DEPARTMENT OF HAWAIIAN HOME LANDS RESIDENTIAL COMMUNITY AND KAMEHAMEHA SCHOOLS LEARNING COMMUNITY ON THE STONE FAMILY LANDS

Draft Environmental Assessment

Prepared for:
State of Hawai‘i, Department of Hawaiian Home Lands / Kamehameha Schools

Prepared by:
PBR HAWAII & ASSOCIATES, INC.

April 2010

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LIST OF ACRONYMS

The following is a list of terms, abbreviations, and acronyms used in this document.

A

ACOE	U.S. Army Corps of Engineers
AIS	Archaeological Inventory Survey
ALISH	Agricultural Lands of Importance to the State of Hawai'i
AM	Morning
AST	Above Ground Storage Tank

B

BMPs	Best Management Practices
BWS	City and County of Honolulu, Board of Water Supply
bgs	below ground surface

C

CDP	Census Designated Population
CFR	Code of Federal Regulations
CSH	Cultural Surveys Hawai'i, Inc.
CWB	State of Hawai'i, Clean Water Branch
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act

D

dba	Doing business as
DBEDT	Department of Business, Economic Development, and Tourism
DHHL	State of Hawai'i, Department of Hawaiian Home Lands
DNL	day-night average sound level
DOE	State of Hawai'i, Department of Education
DOH	State of Hawai'i, Department of Health
DPP	City and County of Honolulu, Department of Planning and Permitting
DTS	City and County of Honolulu, Department of Transportation Services

E

EA	Environmental Assessment
EAL	Environmental Action Levels
EIS	Environmental Impact Statement
EmB	'Ewa Silty Clay Loam, Moderately Shallow 2-6% Slopes
EwA	'Ewa Stony Silty Clay 0-2% Slopes
EwB	'Ewa Stony Silty Clay 2-6% Slopes
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act

F

FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact

G

GAP	U.S. Geological Survey Gap Analysis Program

gpd	Gallons per day
gpm	Gallons per minute
H	
HAR	Hawai'i Administrative Rules
HECO	Hawaiian Electric Company
HOAP	Home Ownership Assistance Program
HRS	Hawai'i Revised Statutes
HUD	U.S. Department of Housing and Urban Development
I	
I-2	Industrial, Intensive
K	
KS	Kamehameha Schools
L	
LOS	Level-of-service is a quantitative and qualitative assessment of traffic operations
LPE	Lualualei Extremely Stony Clay, 3-35% Slopes
LSB	Land Study Bureau
LUC	State of Hawai'i, Land Use Commission
LUO	Land Use Ordinance
LvB	Lualualei Stony Clay, 2-6% Slopes
M	
MGD	million gallons per day
msl	Mean sea level
Mtb	Mokulē'ia Clay
N	
NAAQS	National Ambient Air Quality Standards
NCLB	"No Child Left Behind"
NEPA	National Environmental Policy Act
NFPA 10	National Fire Protection Association Standard for Portable Fire Extinguishers
NMFS	National Marine Fisheries Service
NPDES	National Pollution Discharge Elimination System
NRCS	Natural Resources Conservation Service
NWI	National Wetland Inventory
O	
OHA	Office of Hawaiian Affairs
P	
P-1	Preservation- Restricted
P-2	Preservation- General
PCBs	Polychlorinated-biphenyls
PM	Afternoon
PsA	Pūlehu Clay Loam, 0-3% Slopes
Q	
Qbd	Beach Deposits (Holocene)
Qcrs	Calcareous Reef Rock and Marine sediment (Pleistocene)
R	
R-5	Residential, up to 11.6 lots per acre, areas for urban residential development

R-20	Residential, 2.2 lots per acre, typically located at the outskirts of urban development
REC	Recognized environmental conditions
ROH	Revised Ordinances of Honolulu
rRK	Rock Land
rST	Stony Land
S	
SAP	Special Area Plan
SFHA	Special Flood Hazard Areas
SHPD	State Historic Preservation Division
SIC	Sandwich Island Communications
SIHP	State Inventory of Historic Properties
SMA	Special Management Area
T	
TIR	Traffic Impact Report
TMDL	Total Maximum Daily Load
TMK	Tax Map Key
U	
USFWS	U.S. Fish and Wildlife Service
USDA	U. S. Department of Agriculture
USDA-RD	USDA-Rural Development
USGS	U.S. Geological Survey
UST	Underground Storage Tank
W	
WOC	Wilson Okamoto Corporation
WSCP	Wai‘anae Sustainable Community Plan
WWTP	Wastewater Treatment Plan

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1.0 INTRODUCTION

This Draft Environmental Assessment (EA) is prepared in accordance with the environmental review requirements of 24 Code of Federal Regulations (CFR) 58; 7 CFR 1794, Hawai'i Revised Statutes (HRS) Chapter 343, and Hawai'i Administrative Rules (HAR), Title 11, Chapter 200. Specifically, the proposed Department of Hawaiian Home Lands Residential Community project may secure federal funding, which will require meeting the environmental review requirements of 24 Code of Federal Regulations (CFR) 58; 7 CFR 1794.

In addition, this document has been prepared in accordance with the provisions of Chapter 343, HRS, (Environmental Impact Statement Law) and Title 11, Chapter 200, HAR, (Environmental Impact Statement Rules). Section 343-6, HRS, establishes nine "triggers" that require compliance with these regulations. The trigger(s) for the proposed Department of Hawaiian Home Lands Residential Community and Kamehameha Schools Learning Community on The Stone Family Lands in Mākaha Valley and related off-site infrastructure improvements in Mākaha and Wai'anae Valleys include, but are not limited to, the following:

- Use of State/County lands and funds.

The Proposed Project's on- and off-site infrastructure improvements relating to roadway, traffic, water, sewer, utility (electricity, telephone and communications) and drainage facilities may affect State and/or County roadways or other lands. Additionally, the proposed Department of Hawaiian Home Lands Residential Community project may utilize State funding.

While the specific nature of each improvement is not known at this time, the EA is intended to address all current and future instances involving the use of State and/or County lands relating to the Proposed Project.

1.1 PROJECT SUMMARY

Project Name:	State of Hawai'i, Department of Hawaiian Home Lands Residential Community and Kamehameha Schools Learning Community on The Stone Family Lands (herein referred to as DHHL Residential Community and KS Learning Community)
Location:	Wai'anae and Mākaha, O'ahu (Figure 1)
Tax Map Key (TMK):	1-8-4-002:005, 1-8-4-002:007, 1-8-4-002:014 (por), 1-8-4-002:056, 1-8-4-002:057, 1-8-4-002:061 (por), 1-8-4-002:076, 1-8-4-023:014, 1-8-4-023:015, 1-8-4-024:001, 1-8-4-002:070 (Figures 2 and 3)

Applicant: State of Hawai'i, Department of Hawaiian Home Lands (DHHL) and Kamehameha Schools (KS)

Landowners:

TMK/Location if no TMK	Landowner
1-8-4-002:005 1-8-4-002:007 1-8-4-002:056 1-8-4-002:057 1-8-4-002:076 1-8-4-023:014 1-8-4-023:015 1-8-4-024:001	Ko Olina Mākaha East LLC and Honolulu Ltd.
1-8-4-002:061 (por) 1-8-4-002:014 (por)	City and County of Honolulu, Board of Water Supply(BWS)[1]
1-8-4-002:070	Makaha Valley Inc.
Sewer line improvement • Bayview Street, • Wai'anae Valley Road (por) • Pōka'ī Bay Street	City and County of Honolulu
Sewer line improvement Farrington Highway (por)	State of Hawai'i

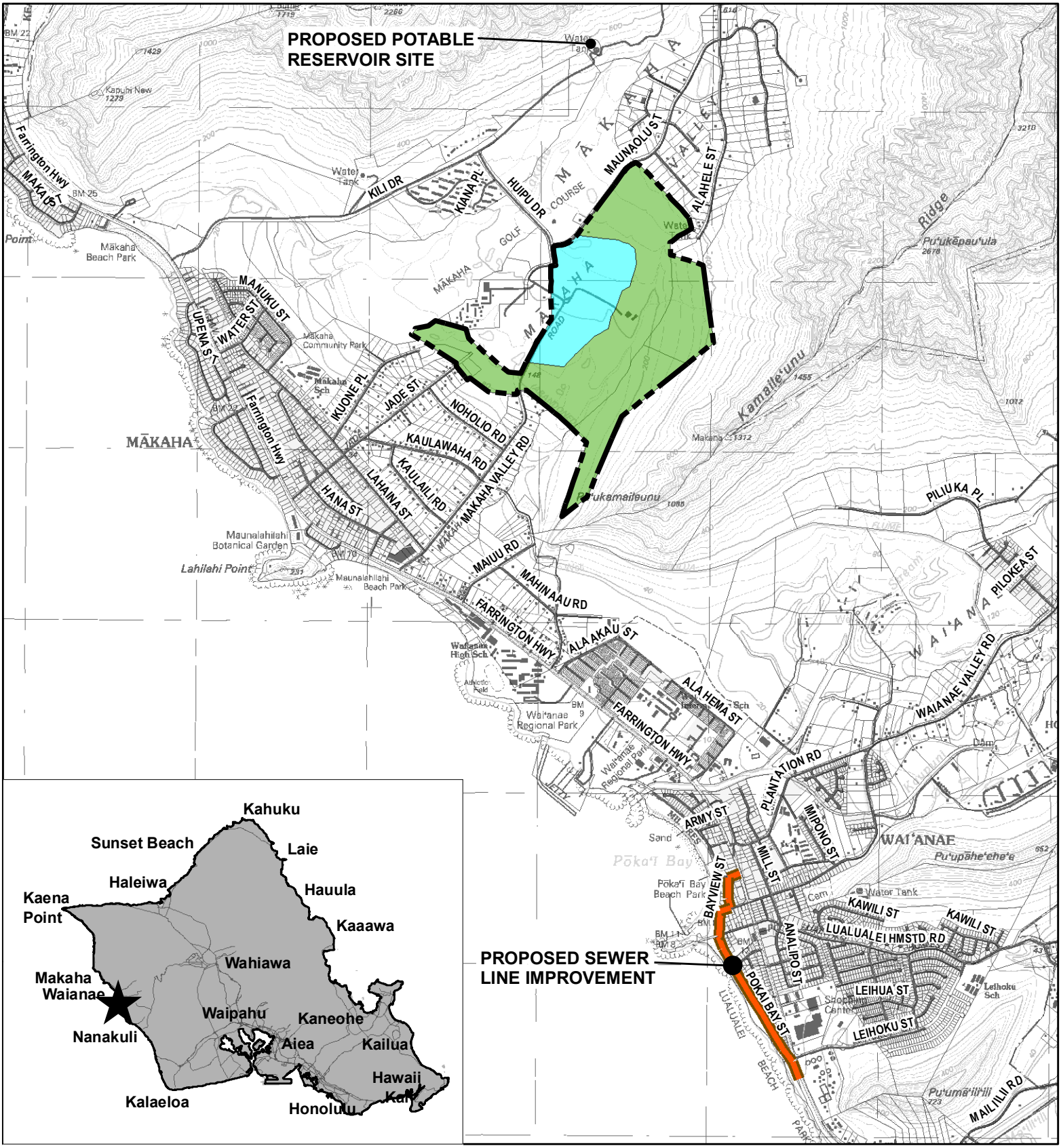
Existing Uses: A portion of the areas proposed for DHHL Residential Community, KS Learning Community and Mākaha Valley Roadway realignment is being used as a golf course, the remainder is vacant land.

The area proposed for the improvement of the existing wastewater conveyance system is currently part of the roadway network.

The area proposed for a new reservoir (if required) is currently being used for BWS purposes and is vacant.

Proposed Action: The Proposed Project is expected to include a DHHL Residential Community and KS Learning Community, roadway realignment, installation of a reservoir and parallel sewer line.

[1] Exact location of BWS infrastructure improvements is anticipated to be at the discretion of BWS.



LEGEND

- Project Site
- DHHL Residential Community
- Kamehameha Schools Learning Community
- Proposed Sewer Line Improvement

Source: U.S. Geological Survey
Disclaimer: This graphic has been prepared for general planning purposes only.

FIGURE 1

Regional Location Map

DHHL Residential Community / KS Learning Community

WAI'ANAE, MĀKAHA, ISLAND OF OAHU

NORTH

LINEAL SCALE (FEET)

0 2,500 5,000

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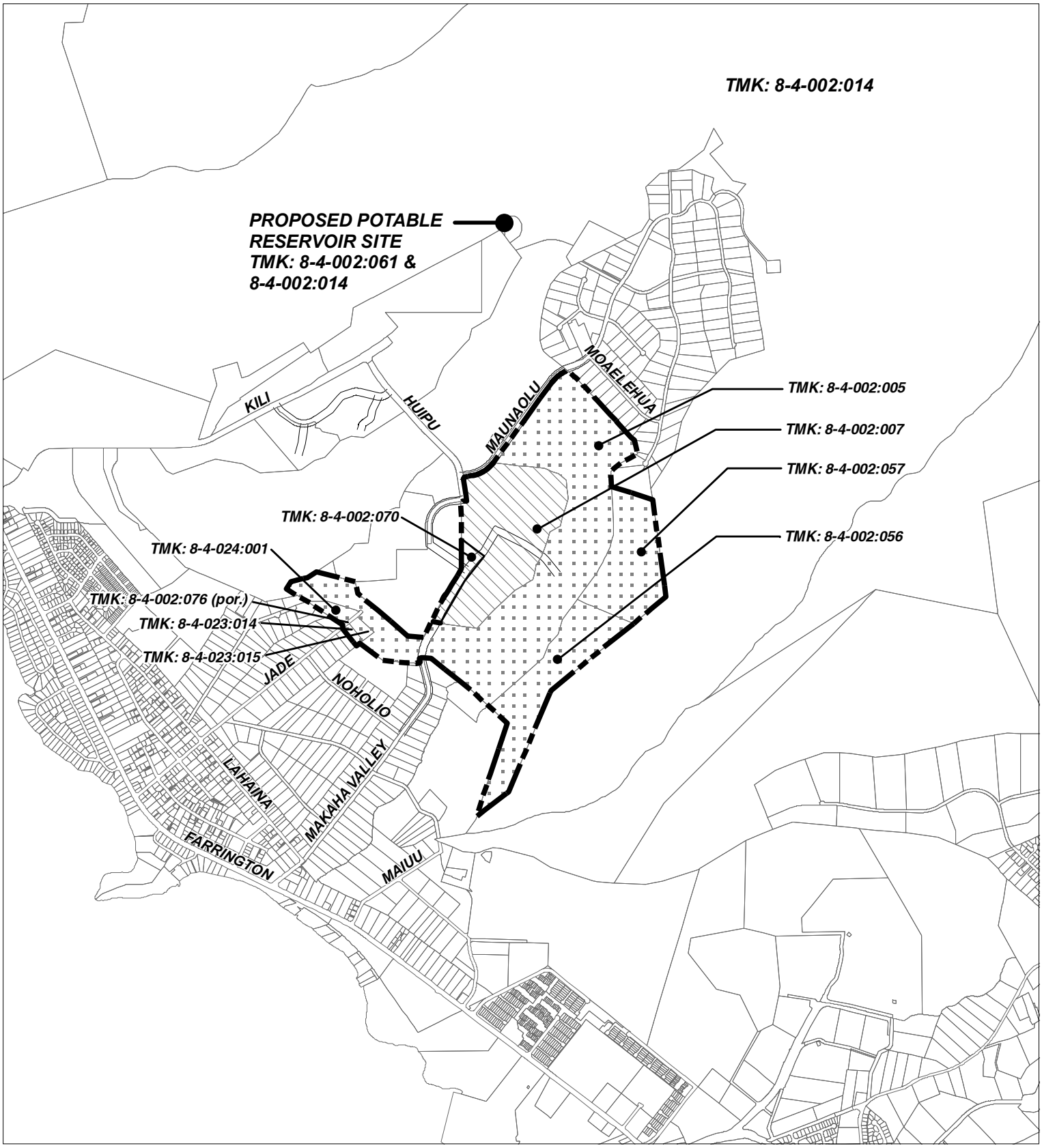

LEGEND

- Project Site
- DHHL Residential Community
- Kamehameha Schools Learning Community

FIGURE 2

Tax Map Key

DHHL Residential Community / KS Learning Community

ISLAND OF O`AHU

NORTH

LINEAL SCALE (FEET)

0 1000 2000 4000

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Source: City and County of Honolulu, Tax Map Key 2010 (GIS)
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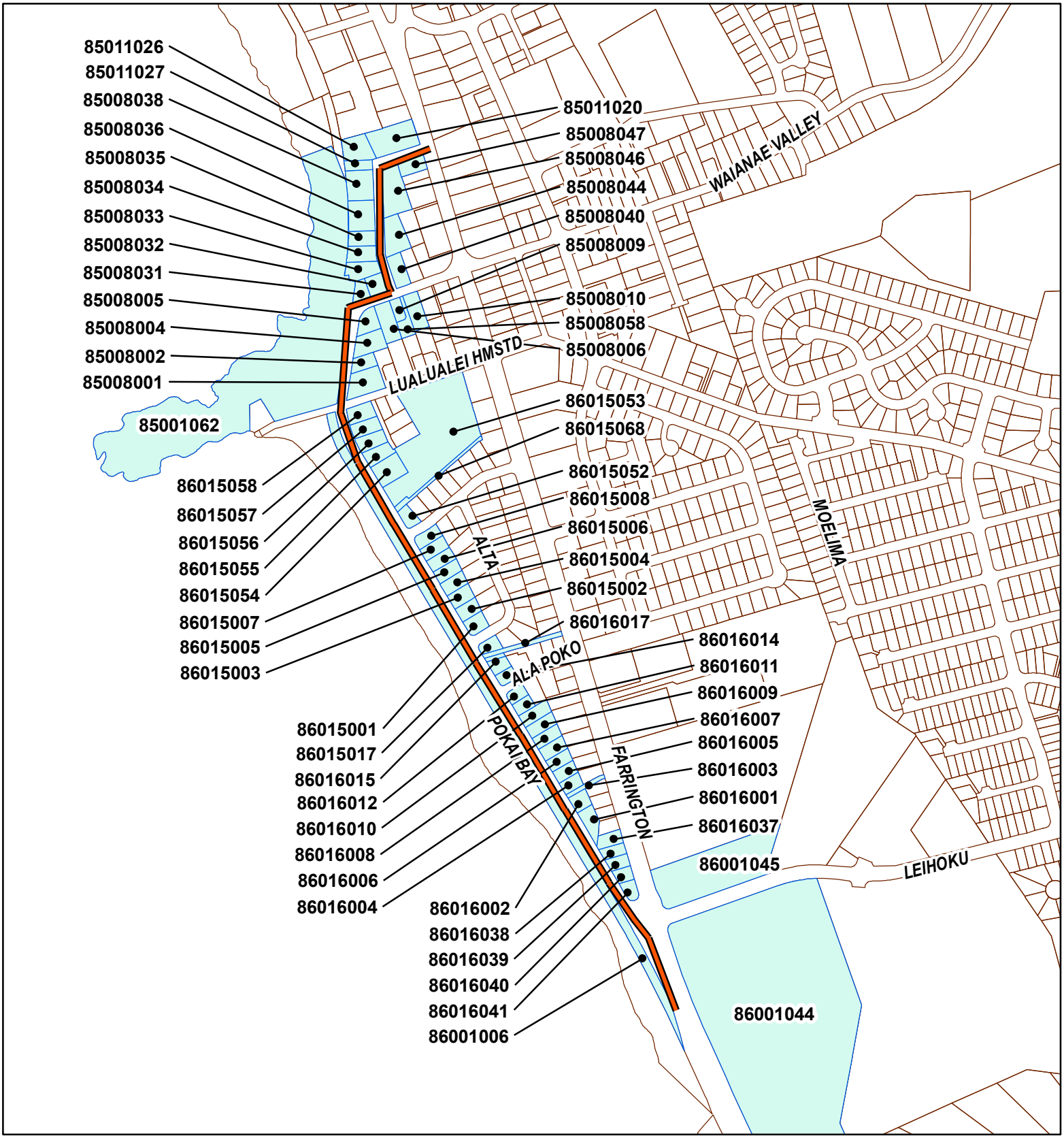

LEGEND

Sewer Line for Improvement

TMK Adjacent to Sewer Line

FIGURE 3

TMK Adjacent to Sewer Line

DHHL Residential Community / KS Learning Community Offsite Sewer Improvement

ISLAND OF O`AHU

NORTH

LINEAL SCALE (FEET)

0 150 300 600 1,200

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Source: City and County Honnolulu Tax Map Key, 2008 (GIS)

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The DHHL Residential Community is expected to include the development of up to 600 residential units, a community/commercial center, cultural landscape area, open space and roadways.

The KS Learning Community is expected to include educational and cultural facilities, internal driveways and open space.

The project proponent expects several infrastructure improvements may be necessary. The realignment of approximately 1,900 linear feet of Mākaha Valley Road is proposed adjacent to the KS Learning Community. Based on City and County of Honolulu recommendations, the proposed action may include a new reservoir in Mākaha Valley, next to an existing one, and the installation of a parallel sewer line adjacent to an existing line in Waiʻanae.

Project Area: The DHHL community, the KS Learning Community and the realignment of approximately 1,900 linear feet of Mākaha Valley Road is expected to include actions on approximately 306 acres of land located in Mākaha Valley primarily east of Mākaha Valley Road. Also located within Mākaha Valley, on the western slopes of the valley is the proposed location for the installation of a new reservoir on approximately 1 acre of land, next to an existing reservoir. The approximately 4,800 linear feet sewer conveyance structure improvement project is expected to include actions along Bayview Street, a portion of Waiʻanae Valley Road, Pōkaʻī Bay Street, and a short portion of Farrington Highway.

Land Use Designations: *State Land Use:*
Urban (Figures 4 and 5) (for all properties identified within the study, except a portion of the proposed potable water reservoir site)
Conservation (Figure 4) (portion of the proposed potable water reservoir site)

DHHL Land Use Designation:
Residential, Special District, Conservation, Community Use, Commercial[2] (Figure 6)

City and County of Honolulu:
Wai'anae Sustainable Community Development Plan (for all properties identified within the study) (Figure 7)

City and County of Honolulu Zoning:

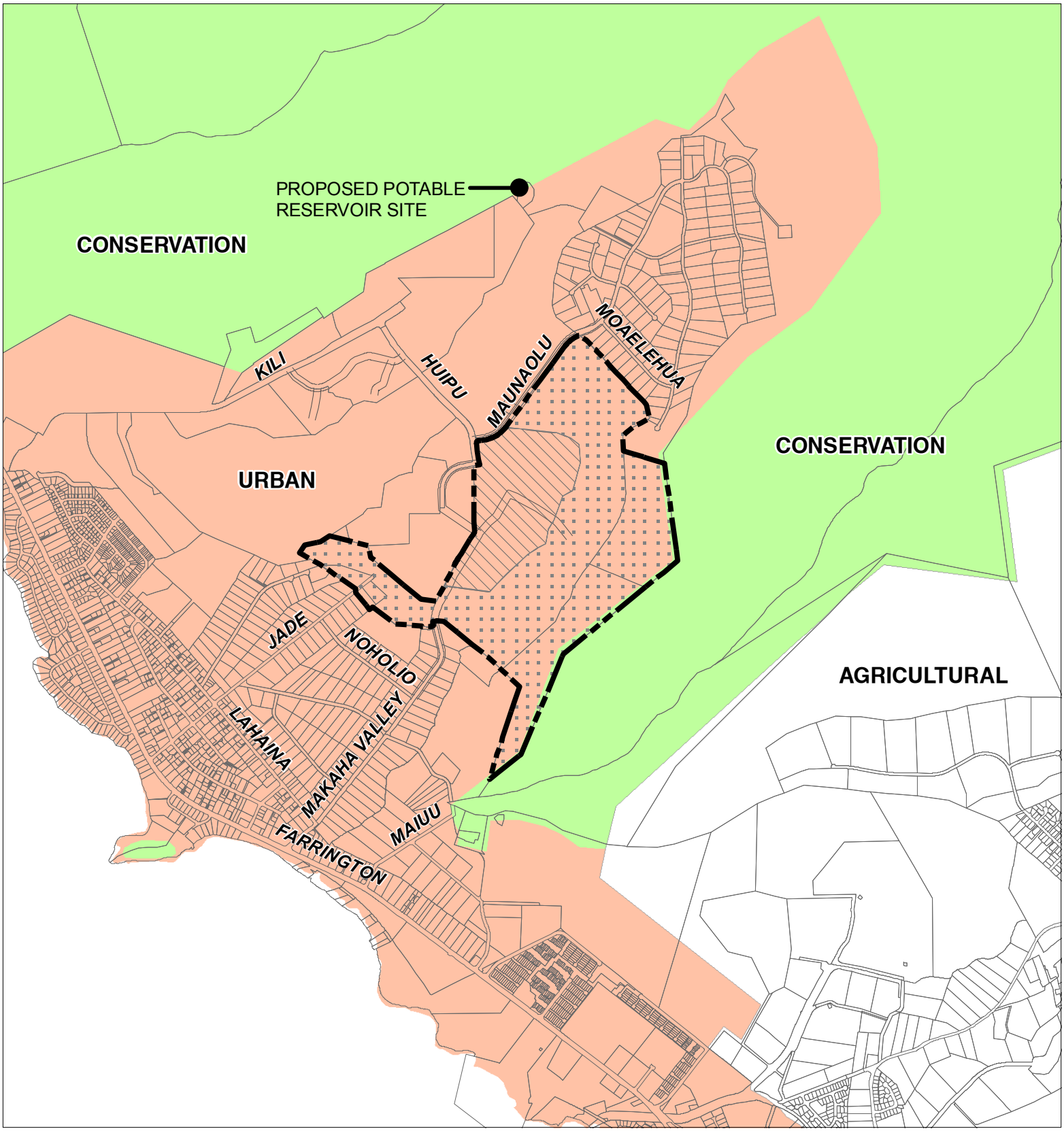
Area	*Zoning*
DHHL Residential Community (Figure 8)	*Preservation (P-2)* *Country* *Agriculture (A-2)*
KS Learning Community (Figure 8)	*Residential (R-20)*
Mākaha Valley Road Improvements (Figure 8)	*Residential (R-20)*
Proposed Potable Water Reservoir (Figure 8)	*Preservation (P-1 & P-2)*
Proposed Sewer Conveyance Structure Improvements (Figure 9)	*Residential (R-5)* *Preservation (P-2)* *Apartment Mixed Use (A-3)* *Business (B-2)* *Industrial (I-2)*

Special Management Area:
The proposed actions within Mākaha Valley are not within the Special Management Area (SMA) (Figure 10). The proposed action in Wai'anae associated with sewer conveyance structure improvement is located within the SMA (Figure 11). However, the Department of Planning and Permitting has indicated in a letter dated April 1, 2010, that the action is exempt from the SMA process under Section 25-1.3 Revised Ordinances of Honolulu (ROH)[3]. (Appendix E)

Actions Requested:

- Compliance with 24 CFR 58
- Compliance with 7 CFR 1794
- Compliance with Chapter 343, Hawai'i Revised Statutes
- Compliance with Hawai'i Administrative Rules Title 11, Chapter 200

[2] The commercial designation is to allow for a small country store.
[3] ROH Section 25-1.3 states "The repair and maintenance of underground utility lines, including but not limited to water, sewer, power and telephone and minor appurtenant structures such as pad mounted transformers and sewer pump stations.



