Robert Chun at 748-5443.

Very truly yours,

for ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

2024 N. King Street
Suite 200
Honolulu, Hawaii 96819-3494
Telephone 808 842 1133
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R. M. TOWILL CORPORATION
SINCE 1930

Planning
Engineering
Environmental Services
Photogrammetry
Surveying
Construction Management

August 28, 2015

Mr. Ernest Y. W. Lau, P.E., Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
601 Kamokila Boulevard, Suite 555
Honolulu, Hawai'i 96806

Attention: Mr. Robert Chun, Project Review Branch, Water Resources Division

Dear Mr. Lau:

Kunia Agricultural Park
Draft Environmental Assessment (DEA) Comments
Kunia, O'ahu, Hawai'i

On behalf of the State of Hawai'i Department of Agriculture (DOA), thank you for your letter of June 10, 2013 concerning the subject DEA. We have prepared the following in response to your comments (italicized herein for reference).

1. *The existing water system is not adequate to accommodate the proposed residential portion of the proposed agricultural park. The proposed residential portion of the development is located approximately 3500 linear feet from the Board of Water Supply (BWS) water system. The developer will be required to install the necessary water system improvements to provide adequate fire protection and peak hour pressures in accordance with BWS Water System Standards. The construction drawings should be submitted for approval. Please be advised that this information is based upon current data, and therefore, the BWS reserves the right to change any position or information stated herein up until the final approval of the building permit application. The final decision on the availability of water will be confirmed when the building permit application is submitted for approval.*

We acknowledge the existing water system is not adequate for the proposed residential portion of the project. As such the DOA will install the necessary onsite water system improvements in compliance with BWS Waster System Standards and will submit construction drawings to the BWS for review and approval. We acknowledge that the availability of water will be confirmed when the building permit is submitted for approval.

Pursuant to a Memorandum of Understanding (MOU) dated March 31, 1993 and amended and revised on March 2, 2007 between the DOA and Halekua Development Corporation, developer for Royal Kunia Phase II, Halekua will be responsible for the design and construction of off-site potable water and irrigation lines up to the boundary of the agricultural park.

2. *Water service cannot be made available to the agricultural lots of the proposed development. The agricultural lots are located above the 540-foot service limit for this area, and the water requirements were not included in the approved water master plan for Royal Kunia. Water service to these lots will require the installation of a complete water system including a source, booster pumps, transmission mains and a reservoir. Therefore, the water requirements for the proposed agricultural park should be provided by a private water system and coordinated through the City Department of Planning and Permitting. The subdivision of the agricultural lots will be required to include a statement in the deeds notifying the purchasers of the parcels that water service will not be made available from the BWS water system.*

DOA acknowledges that the existing BWS water system is not available for the agricultural lots and will coordinate with the City and County of Honolulu Department of Planning and Permitting (DPP) to install the necessary water system improvements to service the agricultural lots. Waiahole Ditch water will be the source of irrigation water to service the agricultural lots. Upon completion of the subdivision, DOA will retain ownership of the subdivided agricultural lots and will inform prospective awardees that water service to the agricultural lots for irrigation will not be made available from the BWS water system.

3. *The developer will be required to obtain a potable water allocation from Halekua Development Corporation.*

Pursuant to the MOU, DOA will continue to work with Halekua Development Corporation to obtain and construct necessary potable water system improvements for the residential portion of the project.

4. *The proposed agricultural park is located upgradient of the BWS Kunia Wells I, Kunia Wells II, Kunia Wells III and Ewa Shaft. Thus, at a minimum, care and the recognition of best management practices should be used in the application of herbicides, pesticides, and fertilizers. Should contamination of these sources be encountered, compensation shall be pursued from the responsible parties.*

DOA acknowledges that the agricultural park is located upgradient of the BWS Kunia Wells I, Kunia Wells II, Kunia Wells III, and the 'Ewa shaft. Additionally, DOA will require each agricultural lot awardee to develop a Conservation Plan with the United States Department of

Agriculture Natural Resources Conservation Service. This Conservation Plan will incorporate best management practices for the use and application of herbicides, pesticides, and fertilizers.

5. *The on-site fire protection requirements should be coordinated with the Fire Prevention Bureau of the Honolulu Fire Department.*

On-site fire protection requirements will be coordinated with the Fire Prevention Bureau of the Honolulu Fire Department (HFD). Notably, the subject DEA was transmitted to HFD for review; however, no comments were received from the agency.

We appreciate your review and comments on the subject DEA. Your comments together with this response will be included in the forthcoming Final EA/Finding of No Significant Impact. Should you have any further questions, please contact me at (808) 842-1133.

Sincerely,

Brian Takeda
Planning Project Coordinator

BT/RL
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cc: Mr. Scott E. Enright, Chairperson, Board of Agriculture

DEPARTMENT OF FACILITY MAINTENANCE

CITY AND COUNTY OF HONOLULU

1000 Ulu`ohia Street, Suite 215, Kapolei, Hawaii 96707
Phone: (808) 768-3343 • Fax: (808) 768-3381
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KIRK CALDWELL
MAYOR

ROSS S. SASAMURA, P.E.
DIRECTOR AND CHIEF ENGINEER

EDUARDO P. MANGLALLAN
DEPUTY DIRECTOR

IN REPLY REFER TO:
DRM 15-280

April 17, 2015

Ms. Robyn L. Loudermilk, AICP
Senior Planner
R. M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawaii 96819-3494

Dear Ms. Loudermilk:

SUBJECT: Review of Draft Environmental Assessment (DEA) for the proposed Kunia Agricultural Park; TMK: (1) 9-4-002: 080 Island O'ahu, Hawai'i

Thank you for the opportunity to review and provide our input regarding your letter dated April 7, 2015, on the above subject project documents and the CD ROM.