LEGEND

- Project Site
- DHHL Residential Community
- Kamehameha Schools Learning Community
- Agricultural
- Conservation
- Rural
- Urban

Source: City County Honolulu Tax Map Key, 2008 (GIS);
State of Hawaii Land Use Districts, 2009 (GIS)
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FIGURE 4

State Land Use Districts

DHHL Residential Community / KS Learning Community

ISLAND OF O'AHU

NORTH

LINEAL SCALE (FEET)

0 1000 2000 4000

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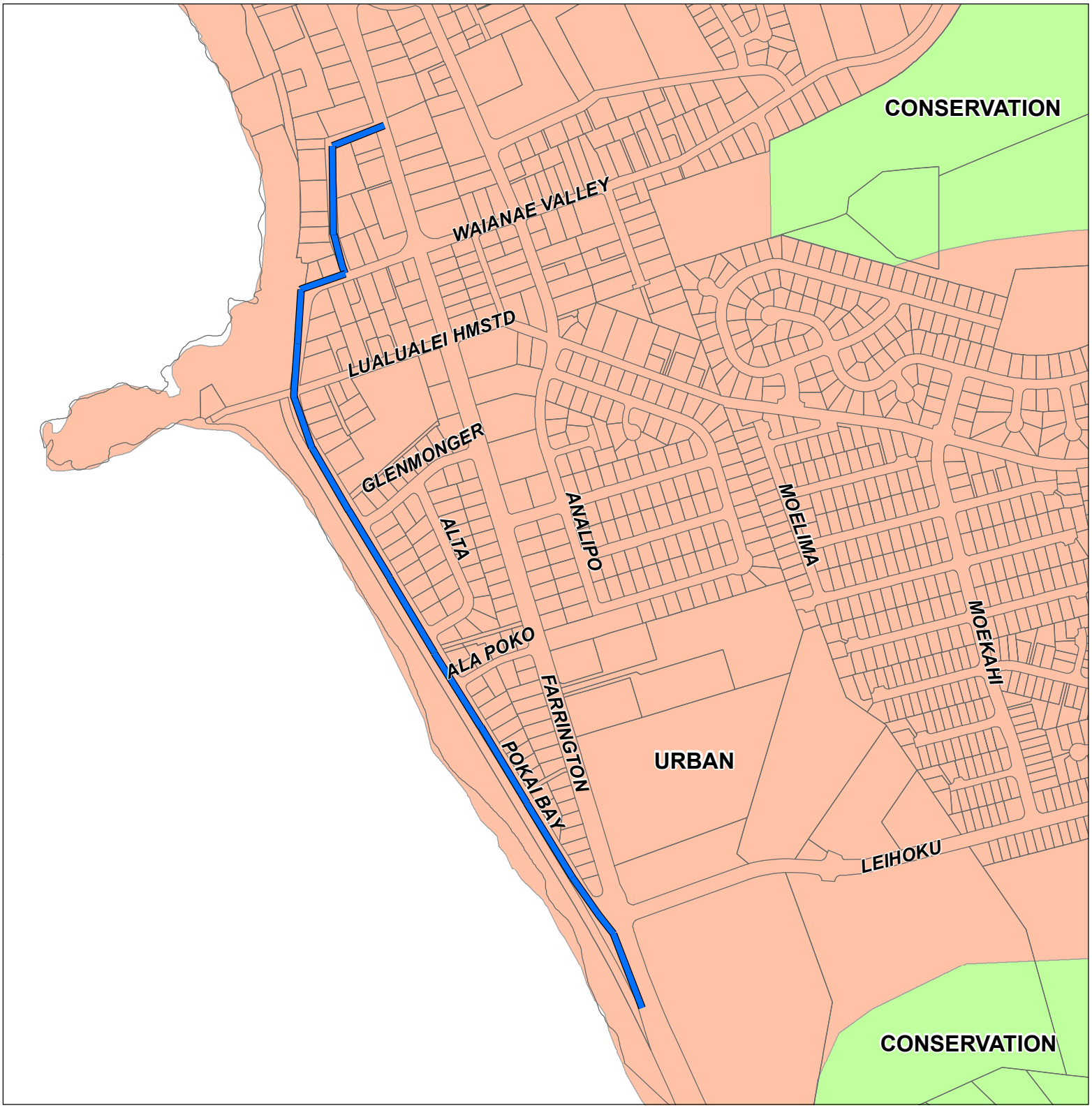

LEGEND

- Sewer Line for Improvement
- Agricultural
- Conservation
- Rural
- Urban

Source: City County Honolulu Tax Map Key, 2008 (GIS);
State of Hawaii Land Use Districts, 2008 (GIS)
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FIGURE 5

State Land Use Districts

DHHL Residential Community / KS Learning Community Offsite Sewer Improvement

ISLAND OF O'AHU

NORTH

LINEAL SCALE (FEET)

0 300 600 1200

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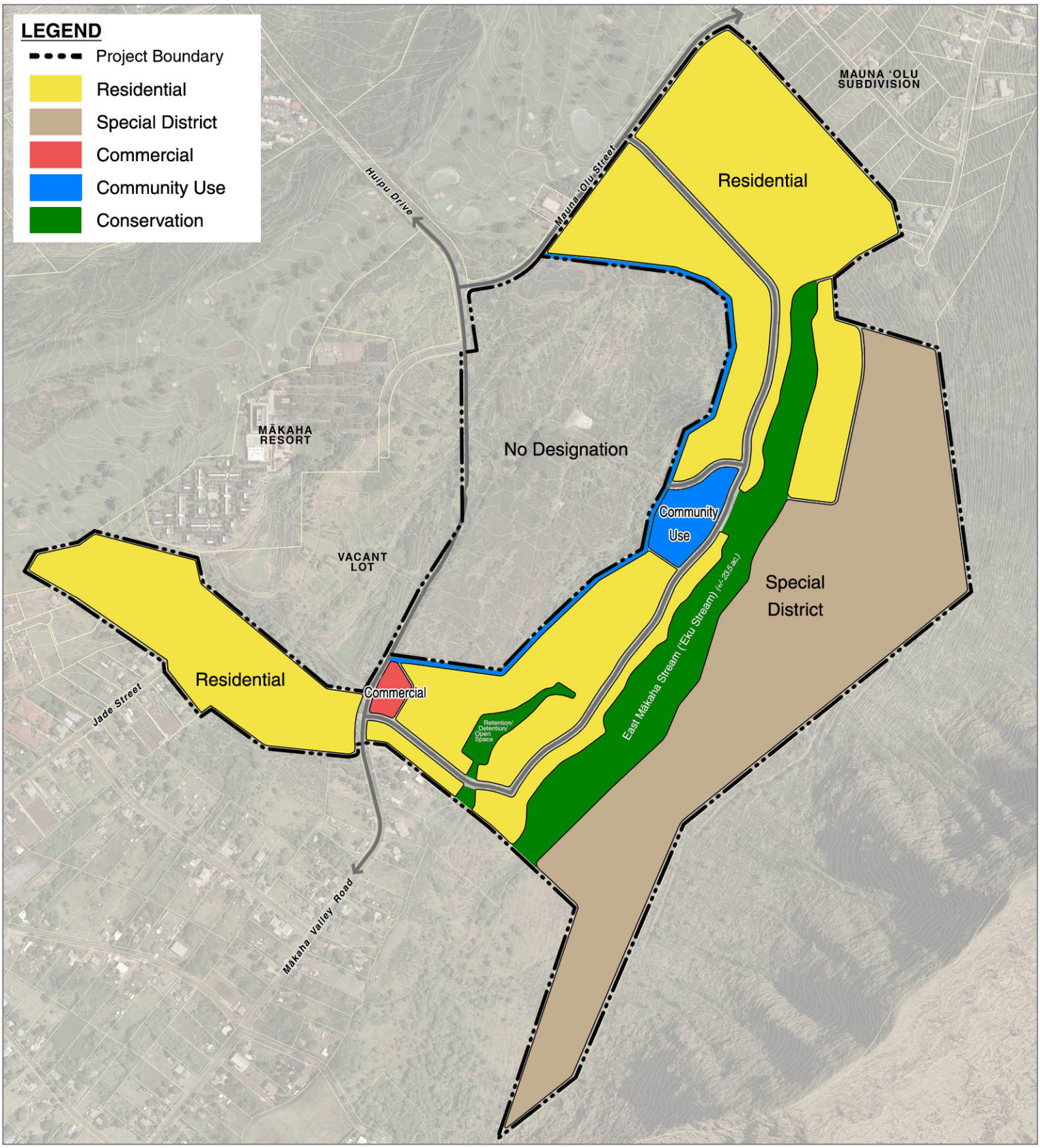

FIGURE 6

DHHL Land Use Designation

DHHL Residential Community / KS Leaning Community

Wai'anae, Mākaha, Island of O'ahu

North

Lineal Scale (ft.)

0 800 1,600

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March 2010

Source: PBR Hawaii; Google Earth

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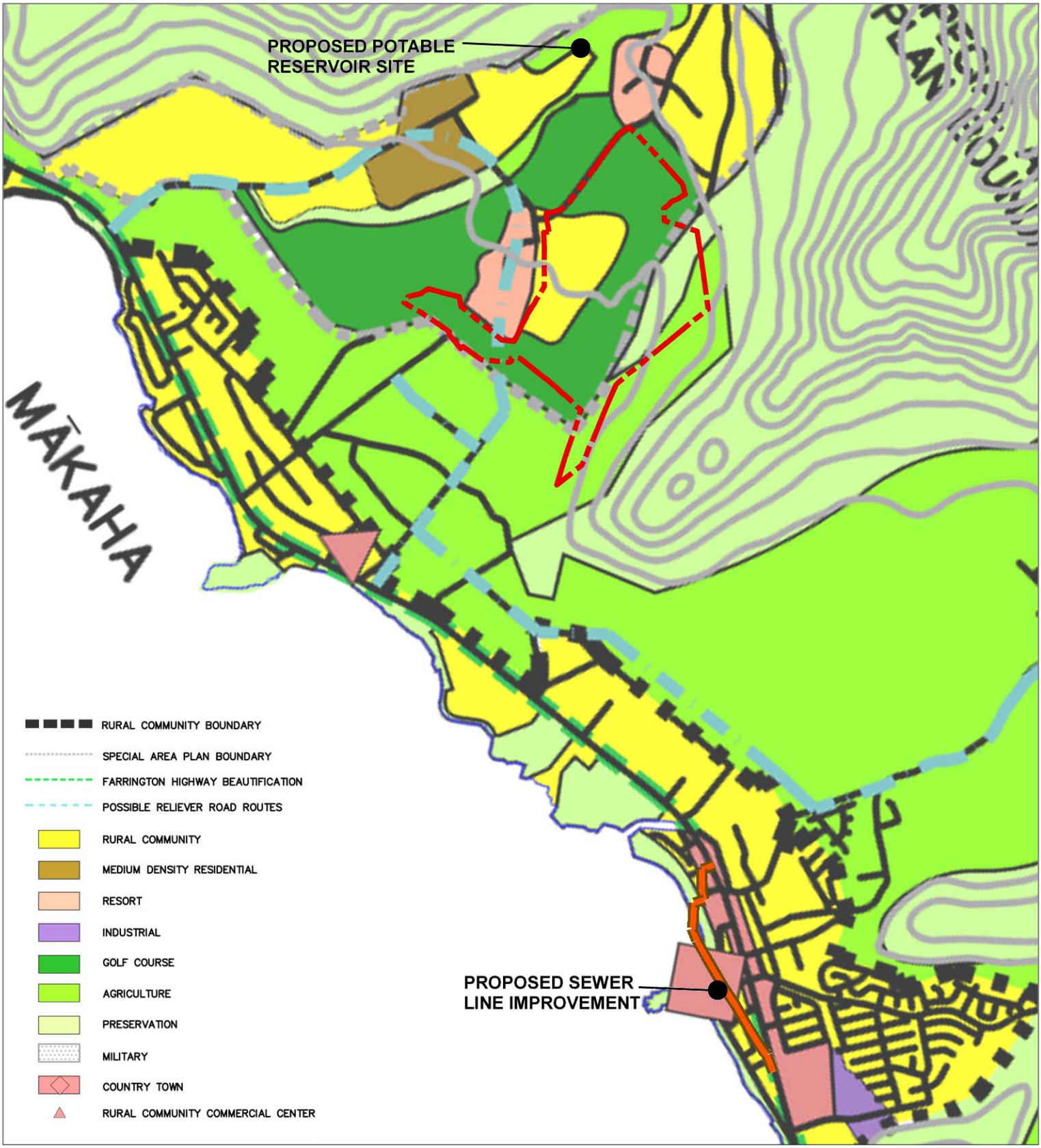

LEGEND

Project Site

Proposed Sewer Line Improvement

FIGURE 7

Wai`anae Sustainable Communities Plan

DHHL Residential Community / KS Leaning Community

Wai'anae, Mākaha, Island of O'ahu

North

Lineal Scale (ft.)

0 2,500 5,000

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April 2010

Source: City and County of Honolulu, Draft Wai'anae Sustainable Communities Plan (Revised 2009)
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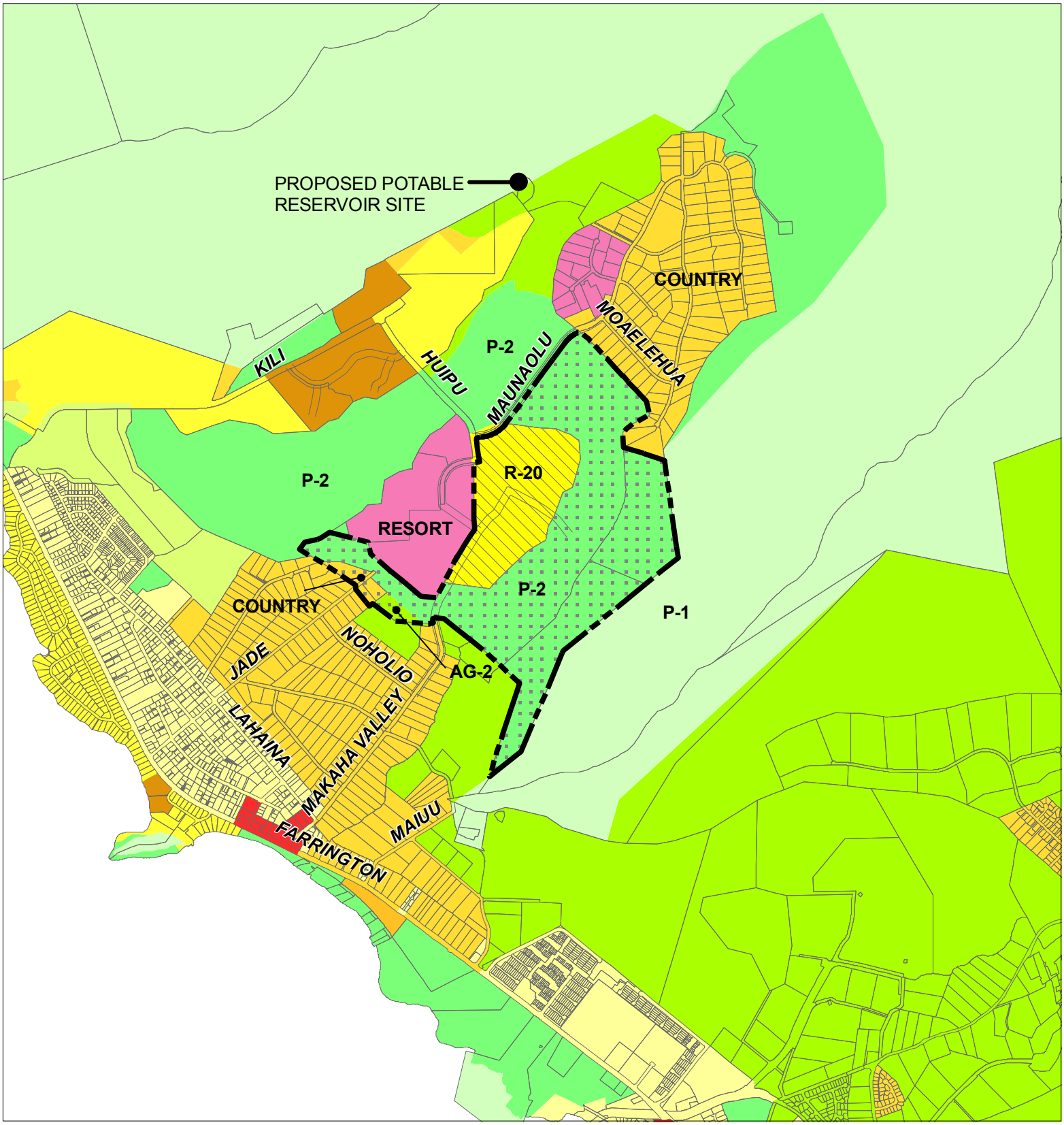

LEGEND

- Project Site
- DHHL Residential Community
- Kamehameha Schools Learning Community
- R-3.5
- R-5
- R-7.5
- R-10
- R-20
- A-1
- A-2
- Resort
- B-1
- B-2
- AG-1
- AG-2
- Country
- P-1
- P-2

Source: City County Honolulu Tax Map Key, 2010 (GIS);
City County Honolulu Zoning, 2010 (GIS)
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FIGURE 8

City and County of Honolulu Zoning

DHHL Residential Community / KS Learning Community

ISLAND OF O'AHU

NORTH

LINEAL SCALE (FEET)

0 1000 2000 4000

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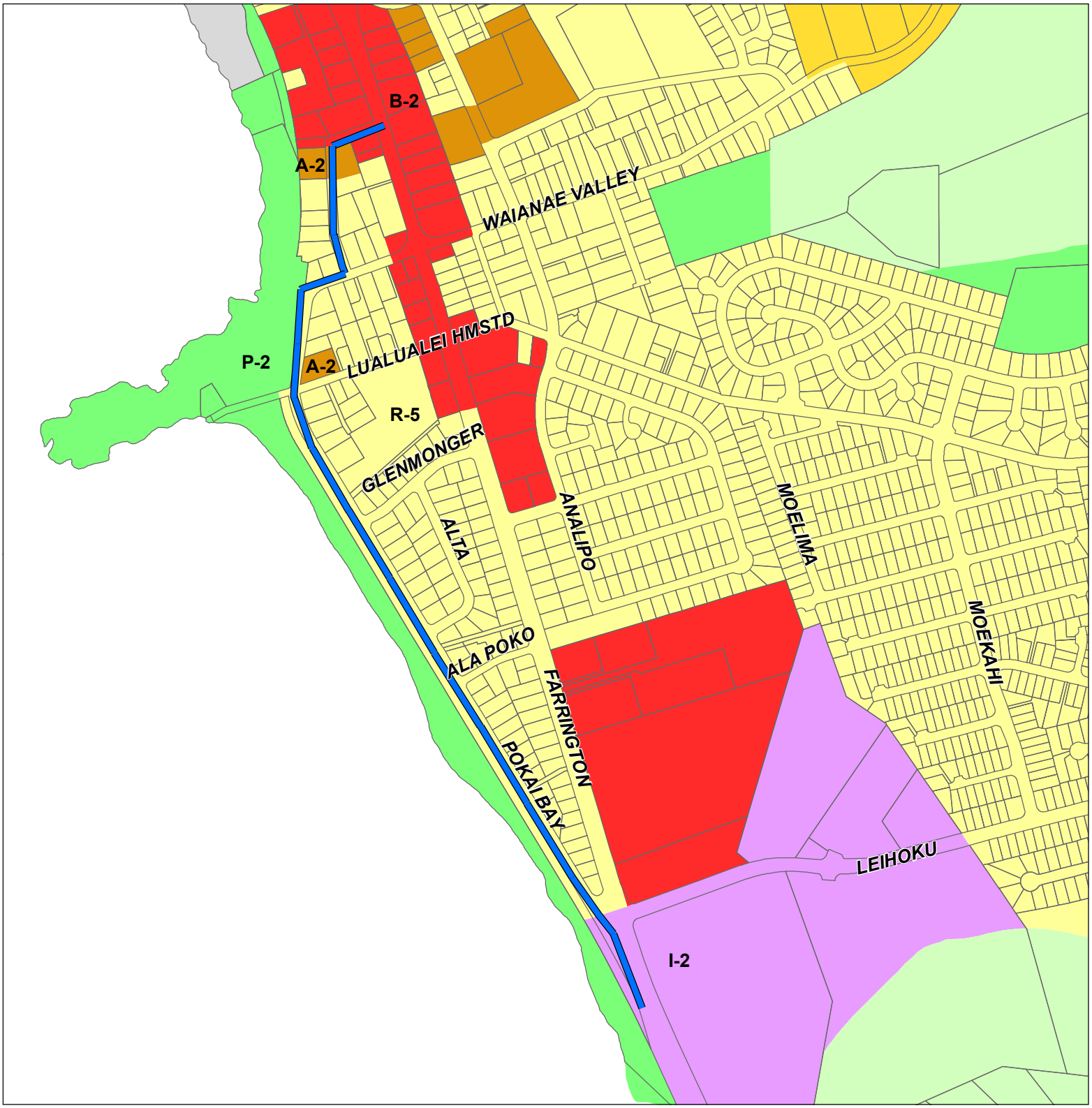

LEGEND

Sewer Line for Improvement	A-3	Country
R-5	B-1	P-1
A-1	B-2	P-2
A-2	I-2	F-1

Source: City County Honolulu Tax Map Key, 2010 (GIS);
City County Honolulu Zoning, 2010 (GIS)
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FIGURE 9

City and County of Honolulu Zoning

DHHL Residential Community / KS Learning Community Offsite Sewer Improvement

ISLAND OF O'AHU

NORTH

LINEAL SCALE (FEET)

0 300 600 1200

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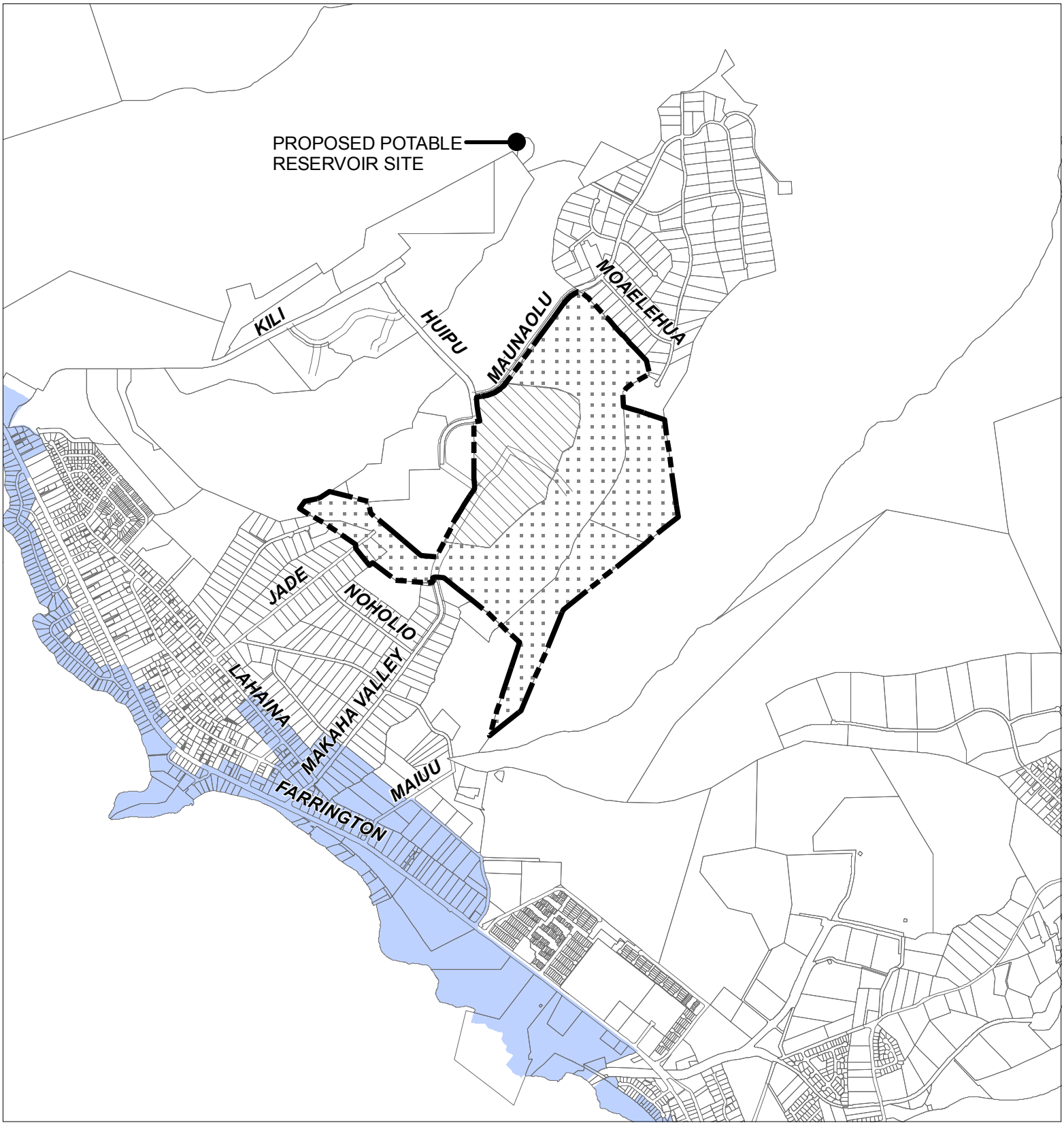

LEGEND

- Project Site
- DHHL Residential Community
- Kamehameha Schools Learning Community
- Special Management Areas

Source: City County Honolulu Tax Map Key, 2008 (GIS);
State of Hawaii Special Management Areas, 2009 (GIS)
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FIGURE 10

Special Management Areas

DHHL Residential Community / KS Learning Community

ISLAND OF O'AHU

NORTH

LINEAL SCALE (FEET)

0 1000 2000 4000

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LEGEND

Sewer Line for Improvement

Special Management Areas

FIGURE 11

Special Management Areas

DHHL Residential Community / KS Learning Community Offsite Sewer Improvement

ISLAND OF O'AHU

NORTH

LINEAL SCALE (FEET)

0 300 600 1200

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Source: City County Honolulu Tax Map Key, 2008 (GIS);
State of Hawaii Special Management Areas, 2008 (GIS)
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- Compliance with Revised Ordinance of Honolulu, Chapter 25

Approving Agency: Department of Hawaiian Home Lands

Anticipated Determination: Finding of No Significant Impact (FONSI)

1.2 LOCATION

The Proposed Project is located in the City and County of Honolulu. With the exception of the sewer conveyance structure improvement, the project is located within the Mākaha Ahupuaʻa, Waiʻanae Moku. Improvements of the sewer conveyance structure are proposed to occur within the Waiʻanae Ahupuaʻa, Waiʻanae Moku (Figure 1).

1.3 LAND OWNERSHIP AND MAJOR APPROVALS REQUIRED

Ko Olina Mākaha East LLC and Honolulu Ltd, collectively known as "Mākaha Owner" holds title to 303 acres of land within the Proposed Project area. Upon completion of the entitlement phase, it is anticipated that roughly 236 acres will be transferred to DHHL for a residential community and 67 acres will be transferred to the KS for the development of an educational complex. In addition, approximately 3 acres of land may also be acquired from Makaha Valley Inc.

Contact: Randall Fujiki
Mākaha Owner
1100 Alakea Street, 25th floor
Honolulu, Hawaiʻi 96813
Phone: (808) 531-9761

Makaha Valley Inc. holds title to a portion of Mākaha Valley Road and surrounding area (approximately 3 acres) that is likely to be involved as a result of the proposed realignment of Mākaha Valley Road.

The City and County of Honolulu holds title to the lands under the location of the proposed sewer conveyance structure improvements along Bayview Street, Waiʻanae Valley Road and Pōkaʻi Bay Street and the proposed potable water reservoir. Due to the location within existing right-of-ways, no TMK have been assigned to the area of the proposed sewer conveyance structure improvements (Figure 3).

Wastewater Contact:
Tessa Ching
Site Development Division
Wastewater Branch
City and County of Honolulu
650 South King Street
Honolulu, Hawaiʻi 96813
Phone: (808) 768-8199

Board of Water Supply Contact:
Robert Chun
City and County of Honolulu
Board of Water Supply
630 South Beretania Street
Honolulu, Hawai'i 96843
Phone: (808) 748-5443

The State of Hawai'i holds title to the lands under the location of the proposed sewer conveyance structure improvements along Farrington Highway. Due to the location within existing right-of-ways, no TMK have been assigned to the area (Figure 3).

State of Hawai'i Department of Transportation Contact:
Brennon Morioka
State of Hawai'i
Department of Transportation
869 Punchbowl Street
Honolulu, Hawai'i 96813
Phone: (808) 587-2356

1.3.1 Identification of Applicant

The State of Hawai'i, Department of Hawaiian Home Lands and Kamehameha Schools are the project applicant.

Contact: Mr. Kamuela Cobb-Adams, LDD Administrator
Department of Hawaiian Home Lands
P.O. Box 1879
Honolulu, Hawai'i 96805
Phone: (808) 620-9273
Fax: (808) 620-9299

Contact: Mr. Walter Thoemmes, Facilities Development and Support Division, Director
Kamehameha Schools
567 South King Street, Suite 617
Honolulu, Hawai'i 96813
Phone: (808) 534-3979
Fax: (808) 534-3848

1.3.2 Identification of Environmental Consultant

The environmental consultant is PBR HAWAII & Associates, Inc. dba PBR HAWAII.

Contact: Grant Murakami, Principal
PBR HAWAII
1001 Bishop Street, Suite 650
Honolulu, Hawai'i 96813
Phone: (808) 521-5631
Fax: (808) 523-1402

1.3.3 Environmental Requirements

Preparation of this document is in accordance with the provisions of Chapter 343, HRS (2007) and Title 11, Chapter 200, HAR pertaining to Environmental Impact Statements (EIS). Section 343-5, HRS established nine "triggers" that require either an EA or an EIS. The use of State or County lands or funds requires the preparation of an EA. In addition, the DHHL is expected to pursue funding in the form of grants and loans from various federal agencies that may include the United States Department of Housing and Urban Development (HUD) and the United States Department of Agriculture (USDA), Rural Development (RD). This EA is prepared to address the impacts of the DHHL Residential Community in compliance with NEPA policies and procedures listed in 24 CFR 58 and 7 CFR 1794.

1.3.4 List of Anticipated Permits and Approvals

A list of anticipated permits and approvals are outlined in Table 1-1, below.

Table 1-1 Permits and Approvals

AGENCY	PERMIT/APPROVAL
FEDERAL	
Department of the Army	• Section 10 permit, Rivers and Harbor Act of 1899 • Section 404 permit, Clean Water Act
STATE OF HAWAI'I	
Department of Land and Natural Resources, Historic Preservation Division	• Section 106, National Historic Preservation Act • Section 6E, Hawai'i Revised Statutes (HRS) Review • Stream Channel Alteration permit
State Department of Transportation	• Permit to perform work within a State Right-of-Way

AGENCY	PERMIT/APPROVAL
STATE OF HAWAI'I (CONTINUED)	
Department of Health (DOH)	• NPDES • Section 401, Clean Water Act, Water Quality Certification • Individual Wastewater System permit
CITY AND COUNTY OF HONOLULU	
Department of Planning and Permitting	• Building Permit • Conditional Use permit • Grading permit • Construction Dewatering permit • Permit to Excavate Public Right-of-way • Permit to Trench • Industrial Wastewater Discharge permit • Construction within a Flood Hazard District approval • Approval for Sewer Connection • Site Development approval • Subdivision approval • Drainage Connection approval
Department of Environmental Services	• Noise Permit for Construction Activities
Department of Transportation Services	• Street Usage Permit
Board of Water Supply	• Approval for connection to potable water storage/distribution system

1.3.5 Identification of Approving Agency

The State of Hawai'i, Department of Hawaiian Home Lands is the approving agency.

Contact: Mr. Kaulana H. R. Park, Chairman
Department of Hawaiian Home Lands
P.O. Box 1879
Honolulu, Hawai'i 96805
Phone: (808) 620-9501
Fax: (808) 620-9529

1.4 SURROUNDING LAND USES

The Mākaha Valley is a unique juxtaposition of resort, apartment, residential, business developments and agriculture and preservation uses. While the Valley is often described as rural in nature, there are several higher density residential properties including the eight-building, 20-story, 587 residential unit, Mākaha Valley Towers complex, and the 3-story, 572 residential unit, Mākaha Valley Plantations. These buildings, which are located west

of the Proposed Project area have been part of the landscape for nearly 40 years. In addition, the center of the valley is dominated by the Mākaha Resort & Golf Club with 196 room/suites, an 18-hole golf course, tennis courts, swimming pool, a restaurant and a variety of banquet/meeting rooms. Mauna ʻOlu Estates, a 129-lot, low density residential development that includes a 26 acre resort component, is located in the mauka region of the valley. The mouth of Mākaha Valley is primarily urban residential, with some agriculture, commercial, and business uses. In addition, several apartment/condo (up to nine stories) complexes are located along the beach in the shadow of Mauna Lahilahi. The slopes of Kamaileʻunu Ridge, east of the Proposed Project area are currently undeveloped preservation lands. The project site is bordered by Mākaha Valley Road, Ala Holo Loop, Huipu Drive, Maunaʻolu Street, a resort and golf course to the northwest; residential properties, vacant undeveloped land and water pumping station to the northeast; and vacant undeveloped land to the southeast and southwest.

1.5 GENERAL BACKGROUND

According to the U.S. Census, the largest Native Hawaiian population in the State lives along the Waiʻanae Coast. DHHL and KS are separate public and private "trusts" created for the benefit of Hawaiians but with separate focuses on homesteading and education.

The mission of DHHL is to manage the Hawaiian Home Lands trust effectively, and develop and deliver land to native Hawaiians.[4] DHHL proposes to develop the 236-acre property in Mākaha Valley. The proposed action will be implemented under the provisions of the Hawaiian Homes Commission Act (HHCA), 1920, as amended. The HHCA authorizes DHHL to lease to native Hawaiians the right to use and occupy Hawaiian home lands for agricultural, pastoral, and residential purposes, and to grant licenses to public utilities and others for various purposes. In accordance with the HHCA, the Hawaiian Homes Commission has the power to designate land uses. As such, Hawaiian Home Lands are not subject to County zoning or other land use controls. DHHL is committed to enhancing the quality of life for native Hawaiians. This commitment extends beyond the provision of homestead lots and affordable homes. DHHL recognizes that to rejuvenate the native Hawaiian population, education needs to be factored into the equation.

KS' mission is to improve the capability and well-being of Native Hawaiians through education. Their educational philosophy recognizes that education often occurs outside the boundaries of a traditional school classroom. As such, their educational facility is being designed to capitalize on this type of learning by creating a learning community that not only teaches the children, but their teachers and families too. Mākaha is an ideal location for a combined project like this, building on the synergy created by these two N(n)ative Hawaiian trusts.

[4] In this report, a lower case 'n' is used in the phrase 'native Hawaiian' when referring to Hawaiian Homes Commission Act beneficiaries, who by definition must have 50 percent Hawaiian ancestry. The upper case 'N' is used when describing persons with any percentage of Hawaiian ancestry, as for Federal programs regarding health and education.

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2.0 PROJECT DESCRIPTION

This section provides background information and a general description of the proposed combined DHHL Residential Community and KS Learning Community in Mākaha Valley and infrastructure improvements in Mākaha Valley and Waiʻanae.

2.1 LOCATION

2.1.1 KS Learning Community and DHHL Residential Community

The KS Learning Community and DHHL Residential Community are proposed to be located on approximately 306 acres in lower Mākaha Valley (Figure 1). A portion of the property is currently used for a golf course (Makaha East Golf Course), while the remainder of the land is currently vacant. Photographs of the site are included as Figure 12. Access to this area is expected to be modified both during construction and over the long-term.

2.1.2 Infrastructure Improvements

In support of the KS Learning Community and the DHHL Residential Community, several offsite infrastructure improvements are being proposed (Figure 1).

- Increase the capacity of the existing sewer conveyance system along Bayview Street, a portion of Waiʻanae Valley Road, Pōkaʻī Bay Street, and a portion of Farrington Highway near the Waiʻanae Wastewater Treatment Facility at the request of the City and County of Honolulu Wastewater Division. Photographs along the route of the proposed sewer conveyance system are included as Figure 13.

- A segment of the existing Mākaha Valley Road may need to be realigned to improve traffic flow in the valley and alignment in relation to the Proposed Project area (Figure 15).

- According to the City and County of Honolulu, Board of Water Supply (BWS) the existing potable water storage system at the 525-foot elevation has adequate storage capacity allocated to service the KS Learning Community property. The DHHL property on TMK 8-4-002:005 does not have storage capacity allocated in the 525 reservoir. However, the project may be able to pay storage facilities charges in lieu of building a new reservoir because the existing properties with allocation in the 525 reservoir are not developed at this time. However, if necessary, the capacity of the 525-foot elevation storage system may need to be increased at the request of the BWS. BWS has also indicated that the developer must provide necessary fire flow at a rate of 1,000 gallons per minute. This could be achieved through onsite infrastructure improvements and should not require offsite modification of the existing BWS conveyance system. If onsite improvements are not able to achieve the necessary fire flow, the capacity of the potable water conveyance system along Jade Street may need to be increased to ensure appropriate flow. A description of

the possible modification of the potable water conveyance system along Jade Street has been included as an alternative to the project as proposed in Section 5.0.

2.2 PROJECT GOALS AND OBJECTIVES

The project objective established by DHHL is to provide a livable community for native Hawaiians, which would include the development of up to 600 residences. The project objective established by Kamehameha Schools is for the KS Learning Community to provide educational outreach opportunities as part of their new *Ka Pua* (The Flower) initiative, which works in concert with the existing educational structure on the Waiʻanae Coast to transform educational outcomes on the Leeward Coast. [The] Ka Pua initiative is described in greater detail in Section 2.4.3. Hawaiian cultural considerations are expected to be incorporated into the educational program currently under development with on-going community consultation.

2.3 NEED FOR THE PROJECT

There is a need for affordable housing opportunities for native Hawaiians. While the Department has lands statewide, there is a significant need for residential homesteads on Oʻahu[5]. By addressing the housing needs of native Hawaiian beneficiaries, the project also is expected to help ease the statewide shortage of housing. Existing residences not on DHHL lands may be made available to the general population as DHHL beneficiaries move to their homestead lots.

According to the State of Hawaiʻi, Department of Education (DOE), the schools on the Waiʻanae Coast managed or funded by the DOE consistently underperform in reading and math competencies when compared to other areas in the State and nationally. While all of the schools struggle to raise student competency, it is also apparent that every school along the coast has a dedicated staff working hard to meet the needs of these students. Many unique and extremely successful programs have been created at various schools along the coast to assist students to become productive members of society as adults. KS recognized both the struggles and successes of this educational complex and saw an opportunity to work with these existing programs and to collaboratively generate new ones to improve the educational success of families (catering to all ages from infancy to kupuna including prenatal education for expecting families), particularly those of Native Hawaiian decent on the Leeward Coast of Oʻahu. The Proposed Project is being designed based on supporting, not replacing the varied educational network already in existence on the Leeward Coast.

[5] According to the *DHHL Applicant Waiting List, 2009*, approximeately 8,800 of the applications are for residential homestead leases on Oʻahu. Based on indicated preferences, these applicants are looking to the DHHL to provide them with housing solutions and have applied for residential homesteads.

1.Mauka view towards Kāne'ākī Heiau from the Kamehameha Schools Complex

2. Mauka view looking towards the Kamehameha Schools Complex

3. View looking west of the existing Golf Course Road toward Kamehameha Schools Complex

4. View from existing golf course onto proposed DHHL residences

5. Makai view looking towards Mauna Lahilahi

6. View looking towards the beginning of 'Eku Stream (East Makaha)

7. View from existing clubhouse towards Kamile'unu Ridge

8. Makai view from existing reservoir looking toward Kamehameha Schools Complex

FIGURE 12

Site Photographs

DHHL Residential Community / KS Learning Community

Mākaha, 'Oahu

PBR HAWAII & ASSOCIATES, INC.

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1. Bayview Street facing south toward Waianae Valley Road intersection.

2. Pokai Bay Street facing south toward Lualualei Homestead Road intersection.

3. Pokai Bay Street looking south toward Glenmonger Street intersection.

4. Pokai Bay Street facing south toward Ala Poko Street intersection.

5. Pokai Bay Street facing south passed Ala Poko Street.

6. Pokai Bay Street facing south toward the southern end of the street.

7. Farrington Highway facing south across from sewage treatment plant.

FIGURE 13

Site Photographs

DHHL Residential Community / KS Learning Community
Offsite Sewer Improvement

ISLAND OF OAHU

PBR HAWAII & ASSOCIATES, INC.

DEC 2009

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2.4 KEY ELEMENTS OF THE PROPOSED PROJECT

The vision and concepts behind the Proposed Project as well as a description of the project and required infrastructure improvements are described below.

2.4.1 Vision Statement

The Vision statement developed for the project jointly by DHHL and KS is described below.

> *The project [DHHL Residential Community and KS Learning Community] is envisioned as an integrated sustainable Hawaiian place serving a special role within the Waiʻanae coast and the region. It will be a special place where people can live, work, learn and play. The project will recognize and incorporate the cultural and historic features within the Ahupuaʻa of Mākaha, as appropriate, into the planning of the property. As a learning community, residents will enjoy life-long learning from infants to our kūpuna. Through shared collaborations with various educational agencies, the educational complex will be a catalyst in the Waiʻanae region, nurturing all aspects of the Hawaiian community. Housing and recreation will be seamlessly interconnected with the learning community to provide integrated living and play environments for this village.*

2.4.2 Key Concepts

The vision statement identifies three key concepts guiding the development of this project. The first is the Hawaiian land management concept of an ahupuaʻa. For this project, the Ahupuaʻa serves as a model of a sustainable, live, learn, work and play environment for its residents and the region as a whole. Within the frame work of the ahupuaʻa, programming and project development will focus on education (life-long, ʻāina-based learning), natural resources, and Hawaiian cultural practices.

The second key concept is the integration of the KS Learning Community component with the Residential component. The exchange of ideas between the community and the learning community, between students and educators, between people and the environment in which they live are fostered in a community committed to life-long learning. Integration between project components is also evident in the design of the project. For example, a key organizing element for the project is a central greenway, a pedestrian/bike greenway located along the shared border between the KS and the DHHL properties. This wide greenway is planned to serve as the spine for the development. The greenway provides a vehicle-free pedestrian connection between the learning community and DHHL Residential Community.

The third key concept guiding the development of the project is the importance of involving the local community in the project. From the beginning of the project, the community has been considered a key component of the project's success. Solutions can

be identified through the exchange of ideas, invigorating the native Hawaiian community in Mākaha and throughout the Waiʻanae Coast. As people share their *manaʻo*[6] and culture, the fabric of the entire community is strengthened.

2.4.3 Site Development

During the conceptual plan development, it became apparent that to be successful, the project needed to fit within the fabric of the existing residential community. Therefore, the Proposed Project needed to blend in with the character of the valley. As such, structures are proposed to be low-rise. Site development and the final layout and configuration of the Proposed Project are expected to be refined to ensure that long-range uses of the property are consistent with the project vision and key elements of the concept plan developed during planning charrettes and community meetings. Wherever appropriate, sustainable development concepts will be incorporated. Major land use elements of the conceptual plan (Figure 14) are described below.

2.4.3.1 KS Learning Community

The KS Learning Community is a part of the larger KS Ka Pua educational outreach program on the Leeward Coast. The initiative is aimed at stimulating, supporting, and ultimately transforming educational outcomes on the Leeward Coast. Working with a variety of public and private community collaborators, including the DOE, KS seeks to serve as a catalyst to build on successful programs already in the community to bridge any gaps that exist. The KS Learning Community is expected to provide facilities to complement what is available on the coast in support of [the] Ka Pua initiative. The KS Learning Community plans include approximately 250,000 square feet of covered space. While the exact programming components are still being refined, uses envisioned include P-20 programs[7] preschool, educational learning labs, and multi-learning halls, cafeteria, and possibly a multi-media library and recreational spaces.

The covered structures being planned on the KS Learning Community are expected to cover approximately seven acres of the roughly 70 acre parcel. Most of the structures being planned are one-story in height to allow better connection to outdoor facilities from the indoor learning space. Several of the buildings (the administrative and office buildings) are expected to be two-stories tall. The spaces within the buildings are being designed to ensure maximum flexibility as programs are developed and refined.

Recognizing that learning does not need to occur under a roof, more than half of the 70 acre KS Learning Community is being planned as open space to allow for outdoor learning opportunities which include a *piko* (a large, central gathering area), indigenous and educational gardens and recreational activities. The *piko*, or center of the campus is being

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[6] Manaʻo can be defined as: thought, idea, belief, opinion, theory, thesis, intention, meaning

[7] Hawaii P-20 Partnerships for Education is a statewide partnership that is working to strengthen the education pipeline from early childhood (preschool) through higher education (level 20)

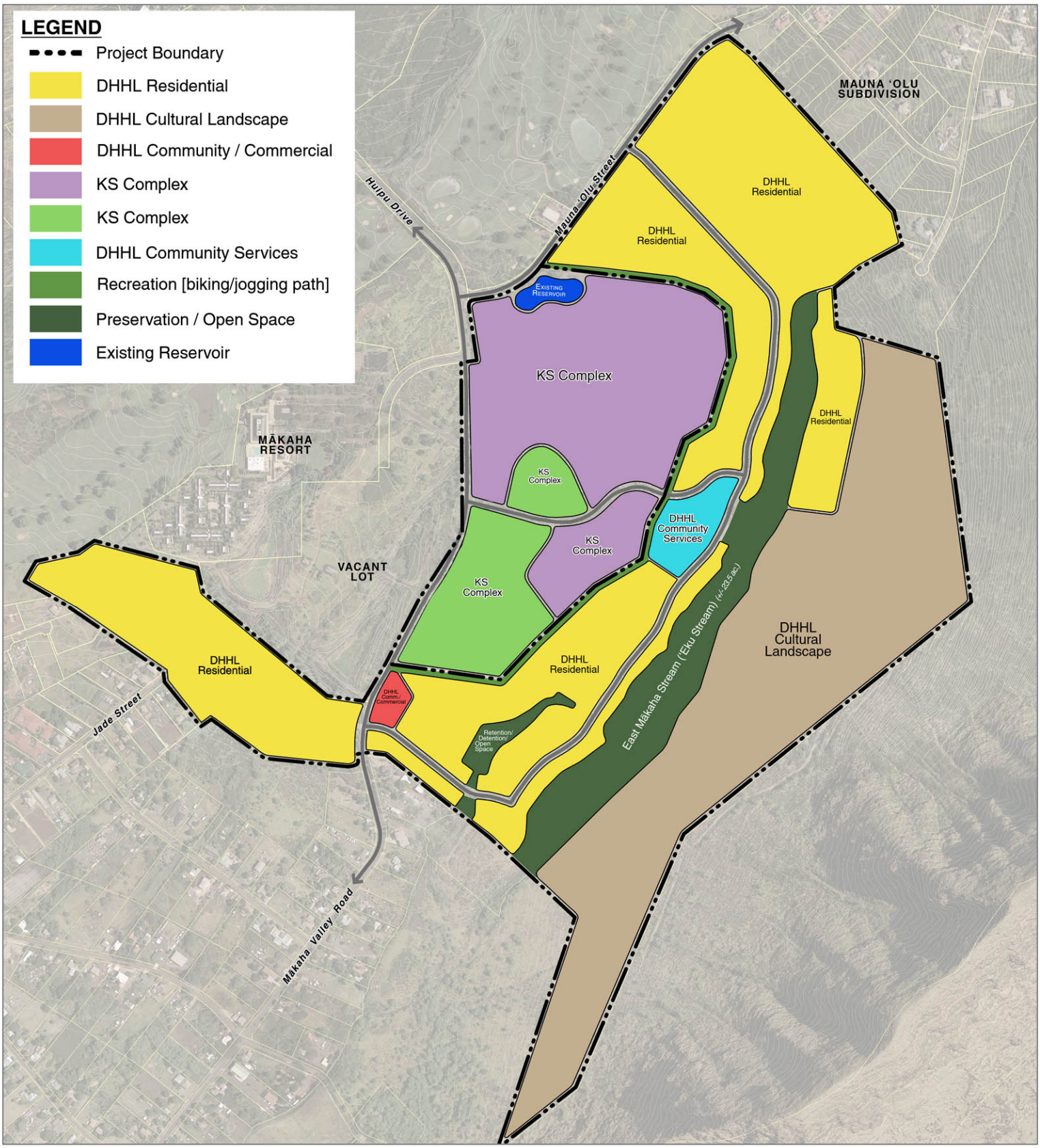

FIGURE 14

Conceptual Site Plan

DHHL Residential Community / KS Leaning Community

Wai'anae, Mākaha, Island of O'ahu

North

Lineal Scale (ft.)

0 800 1,600

PBR HAWAII & ASSOCIATES, INC.

March 2010

Source: PBR Hawaii; Google Earth
Disclaimer: This graphic has been prepared for general planning purposes only.

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planned to facilitate large or intimate gatherings of people under a *Hale*[8], or outside in nature. A hula mound and *imu* is proposed to be integrated into the *piko* along with some conventional kitchen facilities. Indigenous gardens and educational gardens are expected to be incorporated within the learning community so students and the community can learn about endemic, Polynesian-introduced and other plants of cultural value to Hawai'i. Also proposed for the project is a variety of indoor and outdoor recreational facilities. The facilities proposed include sport fields, tennis/basketball/volleyball courts and a pool. Restrooms would be sited for convenient access to the recreational areas.

2.4.3.2 DHHL Residential Community

The DHHL Residential Community is proposed to be located on roughly 236 acres surrounding the KS Learning Community. A portion of the proposed DHHL Residential Community will be located to the west of Mākaha Valley Road in the southern end of the property. Within the property, approximately 118 acres of land are planned for up to 600 residential units. Development siting is expected to respect 'Eku Stream preserving the existing drainage features. Approximately 80 acres along the hillside are expected to be dedicated to "cultural landscape" land uses which may include traditional agricultural terraces, lo'i, native re-vegetation, or the cultivation of other food crops/fruit trees.. Roughly 2 acres in the southern portion of the DHHL Residential Community are planned to be set aside for community/commercial use. While the exact nature of the commercial activities has not been determined, the area is planned to include space for a small country store and an area to house mailboxes that would service homestead residents in order to minimize travel outside of the project area. Approximately 5 acres adjacent to the KS Learning Community is expected to be designated for DHHL community services. DHHL in conjunction with other Native Hawaiian service organizations have developed a successful model, often referred to as a *Kauhale*[9] that brings multiple organizations together in one area. This allows Native Hawaiians to receive a variety of services in one convenient location within the project area.

2.4.3.3 Mākaha Valley Access and Internal Roadway Circulation

Access to the KS Learning Community is anticipated to be provided through a realigned Mākaha Valley Road which will connect to Huipu Drive, providing an improved circulation pattern within the valley (See Section 2.4.4.4 for further detail). Access to the DHHL Residential Community is anticipated to be provided from the existing Mākaha Valley Road and Mauna Olu Road. A collector roadway is planned within the DHHL residential Community. The roadway providing access to the KS Learning Community is planned to connect to the internal DHHL collector road.

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[8] Hale can be defined as a building, hall, or house. While the structure is referred to as a Hale, this "hall" will be built of modern construction, which if possible, will pay tribute to traditional hale style in its design.
[9] Kauhale literally means plural house. Traditionally it was used to describe a group of houses comprising a Hawaiian home, such as the men's/women's eating houses, sleeping house, cook-house, canoe house, etc. The term is also used to describe a hamlet or settlement.

2.4.4 Infrastructure Improvements

Mitsunaga & Associates, Inc. conducted a preliminary assessment of the existing infrastructure and possible improvements required to service the Proposed Project. This information is summarized below:

2.4.4.1 Water Supply and Distribution

Improvements to the BWS distribution and storage system are planned to provide service to the Proposed Project.

The on-site water distribution system is planned to be designed in conformance with the Board of Water Supply Water System Standards and Standard Details. Connection to the proposed system should be serviced by the 525 reservoir service zone. All water services including fire flow are expected to be provided through the connection made to the existing 525 service zone water main on Huipu Drive. It is possible that appropriate pressure reducing devices may need to be installed at lower service elevations of the project site (below the 142-foot elevation).

According to the City and County of Honolulu, Board of Water Supply (BWS) the existing potable water storage system at the 525-foot elevation has storage capacity allocated to service the KS Learning Community property. The DHHL property on TMK 8-4-002:005 does not have storage capacity allocated in the 525 reservoir. However, the Project Proponent may be able to pay storage facilities charges in lieu of building a new reservoir because the existing properties with allocation in the 525 reservoir are not developed at this time.

2.4.4.2 Wastewater Collection and Transmission

The City and County of Honolulu, Wastewater Branch has indicated that from the project connection point to the existing sewer conveyance system at Jade Street to Bayview Street, the system has adequate capacity to convey wastewater from the Proposed Project. However, from Bayview Street to the connection point at the Waiʻanae Wasteater Treatment Plant (WWTP), at Leihōkū Street and Farrington Highway, the sewer line capacity decreases and is inadequate to meet the Proposed Project's needs. The City and County of Honolulu has requested that the sewer line capacity from Bayview Street to the WWTP be increased to accomodate the project. This will assure a continuous flow throughout the sewer line, reducing potential sewer backups and breaks.

The existing wastewater conveyance system capacity is expected to be increased through the installation of approximately 4,800 linear feet of parallel line adjacent to the existing line. It is preliminarily envisioned that the parallel line may be installed utilizing conventional open trench technology within the existing right-of-way on Bayview Street, a portion of Waiʻanae Valley Road, Pōkaʻī Bay Street, and a portion of Farrington Highway near the Waiʻanae WWTP.

2.4.4.3 Drainage Facilities

The Proposed Project is expected to maintain existing drainage patterns. All additional run-off caused by the increase in impervious area as a result of the Proposed Project is proposed to be detained onsite, to current quantities/velocities. Detention ponds, water quality swales and porous pavements and other sustainable design features are expected to be incorporated into the project to detain (and in the case of porous pavements, retain) stormwater runoff to current quantities/velocities.

2.4.4.4 Roadway Improvements

The existing roadways in Mākaha Valley are primarily privately owned. To better accommodate traffic through the center of the valley, and therefore access to the Proposed Project, infrastructure improvements are expected to include the realignment of approximately 1,900 linear feet of Mākaha Valley Road. This would result in not only straightening the connection between Huipu Drive and Mākaha Valley Road, but also promoting safer travel along this stretch of roadway (Figure 15).

Based on the Preliminary Traffic Study prepared by Wilson Okamoto Corporation (Appendix E), some other roadway improvements were recommended. They included modification of traffic signal timing and intersection rehabilitation at Mākaha Valley Road and Farrington Highway. In addition, intersection rehabilitation at Kili Drive and Farrington Highway was recommended. Exact intersection rehabilitation work would be assessed at a later date based on actual conditions, but could include rehabilitation of the existing pavement, replacement of existing striping and markers, and replacement of damaged traffic signal equipment.

2.4.4.5 Electrical System/Lighting

While photovoltaic and other sustainable electrical generating technology may be employed on the project, it is likely that the project may require connection to the existing Hawaiian Electric Company, Inc.'s (HECO) system. Within the Mākaha Valley road realignment, HECO's overhead system is expected to be converted to an underground system. Appropriate transitions from overhead to underground are being considered in the design of the project. Within the DHHL and KS parcels, the proposed electrical transmission is expected to be through an underground system. The system should allow for service extension to accommodate project phasing. It is anticipated that street lights will be installed within the Proposed Project and along the Mākaha Valley Road realignment for improved safety.

Figure 15 - Existing Roadway Alignment along Mākaha Valley Road and Ala Holo Loop Compared to Proposed Mākaha Valley Road Re-Alignment

2.4.4.6 Telephone

Within the proposed DHHL Residential Community and KS Learning Community, an underground telephone system is expected to be constructed to provide communication services. The existing aboveground utilities servicing the remainder of the valley are expected to remain in place. An appropriate system is expected to be constructed along the development roadways for Hawaiian Telcom's equipment within the KS Learning Community and Sandwich Island Communication's (SIC) equipment within the DHHL Residential Community. The system should allow for service extension to accommodate project phasing.

2.4.4.7 Cable

Connection to cable is expected to be provided in the Proposed Project. Overhead Oceanic Time Warner Cable lines are expected to be relocated underground within the Mākaha Valley Road realignment. Appropriate transitions from overhead to underground will be considered in the design of the project. An appropriate system is expected to be constructed along the development roadways for cable and equipment.

2.5 ENVIRONMENTAL SUSTAINABILITY

The concept of developing a Sustainable Hawaiian Community has been an important aspect of this project from the very beginning.

Sustainability means different things to different people/organizations. DHHL has been at the forefront of pushing sustainability in its most recent "turn-key" residential development on Oʻahu. DHHL's newest project, Kaupuni, a small residential community in Waiʻanae is being designed with net-zero energy homes[10]. Kaupuni implements DHHL's Hoʻomaluō energy policy that includes objectives to protect land, design energy efficient, self-sufficient and sustainable communities and prepare/equip beneficiaries to promote an energy efficient lifestyle. Kaupuni also features an aquaponics system[11] for use by the community. Lessons learned in the development of this, the first turn-key, net-zero subdivision in Hawaiʻi, will be applied to the larger Mākaha DHHL Residential Community.

Kamehameha Schools has also expressed their desire for the KS Learning Community to be a sustainable cultural and educational gathering center that supports the entire Leeward Coast. With the DHHL Residential Community built around the complex, the project is expected to exemplify seamless integration of live, learn, work and play ideals and principles. It is the design intent of the KS Learning Community to blend with the fabric of the existing Mākaha community, incorporating applicable sustainable design concepts into the layout of the educational complex. For example, to maintain the low-density character of the existing development in this portion of Mākaha Valley, the proposed structures are expected to be low-rise. Because of the significance of ʻāina-based learning in teaching indigenous practices that sustain Hawaiian lands and communities, large areas of the KS Learning Community are anticipated to be designated for open space, indigenous gardens, recreational facilities and outdoor gathering areas.

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[10] Net zero energy homes generate on average enough electricity (for example through photovoltaic solar systems on roof tops) to meet projected energy consumption needs within the home.
[11] Aquaponics is the cultivation of plants and aquatic animals in a recirculating environment. The nutrient rich water from fish waste fertilizes cultivated plants and is ultimately returned back to the fish environment.

2.6 PROJECT IMPLEMENTATION

2.6.1 Timing of Action

Project construction is expected to begin in 2013 and should be completed incrementally. The Project Proponent hopes to complete construction in 15 years. However, unforeseen delays may extend completion of construction to 20 years (Table 2-1). A 15-year time horizon was utilized as a base for the preparation of the master plan. Economic, funding, market, development, construction and other factors beyond the Project Proponent's control could extend the project development to 20 years. As such, a 15- to 20-year project phasing timeframe is being assumed. Because this is a joint project, development of the KS Learning Community has been integrated with the development of the DHHL Residential Community. Careful consideration was given to ensure that the construction of adjacent portions of the project occur around the same time whenever possible. This plan affords better connectivity between the DHHL Residential Community and the KS Learning Community.

Table 2-1 Preliminary Project Phasing

Phase	Estimated Time to Complete	Site Development
1	7 -10 years Completed by 2018 - 2021	Approximately 300 homes Community Center Preschool (to support up to 160 students) P-20 Learning Facility (to support up to 120 students) Gathering space Indigenous gardens Sports fields Recreational Biking/Jogging paths On-site Infrastructure (portion) Off-site Infrastructure (portion)
2	8 -10 years Completed by 2026 - 2031	Approximately 300 homes P-20 Learning Facility (expansion to accommodate an additional 1020 students) Sports field expansion Off-site Infrastructure (expansion) On-site Infrastructure (expansion)Cultural Landscape Neighborhood Commercial

2.6.2 Estimated Costs

The estimated infrastructure costs for all increments of the DHHL Residential Community and KS Learning Community is $149,000,000 in 2009 dollars (Table 2-2).

Table 2-2 Estimated Construction Cost

Activity	Cost
Shared Off-site Infrastructure Costs Roadway Water System Drainage Wastewater Electrical	$25,000,000
On-site Infrastructure Costs KS Learning Community DHHL Residential Community	 $34,000,000 $90,000,000
TOTAL COST	$149,000,000

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3.0 RELATION TO PLANS AND POLICIES

State of Hawai'i and City and County of Honolulu land use plans, policies, required permits and approvals relevant to the Proposed Project are described below.

3.1 STATE OF HAWAI'I

3.1.1 State Land Use Law, Chapter 205, Hawai'i Revised Statutes

The State Land Use Law (Chapter 205, HRS), establishes the State Land Use Commission (LUC) and authorizes this body to designate all lands in the State into one of four districts: Urban, Rural, Agricultural, or Conservation. These districts are defined and mapped by the LUC in order to ensure compatibility with neighboring land uses and protection of public health.

Discussion: With the exception of the proposed potable water reservoir site (State Conservation District), all aspects of the DHHL Residential Community and KS Learning Community project are located within the State Urban District (Figure 4).

3.1.2 Coastal Zone Management Act, Chapter 205A, Hawai'i Revised Statutes

The Coastal Zone Management (CZM) Area, as defined in Chapter 205A, HRS, includes all the lands of the State. Therefore, the Proposed Project lies within the CZM Area.

Discussion: The CZM Program aims to provide recreational opportunities, protect historic resources, protect scenic and open space resources, protect coastal ecosystems, provide facilities for economic development, reduce hazards, and manage development. Program objectives and applicability to the proposed DHHL Residential Community and KS Learning Community project are discussed in greater detail section 4.2.4, Coastal Zone Management.

3.1.3 Hawai'i State Planning Act, Chapter 226, Hawai'i Revised Statutes

The Hawai'i State Plan, Chapter 226 HRS (2007) provides guidelines for the future growth of the State of Hawai'i. The Hawai'i State Plan identifies goals, objectives, policies, and priorities for allocating the State's resources, including public funds, services, human resources, land, energy, and water. The plan was enacted to achieve "a desired physical environment, characterized by beauty, cleanliness, quiet, stable natural systems, and uniqueness, that enhances the mental and physical well-being of the people." Chapter 226 HRS (2007).

Discussion: The proposed DHHL Residential Community and KS Learning Community Project is consistent with and implements many of the planning goals and policies specified in Chapter 226, HRS. Section 226-10 sets forth goals relating to support of joint federal and state initiatives to attract federal programs. Section 226-15 sets forth goals

relating to provisioning of adequate sewerage facilities. Section 226-19 sets forth goals and policies directed at providing opportunities for Hawai'i's people to secure affordable homes. Section 226-20 sets forth goals to ensure environmentally healthful and sanitary conditions. Section 226-21 sets forth goals relating to the support of educational programs and activities that enhance personal development, physical fitness, recreation, and cultural pursuits of all groups and promote programs enhancing understanding of Hawai'i's cultural heritage. Section 226-23 sets forth goals relating to the availability of sufficient resources to provide for recreational needs and adequate, accessible physical fitness programs to promote the physical and mental well-being of Hawai'i's people, and support of cultural activities. Section 226-25 sets forth goals relating to the improve knowledge and Hawai'i's cultural heritage and support cultural values. The Proposed Project is consistent with the State's goals for individual and family self sufficiency, social mobility and community well being.

3.1.4 Department of Hawaiian Home Lands, Land Use Designations

DHHL has developed a tiered planning process for lands for its inventory of lands. Because DHHL is not subject to the City and County of Honolulu regulations, including zoning, it was necessary to develop land use designations to guide development within DHHL lands. Being exempt from county zoning provides DHHL with the opportunity as well as the responsibility to ensure that the land designations are appropriate based on the needs of the Department, its beneficiaries, as well as protecting key environmental and cultural resources of the land. DHHL lands are categorized into ten different land use designations, or zones. Four of the designations, residential, subsistence agriculture, supplemental agriculture, and pastoral, are for homesteading. The remaining six designations are general agriculture, special district, community use, conservation, commercial and industrial.

Discussion: Currently, the lands proposed for the DHHL Residential Community development are owned by Ko Olina Mākaha East LLC and Honolulu Ltd. and are subject to county zoning. However, lands will be legally transferred to DHHL prior to construction.

In preparation for the transfer, DHHL has begun its assessment of these lands to determine the identified appropriate land use designations for the DHHL portion of the project site. The Department is in the process of scheduling a beneficiary consultation meeting with Wai'anae Coast beneficiaries. It is expected that the proposed DHHL Residential Community project will be subject to the following DHHL Land Use Designations: Residential, Community Use, Conservation, Commercial and Special District (Figure 6).

The roughly 70 acre parcel proposed for development by KS is subject to City and County of Honolulu regulations.

3.2 CITY AND COUNTY OF HONOLULU PLANS

3.2.1 O'ahu General Plan

The O'ahu General Plan is the policy document for the long-range development of the Island of O'ahu. The O'ahu General Plan is a statement of general conditions to be sought in the 20-year planning horizon and policies to help direct attainment of the plan's objectives.

Specific General Plan goals and policies applicable to the proposed DHHL Residential Community and KS Learning Community project are discussed below.

Housing

Objective A - To provide decent housing for all the people of O'ahu at prices they can afford.

(1) Develop programs and controls which will provide decent homes at the least possible cost.
(2) Streamline approval and permit procedures for housing and other development projects.
(3) Encourage innovative residential development which will result in lower costs, added convenience and privacy, and the more efficient use of streets and utilities.
(5) Make full use of State and Federal programs that provide financial assistance for low- and moderate-income homebuyers.
(7) Provide financial and other incentives to encourage the private sector to build homes for low- and moderate-income residents.
(8) Encourage and participate in joint public-private development of low- and moderate-income housing.
(10) Promote the construction of affordable dwellings which take advantage of O'ahu's year-round moderate climate.

Discussion: The DHHL Residential Community being planned as part of this development is being designed to provide native Hawaiian families with an opportunity to become homeowners. DHHL works on a variety of levels to improve the affordability of homes for its beneficiaries.

DHHL has a shortage of land available for residential development in its O'ahu inventory. By working together with Ko Olina Mākaha East LLC and Honolulu Ltd, KS and DHHL may be able to create an affordable housing community for native Hawaiians on O'ahu that can take full advantage of the educational/cultural/recreational opportunities provided at the KS Learning Community, all within a short walk/bike distance.

DHHL is also actively pursuing federal funds to offset some of the costs for development. Reducing the overall infrastructure cost can ultimately allow DHHL to utilize more of its revenue stream to develop additional new homes and/or preserve existing homes. Some of

the sources that DHHL is expected to likely pursue include the HUD, Native American Housing Assistance and Self Determination Act's and USDA-RD's grant and loan funding programs.

DHHL has developed programs such as the Home Ownership Assistance Program (HOAP). HOAP offers classes, counseling and training to address barriers that native Hawaiians may face in achieving homeownership including: Financial Literacy Services, Job Training and Placement Services, and Addiction Treatment Services. The HOAP program helps transform applicants into future homeowners.