Our comments are as follows:

- The Department of Facility Maintenance's Division of Road Maintenance has no easements or facilities within the subject Parcel 80.
- Parcel 80 abuts the east side of Kunia Road, which is under the jurisdiction of the State of Hawaii, Department of Transportation.
- The proposed development appears to be a "Cluster" housing development. Article 32, Section 14-32.2(a) (6) of the Revised Ordnances of Honolulu states, "The street or road is not part of a cluster housing development, planned development, or similar type of development" may be maintained by the City. It is our understanding that this proposed cluster development will remain private and will not be maintained by the City and County of Honolulu.
- Plantation Road is presently used as an egress/ingress to the subject Parcel 80. Will this road remain after the development of Kunia Agricultural Park? If this road remains, who will be responsible for maintenance? Will it be the State Department of Agriculture?
- We found that Appendix C in the hardcopy report was displayed as Appendix A on the CD ROM. Also, there were two pages in the Appendix C hardcopy report, versus four pages on the CD ROM, for the same section.

If you have any questions, please contact Kyle Oyasato of the Division of Road Maintenance at 768-3697.

Sincerely,

Ross S. Sasamura, P.E.
Director and Chief Engineer

2024 N. King Street
Suite 200
Honolulu, Hawaii 96819-3494
Telephone 808 842 1133
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Planning
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Environmental Services
Photogrammetry
Surveying
Construction Management

August 28, 2015

Mr. Ross S. Sasamura, P.E., Director and Chief Engineer
Department of Facility Maintenance
City and County of Honolulu
1000 Ulu'ohia Street, Suite 215
Kapolei, Hawai'i 96807

Attention: Mr. Kyle Oyasato, Division of Road Maintenance

Dear Mr. Sasamura:

Kunia Agricultural Park
Draft Environmental Assessment (DEA) Comments
Kunia, O'ahu, Hawai'i

On behalf of the State of Hawai'i Department of Agriculture (DOA), thank you for your letter of April 17, 2015 concerning the subject DEA (DFM Reference: DRM 15-280). We have prepared the following in response to your comments (italicized herein for reference).

1. *The Department of Facilities Maintenance's (DFM) Division of Road Maintenance has no easements or facilities within the subject Parcel 80.*

DOA acknowledges that DFM has no facilities or easements on the property.

2. *Parcel 80 abuts the east side of Kunia Road, which is under the jurisdiction of the State of Hawaii, Department of Transportation.*

Your comment is duly noted.

3. *The proposed development appears to be a "Cluster" housing development. Article 32, Section 14-32.2 (a) (6) of the Revised Ordinances of Honolulu states, "The street or road is not part of a cluster housing development, or similar type of development" may be maintained by the City. It is our understanding that this proposed cluster development will remain private and will not be maintained by the City and County of Honolulu.*

This confirms that DOA will develop and maintain the project as a cluster housing development, including the internal roadway system. An agricultural cluster permit application will be submitted to the Department of Planning and Permitting (DPP) pursuant to the LUO.

4. *Plantation Road is presently used as an egress/ingress to the subject Parcel 80. Will this road remain after the development of Kunia Agricultural Park? If this road remains, who will be responsible for maintenance? Will it be the Department of Agriculture?*

Plantation Road is not owned by the DOA. Rather, it is located adjacent to the project site and is privately owned and maintained. The DOA will develop and maintain a separate access road to the project from Kunia Road.

5. *We found that Appendix C in the hardcopy was displayed as Appendix A on the CD ROM. Also, there were two pages in Appendix C hardcopy report, versus four pages on the CD ROM for the same section.*

We acknowledge the inadvertent discrepancies regarding the appendices and will make corrections accordingly in the hard and soft copies of the Final Environmental Assessment (FEA).

We appreciate your review and comments on the subject DEA. Your comments together with this response will be included in the forthcoming Final EA/Finding of No Significant Impact. Should you have any further questions, please contact me at (808) 842-1133.

Sincerely,

Brian Takeda
Planning Project Coordinator

BT/RL
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cc: Mr. Scott E. Enright, Chairperson, Board of Agriculture

DOA acknowledges that the project site was included in the 2002 Royal Kunia Revised Sewer Master Plan. Construction Plans and a Site Development Plan Master Application for sewer connection will be submitted to the DPP for review and approval.

9. *Section 7.3 of the FEA should include the need for a grading permit from the City and County of Honolulu.*

Section 7.3, Permits and Approvals That May be Required City and County of Honolulu, will be revised in the Final EA to indicate that a CCH grading permit is required.

We appreciate your review and comments on the subject DEA. Your comments together with this response will be included in the forthcoming Final EA/Finding of No Significant Impact. Should you have any further questions, please contact me at (808) 842-1133.

Sincerely,

Brian Takeda
Planning Project Coordinator

BT/RL
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cc: Mr. Scott E. Enright, Chairperson, Board of Agriculture