Transportation and Utilities

Objective B – To meet the needs of the people of O'ahu for an adequate supply of water and for environmentally sound systems of waste disposal.

(2) Develop and maintain an adequate supply of water for agricultural and industrial needs.
(5) Provide safe, efficient, and environmentally sensitive waste-collection and waste-disposal services.

Objective C - To maintain a high level of service for all utilities.

(1) Maintain existing utility systems in order to avoid major breakdowns.
(2) Provide improvements to utilities in existing neighborhoods to reduce substandard conditions.

Discussion: A portion of the Proposed Project is located on the existing Makaha Valley Country Club, a golf facility. The golf course currently utilizes non-potable water from an on-site well and reservoir to irrigate the golf course. This non-potable source is expected to be utilized to meet the irrigation requirements of the proposed KS Learning Community, Cultural Landscape, and the biking/jogging greenway (Figure 14). By utilizing this non-potable source, the Proposed Project is expected to reduce its demand for potable water.

The Proposed Project is located within the City and County of Honolulu's Wai'anae Community (Figure 7) planning area. In 1995, the State Clean Water Branch (CWB) and the United States Environmental Protection Agency (EPA) issued a Notice of Violation to the City for failing to comply with the National Pollution Discharge Elimination System (NPDES) permit conditions for pretreatment and discharge. The CWB, EPA and the City entered into a Consent Decree whereby the City agreed to the following:

- come into and maintain compliance with the sections 301 and 307 of the Clean Water Act,
- revise and implement pretreatment program,
- develop a system rehabilitation/reconstruction schedule to prevent and or reduce spills, and
- further the goals of objectives of the Clean Water Act.

According to the Wastewater Division, as part of the consent decree, the wastewater conveyance system in Waiʻanae needs to be rehabilitated to ensure that there is adequate capacity to convey peak wet weather flows safely. In addition, the wastewater conveyance system from Bayview Street to the treatment plant is not adequate based on upstream flow volume potential. The Proposed Project is anticipated to include the installation of a parallel line by KS and DHHL. The proposed sewer conveyance structure improvement project parallel line should not only improve capacity to meet the current needs of the area, it allows the City to respond to upset conditions by transferring the wastewater load between the main and parallel lines to allow for repairs. Quick response to upset conditions can reduce the risk of accidental release or backflow of untreated wastewater from this segment of the system furthering the objectives of the Clean Water Act. The entire Waiʻanae Coast community could benefit from the proposed sewer conveyance structure improvement project.

Energy

Objective C – To fully utilize proven alternative sources of energy.

(1) Encourage the use of commercially available solar energy systems in public facilities, institutions, residences and business developments.

Discussion: DHHL is committed to its Hoʻomaluō energy policy that includes objectives to protect land, design energy efficient, self-sufficient and sustainable communities and prepare/equip beneficiaries to promote an energy efficient lifestyle. DHHL has become an industry leader in the incorporation of energy saving production measures. The newly constructed DHHL Kaupuni subdivision homes are designed to consume net zero energy through the use of both energy conservation measures, and production of energy. The successes of the Kaupuni project will be studied and incorporated into the design of the proposed DHHL Residential Community project in Mākaha. DHHL will also be looking at the missed opportunities, problems and/or failures from the Kaupuni project, to learn and apply to the Proposed Project. In addition, DHHL has entered into a partnership with HECO to incorporate energy efficiency into their homes. A commitment to sustainability and energy efficiency can ultimately be translated into lower energy cost for the homeowner, as well as reduce air pollution and the dependence on fossil fuels.

Health and Education

Objective B – To provide a wide range of educational opportunities for the people of Oʻahu.

(1) Support education programs that encourage the development of employable skills.
(2) Encourage the provision of informal educational programs for people of all age groups.
(3) Facilitate the appropriate location of learning institutions from the preschool through the university levels.

Discussion: The KS Learning Community at Mākaha is expected to be a sustainable, cultural and educational gathering center that will support the entire Leeward Coast. It can serve as a model for delivery of an innovative and collaborative educational program for learners of all age groups that is integrated with public and private educational facilities, programs and opportunities along the Leeward Coast and beyond. While the complex is still conceptual at this stage, it is envisioned as a multi-generational learning venue that blends the best of indigenous and western knowledge and experiences. The KS Learning Community would, however, first and foremost, serve the youngest of learners (ages 0-5) and their families through early learning facilities. The educational complex is expected to have some classroom instruction for students and teachers, in the P-20 (prenatal through post high school instruction) range, as well as hands-on, *ʻāina*-based (place-based) education to teach indigenous practices to sustain Hawaiian lands and communities. The complex is also expected to include a multi-media lab, dining hall, P-20 classrooms, learning halls, and indigenous gardens.

3.2.2 Waiʻanae Sustainable Community Plan

The City and County of Honolulu has adopted the Waiʻanae Sustainable Community Plan (WSCP) as one of eight community-oriented plans to guide public policy, investment and decision making through the 2025 planning horizon. The WSCP was developed by Department of Planning and Permitting (DPP) and its consulting team in partnership with the community. The document contains policies specific to the Waiʻanae Coast. These policies are then adopted through ordinances. The current WSCP was adopted in 2000. In 2008, with community input, the City and County of Honolulu along with their consultants began revising the plan. The Public Review Draft of the WSCP was made available for review in October 2008. The Public Review Draft WSCP has not yet been adopted by the City and County of Honolulu.

The WSCP and the Public Review Draft WSCP include recommendations to incorporate Native Hawaiian Values into plans, develop community gathering places, develop and support community-based business, coordinate with DHHL, and consider the multi-purpose function of educational facilities. The Draft WSCP "inside the vision statement" clearly identifies the importance of providing for the needs of the children of the Waiʻanae Coast, the importance of place, a good social, spiritual and social environment, and the importance of family. The vision in both the current and Draft WSCP also point to the importance of providing educational opportunities that are compatible with the ways or styles of learning of the children of the Waiʻanae Coast.

Discussion: The project as proposed closely matches the Vision and Community Values as described in the current WSCP, and the Vision (including "Inside our Vision" and "Native Hawaiian Connection to the Land") and Key Concepts of the Public Review Draft WSCP. During a pre-consultation meeting, the Department of Planning and Permitting requested the project proponent submit information describing the project's consistency with the Draft WSCP. A summary of the projects consistency follows:

The KS Learning Community and DHHL Residential Community are being developed to help meet the needs of N(n)ative Hawaiians by addressing the needs of the family through educational. Both DHHL and KS recognize that the Leeward Coast is home to the largest Native Hawaiian population in the world, and that any programs developed along the coast should incorporate the values of the community. At the forefront is the need to provide educational opportunities that work in concert with the existing educational structure on the Wai'anae Coast. It is KS, DHHL and Ko Olina Mākaha East LLC and Honolulu Ltd's desire that the KS Learning Community serve as a catalyst to build upon successful programs already in the community, and to attract other resources to the Leeward Coast to help bridge any gaps that exist. KS has begun a two-year community planning effort designed to engage the community in the refining of the educational programs for their facilities to assure they meet the needs of the coast. While the detailed program for the KS Learning Community is not yet set, it is clear that whatever is developed, is expected to allow children, their families, educators, and the entire community to be engaged in life-long learning in a supportive environment that is based on the natural landscape, with the goal of lifting the level of education and well-being of the entire community.

In the planning for the development of the KS Learning Community, great care has been taken to look at opportunities for the community to gather within the proposed educational complex. While development of programming for the KS Learning Community is still being refined, the planned recreational areas and *piko* within the KS Learning Community may be consistent with meeting some of the needs of the community gathering space described in the WSCP, with the added benefit of being maintained by a private, and not a public, entity.

At full build out, the KS Learning Community is anticipated to have a staff of approximately 300. In addition, the DHHL Residential Community is anticipated to include two community centers, one which may include a small "mom-and-pop store", and another providing Native Hawaiian, and other community services, that can provide both employment and small business opportunities. The project provides both short- and long-term employment, which may provide opportunities for community members to work near where they live, reducing the time spent each day during work-related commutes and improving quality of life.

3.2.3 Makaha Special Area Plan

Special Area Plans are generally intended to give communities the opportunity to define the identity, function, organization, and character of their specific neighborhoods in accordance with the general planning framework provided by their area's Development or Sustainable Communities plan (in this case, the *Wai'anae SCP*).

The *Mākaha Special Area Plan* (SAP) was prepared pursuant to the recommendations of the *Wai'anae SCP* adopted in 2000. The *Wai'anae SCP* recognized that a large portion of Mākaha Valley was designated State Land Use Urban, contained large undeveloped parcels, and was identified by some residents as an important resource area for water, rare

and endangered plants and animals, and cultural sites. The objective of *Mākaha SAP* was to balance preservation of the Mākaha Valley's character with the existing urban zoning, and to provide guidance for future projects and actions. The *Mākaha SAP* also suggested the creation of a partnering process through which major stakeholders can formulate an agreement for further cooperative actions. Also, the study presents a concept plan addressing the character of the Valley, environmental protection, open space preservation, land use compatibility, and circulation.

The *Mākaha Special Area Plan* has not been adopted by the City Council.

3.2.4 Land Use Ordinance

The Land Use Ordinance (LUO) implements the goals and objectives of the Oʻahu General Plan and the *Waiʻanae SCP*. All lands within the City and County of Honolulu are zoned into specific districts. According to the DPP, the KS Learning Community portion of the project is zoned R-20 (Residential), and the DHHL portion of the project is zoned P-2 (Preservation), Country and Ag-2 (General Agriculture).

P-2 The area zone is located at the proposed DHHL development. The purpose of the preservation districts are to preserve and manage major open and recreation lands, as well as lands of scenic and other natural resource value. It is the intent that lands designated urban by the state, but well-suited to the functions of providing visual relief and contrast to the city's built environment or serving as outdoor space for the public's use and enjoyment be zoned P-2 general preservation district.

C The area zone is located at the proposed DHHL development. The purpose of the country district is to recognize and provide for areas with limited potential for agricultural activities but for which the open space or rural quality of agricultural lands is desired. The district is intended to provide for some agricultural uses, low density residential development and some supporting services and uses.

AG-2 The area zone is located at the proposed DHHL development. The purpose of the AG-2 general agricultural district is to conserve and protect agricultural activities on smaller parcels of land. The LUO developed the following guidelines for identifying lands for consideration for the Ag-2 general agriculture district:

> *(1) Lands which are in the State-designated agricultural or urban district and designated agricultural by adopted City land use policies; (2) Lands which are predominantly classified as other under the agricultural lands of importance to the State of Hawaii system; and (3) Lands which are used or are suitable for agricultural purposes and where a substantial number of parcels are less than five acres in size.*

While a portion of the proposed DHHL development is located with an area zoned AG-2, it is currently designated as a golf course in the WSCP. The Proposed Project area does not include any lands of agricultural importance to the State of Hawaiʻi.

R-20 The area zoned R-20 is located within the area proposed for the KS Learning Community. The intent of R-20 is to provide areas for large lot development.

According to the LUO Master Use Table (Table 21-3), utility installations are permitted in all zoning districts regulated by the City and County of Honolulu. In addition, schools catering to elementary, middle or high school age children are permitted under a Conditional Use Permit-Minor in districts zoned R-20. Based on the siting of the existing 525 elevation potable water reservoir, the proposed reservoir is consistent with relevant zoning and land uses.

The sewer conveyance structure improvement project is also located within the Coastal High Hazard District, and Flood Fringe Districts. These have been described in Section 3.5, Natural Hazards.

Discussion: The KS Learning Community project is permitted in the R-20 and other residential-zoning districts with a Conditional Use Permit. The parcels proposed for inclusion in the DHHL land inventory are not subject to City and County of Honolulu zoning but are consistent with the DHHL land use designations.

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4.0 DESCRIPTION OF THE NATURAL AND HUMAN ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATIVE MEASURES

This section describes the existing conditions of the natural and human environment, potential impacts of the DHHL Residential Community and KS Learning Community Project to these environments, and mitigation measures to minimize impacts.

4.1 STATE OF HAWAIʻI ENVIRONMENTAL IMPACT STATEMENT LAW

4.1.1 Climate

Oʻahu's geological features heavily influence its climate. The Waiʻanae Mountain Range dominates ground-based atmospheric influences within Mākaha Valley. Located on the northwest coastline of Oʻahu, Mākaha is generally warm and dry.

The average daily temperature ranges from 70 to 90 degrees Fahrenheit with an average rainfall of approximately 32 inches per year in the valley, and a little over 20 inches per year at the coast (NOAA, 2010). Trade winds are typical of the Hawaiian Islands, blowing predominantly from a northeast direction, and averaging approximately seven (7) miles per hour (mph). The tradewinds are generated by semi-permanent Pacific high-pressure cells; however, their impact is less prominent in Mākaha, as the Waiʻanae Mountain Range obstructs winds from Oʻahu's windward coast from making their way over to the leeward side. In the absence of the trades, or winds from the southwest associated with "Kona" storms occurring predominately in the winter months, winds in Mākaha are generally light to variable. For the most part, the diurnal heating and cooling of the island gives rise to light onshore sea breezes during the day, and gentle offshore land breezes at night.

Potential Impacts and Mitigation Measures

The project as proposed is not anticipated to have significant impact on regional climatic conditions. Some localized temperature increases resulting from paved surfaces and roof tops are to be expected. Based on the Proposed Project design, approximately 26 acres within the proposed DHHL Residential Community project site are planned for designation as preservation/open space along ʻEku Stream and in an area proposed for storm water detention. Nearly 81 acres are being proposed by DHHL for a cultural landscape that is expected to have minimal impervious surfaces. Within the KS Learning Community, roughly 25 of the approximately 70 acre complex is expected to be paved or covered by facilities. Not including residential landscaping, over 1/3 of the project area will be free of structures and should not result in significant temperature increases from roadways and buildings. No additional mitigation measures are planned.

4.1.2 Geology and Topography

Geology

The Island of Oʻahu was formed by two volcanoes; Koʻolau to the east and the older Waiʻanae, to the west. The volcanoes are believed to have formed during the late tertiary to early Pleistocene periods (Macdonald et al., 1983). The Waiʻanae Volcano is thought to be approximately 4 million years old with the caldera located in what is now the Lualualei valley. Extensive erosion and stream activity carved deep valleys into the mountain range. The Proposed Project is located within the Mākaha Ahupuaʻa, part of the Waiʻanae Mountain Range. The valley is flanked by two major ridges, the Puʻu Keaʻau to the west and Puʻu Kamaileʻunu to the east. The Proposed Project is adjacent to Puʻu Kamaileʻunu ridge. The ridge is of basaltic origin, and is known locally as the pāhoehoe formation.

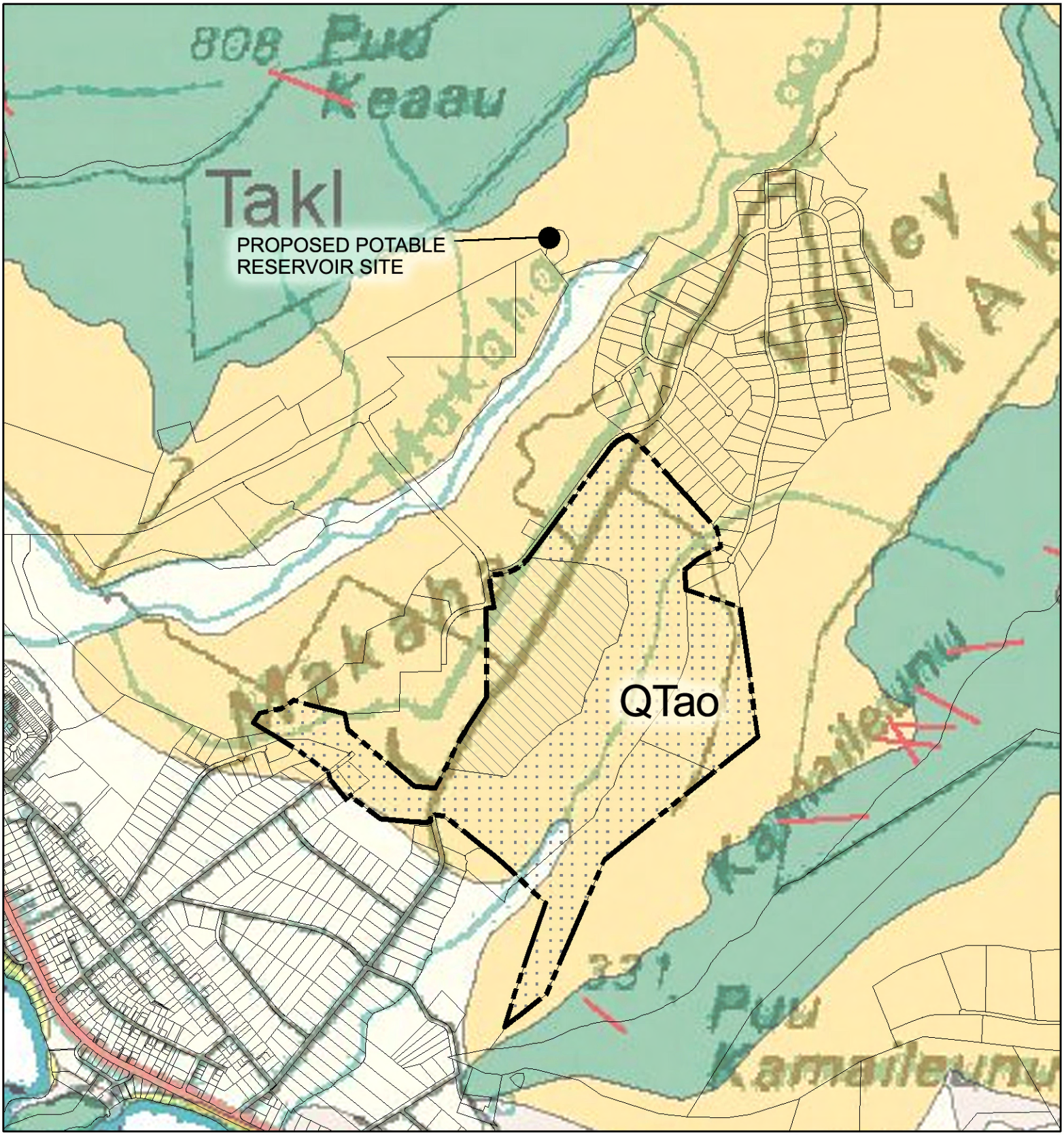
Fossilized coral reefs are also an important component of the geology of the Hawaiian Islands. According to Macdonald et al. (1983), "The emerged reefs on Oʻahu are more extensive than those of any other of the Hawaiian Islands". Most of the southern edges of Oʻahu are underlain by a broad, elevated coral reef. The plains were formed from emerged coral reefs and alluvial deposits that developed along the southern edge of the island during interglacial sea level highs. Most of the fossil reefs of southern Oʻahu are about 25 feet above current sea level, and reef limestone extends up to 66 feet above sea level, and covered by approximately ten feet of sand near Mākaha and Waiʻanae (Macdonald et al., 1983). It has been suggested that, historically, sea level changes in Hawaiʻi may have ranged from 250 feet above present levels to as low as 300 feet below current sea levels. Various other sedimentary deposits intersperse the nearby shoreline. These include Holocene beach deposits and alluvium, which are composed mainly of unconsolidated sediment, and are mostly found along the coastline and in drainage ways.

According to the U.S. Geological Survey (USGS), the Proposed Project site, and the site of the proposed reservoir are underlain by older alluvium from the Pleistocene and Pliocene epochs. The proposed sewer line is underlain by calcareous reef rock and marine sediment (Qcrs) and beach deposits (Qbd) from the Pleistocene and Holocene epochs respectively (Figures 16 and 17).

Topography

The Proposed Project lies in a valley at the base of the 22 mile long Waiʻanae Mountain Range. The range, a rugged, mountainous sequence of tapered ridges with very steep slopes, is the remnant of a now dormant shield volcano. The highest point on the Waiʻanae mountain range, and of Oʻahu, is Mt. Kaʻala, rising 4,025 feet above sea level. The Proposed Project is located approximately 80 to 430 feet above mean sea level (msl). A majority of the project area is relatively level with gentle slopes. However, portions of the eastern boundary of the proposed DHHL Residential Community are nestled against Kamaileʻunu Ridge and the terrain is moderately sloped.

The topography has been affected by natural and man-made drainage features. ʻEku Stream (also known as ʻEku Gulch or East Mākaha Stream), meanders through the Proposed Project. While the stream is typically dry, it flows during heavier rain events. At its "head



LEGEND

- QTao: Older Alluvium (Pleistocene and Pliocene)
- Project Site
- DHHL Residential Community
- Kamehameha Schools Learning Community

Source: Sherrod et al (2007): USGS Geologic Map of the State of Hawai'i.
Disclaimer: This graphic has been prepared for general planning purposes only.

FIGURE 16

Geologic Map

DHHL Residential Community / KS Learning Community

MĀKAHA, ISLAND OF OAHU

NORTH

LINEAL SCALE (FEET)

0 750 1,500 3,000

PBR HAWAII & ASSOCIATES, INC.

JAN 2010

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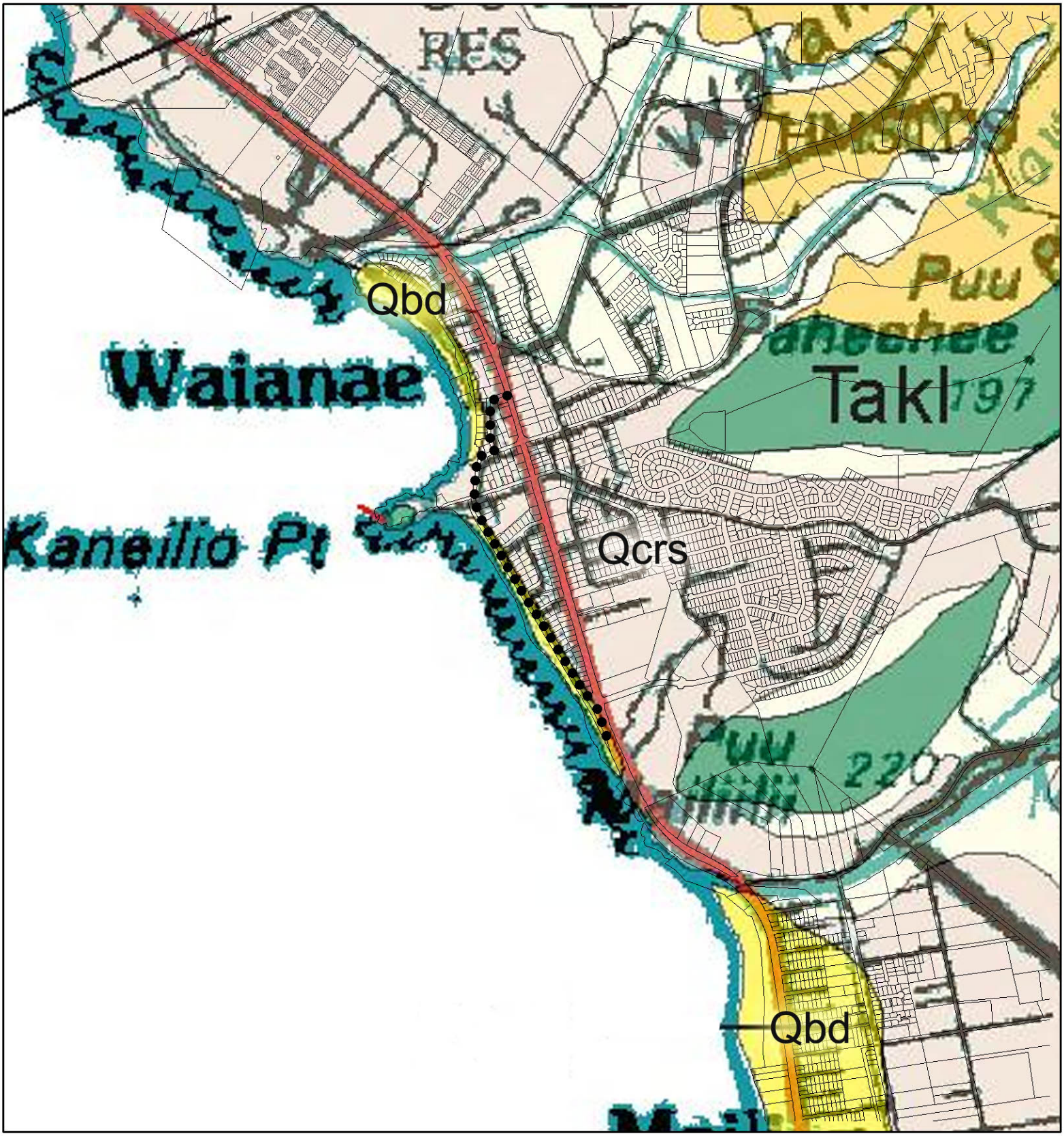

LEGEND

- Qcrs: Calcareous Reef Rock and Marine Sediment (Pleistocene)
- Qbd: Beach Deposits (Holocene)
- ●●●●● Sewer Line for Improvement

FIGURE 17

Geologic Map

DHHL Residential Community / KS Learning Community
Offsite Sewer Improvement

ISLAND OF OAHU

NORTH

LINEAL SCALE (FEET)
0 750 1,500 3,000

PBR HAWAII & ASSOCIATES, INC.

DEC 2009

Source: Sherrod et al (2007): USGS Geologic Map of the State of Hawai'i.
Disclaimer: This graphic has been prepared for general planning purposes only.

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waters," 'Eku Stream is a shallow depression graded into the golf course landscape, capturing storm water runoff from the adjacent residential community upstream of the site through various pipes and manmade conveyance structures, as well as natural runoff from Kamaile'unu Ridge. Rain and storm water channeled into 'Eku Stream have cut the surrounding area, creating steep stream banks up to 40 feet deep in some areas.

The topography of the Proposed Project area has been influenced by water distribution and grading activities of the previous and existing land owners and managers. The existing topography of the areas proposed for the DHHL Residential Community has been graded and modified to create an 18-hole golf course. The topography of the Proposed Project area, both the areas proposed for the DHHL Residential Community, and development of a KS Learning Community, was probably heavily altered by plantation era sugar cane production. The landscape was graded for fields and plantation housing. Drainage diversions, water distribution and water storage systems were also created.

Portions of the proposed sewer conveyance structure improvements are located in roadway corridors located makai of Farrington Highway at the base of Wai'anae Valley, near the shoreline. As proposed, the sewer conveyance structure improvements will occur entirely within the right-of-ways of the portions of the streets affected. No encroachment outside of the right-of-ways towards the shoreline is expected.

Potential Impacts and Mitigation Measures

While some grading is likely necessary to accommodate the Proposed Project, much of the site is relatively flat or already extensively graded to create the Makaha Valley Country Club (golf course). To the extent possible, improvements are expected to conform to the existing contours of the land to limit grading. Grading plans will attempt to balance excavation and embankment quantities to the extent practicable. Appropriate engineering, design, and construction measures will be undertaken to minimize potential erosion of soils during construction. All ground-altering activities are expected to incorporate appropriate erosion and sedimentation control. Adverse impact to topography and landforms, attributable to grading activity, is not anticipated at the KS Learning Community, the DHHL Residential Community, Mākaha Valley Road realignment, the potable water reservoir installation, or the sewer conveyance structure improvement corridor.

4.1.3 Ground Water Resources/Hydrology

According to the Groundwater Protection Strategy for Hawaii (Mink, J.F. and L.S. Lau, 1990), the upper and lower aquifers below the DHHL Residential Commuinty and KS Learning Community are part of the Mākaha aquifer system of the Wai'anae sector, on the island of O'ahu. The aquifer below the northern portion of the the Proposed Project area is either a confined or an unconfined (actual condition is uncertain) high level aquifer of the dike type, occurring in dike compartments. Its status is described as an irreplaceable water supply with fresh salinity (<250 milligrams per liter [mg/L] Chloride) that is currently used. The aquifer below the southern portion of Proposed Project area is an unconfined basal aquifer of the dike type, occurring in dike compartments. Its status is described as an

irreplaceable water supply with fresh salinity that is currently used. Based on the 1998 USGS, Waiʻanae, Hawaiʻi, 7.5-minute topographic quadrangle map, the estimated depth to first groundwater ranges from approximately 140 feet below ground surface (bgs) in the southern portion to approximately 230 feet bgs in the northern portion. The regional groundwater flow direction is inferred to follow surface topography and flow in a southwestern direction towards the Pacific Ocean coastline at Lahilahi Point. However, the local gradient and flow direction under the property may be influenced naturally by zones of higher or lower permeability, tidal changes, or by nearby pumping or recharge, and may deviate from the regional trend.

Modifications to the land by previous land managers and owners have significantly changed the hydrology of Mākaha Valley. A number of man-made reservoirs were installed in the center of the valley to control runoff and provide water for irrigation and other activities. The valley topography was dramatically altered in the 20th century to meet the needs of the sugar cultivators, and later, golf course design. Natural water sources that fed the historically perrennial Mākaha Stream and the Kamaile spring were capped or diverted for sugarcane, and then Board of Water Supply uses. Cutoff ditches diverted flow away from the natural drainage pattern as new residential developments entered into the valley.

Potential Impacts and Mitigation Measures

The proposed development will result in an increase in impervious area. The increase in impervious area may result in a reduction in water infiltration. However, storm water best management practices, including detention ponds and water quality swales will help to mitigate the impacts. Mitsunaga and Associates, Inc., a civil engineering firm, was retained to address groundwater and hydrology issues. Detention basins are planned for development to maintain the existing design storm peak flows exiting the project site. The potential drainage impacts and mitigation are described in greater detail in section 4.1.14.3. Where possible, groundwater infiltration rates will be maximized through the implementation of various sustainability features. These could include landscaping features, pervious pavement, vegetative swales, etc.

Protection of ground water quality is also a concern. During construction, best management practices should be implemented to reduce the potential for storm water pollution. Once operational, both the DHHL Residential Community and the KS Learning Community projects are anticipated to establish management plans to ensure that any hazardous materials utilized are properly stored to reduce the potential for spills. Appropriate spill prevention control and counter measures planning can reduce the potential of spills and releases that may impact the groundwater. Should a release of a hazardous material to the environment occur, the release will be properly reported as required and appropriate clean-up conducted. The State Department of Health, Clean Water Branch (CWB) has developed a variety of warning advisories, workshops and presentations that are available to educate people about water pollution.

4.1.4 Soils and Agriculture Impact

Three soil suitability studies prepared for lands in Hawai'i principally focus on the relative agricultural productivity of different land types. These studies are: 1) the U.S. Department of Agriculture Natural Resource Conservation Service (NRCS) Soil Survey; 2) the University of Hawai'i Land Study Bureau (LSB) Detailed Land Classification; and 3) the State Department of Agriculture's Agricultural Lands of Importance to the State of Hawai'i (ALISH).

4.1.4.1 Natural Resources Conservation Service (NRCS)

According to the United States Department of Agriculture NRCS's Soil Survey of Islands of Kaua'i, O'ahu, Maui, Moloka'i and Lāna'i, State of Hawai'i, 1972, the soils of the KS Learning Community and DHHL Residential Community project and Mākaha Valley Road realignment are classified as *'Ewa Stony Silty Clay (A and B Series), Lualualei Stony Clay (Stony and Extremely Stony Series), Rock Land, and Stony Land.* The soils Series associated with the location selected for the proposed reservoir is classified as "*other*" (Figure 18). The Series of soils associated with the sewer conveyance structure improvement project are classified as *'Ewa Silty Clay Loam*, *Mokulē'ia Clay*, *Pūlehu Clay Loam* and *Beaches* (Figure 19).

'Ewa Stony Silty Clay (EwA), 'Ewa Stony Silty Clay (EwB) and 'Ewa Silty Clay Loam, Moderately Shallow (EmB) - The 'Ewa series of soils are deep, well-drained soils that formed in alluvium weathered from basaltic rock. According to the NRCS, "'Ewa soils are on alluvial fans and terraces and have slopes of 0 to 12 percent". These series of soils are found in areas where the mean annual rainfall is about 24 inches, and the mean annual temperature is about 73 degrees Fahrenheit. 'Ewa Stony Silty Clay (EwA) soils are found in areas where the land typically slopes between 0-2% and both 'Ewa Stony Silty Clay (EwB) and 'Ewa Silty Clay Loam, Moderately Shallow (EmB) soils in areas with slopes between 2-6%.

Lualualei Stony Clay (LvB) and Lualualei Extremely Stony Clay (LPE) - According to the NRCS, the Lualualei series of soils consists of "deep, well-drained soils that formed in alluvium and colluviums from basalt and volcanic ash. Lualualei soils are on fans and talus slopes and have slopes of 0 to 25 percent". These types of soils are found in areas in which annual rainfall is about 24 inches and mean annual temperature is about 75 degrees Fahrenheit. Specifically, Lualualei Stony Clay (LvB) occurs in areas in which slopes equal 2-6%, and Lualualei Extremely Stony Clay (LPE) in areas in which slopes are around 3-35%.

Rock Land (rRK) and Stony Land (rST) - Rock lands are characterized as areas where exposed rock covers 25-90% of the surface, with rock outcrops of basalt and andesite and shallow soils being the main characteristics. Rock lands are suitable for pasture, wildlife habitat and water supply.

Mokulēʻia Clay (Mtb) - According to the NRCS, the Mokulēʻia series of soils consists of well-drained soils that formed in recent alluvium deposited over coral sand. Mokulēʻia soils are on coastal plains and have slopes of 0 to 2 %. The mean annual rainfall is about 40 inches and the mean annual temperature is about 74 degrees Fahrenheit.

Pūlehu Clay Loam (PsA) 0-3% Slopes - The Pūlehu series is made of soils which are well-drained, and formed from alluvium washed from basic igneous rock. Pūlehu soils are on alluvial fans and stream terraces and in basins and have slopes of 0 to 12%. Rainfall in regions where this type of soil is found reaches about 25 inches annually on average, and the mean annual temperature is about 74 degrees Fahrenheit.

Beaches - Beaches are described as sandy, gravelly, or cobbly areas washed by ocean waves. They are considered highly suitable for recreational uses and resort development.

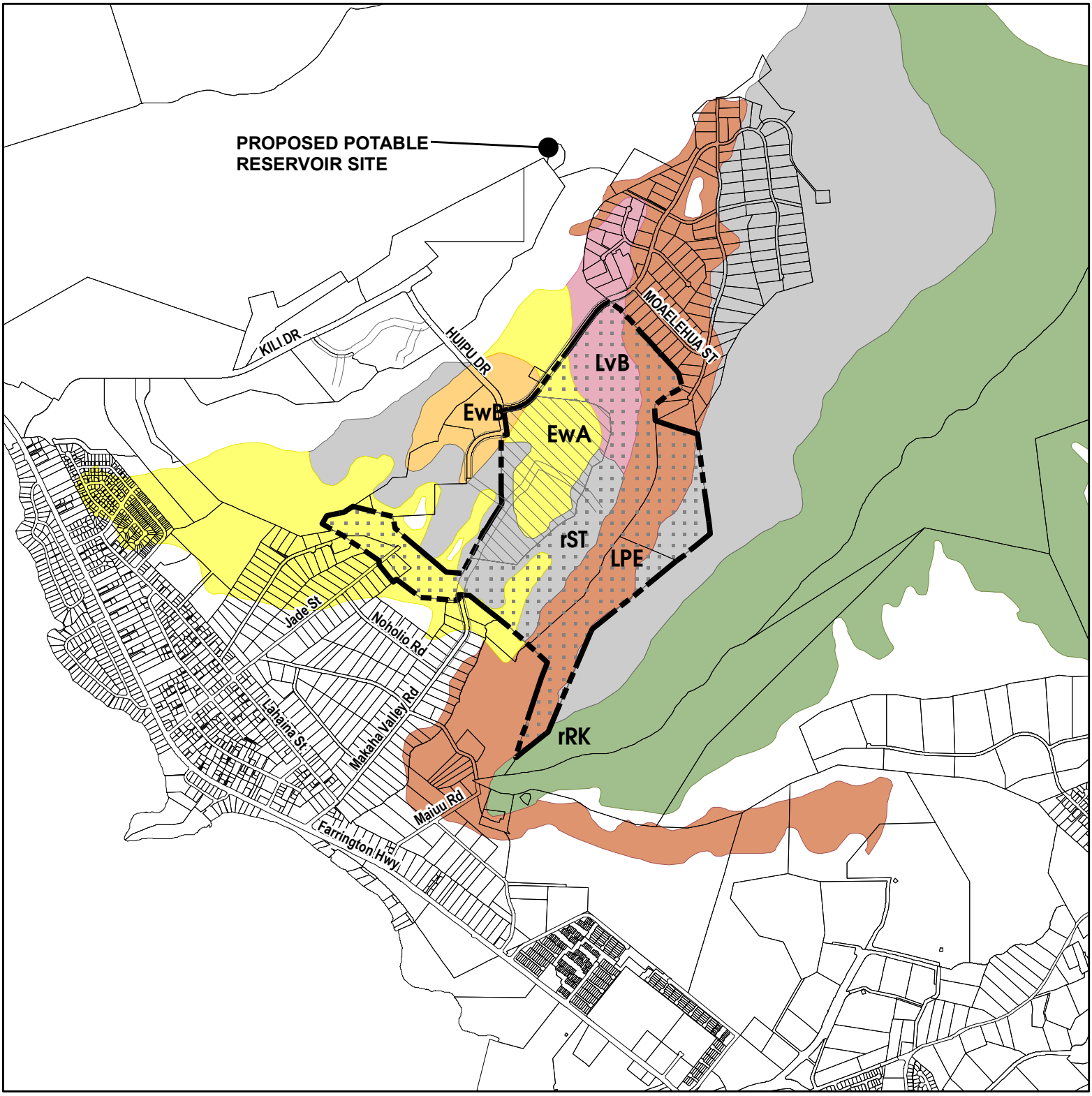
4.1.4.2 Land Study Bureau (LSB) Detailed Land Classification

The University of Hawaiʻi LSB document, *Detailed Land Classification, Island of Oʻahu,* classifies soils based on a cultivated crop productivity rating. Letters indicate class of productivity, with A representing the highest class, and E the lowest.

The Detailed Land Classification, Island of Oʻahu, prepared by the University of Hawaiʻi LSB, does not classify any portion of the KS Learning Community and DHHL Residential Community Project site, Mākaha Valley Road realignment, or the proposed reservoir site as significant productive agricultural lands (Figure 20). Likewise, the site of the proposed sewer conveyance structure improvement project does not have any portions of lands under any type of agricultural productivity rating (Figure 21), because all of the above areas were already urbanized when the Land Study Bureau completed their study in 1972.

4.1.4.3 Agricultural Lands of Importance to the State of Hawaiʻi (ALISH)

The ALISH system classifies important agricultural lands as Prime, Unique, or Other Agricultural Land. Lands classified as "Other" Important Agricultural Land represent lands which may have some agricultural significance however; they exhibit properties, such as seasonal wetness, erodibility, limited rooting zone, excessive slope, flooding, or doughtiness, which exclude them from the Prime or Unique Agricultural Land classifications. These lands can be farmed satisfactorily by applying greater inputs of fertilizer and other soil amendments, drainage improvement, erosion control practices, flood protection and produce fair to good crop yields when managed properly. The remaining lands that do not meet the criteria for Prime, Unique, or Other are not classified as agricultural lands of importance to the State. According to the ALISH system, the soils underlying the proposed DHHL Residential Community, KS Learning Community, and proposed sewer conveyance structure improvement corridor are not classified and are therefore not considered important agricultural lands. The proposed potable water



LEGEND

- EwA: Ewa Stony Silty Clay, 0-2% Slopes
- EwB: Ewa Stony Silty Clay, 2-6% Slopes
- LvB: Lualualei Stony Clay, 2-6% Slopes
- LPE: Lualualei Extremely Stony Clay, 3-35% Slopes
- rRK: Rock Land
- rST: Stony Land
- Others

- Project Site
- DHHL Residential Community
- Kamehameha Schools Learning Community

Source: U.S. D. A. Natural Resources Conservation Service
Disclaimer: This graphic has been prepared for general planning purposes only.

FIGURE 18

NRSC Soil Survey Map

DHHL Residential Community / KS Learning Community

MĀKAHA, ISLAND OF OAHU

NORTH

LINEAL SCALE (FEET)
0 1000 2000 4000

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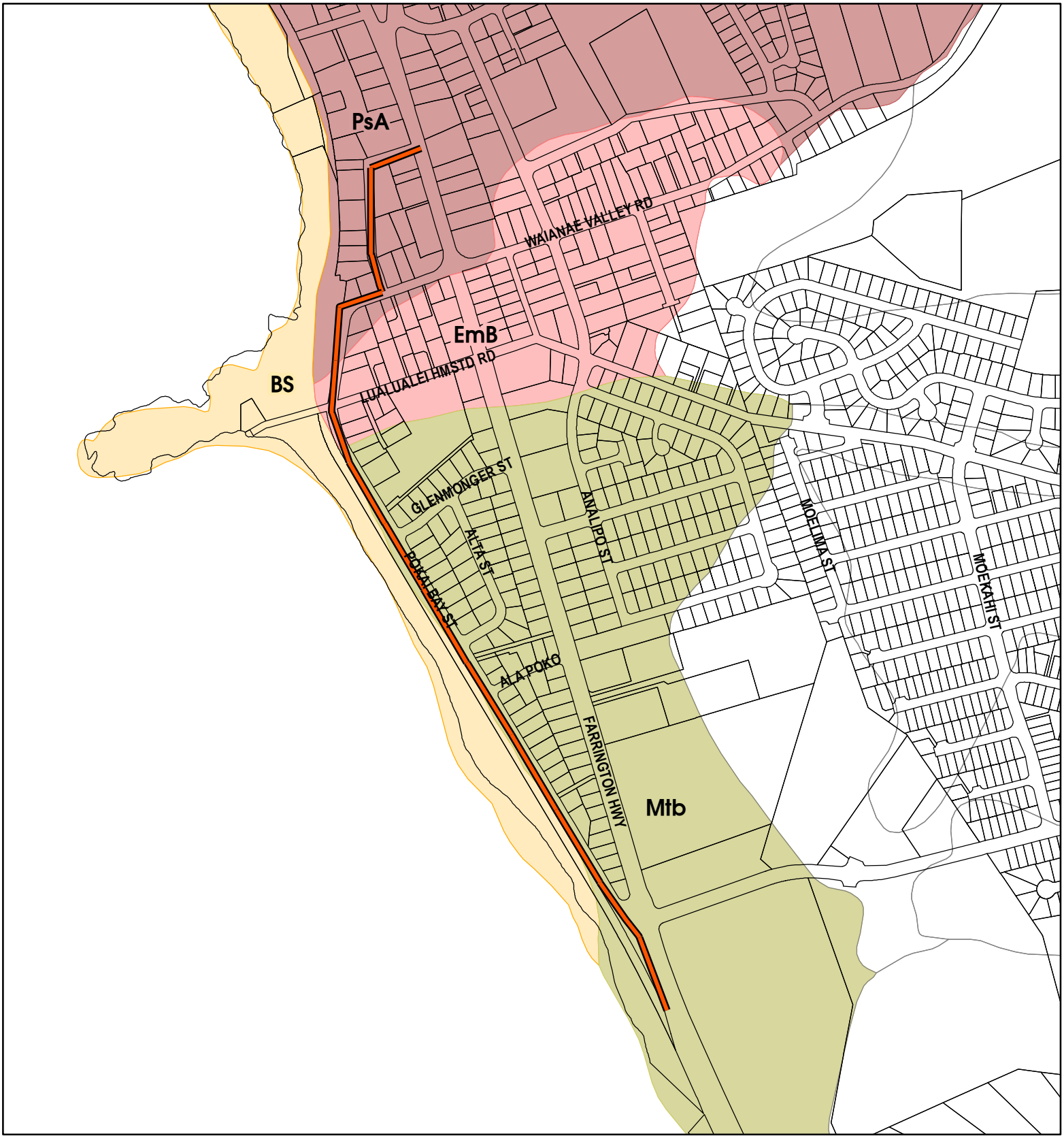

LEGEND

- EmB: Ewa Silty Clay Loam, Moderately Shallow, 2-6% Slopes
- Mtb: Mokuleia Clay
- PsA: Pulehu Clay Loam, 0-3% Slopes
- BS: Beaches
- Others
- Sewer Line for Improvement

Source: U.S. D. A. Natural Resources Conservation Service
Disclaimer: This graphic has been prepared for general planning purposes only.

FIGURE 19

NRCS Soil Survey Map

DHHL Residential Community / KS Learning Community Offsite Sewer Improvement

ISLAND OF O'AHU

NORTH

LINEAL SCALE (FEET)

0 150 300 600 1,200

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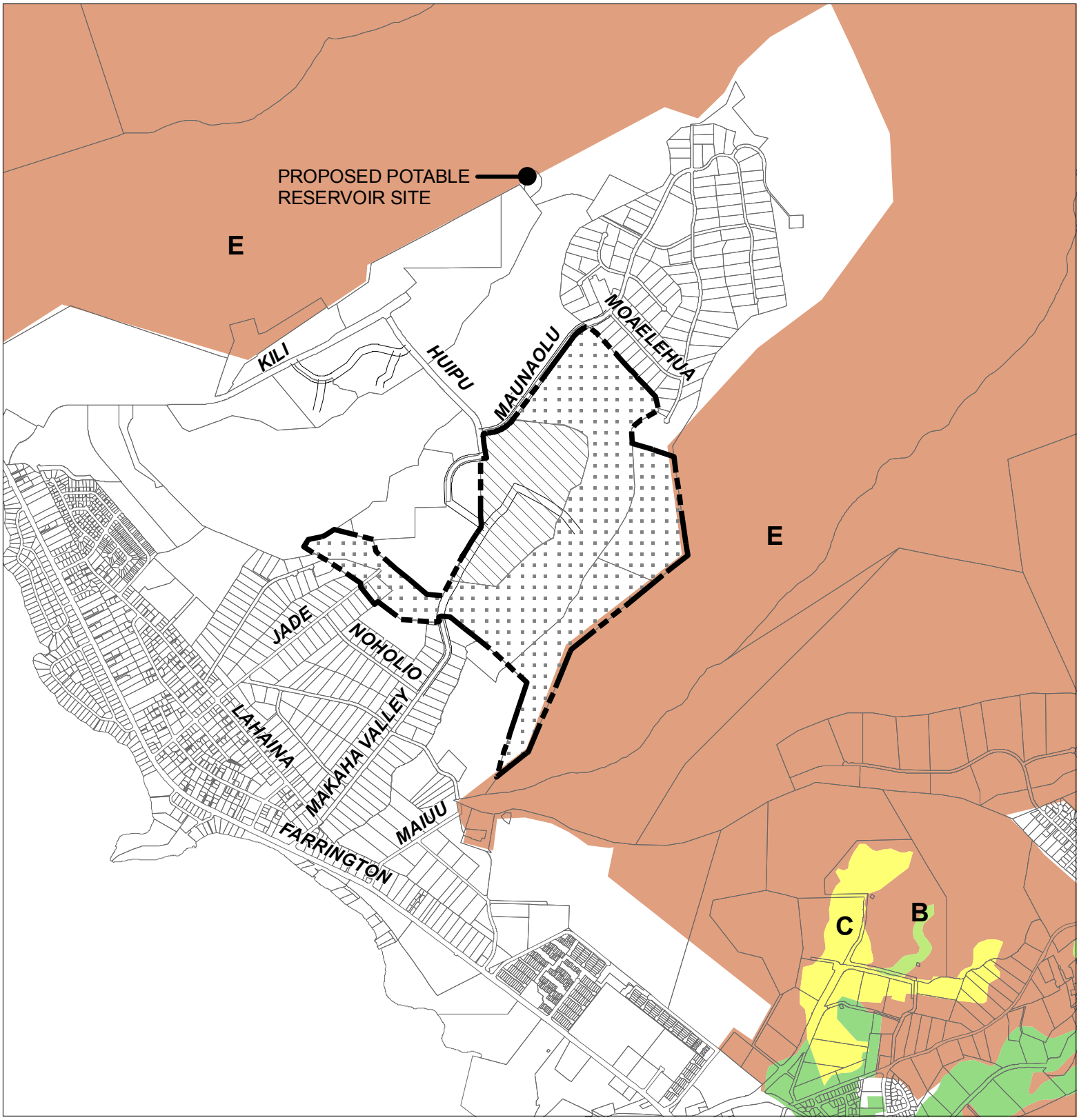

LEGEND

- Project Site
- DHHL Residential Community
- Kamehameha Schools Learning Community
- A : Excellent
- B : Good
- C : Fair
- D : Poor
- E : Very Poor

FIGURE 20

Land Study Bureau's Detailed Agricultural Land Productivity Ratings

DHHL Residential Community / KS Learning Community

ISLAND OF O'AHU

NORTH

LINEAL SCALE (FEET)

0 1000 2000 4000

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Source: City County Honolulu Tax Map Key, 2008 (GIS);
Land Study Bureau's Detailed Agricultural Land Productivity Ratings (LSB), State of Hawaii, 2008 (GIS)

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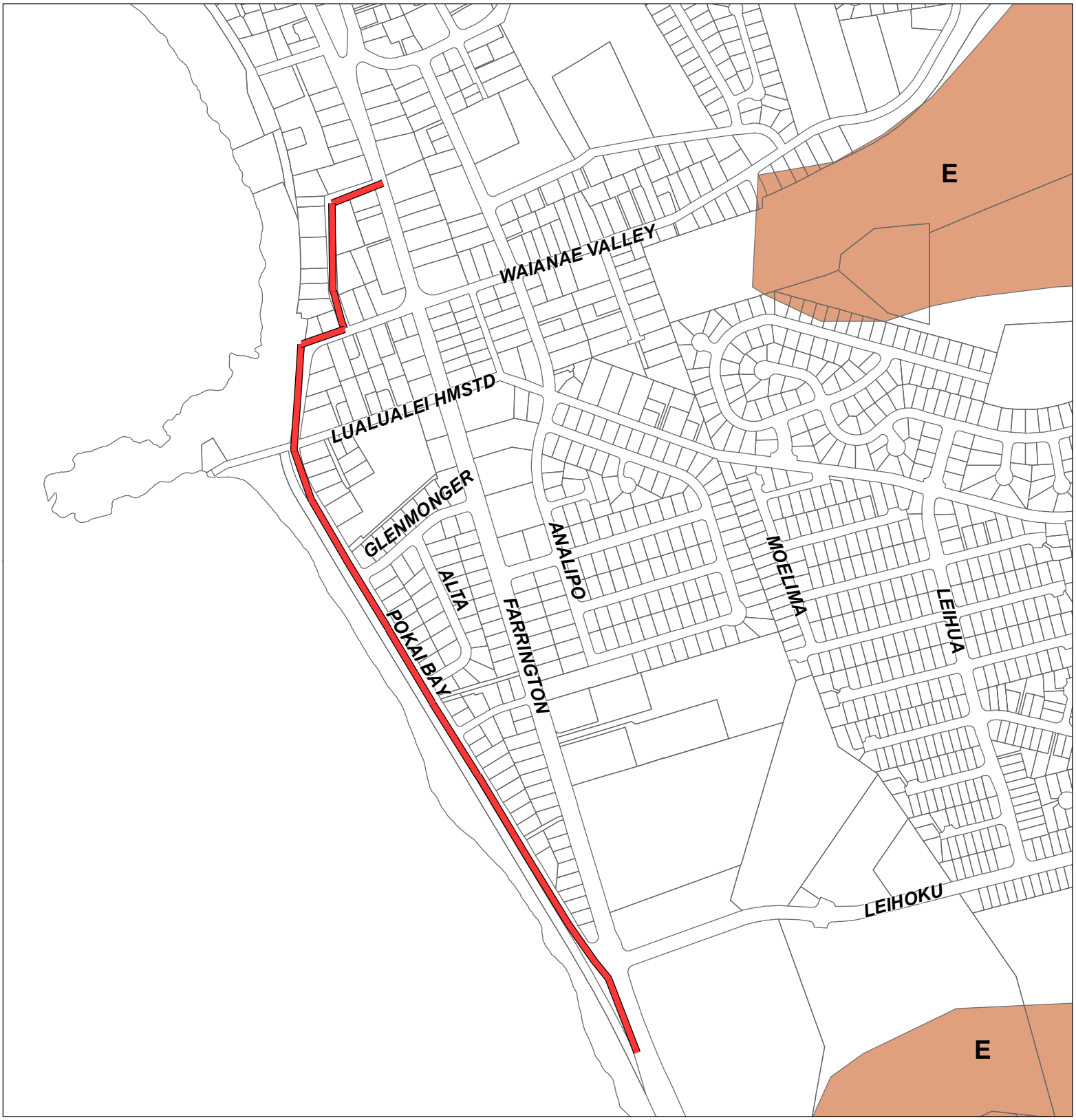

LEGEND

- Sewer Line for Improvement
- A : Excellent
- B : Good
- C : Fair
- D : Poor
- E : Very Poor

Source: City County Honolulu Tax Map Key, 2008 (GIS);
Land Study Bureau's Detailed Agricultural Land Productivity Ratings (LSB), State of Hawaii, 2008 (GIS)
Disclaimer: This graphic has been prepared for general planning purposes only.

FIGURE 21

Land Study Bureau's Detailed Agricultural Land Productivity Ratings

DHHL Residential Community / KS Learning Community Offsite Sewer Improvement

ISLAND OF O`AHU

NORTH

LINEAL SCALE (FEET)
0 300 600 1200

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reservoir site is located on both unclassified lands, and lands classified as "Other" (Figure 22 and 23).

4.1.4.4 Regional Agriculture History

Agriculture has helped to shape the history of the Waiʻanae region. The entire region is recognized as a Major Agricultural Area by the State of Hawaiʻi (State of Hawaiʻi DOA, 2010). The agricultural history of Waiʻanae goes back many generations. Traditional subsistence lifestyle methods which sought to minimize water use, while maximizing food production to grow taro and other crops in the Waiʻanae region proved successful despite the dry and hot climate. This is demonstrated through multiple agricultural remains sited throughout the region (such as irrigation channels, traces of intricate terracing, and other indications of past agricultural practices), which serve as evidence that Waiʻanae once supported a large population (State of Hawaiʻi DBEDT, 2010).

From around 1811 to 1829, the trading of sandalwood thrived in the region. Livestock then became an important operation around the mid-1800's. Later in the century, sugar became the predominant crop. The Waiʻanae Sugar Mill was the first sugar mill on Oʻahu. Built in 1880, the Mill operated for over 70 years in Waiʻanae. In 1946, the Waiʻanae Sugar Plantation closed due to economic and environmental pressures (McGrath, 1973).

In pre-contact Mākaha Valley, the then perennial Mākaha Stream supported traditional wetland agriculture. Seasonal dryland crops were cultivated in the inland areas of the valley. After the mahele, traditional subsistence agriculture was replaced by both ranching and eventually sugarcane cultivation. Since the 1940s, most agricultural activities in Mākaha Valley ceased as the areas under production were redeveloped as golf courses and a resort.

Today a few areas in Mākaha continue to conduct agricultural activities. A portion of the valley is still being utilized for ranching. Kolona Ranch, northwest of the Proposed Project area, primarily maintains horses and goats on its facilities. A portion of the valley continues to operate as a working educational farm. Hoa ʻĀina O Mākaha, has centered its focus on supporting family, community self-reliance and peacemaking on the Waiʻanae Coast. *"The Farm",* as it is known by community residents, is a place where dreams have become reality by developing a barren piece of land into an educational center that works closely with the adjacent Mākaha Elementary School. Many residences maintain small "backyard" farms for personal consumption and there are a handful of flower nurseries. According to the State Historic Preservation Division (SHPD), restoration of loʻi along Mākaha Stream, northwest of the Proposed Project is being proposed.

Potential Impacts and Mitigation Measures

The development of the DHHL Residential Community and KS Learning Community is expected to cause some land disturbance, including removal of existing vegetation (clearing and grubbing) and some mass grading. Typical impacts to the soils include the temporary exposure of soils to wind and storm water runoff.

Grading plans will attempt to achieve a balanced excavation and embankment quantities to minimize disturbance to the topography and soils as much as practicable. A NPDES Notice of General Permit Coverage for Storm Water Associated with Construction Activity will likely be required.

During site grading and all other construction activities, implementation of Best Management Practices (BMPs), which may include use of silt fences, sediment traps, and diversion swales, temporary groundcover, hydro-mulching, etc., will minimize erosion and the discharge of other pollutants. After construction, landscaping should provide long-term erosion control. The Proposed Project is not expected to have a deleterious effect on the soil in the project site.

The soils of the Proposed Project site are not well suited for agricultural cultivation or production, and are not located on ALISH or high productivity LSB lands. In addition, the Proposed Project is not located on lands zoned agriculture by the City and County of Honolulu. As such, the Proposed Project and necessary infrastructure improvements are not expected to influence the availability of agricultural land. Therefore, no mitigation measures are proposed.

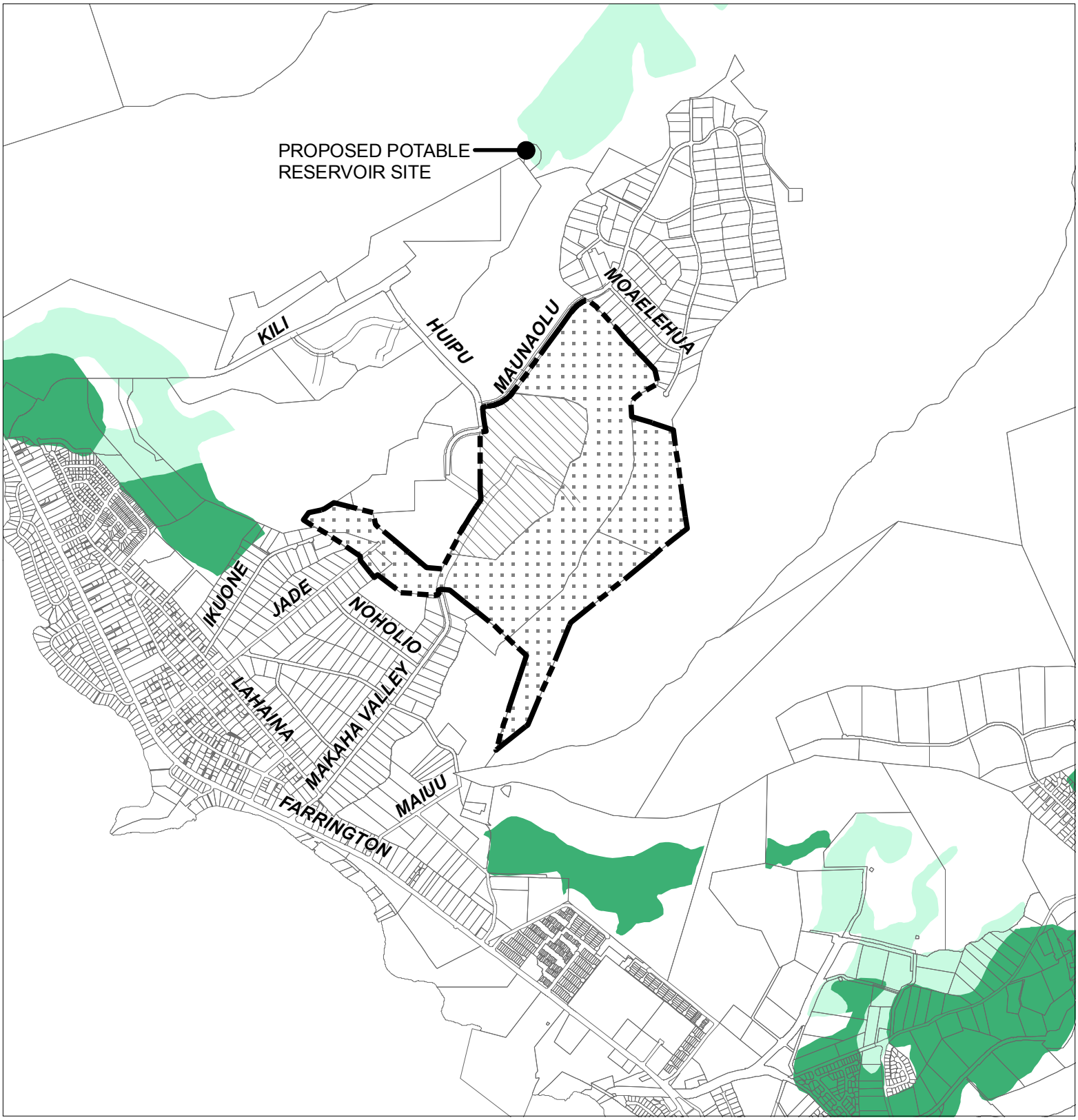
4.1.5 Flora and Fauna

4.1.5.1 Botanical Survey

A botanical survey of the DHHL Residential Community and KS Learning Community and Mākaha Valley Road realignment was conducted by Robert W. Hobdy, Environmental Consultant, during October 2009 (Appendix A). The objective of the survey was to document plant species occurring on the property, their abundance and status. In addition, the survey was designed to determine the likelyhood of native flora, including thoses listed as threatened/endangered/species of concern, as well as special habitat within the subject property, that if lost or altered, would result in a significant impact to flora or fauna in this region. Notes were taken on the plant species, distribution, abundance as well as the terrain and substrate where the plants were located.

The Proposed Project area was dominated by hardy, fire-adapted non-native species. A total of 107 plant species were recorded during the survey. Of the documented species, only four were native. All four native species, ʻuhaloa (*Waltheria indica*), ʻilima (*Sida fallax*), kou (*Cordia subcordata*), and moa (*Psilotum nudum*) are indigenous plants found through out Hawaiʻi and the Pacific. None are listed as species of concern, threatened, or endangered. Two of the four native species, ʻilima and ʻuhaloa, were found in their natural environment. The remaining two natives identified during the survey, kou and moa, were utilized as landscape plants within the golf course.

No Federally listed Endangered or Threatened native plants (USFWS, 2009) were encountered during the course of the survey nor were any species that are candidate for such status seen. No special native plant habitats were seen on the property.



LEGEND

- Project Site
- DHHL Residential Community
- Kamehameha Schools Learning Community
- Prime ALISH Lands
- Unique ALISH Lands
- Other ALISH Lands

FIGURE 22

Agricultural Lands of Importance to the State of Hawai'i (ALISH)

DHHL Residential Community / KS Learning Community

ISLAND OF O'AHU

NORTH

LINEAL SCALE (FEET)

0 1000 2000 4000

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Source: City County Honolulu Tax Map Key, 2008 (GIS);
ALISH, Department of Agriculture, State of Hawaii, 2008 (GIS)
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LEGEND

- Sewer Line for Improvement
- Prime ALISH Lands
- Unique ALISH Lands
- Other ALISH Lands

FIGURE 23

Agricultural Lands of Importance to the State of Hawai`i (ALISH)

DHHL Residential Community / KS Learning Community Offsite Sewer Improvement

ISLAND OF O`AHU

NORTH

LINEAL SCALE (FEET)

0 300 600 1200

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Source: City County Honolulu Tax Map Key, 2008 (GIS);
ALISH, Department of Agriculture, State of Hawaii, 2008 (GIS)
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4.1.5.2 Wetland Survey

A wetland survey was conducted of the proposed DHHL Residential Community and KS Learning Community project sites, as well as the proposed sewer conveyance structure improvement project alignment by Robert W. Hobdy, Environmental Consultant, during March 2010 (Appendix B). U.S. Fish and Wildlife National Wetland Inventory Maps (Figures 24 and 25) were compared to site conditions. During the survey, observations were made to determine if the area contained the three following features utilized to identify a wetland:

1. Hydric soils
2. Wetland vegetation
3. Hydrology indicators

Wetlands as defined by the U.S. Army Corps of Engineers (ACOE) are areas that are periodically or permanently inundated by surface or ground water and support vegetation adapted for life in saturated soil. To be determined a wetland, ACOE requires that there be positive wetland indicators in all three parameters.

Wetlands as defined by the USFWS requires the presence of positive wetland indicators in any one of the three parameters.

Within the Proposed Project area in Mākaha, ʻEku Stream (also known as ʻEku Gulch or East Mākaha Stream) runs through the proposed DHHL Residential Community project area. It has been classified by Mr. Hobdy as an ephemeral intermitent stream. The stream is one of two primary drainage channels through the valley. Mauna ʻOlu subdivision and Kamaileʻunu Ridge drain into ʻEku Stream. Due to the gradient, and its location on the leeward side of the island, this stream has water for only short periods of time during and shortly after heavy rains. Although vegetation was identified on the gravel bars within the stream bed, all species were upland plants. No facultative wetland or obligative wetland plants were identified during the survey either along the banks or within the stream bed itself. The stream did not contain standing water, however prominent drift lines were identified. Examination of the substrate revealed dry powdery soils at the makai extent of the stream on the property. Further inland the soils were dry, but not quite as powdery, and contained a higher clay content. At the uppermost reaches of ʻEku Stream on the property, the very steep gradient did not allow for the accumulation of water as it quickly flows downhill. ʻEku Stream and the tributaries assessed were rated as upland sites lacking hydric soils and wetland vegetation, and therefore not a jurisdictional resource as defined by ACOE. However, ʻEku Stream and its tributaries have been determined to be within the FWS wetland classification system because each transect had a positive indicator of wetland hydrology (i.e. drift line deposits). The FWS determination applies to the stream itself and not to the adjacent lands.

Within the proposed sewer conveyance structure improvement project alignment, five drainage channels were identified. All five channels provide drainage to a small watershed between Leihōkū Street and Lualualei Valley Road. Storm water runoff from the makua

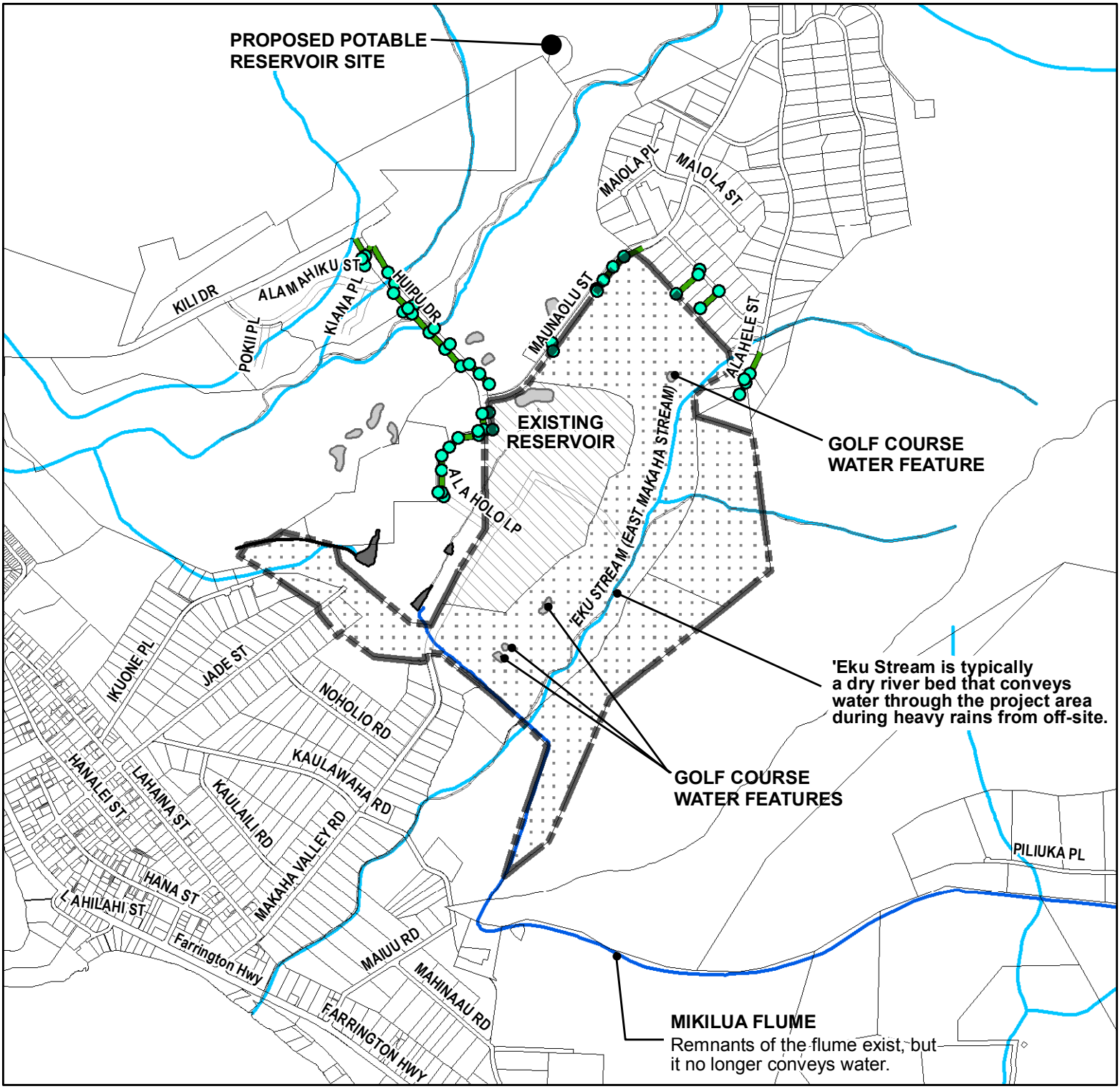
areas are drained by underwater conduits to Farrington Highway. From Farrington Highway to the beach, three of the five drainage channels are daylighted. The remaining two channels (on Bayview Street and Leihōkū Street) remain completely underground until they reach the beach where the conveyance structures came back to the surface. These two drain channels do not appear to meet the jurisdictional requirements of the ACOE. The channel along Glenmonger Road has been completely hardened on three sides, and is an approximately ten foot wide by ten foot deep concrete open channel from Farrington to Pōkaʻī Bay Street. After crossing under Pōkaʻī Bay Street, the drainage empties into a sandy area on the beach. The channel west of Alta Street is an open, but unlined, from Farrington to Pōkaʻī Bay Street. Residential properties bordering the easement have built stone walls along the edges of the channel. After crossing under Pōkaʻī Bay Street, the channel empties into a hardened coral and sand beach. The channel east of Alta Street is also an open, but unlined channel, from Farrington to Pōkaʻī Bay Street. After crossing under Pōkaʻī Bay Street, the stormwater continues to flow within a hardened, concrete channel for approximately 200 feet before emptying into a hardened coral and sand beach. The five channels did not have the three essential parameters of a wetland. During the pre-consultation process, in a letter dated February 3, 2010, the Department of the Army stated,

> *"…upon our receipt of the DEA, we will provide an Approved geographic Jurisdictaional Determination whether jurisdictional waters of the U.S. are present and whether a Department of Army permit for Section 404 activities of the Clean Water Act may or may not be required for activities associated with the proposed Department of Hawaiian Home Lands Residenital Community and Kamehameha Schools Learning Complex [Community] Project."*

The project team will continue to work with the Department of the Army on actions with areas under their jurisdiction.

4.1.5.3 Wildlife Survey

A wildlife survey of the DHHL Residential Community and KS Learning Community and Mākaha Valley Road realignment was conducted by Robert W. Hobdy, Environmental Consultant during October 2009 (Appendix A). The objective of the survey was to document bird and mammal species occurring on these project areas, their abundance, and status. The survey was designed to determine the likelihood of native fauna, including those listed as threatened/endangered/species of concern, as well as special habitat(s) that may be essential for these species. The undeveloped areas of the project areas are dominated by hardy, fire-adapted, non-native scrub vegetation. The developed portion of the project areas is occupied by the Makaha East Golf Course. This area consists primarily of an irrigated landscape with man-made, permanent water features. Visual and auditory field observations were made during daylight and evening hours of mamallian and avian species in the project areas. Observations were made of trails, tracks, scat, signs of feeding, as well as species abundance and location. The Batbox IIID, a special bat detecting device was also employed to assist in locating native Hawaiian hoary bats in the area. In addition to avian/mammal surveys, observations were made for the precence or



LEGEND

- Storm Water Structure
- Storm Water Conduit
- Freshwater Pond
- Freshwater Forested/Shrub Wetland
- Freshwater Emergent Wetland
- Stream/ River
- Canal/ Ditch
- Project Site
- DHHL Residential Community
- Kamehameha Schools Learning Community

Source: National Wetland Inventory Maps, U.S. Fish and Wildlife Service (1978)
City and County of Honolulu
Disclaimer: This graphic has been prepared for general planning purposes only.

FIGURE 24

NWI Wetlands and Storm Water Conveyance Map

DHHL Residential Community / KS Learning Community

MĀKAHA, ISLAND OF OAHU

NORTH

LINEAL SCALE (FEET)
0 750 1,500 3,000

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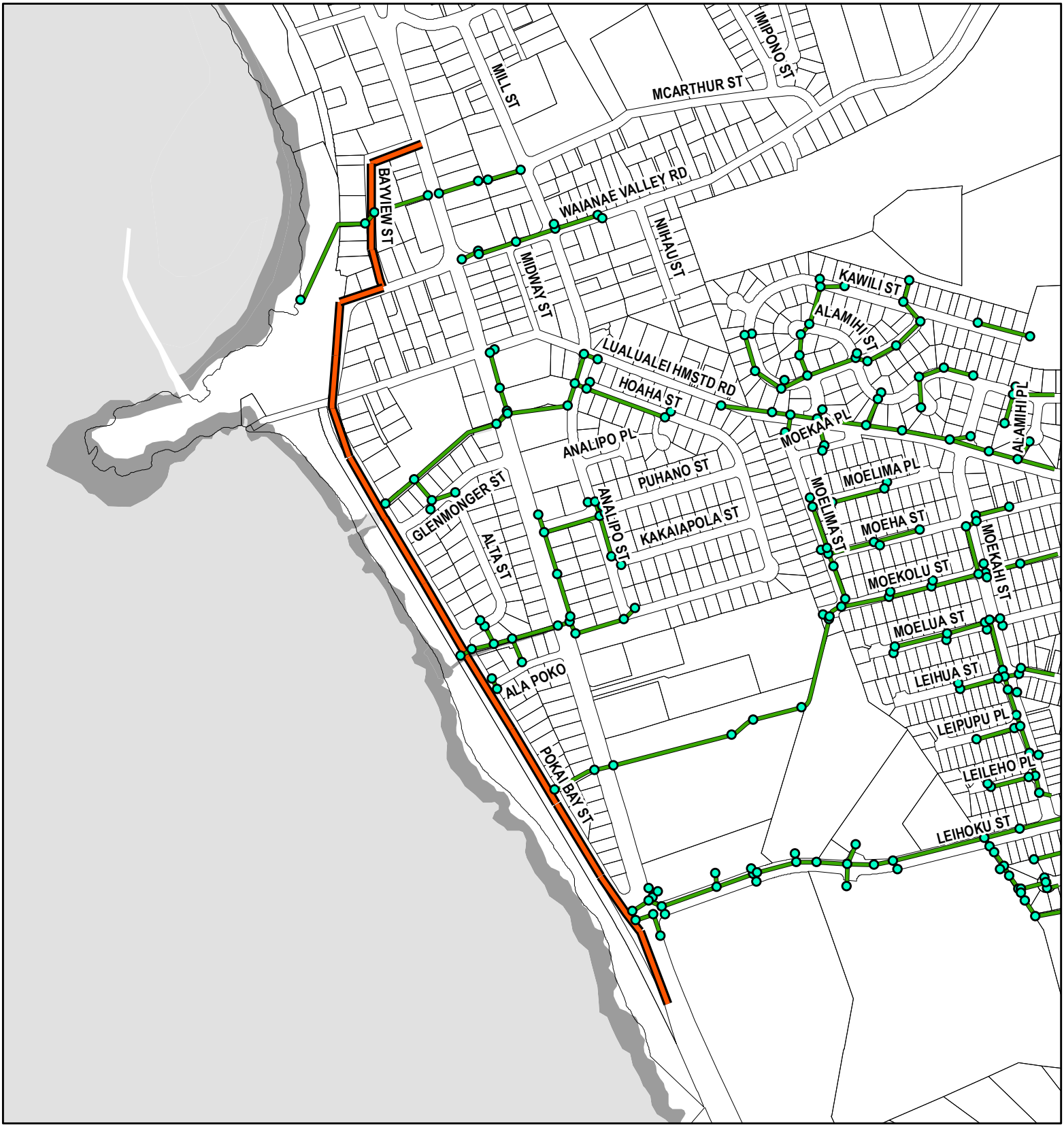

LEGEND

- Storm Water Structure
- Storm Water Conduit
- Estuarine and Marine Wetland
- Estuarine and Marine Deepwater
- Sewer Line for Improvement

Source: National Wetland Inventory Maps, U.S. Fish and Wildlife Service (1978)
City and County of Honolulu
Disclaimer: This graphic has been prepared for general planning purposes only.

FIGURE 25

NWI Wetlands and Storm Water Conveyance Map

DHHL Residential Community / KS Learning Community Offsite Sewer Improvement

ISLAND OF OAHU

NORTH

LINEAL SCALE (FEET)
0 150 300 600 1,200

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absence of insects and snails, particularly those that are listed as endangered or threatened. Particular attention was paid to the presence of insect and snail host plant species.

Mammals
A total of four mammals were either observed, or evidence of their activities was observed. These included the mongoose, *(Herpestes auropunctatus)*, cat *(Felis catus)*, pig *(Sus scrofa)*, rat *(Rattus spp.)*. None are listed as species of concern, threatened, or endangered. The area along the hillside is also a likely utilized by wild goats although none were observed. The native Hawaiian Hoary bat was not observed in the project areas.

Birds
Eighteen bird species were recorded within the property boundaries. Seventeen of the eighteen species observed are non-native. Only one native bird species, the Pacific golden-plover (*Pluvialis fulva*), a migratory bird, was observed in the project areas. Two endangered native birds, the *pueo* (*Asio flammeus sandwichensis*), and the *ae'o* or black-necked stilt (*himantopus mexicanus knudseni*) have been observed historically in the region by golf course maintenance workers. The *pueo* has not been seen since the development of Mauna 'Olu. Maintenance workers stated that the ae'o are still occasionally seen in the onsite reservoir.

Insects
Seven endangered native insects, one Sphingid moth (*Manduca blackburni)* and six picture wing flies (*Drosophila spp.*) have been known to inhabit western O'ahu. However, the three host plants of the Sphingid moth were not observed in the project areas. Typically, the native Drosophila inhabit native plant communities located in the higher elevations of the Ko'olau and Wai'anae Ranges. No moths, larvae, or flies were observed during the survey.

Snails
No Federally listed Endangered or Threatened native snails were encountered during the course of the survey nor were any species that are candidate for such status seen.

Potential Impacts and Mitigation Measures

No Federally listed Endangered or Threatened native plants (USFWS, 2009) were encountered during the course of the survey nor were any species that are candidate for such status seen within the Proposed Project areas in Mākaha Valley. No special critical habitats essential for native fauna were seen on the property. In addition, cross referencing of the site information with data compiled by the Hawaii Biodiversity and Mapping Program and the Hawaii Gap Analysis Program (GAP) indicated no critical habitats were present within the DHHL Residential Community and KS Learning Community and Mākaha Valley Road realignment, or proposed potable water reservoir project boundaries (Figure 26).

The proposed DHHL Residential Community project is expected to result in the draining of several water hazards located on the existing Makaha East Golf Course. Although the

water hazards are shown on the FWS National Wetland Inventory (NWI) maps as waterbird habitats, no native waterbirds were observed utilizing these water hazards. Even if the golf course water hazards were occasionally used for resting, the water hazards do not provide the habitat required for nesting, nor were they designed to protect waterbird nests from possible predators, such as dogs, cats, mongoose or rats. The KS Learning Community project as proposed is expected to maintain the existing reservoir and the DHHL Residential Community project proposes to designate ʻEku Stream as a conservation area. The existing reservoir can provide resting and feeding habitat for water fowl in this region of the valley. In addition, where possible, native, and culturally significant (to the Native Hawaiian community) plants are expected to be incorporated into the landscape design of both the proposed DHHL Residential Community and KS Learning Community projects. No additional mitigations measures are proposed within Mākaha Valley.

The proposed sewer conveyance structure improvement project is located within an existing right-of-way in an urbanized area. Cross referencing site information with data compiled by the Hawaii Biodiversity and Mapping Program and the Hawaii GAP indicated no critical habitats are present within the sewer conveyance structure improvement project corridor (Figure 27). With the exception of grasses and kiawe along Pōkaʻī Bay Street, the project area is devoid of any landscaping. As proposed, the project is not anticipated to have any significant impact on endangered flora or faunal species. As part of the pre-consultation process, the United States Fish and Wildlife (FWS) and the National Marine Fisheries Services (NMFS) were contacted. In a letter dated March 22, 2010, FWS stated,

> *"According to information in our files and the Hawaiʻi Biodiversity and Mapping Program, the threatened green sea turtle (Chelonia mydas) could nest along beaches in the project area. We are not aware of other threatened or endangered species or critical habitat in the project vicinity. However, we recommend precautionary conservation measures regarding sea turtles…."*

In accordance with FWS recommendations, an appropriate spill prevention control and counter measures plan is anticipated to be implemented to reduce the risk of contamination of the marine environment during construction. National Marine Fisheries Service (NMFS), ACOE, and USFWS required best management practices may also be necessary.

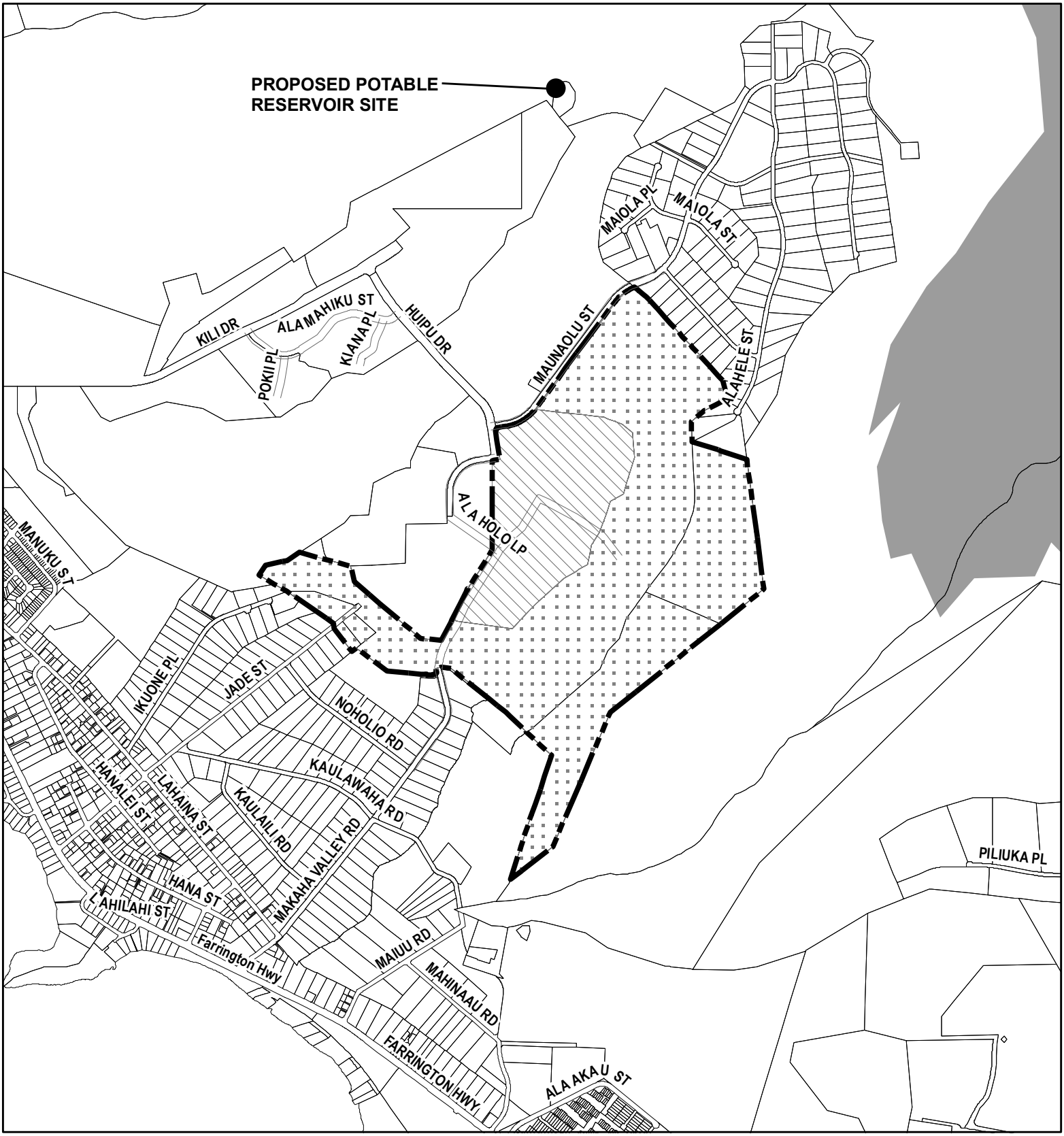
No additional mitigation measures are proposed.

4.1.6 Natural Hazards

Natural hazards such as flooding, tsunami inundation, hurricanes, earthquakes, volcanic eruptions, and wildfires have historically affected the State of Hawaiʻi.

Flooding

Flood Insurance Rate Maps (FIRM) indicate areas that would be flooded during 100- and 500-year flood events. Areas recognized as falling within a 100-year flood area are further



LEGEND

- Critical Habitat for Plants
- Project Site
- DHHL Residential Community
- Kamehameha Schools Learning Community

FIGURE 26

Critical Habitats Map

DHHL Residential Community / KS Learning Community

MĀKAHA, ISLAND OF OAHU

NORTH

LINEAL SCALE (FEET)

0 750 1,500 3,000

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Source: U.S. Fish and Wildlife Service, Pacific Islands Office (2004)
Disclaimer: This graphic has been prepared for general planning purposes only.

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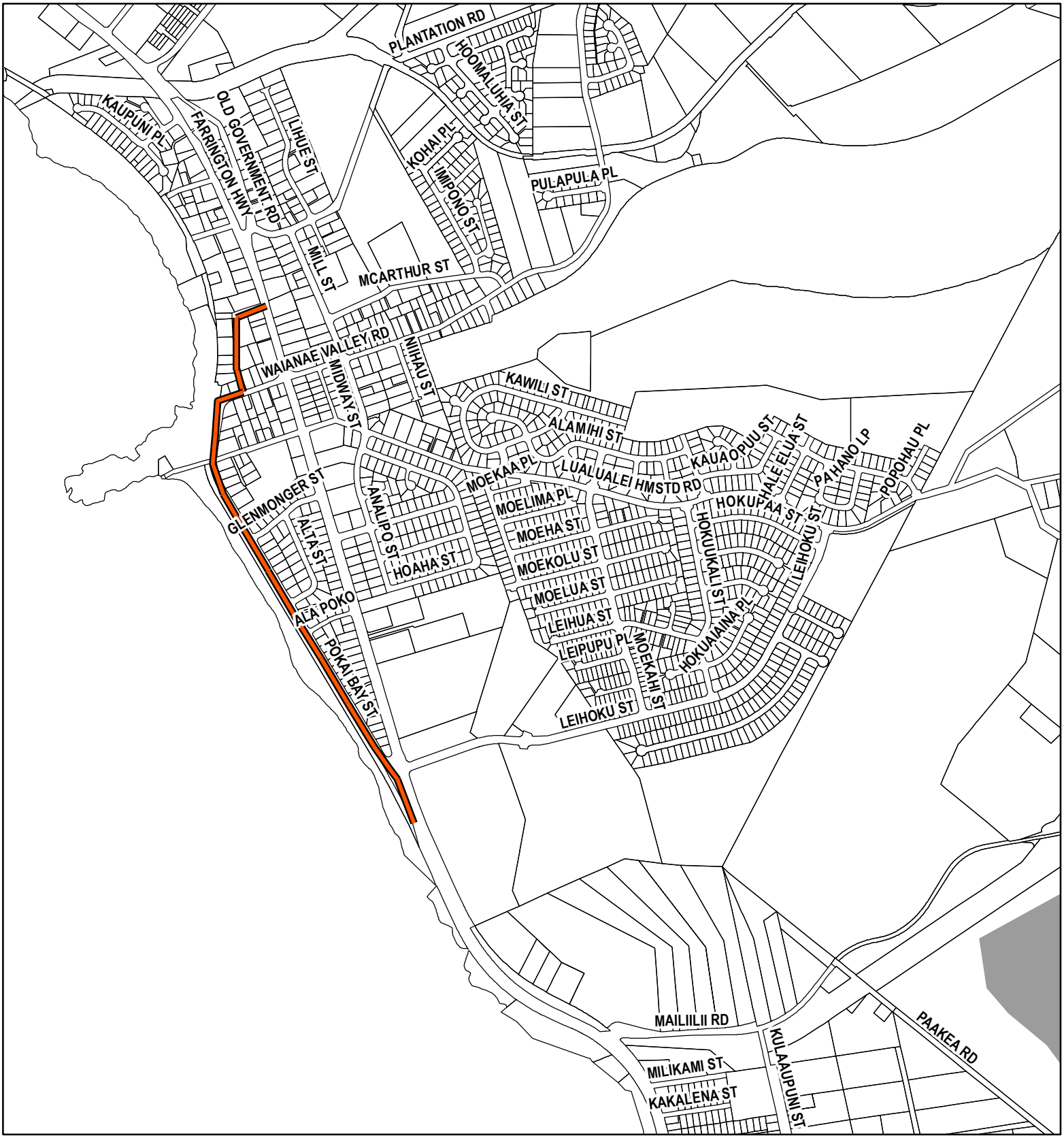

LEGEND

Critical Habitat for Plants

Sewer Line for Improvement

FIGURE 27

Critical Habitats Map

DHHL Residential Community / KS Learning Community Offsite Sewer Improvement

ISLAND OF OAHU

NORTH

LINEAL SCALE (FEET)

0 250 500 1,000 2,000

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Source: U.S. Fish and Wildlife Service, Pacific Islands Office (2004)

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divided into Special Flood Hazard Areas (SFHA), which are insurance risk rate zones which range from moderate flood hazard areas (100- and 500-year flood boundaries) to minimal flood areas (for anything greater that 500-year flood level). SFHA's are further classified into zones "V" and "A", which are zones which have the highest risk of flooding; and zone "X" which represents minimal-risk zones.

According to the FIRM prepared by the Federal Emergency Management Agency's (FEMA), National Flood Insurance Program, the DHHL Residential Community, KS Learning Community, and proposed potable water reservoir site are located in an undetermined flood hazard zone, which indicates that these projects would not be subject to flooding (Figure 28).

The sewer conveyance structure improvement corridor along Pōkaʻī Bay Street is determined to be almost completely within a Coastal, High Hazard District (Zone VE), with some northern portions designated as within the Flood Fringe District (Zone AE) (Figure 29). According to FEMA, "VE zones are coastal high hazard areas where wave action and/or high velocity water can cause structural damage during the 1-percent-annual-chance flood." AE Zones are special flood hazard areas which are subject to a one percent (1%) annual chance of flood. Flood hazard zone AE, also known as the 100-year flood zone is a flood insurance rate zone which corresponds to areas of one percent (1%) annual chance of shallow flooding, with a constant water-surface elevation where average depths are between 1 and 3 feet.

According to the USGS, the majority of the coastline at Mākaha is on lands with very low slopes, which has historically received significant wind and wave energy associated with passing tropical storms that tend to pass west of Oʻahu as they pass the Hawaiian Islands (USGS, 2004). Hurricanes ʻIwa (1982) and ʻIniki (1992) generated damaging high waves, and the associated storm surge produced coastal flooding to an elevation upwards of 11 feet above msl (USGS, 2004).

As part of the pre-consultation process, the State of Hawaiʻi, Department of Defense, Office of the Director of Civil Defense (Civil Defense) was contacted. In a letter dated February 17, 2010, Civil Defense stated,

> *"These projects are adjacent to the ʻEku Stream flood zone, which experienced serious flooding in December 2008 and could again be subject to heavy rains in the future."*

In a joint effort by the State Civil Defense and the U.S. National Guard, tons of debris were removed to address the potential for future flooding at ʻEku Stream. Plans to remove debris from three of the other region's streams are underway.

Tsunami

Since the early 1800s, approximately 50 tsunamis have inundated the State of Hawaiʻi's shores. Seven historical events have caused major damage. Two tsunamis were generated in the State on the island of Hawaiʻi. According to the FIRM, the DHHL Residential

Community, KS Learning Community, and proposed potable water reservoir sites are located well outside of areas which would be impacted by coastal flooding (from tsunami). According to the Pacific Disaster Center, the sewer conveyance structure improvement site is located within the tsunami evacuation zone.

Hurricanes
Since 1980, two hurricanes have had a devastating effect on Oʻahu, Hurricane ʻIwa in 1982 and Hurricane ʻIniki in 1992. In both instances, much of the damage sustained on Oʻahu occurred along the Waiʻanae Coast as the hurricanes passed between Kauaʻi and Oʻahu. Long-term prediction of future hurricanes is virtually impossible. However, one should reasonably anticipate the prospect of another hurricane affecting the islands.

Earthquake & Volcanic Hazards
In Hawaiʻi, volcanic activity produces more earthquakes than most other areas sitting on tectonic plate margins. Thousands of earthquakes occur in Hawaiʻi each year. However, the vast majority of them are undetectable through normal human senses. A few historical earthquakes have reached moderate and even disastrous magnitudes.

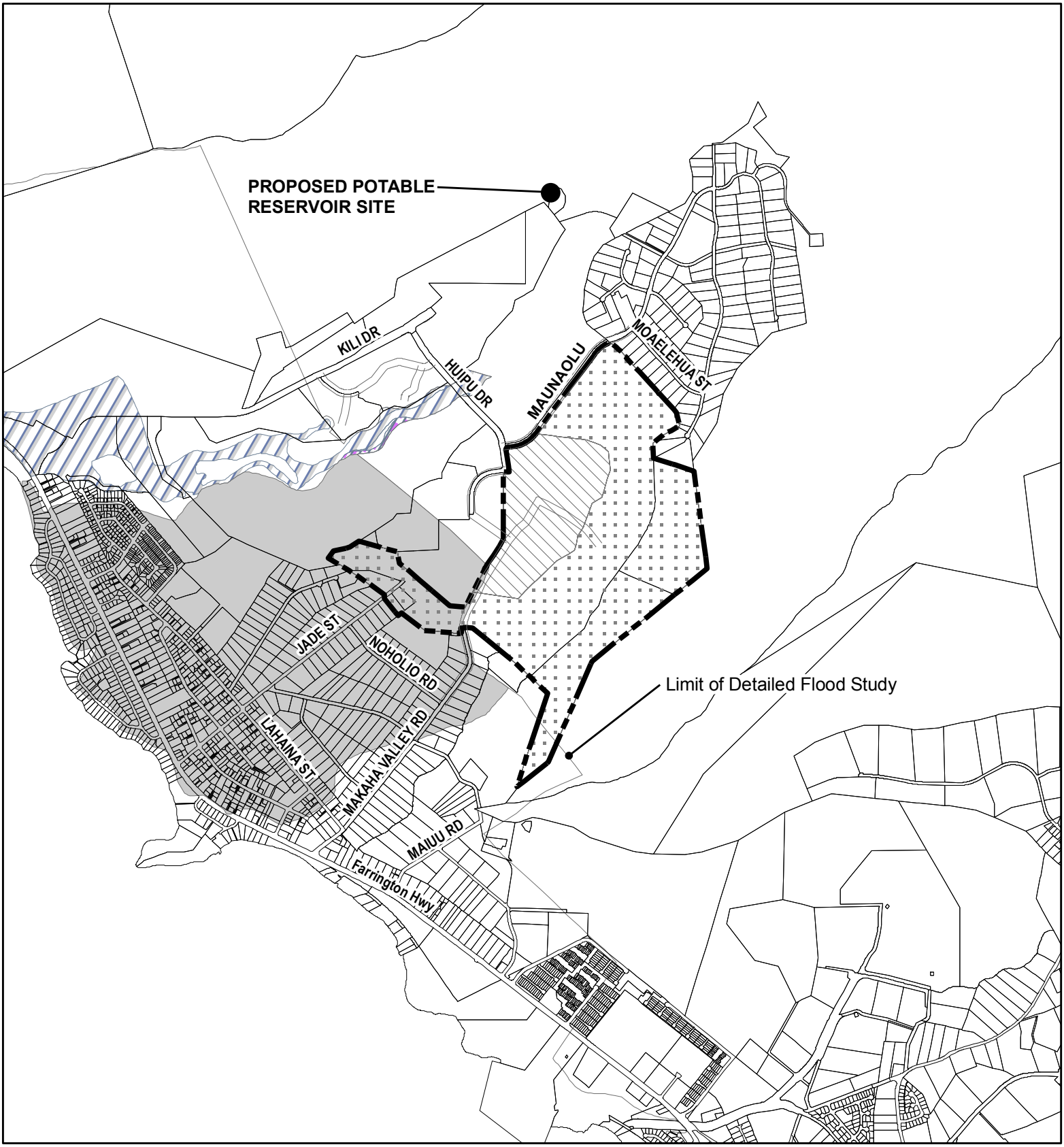
The last earthquakes felt statewide were magnitudes of 6.7 and 6.0. These earthquakes occurred at Kīholo Bay along Hawaiʻi Island's Kona Coast on October 15, 2006. These earthquakes resulted in more than $100 million in damages to the northwest area of Hawaiʻi Island and minimal damage on Oʻahu. From that same event, Oʻahu was also subject to an earthquake-induced electrical blackout that paralyzed the City and County of Honolulu and shut down the Honolulu International Airport for nearly a day. While it is difficult to predict such natural occurrences, it is reasonable to assume that future incidents are probable, given historical events.

Rockfall Hazards
As elsewhere on Oʻahu next to sloping areas, it is anticipated that there might be a potential for rockfalls from the slopes of Kamaileʻunu Ridge.

Wildfires
According to the City and County of Honolulu, the greatest danger of fire is where *wildland* (trees and brush) border urban areas. Although all the Hawaiian Islands are vulnerable to wildland fires (especially during the summer months, prolonged drought and/or high winds), the great majority of wildfires are human-caused (intentionally caused or by negligence) and start along roadsides. Wildfires can and do also occur naturally. Fires occur frequently on the Waiʻanae Coast, particularly along the hillsides and mountains. As a result, the Waiʻanae Fire Station is one of the busiest stations on the island. Within the Proposed Project area, fire-tolerant and fire-adapted vegetation dominate the non-landscaped areas.

Potential Impacts and Mitigation Measures

While flooding is not expected to immediately occur within ʻEku Stream since debris has been recently removed, regular maintenance of the gulch is necessary to ensure debris



LEGEND

- 100-year Flood Fringe District (Zone AE)
- 500-year Floodplain District (Zone X)
- Outside Floodplain
- Undetermined Flood Hazards
- Project Site
- DHHL Residential Community
- Kamehameha Schools Learning Community

Source: Federal Emergency Management Agency, GIS (2007)
Disclaimer: This graphic has been prepared for general planning purposes only.

FIGURE 28

Flood Insurance Rate Map

DHHL Residential Community / KS Learning Community

ISLAND OF O'AHU

NORTH

LINEAL SCALE (FEET)
0 1000 2000 4000

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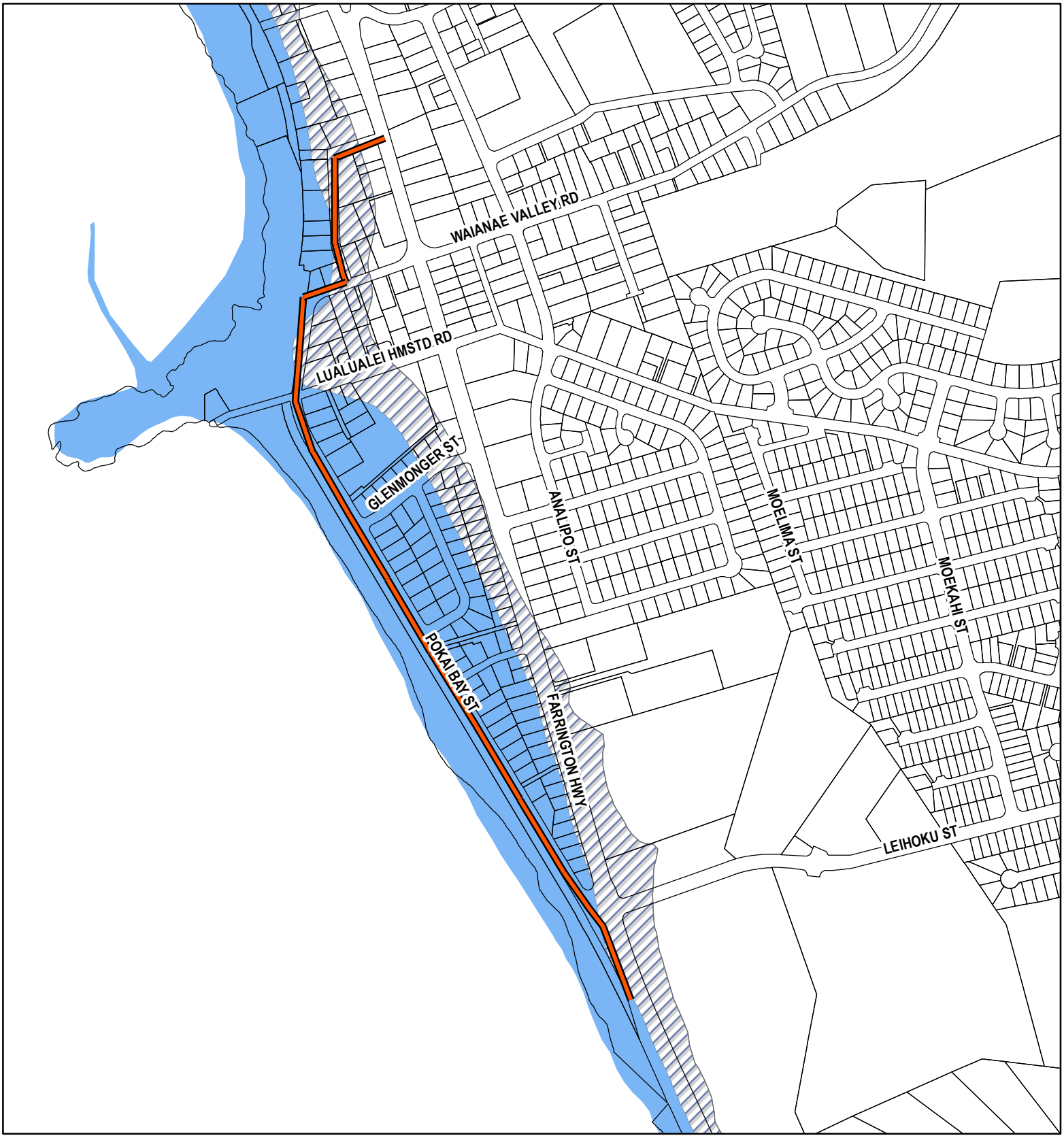

LEGEND

- Flood Fringe District (Zone AE)
- Coastal High Hazard District (Zone VE)
- Undetermined Flood Hazards (Zone D)
- Sewer Line for Improvement

FIGURE 29

Flood Insurance Rate Map

DHHL Residential Community / KS Learning Community Offsite Sewer Improvement

ISLAND OF O'AHU

NORTH

LINEAL SCALE (FEET)

0 150 300 600 1,200

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Source: Federal Emergency Management Agency
Flood Insurance Rate Map, Panels 185 (2004) and 195 (2005)
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does not accumulate and impede the flow of water during future storm events. The sewer conveyance structure improvement project is located within the Flood Hazard District of the City and County of Honolulu. Flood Hazard Districts are regulated by Chapter 21, Article 9 Special District Regulation of the Revised Ordinance of Honolulu (ROH).

To ensure adequate flood protection, the sewer conveyance structure improvement portion of the project will comply with development standards as described in section 21-9.10-4, ROH particularly:

(C)(8) *For new or replacement sanitary sewer system and waste disposal system, be designed, located and constructed so as to minimize impairment to them or contamination from them during and subsequent to flooding by regulatory flood.*

In addition, the sewer conveyance structure improvements will comply with the provisions of Sections 21-9.10, ROH through 21-9.10-14, ROH. When required, hydrologic and hydraulic analyses will be performed and a licensed engineer will certify that the proposed encroachment will not cause any increase in regulatory flood elevations during the occurrence of a regulatory flood. Areas identified as located within the Flood Fringe District will also comply with Section 21-9.10-6, ROH. Areas identified as located within the Coastal High Hazard District will also comply with Section 21-9.10-7, ROH.

The sewer conveyance structure improvement corridor is located within the tsunami evacuation zone. However, upon completion, the improvements are expected to be sited underground and not susceptible to destruction from coastal flooding. No mitigations measures are recommended.

The proposed KS Learning Community, DHHL Residential Community, Mākaha Valley Road realignment, potable water reservoir, and the sewer conveyance structure improvement project is not expected to exacerbate any natural hazard conditions. Should there be a hurricane, the potential impact of destructive winds and torrential rainfall can be mitigated through compliance with the International Building Code (IBC). All structures are expected to be constructed in consideration of the possibility of earthquake occurrence.

At the appropriate stage in the development process, a geotechnical engineering firm will need to be retained to conduct a site inspection and modeling of the Kamaileʻunu Ridge slope to determine the kinetic rolling energy of the rocks on the slopes. If the geotechnical engineer determines that the potential for damage will be low, it may recommend that a standard 6-foot high chain link fencing erected upslope of the proposed DHHL Residential Community project should be capable of intercepting relatively small-sized rocks. DHHL has planned to keep much of the lower slopes of Kamaileʻunu Ridge as a cultural landscape (undeveloped and in open space). If the geotechnical engineer determines that significant rockfall hazards exist, he/she may recommend removal of some rocks and boulders and/or some form of netting to reduce safety hazards. The KS Learning

Community is unlikely to be impacted by rockfall hazard as it is located closer to the middle of Mākaha Valley, away from both ridges which form the Valley.

Fire hazards, particularly on lands adjacent to large undeveloped parcels is always a possibility during summer months, drought periods and/or high winds. Appropriate fire breaks are expected to be maintained around the proposed DHHL Residential Community and proposed potable water reservoir projects to reduce the risk of wildfires burning buildings. The KS Learning Community should not be affected by wildfires once that project is fully built-out.

4.1.7 Historic, Archaeological and Cultural Resources

An archaeological consultant, *Cultural Surveys Hawai'i, Inc.* (CSH), was contracted to conduct an Archaeological Inventory Survey (Appendix C).

Existing Conditions

4.1.7.1 Historic and Archaeological Resources

An Archaeological Inventory Survey (AIS) for the Proposed Project was conducted in November 2009. The 303 acre survey met the requirements set forth in HRS 13-13-276 including historic and archaeological research and an on-site pedestrian inspection. The on-site investigation was completed in three phases. The undeveloped lands at the base of Mākaha Valley were inspected first, followed by the existing Makaha Valley Country Club and 'Eku Stream gully at the base of Mākaha Valley, and finally, the undeveloped lands along the lower slopes of Kamaile'unu Ridge. Surface historic properties were identified and documented in terms of age, function, interrelationships, and significance.

The findings of the current study closely matched those of previous archaeological studies conducted in the project vicinity. Land clearing activities associated with previous development plans and post-contact agriculture land use have significantly disturbed and modified the landscape surrounding the project area. Despite the disturbances, 5 historic sites were identified during the AIS (Figure 30). Of the five sites, one was a pre-contact (or early post-contact) feature, two were plantation era features, one was a post-plantation era feature, and the fifth feature was determined to be of modern origin.

Each of these archaeological sites was assessed for their significance based on criteria established and promoted by the SHPD and contained in section 13-284-6 of the HAR. In order for resources to be significant they must possess integrity of location, design, setting, materials, workmanship, feeling, and association, and meet one or more of the following criteria:

(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 important in our past;

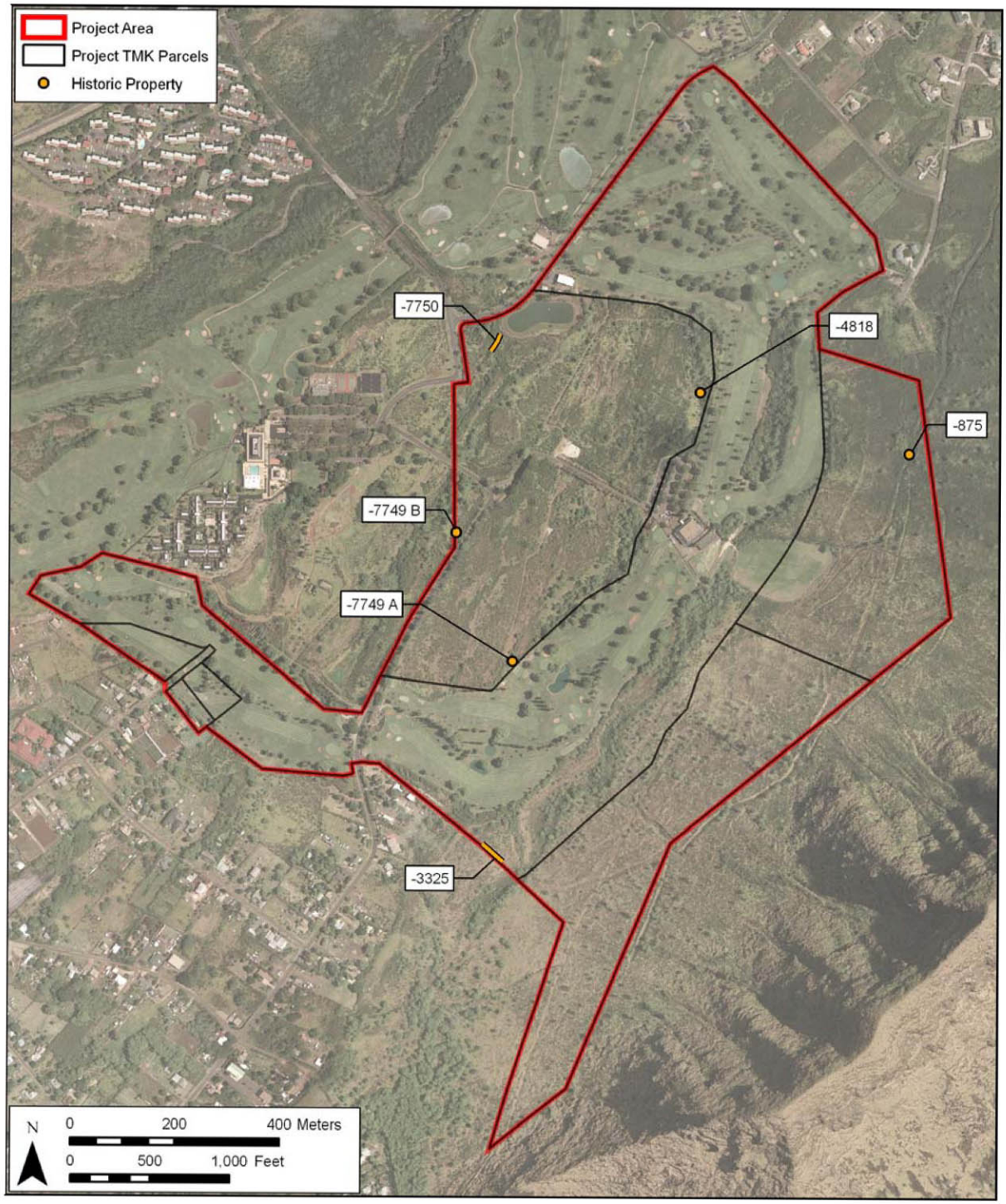

Figure 20. Aerial photograph (source: U. S. Geological Survey Orthoimagery 2005), showing the locations of historic properties identified in the project area

FIGURE 30

Historic Properties Identified during AIS

DHHL Residential Community / KS Learning Community

MĀKAHA, ISLAND OF OAHU

NORTH

LINEAL SCALE (FEET)

0 500 1,000 2,000

PBR HAWAII & ASSOCIATES, INC.

APR 2010

Source: Cultural Surveys Hawai'i
Disclaimer: The area indicated with a hatching was included in the AIS, but is not part of the proposed project area.

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(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 is likely to yield, information important for research on prehistory or history;
(E) Have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the Property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group's history and cultural identity.

Site # 50-80-07-875, a **pre-contact or early post-contact agricultural terrace** located on the lower slopes of Kamaileʻunu Ridge in the northeastern portion of the project area (within the proposed DHHL Residential Community project site). Although the terrace has been disturbed by land clearing and drainage improvement activities over the years, this site is the only remnant of traditional Hawaiian agricultural activities on the project site. Site # 50-80-07-875 was deemed significant under criterion D.

Site # 50-80-07-7750, a **plantation-era irrigation ditch** located in the northwestern portion of the project area (within the proposed KS Learning Community project site) is a remnant attributable to the Waiʻanae Sugar Company. Historically, this ditch diverted water from Mākaha Stream to the plantation reservoir, where the water was stored and distributed to sugarcane fields in lower Mākaha Valley. According to historic maps, this ditch originated at the Mākaha Stream, approximately 0.7 miles northeast of the project area, and ended at a reservoir near the western edge of the project area (within the northern boundary of the proposed KS Learning Community project site). Under the Hawaiʻi Register of Historic Places evaluation criteria, this site was reported as significant under criterion D, as it yields information important for research on prehistory or history.

Site # 50-80-07-3325, a **plantation-era irrigation flume**, known as the "Mikilua Flume" was likely constructed in the late 1800s, to provide irrigation water to the extensive sugar cane fields of the Waiʻanae Sugar Company. As evidenced through historic maps, the flume apparently originated at the plantation reservoir near the western edge of the project area (within the northern boundary of the proposed KS Learning Community project site) and extended east into neighboring Waiʻanae and Lualualei. This would allow for irrigation water from Mākaha to be transported to the extensive sugar cane fields of the Waiʻanae Sugar Company. This site was also deemed significant under criterion D of the Hawaiʻi Register of Historic Places evaluation criteria.

Site # 50-80-07-7749 consists of **two concrete slab building foundations** which are located within the proposed KS Learning Community project site. Their construction has been estimated at the late 1940s or early 1950s, and there is belief that they may have been related to post-plantation agricultural activities based on information uncovered from historic maps. The site was recognized as being significant under criterion D of the Hawaiʻi Register of Historic Places evaluation criteria.

Site # 50-80-07-4818, a **stone mound**, interpreted to be related to modern land clearing activities in a previous archaeological survey (Donham, 1990) underwent sub-surface testing and ultimately deemed NOT significant under the Hawai'i Register of Historic Places criteria.

Potential Impacts and Mitigation Measures

The AIS identified five historic properties in the project area. Due to the potential adverse effect on significant historic properties, each of the five historic properties identified in the project area were documented with detailed written descriptions, photographs, and accurately located with GPS survey equipment. Scale drawings were made of SIHP # 50-80-07-875, -4818, and -7749, and limited subsurface testing was conducted at SIHP # 50-80-07-875 and -4818. Sufficient information regarding the location, function, age, and construction methods of the five historic properties has been generated by the current inventory survey investigation to mitigate any adverse effect caused by proposed development activities. According to CSH, no further work is recommended for SIHP #s 50-80-07-875, -3325, -4818, -7749, and -7750. Should the inadvertent discovery of significant cultural materials and/or burials occur during construction, all work in the immediate area of the find will cease and the SHPD will be notified.

The AIS and summary of mitigative measures performed by CSH along with the appropriate fees were submitted to the SHPD on December 9, 2009. On January 21, 2010, SHPD found the AIS to be acceptable in satisfying the requirements of the Hawai'i Administrative Rules (HAR) Chapter 13-276-5. In addition, SHPD agreed with mitigation measures completed by CSH and that no further archaeological work was recommended as described in the following excerprt from the letter:

> *Five new historic properties, State Inventory of Historic Properties (SIHP) #'s 50-80-07-875 [post contact agricultural terrace], 50-80-07-3325 [plantation era flume Mikilua Flume], 50-80-07-7749 [two concrete slab foundations], and 50-80-07-7750 [plantation era ditch], were idendified during the survey as well as one site 50-80-07-4818 [a stone mound] that was determined at the time of the suryvey to not be significant. All other sites and features are eligible for the National and State Registers of Historic Properties under criterion 'D' (information relevant to history and/or prehistory). We concur with this determination.*
>
> *Based on this survey five historic sites were to be impacted by the development. After completion of the this AIS, the five sites have been docuemented with descriptions, photographs and limited subsurface testing conducted at site 875 and 4818. We agree this has been done. No further archaeological work has been recommended.*
>
> *This is an acceptable archeological inventory survey report….*

It should be noted that Site # 50-80-07-875 is located within a portion of the proposed DHHL Residential Community proposed for "cultural landscape", and thus, will likely be preserved in place.

4.1.7.2 Cultural Resources

Cultural Surveys Hawai'i began a Cultural Inventory Assessment (CIA) for the Proposed Project in November 2009. The process of assessing cultural resources involved research and review of relevant historical documents and previous studies conducted in and around the area as well as discussions with kama'āina, kūpuna and other area experts. Hawaiian organizations, agencies and community members were contacted to identify individuals with cultural expertise and/or knowledge of the project area and the vicinity. As part of this process, CSH consulted with SHPD, OHA, the O'ahu Burial Council, Hawaiian civic clubs, and Hui Mālama I Nā Kūpuna O Hawai'i. OHA requested, "*a comprehensive review of cultural and archaeological studies related to the project area….*" In a written response dated December 17, 2009, SHPD also commented on the project:

> *This project has been presented to several Hawaiian organizations and folks are aware of this innovative project that will enhance partnerships in the Hawaiian community to address housing, education, cultural practices and socio-economics. Please also contact the Neighborhood Boards for Waianae and for Nānākuli (see County website for contact list). There are various community leaders and individuals who may be helpful to your CIA regarding that land area.*
> *SHPD recommends you search for core families (three generations) of the area who can recall <u>the land use and access of the area to get a glimpse of any cultural practices (i.e., gathering, access to sacred sites, burials, endangered species) that may be impacted by this project</u>.* [emphasis added]

CSH contacted 42 individuals specifically for the Cultural Inventory Assessment taking into account recommendations from SHPD and OHA. Twenty eight individuals participated in some form of discussion with CSH. During the course of CSH's interviews, CSH was not aware that the project proponent met with over 900 individuals, including presentations to the Wai'anae, Nānākuli, and Kapolei Neighborhood Boards, to discuss the project in general, While consultation with individuals is still ongoing, a draft Cultural Impact Assessment has been prepared and is included in Appendix D. The CIA provides information pertinent to the assessment of the Proposed Project's impacts on cultural practices and resources (per the Office of Environmental Quality Control's Guidelines for Assessing Cultural Impacts) which may include traditional cultural properties of ongoing cultural significance that may be eligible for inclusion on the State Register of Historic Places, in accordance with Hawai'i State Historic Preservation Statute (Chapter 6E) guidelines for significance criteria (HAR §13-284) under Criterion E.

According to CSH, a wide variety of religious shrines and natural landscape features used for spiritual practices has been documented in the vicinity of the Proposed Project. These included sacrificial *heiau* (pre-Christian places of worship) dedicated (or re-dedicated) to *Kū* (the war god), agricultural and other fertility shrines dedicated to *Lono* or *Kāne,* fishing shrines along the coast such as *ko'a* or *Kū'ula,* and personal or family "god stones" such as

pōhaku o Kāne. These features were considered culturally important to Hawaiians. Two major *heiau* in the vicinity of the Proposed Project are still largely intact today. *Kāneʻakī Heiau* is north of the Proposed Project area in Mākaha Valley. *Kamaile Heiau* is situated on Kamaileʻunu Ridge to the south of the Proposed Project area. In the case of both *heiau*, they were associated with major pre-contact settlements in the area. One of several natural landscape features of cultural significance is Mauna Lahilahi peninsula. It is an example of a specific religious place known as Kaʻananiʻau. From Mauna Lahilahi, one can see all of Waiʻanae. Another example of a natural feature of cultural significance located within the *moku* of Waiʻanae is Kawiwi, a mountain between Mākaha and Waiʻanae Ahupuaʻa. Kawiwi was deemed a place of refuge in war. Upon Kamehameha I's conquest of Oʻahu, many *kahuna* took refuge there. The nearby Pōkaʻī Bay became a school for these displaced *kahuna*. Historical documents indicate that Mākaha's primary pre-contact settlement was inland, north of the Proposed Project area, where waters from then perennial Mākaha Stream could support *loʻi* (irrigated agricultural terrace) and sufficient rainfall was available for other agricultural activities. A smaller settlement was located along the coast.

At the time of the Māhele, most of the ahupuaʻa of Mākaha went to Abner Pākī, Bernice Pauahi Bishop's father, with just less than ten kuleana awards going to commoners in the area. Upon Pākī's passing the lands of Mākaha changed ownership several times moving the economic base away from traditional Hawaiian agriculture to ranching and then sugar. By twentieth century sugarcane cultivation dominated both the land and water resources. Water to irrigate the growing plantation was supplied by both Mākaha Stream, and Kamaile spring with reservoirs and ditches (including Mikilua flume) constructed to divert, store, and distribute the water to the cane fields. Little water remained for irrigation of taro *loʻi*, contributing to the demise of traditional agriculture in Mākaha (and other communities within the Waiʻanae Moku) and displacement of the native population. However, by the mid-1930s, sugar cultivation in Mākaha Valley also diminished, due in part to the lack of adequate water resources to meet the high water demands of the plantation. Capital Investment Company purchased the sugar lands in Mākaha Valley and by 1956, a U.S. Army Mapping Service map shows the extensive development of the former cane lands in coastal Mākaha, with a network of roads and many house structures. Some of the former plantation irrigation infrastructure in the vicinity of the project area, including ditches and reservoirs, remained in-place. While the Mikilua Flume is indicated to have been abandoned by this time, portions of the plantation water system were likely converted for use by the growing residential community, as well as for small scale farming operations. In the mid-1960s, Chinn Ho of Capital Investment Company envisioned Mākaha as a tourist destination rivaling Waikīkī. Construction of the Mākaha Inn, a 200 room luxury hotel, was completed in 1969. Along with the hotel construction, associated resort development included recreational facilities, two golf courses (including the one within the project site) and both low- and high-rise condominiums.

Today, approximately half of the project area consists of one of two golf courses (Makaha East Golf Course) in Mākaha Valley, the remainder is not occupied by any residents and is overgrown. The portion along the lower slopes of Kamaileʻunu Ridge) is both steep and overgrown, and shows signs of being used for agriculture.

While there are significant cultural resources off-site, the Proposed Project is not sited such that it restricts access to these sites or cultural religious practices. According to CSH, community members indicated that *laua'e*, *kī* (ti leaf) and *kukui* in Mākaha Valley are being gathered by some *hula hālau* (Hawaiian dance school). However, a botanical survey conducted in October 2009 (Appendix A) found that the project area is dominated by hardy, fire-adapted non-native species. Of the documented species, only four were native. Two of the four native species, 'ilima (*Sida fallax*) and 'uhaloa (*Waltheria indica*) were found in their natural environment. The remaining two natives identified during the survey, kou (*Cordia subcordata*) and moa (*Psilotum nudum*), were utilized as landscape plants within the golf course. Laua'e[12], a non-native was also found within the landscaped areas within the golf course. Neither kī nor kukui were identified during the botanical survey.

According to CSH, there are many traditional accounts detailing the pre-contact period of Wai'anae Moku, and some specifically reference Mākaha Ahupua'a. There are numerous *mo'olelo* associated with Mākaha that represent a colorful and rich history. Often places and landscape features have multiple names that may convey *kaona* (hidden meanings) and/or *huna* (secret) information. These names sometimes have political or subversive undertones. There are several interpretations regarding how Mākaha was named. One is that Mākaha is a play on words identifying it as being likened to a sluice gate (Mākāhā) of a fishpond, allowing inhabitants to be fishermen of men. Some older families from Wai'anae Moku believe this negative interpretation is propaganda intended to discredit the old O'ahu natives for whom Wai'anae was and remains a stronghold of residency. Edward Iopa Kealanahele's account "How Mākaha got its name" (Kealanahele 1975) tells more positive story of how Mākaha was named that instead highlights the varied and abundant ocean resources of the ahupua'a and the skill of local fishermen:

> *Long ago, there lived in this valley a handsome young chief named Mākaha. His skill as a fisherman gained island-wide attention, which eventually reached the ears of Ke Anuenue [the rainbow], the goddess of rain, who lived in upper Mānoa Valley.*
>
> *She was so intrigued that she sent her trusted winged friend, 'Elepaio, to investigate Mākaha. 'Elepaio returned with exciting stories of Mākaha's daring and skills.*
>
> *The next morning, Ke Anuenue created an awe-inspiring double rainbow which arched from Mānoa Valley to this valley, from where she and her retinue could watch Mākaha perform his daring feats at the ocean.*
>
> *The people of the Wai'anae Valley were petrified by that magnificent rainbow that ended in this unnamed valley where Mākaha lived.*

[12] The plant referred to as lau'ae today (*Phymatosorus grossus*) is a non-native that was not introduced by Polynesians, but rather a post-contact introduced species.

Knowing that Ke Anuenue was watching, they prayed that she would bring them the much needed gentle rains and not the harsh storms she could create when displeased.

Mākaha, aware of her presence, scaled Mauna Lahilahi and called loudly to his ʻaumakua [his ancestral spirit] Manō ʻai Kanaka, the most vicious of man-eating sharks. As Manō ʻai Kanaka glided in from the ocean, Mākaha dived from the rocky pinnacle, emerged on Manō ʻai Kanaka's back and rode with regal grandeur.

As the two disappeared into the depths, the sea became calm. Suddenly Mākaha seemed to be everywhere along the rocky coast gracefully tempting death. Then, just as suddenly, Mākaha seemed to skim the ocean as Manō ʻai Kanaka carried him to shore.

Mākaha then carried his entire catch to the rainbows end deep in the valley and offered it to Ke Anuenue. Deeply touched, she sent gentle rains to the parched earth of the great Waiʻanae Valley. She was impressed by the selection of seafood that was offered her but was disappointed by the quality of the poi, maiʻa [banana] and uala [sweet potato] which were dry and stringy. She demanded to know why since she was so accustomed to good quality fruits. She was told that it was because of the lack of rainfall in the valley.

Ke Anuenue became enamored with Mākaha and from then on her double rainbow would appear in Mākaha's kuleana [land area] and gentle rains would fall on Waiʻanae so the people could enjoy lush bananas and an abundance of taro.

The people built a heiau in honor of Ke Anuenue and Mākaha but Ke Anuenue refused the honor and named the entire valley, Mākaha, by which it is now known.

CSH's assessment of cultural resources included extensive consultation with *Kamaʻāina* and *kūpuna* with knowledge of the proposed Project area and/or surrounding areas. Participants expressed a broad range of comments, and none were opposed to the Proposed Project. Individually, four community participants expressed their excitement about the Proposed Project. Others also expressed their desire that this project succeed. However, the primary concern of the community participants was in regard to the incorporation of Native Hawaiian culture in the development of the project and educational programs. Specifically, participants requested KS and DHHL to consult with community leaders and residents of the Waianae Coast, and work with existing educational providers. Detailed accounts of the interviews and recommendations are included in Appendix D.

Potential Impacts and Mitigation Measures

Construction of the Proposed Project is unlikely to negatively impact any Hawaiian cultural practices that may be occurring on the project site, such as gathering of materials for *lei*

making. There are only two native species, *ʻilima* and *ʻuhaloa*, that occur in their natural environment, within the project site. Both species are common throughout the region. While a community member indicated *kī, lauae,* and *kukui* are gathered in Mākaha, it is unlikely that it is being gathered on the project site.

Once in operation, the Proposed Project is anticipated to have a positive impact on cultural use of the project site. Recognizing that learning does not need to occur under a roof, more than half of the 70 acre KS Learning Community is being planned as open space to allow for outdoor learning opportunities which include a *piko* (a large, central gathering area), indigenous and educational gardens and recreational activities.. Indigenous and educational gardens are expected to be incorporated within the KS Learning Community so students and the community can learn about, cultivate and gather endemic, Polynesian-introduced and other plants of cultural and economic value to Hawaiʻi. CSH believes the cultural practices of Mākaha Valley will be impacted by the construction and implementation of these teaching programs.

Over a span of six months (September 2009 to April 2010), KS has met more than 35 groups/organizations, including presentations to the Waiʻanae, Nānākuli and Kapolei Neighborhood Boards, on the Mākaha KS Learning Community informing/updating/getting feedback from more than 900 people. Initial programs for the KS Learning Community will be developed after a two-year effort of meeting with many residents and educators who live and work along the Waiʻanae Coast. KS will continue to develop and refine programming with input from residents, educators, and participants. KS will continue to meet with Waiʻanae Coast residents to increase its knowledge of the cultural resources and educational needs of the Waiʻanae Coast as well as how best to preserve and enhance the cultural resources of Mākaha Valley.

DHHL has been implementing sustainable design concepts in its recent projects such as the Kaupuni subdivision project in Waiʻanae Valley. Some of the sustainability features of the DHHL Kaupuni project were designed with input from Waiʻanae Coast residents such as Eric Enos. Kaupuni is expected to include features such as photovoltaic solar panels and dedicated space for aquaponics and community gardening. These features not only make the Kaupuni Community energy efficient, but may provide a level of food security to the residents as well. DHHL plans to further refine the sustainable design concepts from its Kaupuni project to its DHHL Residential Community on the project site.

4.1.8 Roadways and Traffic

The Proposed Project is located within Mākaha Valley. A traffic impact report (TIR) was prepared by Wilson Okamoto Corporation (WOC) in February 2010 and is summarized below and attached to this report as Appendix E.

Existing Conditions

The project site is located adjacent to Mākaha Valley Road east of Farrington Highway. Farrington Highway serves as the main access roadway along the southwestern coastline of

the island of O'ahu. Near the project site, Farrington Highway is primarily a four-lane, two-way roadway generally oriented in the north-south direction that transitions to a two-lane roadway north of Mākaha Valley Road.

West of the project site, Farrington Highway intersects Mākaha Valley Road. At this signalized T-intersection, the northbound approach of the highway has one through lane and an exclusive right-turn lane while the southbound approach has an exclusive left-turn lane and two through lanes. Mākaha Valley Road is a primarily two-lane, two-way roadway generally oriented in the west to east direction. At the intersection with Farrington Highway, the Mākaha Valley Road approach has an exclusive left-turn lane and a shared left-turn and right-turn lane.

North of Mākaha Valley Road, Farrington Highway intersects Kili Drive. At this unsignalized T-intersection, the northbound approach of the highway has a shared through and right-turn lane while the southbound approach has a shared left-turn and through lane. Kili Drive is a two-lane, two-way roadway generally oriented in the east-west direction. There is very little in the way of residential development along Farrington Highway north of Kili Drive. At the intersection with Farrington Highway, the Kili Drive approach has one stop-controlled lane that serves left-turn and right-turn traffic movements.

Field investigations were conducted on October 14-15, 2009 on days when public schools were in session, and consisted of manual turning movement count surveys along Farrington Highway in the project vicinity. The turning movement count surveys were conducted between the hours of 5:30 AM to 8:30 AM, and also between the hours of 3:00 PM to 6:00 PM at the intersections of Farrington Highway and Mākaha Valley Road, and Farrington Highway and Kili Drive.

After analysis of the traffic counts, the commuter AM and PM peak hours for each of the aforementioned intersections are shown below:

Intersection	**AM Peak**	**PM Peak**
Farrington Highway/ Mākaha Valley Road	7:00 – 8:00 AM	4:00 – 5:00 PM
Farrington Highway/ Kili Drive	7:15 – 8:15 AM	3:30 – 4:30 PM

The highway capacity analysis performed in this Traffic Impact Report was based upon established traffic engineering procedures and is based on the concept of Level of Service (LOS). LOS is quantitative and qualitative assessment of traffic operations. Levels of Service are defined by LOS "A" through "F"; with LOS "A" representing ideal or free-flow traffic operating conditions and LOS "F", unacceptable or potentially congested traffic operating conditions.

South of Mākaha Valley Road, Farrington Highway operates at LOS "A" in the northbound and southbound directions during both the morning and afternoon peak periods. The traffic movements on the northbound and southbound approaches the Farrington Highway

and Mākaha Valley Road intersection operate at LOS "A" during both peak periods. The Mākaha Valley Road approach to the intersection with Farrington Highway operates at LOS "A" and LOS "B" during the AM and PM peak periods, respectively.

At the intersection with Kili Drive, the critical traffic movement on the highway approaches of the intersection is the southbound left-turn and through traffic movements which operate at LOS "A" during both peak periods. The Kili Drive approach of the intersection operates at LOS "B" during both peak periods.

TheBus

TheBus is a public transportation service provided by the City and County of Honolulu. It provides bus service in the Mākaha and Waiʻanae areas. These service routes include:

Route C – Country Express bus service connects the Waiʻanae Coast to the Ala Moana Shopping Center, and several points in-between, including Kapolei, Kalihi, and downtown Honolulu.

Route PH1 – Pearl Harbor and Hickam AFB follows a similar route as Route C, with an additional loop through the Pearl Harbor/Hickam Air Force Base.

Route 93 & 93A – Waiʻanae Coast Express connects the Waiʻanae Coast to downtown Honolulu as far east as Alapaʻi and King. It follows a similar route as Route C, Country Express, except that it does not continue to Ala Moana Center, instead offering stops on Vineyard and continuing along Middle Street before returning to the Waiʻanae Coast.

Route 40 & 40A – Honolulu-Mākaha connects the Mākaha Towers to the Ala Moana Center. The route follows Farrington Highway with stops at Mākaha Valley Road, the Waiʻanae Transit Center, the Wet n' Wild Hawaiʻi Water Park and Kapolei. The route continues on to Honolulu via the Kamehameha Highway to Nimitz Highway, Dillingham Boulevard, King Street and Kapiʻolani Boulevard.

Route 401 – Waiʻanae Valley connects the Waiʻanae Transit Center to Waiʻanae Valley Road and Haleahi Road, passing through Waiʻanae neighborhoods via Kāneʻakī Street, Plantation Road and Leihōkū Street.

While a one-way fare is $2.25, monthly and annual adult passes offering unlimited rides are available for $50/month or $550/year respectively.

Potential Impacts and Mitigation Measures

Based on the proposed land use plan and phasing of development, WOC estimated the project-related traffic. The TIR summarizes the adjusted project site trip generation characteristics applied to the AM and PM peak hours of traffic to measure the impact resulting from the proposed traffic through the year 2018 and through year 2026 (estimated full-buildout of the project). Within the TIR, WOC also shows the distribution of

site-generated vehicular trips at the study intersections during the Year 2018 and Year 2026 AM and PM peak hours of traffic. Trips associated with the KS Learning Community were divided into three categories: students commuting by KS bus, staff commutes and students commuting by car. KS plans to utilize buses to transport at least half the students going to the P-20 facilities to and from the KS Learning Community. To reduce traffic along Mākaha Valley Road, these buses are expected to be directed to utilize the secondary access along Kili Drive to travel to and from areas to the south via Farrington Highway. Of the remaining trips generated by the KS Learning Community, approximately 20 percent are identified as staff-related trips that enter the site during the AM peak period and exit during the PM peak period. Similar to the routing of the buses, staff are expected to be directed to utilize the secondary access along Kili Drive to travel to and from areas to the south via Farrington Highway.

The remaining trips generated by the KS Learning Community are assumed to be comprised of students. It is assumed that those students not residing in the proposed DHHL Residential Community will be driven to and from site, either by KS buses or by parents or by carpools. These trips were assigned to utilize Mākaha Valley Road to travel to and from areas south via Farrington Highway.

To describe the future traffic on the Mākaha Valley Road and Kili Drive intersections with Farrington Highway without the proposed traffic, WOC forecasted traffic along Farrington Highway to the year[13]s 2018 and 2026. The travel forecast developed for this TIR conservatively assumed the existing traffic volumes along Farrington Highway will increase at a rate of 0.5% per year. With the forecasted traffic, WOC provided LOS rating for each turning movement at the Mākaha Valley Road and Kili Drive intersections with Farrington Highway.

Traffic Operations under Year 2018 <u>Without</u> the Proposed Project – South of Mākaha Valley Road, the northbound direction of traffic along Farrington Highway is expected to continue operating at LOS "A" during the AM peak period while the southbound direction of traffic is expected to operate at a slightly lower LOS "B". During the PM peak period, the northbound direction of traffic is expected to operate at a slightly lower LOS "B", while the southbound direction is expected to continue operating at LOS "A." At the intersection with Mākaha Valley Road, the traffic movements on both approaches to the highway are expected to continue operating at LOS "A" during both peak periods while the Mākaha Valley Road approach of the intersection is expected to operate at LOS "B" during both peak periods. At the intersection with Kili Drive, the critical traffic movement on the highway approaches is expected to continue operating LOS "A" during both peak periods while the Kili Drive approach is expected to continue operating LOS "B" during both peak periods.

[13] The project is anticipated to be completed in 15 years, therefore the traffic forecasts have been prepared at full-buildout (2026), and at the mid-way point (2018), however due to unforeseen circumstances, the ultimate completion of the project may take up to 20 years.

Traffic Operations under Year 2018 With the Proposed Project – According to WOC, traffic operations in the project vicinity are expected, in general, to remain similar to Year 2018 without project conditions despite the addition of project-generated vehicles to the surrounding roadway network. South of Mākaha Valley Road, the northbound direction of traffic along Farrington Highway is expected to continue operating at LOS "A" and "B" during the AM and PM peak periods, respectively, while the southbound direction of traffic is expected to operate at LOS "B" and "A" during the AM and PM peak periods, respectively. At the intersection of Farrington Highway with Mākaha Valley Road, the traffic movements on the northbound approach, the southbound through traffic movement, and westbound approach are expected to operate at a slightly lower LOS "B" during the AM peak period. The remaining critical traffic movements at this intersection, as well as, the intersection with Kili Drive are expected to continue operating at levels of service similar to Year 2018 without project conditions.

Traffic Operations under Year 2026 With the Proposed Project –Traffic operations in Year 2026 in the project vicinity are expected to deteriorate slightly from Year 2018 as the project is fully built out due to ambient growth in traffic along the highway and the addition of project-generated traffic to the surrounding roadway network. South of Mākaha Valley Road, the northbound direction of traffic along Farrington Highway is expected to continue operating at LOS "B" and "C" during the AM and PM peak periods, respectively, while the southbound direction of traffic is expected to operate at LOS "C" and "B" during the AM and PM peak periods. At the intersection of Farrington Highway with Mākaha Valley Road, the northbound through traffic movement is expected to operate at LOS "B" and LOS "A" during the AM and PM peak periods, respectively, while the northbound right-turn traffic movement is expected operate at LOS "B" during both peak periods. On the southbound approach of the highway, the left-turn and through traffic movements are expected to operate at LOS "B" and "A" during the AM and PM peak periods, respectively. At the intersection with Kili Drive, the critical traffic movement on the highway approaches is expected to continue operating LOS "A" during both peak periods while the Kili Drive approach is expected to continue operating LOS "B" during both peak periods.

In summary, traffic operations in the vicinity of the project site, both at Year 2018 and Year 2026, are expected to continue operating at acceptable levels of service.

Construction Related Traffic Impact

The Proposed Project includes the sewer conveyance structure improvements to be installed within the road ROW along Bayview Street, a portion of Waiʻanae Valley Road, Pōkaʻī Bay Street, and a portion of Farrington highway (Figure 31). Construction within this utility corridor is expected to interrupt traffic, resulting in longer travel times, and generally inconvenience motorists. These impacts cannot be avoided. This location is the preferred alternative to the shorter, straighter Farrington Highway utility corridor. Construction along the preferred alternative was designed to minimize traffic interruption by reducing the construction activities along the primary transportation corridor along the coast (Farrington Highway).

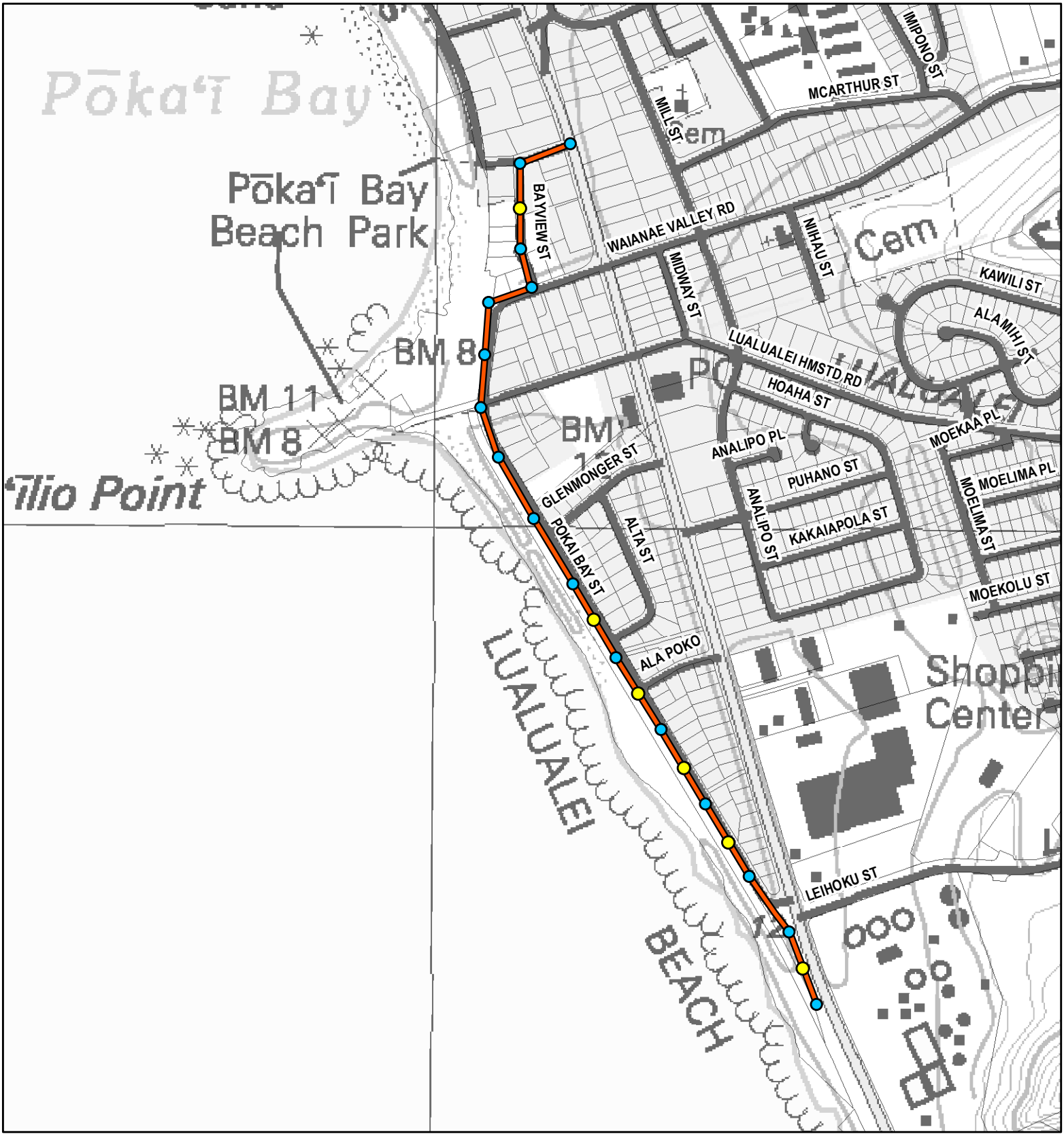
Public transit routes C, 93, 93A, 40, 40A, 401, and PH1 cross through the Proposed Project area (Figure 32). These routes may be affected by delays resulting from construction activities. The following public transit stops and access to these stops may also be affected (Table 4-1). The preferred location proposed for the sewer line decreases contact with Farrington highway by moving most of the construction to Bayview and Pōkaʻī Bay Streets, reducing the number of stops affected from ten to two.

Table 4-1
Public Transit Stops Potentially Impacted by Proposed Construction Activities

Route	***Stop ID #***	***Nearby intersection***	***Activities in the area that may impact transit stops***
401	2647	Pōkaʻī Bay Street and Lualualei Homestead Road	Open-trench construction of new sewer line, increasing capacity of existing sewer conveyance system
40, 40A, 93, 93A, C, PH1	569	Mākaha Valley Road and Farrington Highway	Surface improvements to Mākaha Valley Road-at the discretion of DTS, DOT, DPP
40, 40A, 93	735	Mākaha Valley Road and Farrington Highway	Surface improvements to Mākaha Valley Road-at the discretion of DTS, DOT, DPP
40A, 93	573	Ala Holo Loop and Huipu Drive	Roadway realignment
40, 40A, 93	730	Huipu Drive and Mauna'olu Street	Roadway realignment
40, 40A	731	Huipu Drive and Mauna'olu Street	Roadway realignment
40A, 93	574	Huipu Drive and Mauna'olu Street	Roadway realignment

It is anticipated that a Traffic Control Plan will be developed for each phase of work. Traffic cones and other directional devices are expected to be placed in the roadway to guide vehicles around work areas. The contractor is expected to implement measures to provide access past work sites and minimize the inconvenience to community members. These measures may include:

- Posting flagmen for traffic control around work sites.
- Covering trenches at the end of the work day.
- Posting safety devices and signs for the duration of construction.
- Scheduling construction and material deliveries during non-peak traffic hours.
- Coordinating driveway crossings with homeowners and business occupants/ customers/ clients.
- Coordinating construction schedule with the City's Department of Facility Maintenance.
- To reduce the impact on transient traffic, construction activities that require lane closures will not occur before 8:30 AM.



LEGEND

- Sewer Line for Improvement
- Existing Sewer Manhole
- New Sewer Manhole

FIGURE 31

Site Plan

DHHL Residential Community / KS Learning Community Offsite Sewer Improvement

ISLAND OF OAHU

NORTH

LINEAL SCALE (FEET)

0 150 300 600 1,200

PBR HAWAII & ASSOCIATES, INC.

APR 2010

Source: Mitsunaga & Associates, Inc. (2009)
City and County of Honolulu (2009)
Disclaimer: This graphic has been prepared for general planning purposes only.

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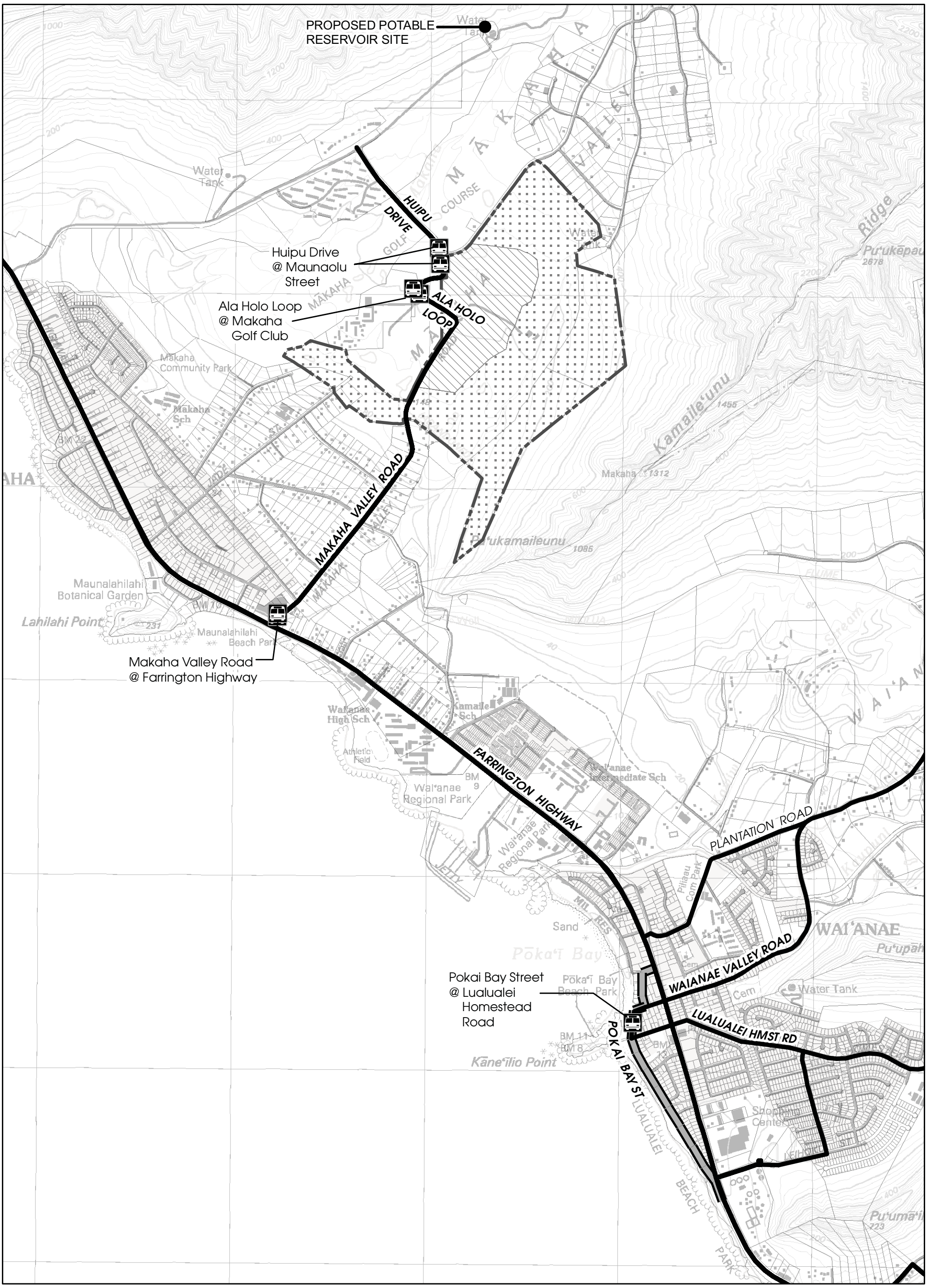

LEGEND

- Public Bus Stops
- Public Bus Routes
- Proposed Sewer Line Improvement
- Project Site
- DHHL Residential Community
- Kamehameha Schools Learning Community

Source: City and County of Honolulu Bus Routes and Stops, 2009 (GIS);
U.S. Geological Survey Digital Raster Graphic, 2003 (GIS)
Disclaimer: This graphic has been prepared for general planning purposes only.

FIGURE 32

Public Transit Routes and Stops

DHHL Residential Community / KS Learning Community

WAIʻANAE, MĀKAHA, ISLAND OF OAHU

NORTH

LINEAL SCALE (FEET)
0 750 1,500 3,000

PBR HAWAII & ASSOCIATES, INC.

APR 2010

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- Staging equipment and work activities to limit disruption of on-street parking, road closure and blockage of private driveways.

Conducting trench work in the evenings could potentially minimize the traffic impact to the community. However, this must be balanced against the needs of the nearby residential community need for noise control particularly between 10 PM and 7 AM. In addition, operations are expected to be designed to ensure total road closure is avoided.

When required, the project proponent will notify Public Transit Division and Oʻahu Transit Services (bus and para-transit operations) of proposed traffic lane, sidewalk, and bus stop closures to ensure the safety of passengers during construction. Detours or bus service alterations should be listed in the "updates" section of The Bus website prior to the start of construction.

4.1.9 Noise

Current sources of noise in the vicinity of the project area include vehicular traffic, typical residential noise, occasional aircraft, and natural sounds associated with weather and birds.

Potential Impacts and Mitigation Measures

The proposed KS Learning Community and DHHL Residential Community is expected to produce increased noise levels both during construction and once operational. The nearest public school that may be impacted by noise generated as a result of the construction of the KS Learning Community and DHHL Residential Community portions of the project is the Mākaha Elementary (approximately half a mile away from the KS Learning Community). The proposed sewer conveyance structure improvement project and potable water reservoir installation is expected to produce increase noise levels during construction. Noise levels at the proposed sewer conveyance structure improvement project site, and Potable Water Reservoir is expected to decrease to pre-construction levels once operational.

4.1.9.1 Construction Noise

Construction activities for all aspects of the Proposed Project are anticipated to create temporary noise impacts. Community Noise Control regulations (HAR Title 11, Chapter 46) establish maximum permissible sound levels for construction activities occurring within "acoustical" zoning districts. Based on the mixed use, multi-family dwellings, and commercial and business uses of the area, the sewer conveyance structure improvement project is considered located in the Class B zoning district for noise control purposes. The maximum permissible daytime (7:00 AM to 10:00 PM) sound level in the district B is 60 db(A). The remainder of the project in located Class A zoning district, with all areas equivalent to lands zoned residential, conservation, preservation, public space, open space, or similar. The maximum permissible daytime (7:00 AM to 10:00 PM) sound level in the district A is 55 db(A).

In general, construction activities cannot exceed the permissible noise levels for more than ten percent of the time within any twenty minute period except by permit or variance. Any noise source that emits noise levels in excess of the maximum permissible sound levels cannot be operated without first obtaining a noise permit from the DOH. Although the permit does not attenuate noise, it regulates the hours during which excessive noise is allowed.

Exposure to noise is expected to vary by construction activity, and the type of equipment used during the different activities. Heavy machinery and pneumatic impact equipment will likely generate noise in the range of 82-96 decibels-weighted (dB(A)) within 50 feet of the source. The general contractor(s) is expected to be responsible for obtaining necessary permits and complying with all permit conditions. There is a need to balance work activities to meet permit conditions for "acoustical" zoning districts while minimizing traffic disruptions. Work is expected to be scheduled primarily for daytime hours, as described in HAR Title 11, Chapter 46 (7:00 AM to 10:00 PM), Monday through Friday. The contractor is also expected to ensure that all construction equipment with motors are properly equipped with mufflers in good operating condition. The contractor may employ other mitigation measures to minimize those temporary noise impacts.

The closest existing school to the proposed DHHL Residential Community and KS Learning Community projects, Mākaha Elementary School, is approximately 0.8 miles away. The distance from the Proposed Project is anticipated to effectively attenuate construction and operation noise from the project on Mākaha Elementary School. The KS Learning Community and DHHL Residential Community is not planned to be constructed all at once, but developed in phases. The proposed KS Learning Community project includes the creation of a preschool during the first phase of construction. As each facility is constructed, it is anticipated that the surrounding buildings and residences within the project area are likely to experience the temporary inconvenience of construction noise.

4.1.9.2 Operational Noise

Operational Noise from the KS Learning Community

Once operational, the noise levels at and immediately adjacent to the KS Learning Community site is expected to mimic those typical of an educational center with relatively longer periods of quiet, and periods of noise levels during student movement, and outdoor activities. According to Community Noise Control regulations (HAR 1-46-5(7)), school activities approved by school authorities are exempt from these regulations provided that the activities occur between 7:00 AM and 10:00 PM.

It is anticipated that noise may be generated from several different types of sources. One substantial noise generator is the need for mechanical equipment such as heating and cooling systems, rotating or reciprocating equipment, active piping or ducting, etc. Whenever required, noise impact can be reduced by the use of sound enclosures, mufflers, etc. Another source of operational noise is from the buses and cars dropping off and

picking up students and staff from the facility. KS intends to properly maintain the buses and ensure appropriate mufflers are in place. The third source of operational noise is a result in the increased number of people within the complex. Currently, the KS Learning Community parcel is vacant. Recreational and educational activities located outside of buildings are expected to increase the ambient noise level at the site. A large portion of the proposed DHHL Residential Community is in operation as Makaha East Golf Course, which generates some operational noise.

Operational Noise from the DHHL Residential Community
Once operational, the noise levels at and immediately adjacent to the proposed DHHL Residential Community is expected to be similar to the surrounding residential communities.

Within the DHHL parcels, approximately 7 acres is anticipated to be designated for community services and commercial activities. While the exact nature of the commercial activities has not been determined, the area was created to provide a small area for a small country store and to pick up mail. Approximately 5 of the 7 acres are anticipated to be designated for community services. DHHL in conjunction with other Native Hawaiian service organizations have developed a successful model that brings multiple organizations together in one area. This allows Native Hawaiians to receive a variety of services in one convenient location. It is anticipated that the community and commercial activities may produce noise levels different from the DHHL Residential Community, with most noise generated during normal business hours.

Long-term noise impacts due to the proposed DHHL Residential Community are not expected to be significant. Therefore, no mitigation measures are proposed.

Operational Noise from Infrastructure Projects
Upon completion of the Sewer conveyance structure improvement project and installation of the potable water reservoir, noise levels are expected to be reduced back to pre-construction levels. Therefore, no mitigation measures are proposed.

4.1.10 Air Quality

The State's good air quality is largely a function of the predominant tradewinds blowing from the northeast. The typical tradewinds pattern blows anthropogenic and volcanic pollutants out from the valley toward the ocean. However, during non-tradewind periods, both anthropogenic and volcanic pollutants can accumulate on island, affecting both visibility and air quality (increase in sulfur oxides (SOx) and particulates). According to the EPA, there are no "non-attainment" areas on the island of O'ahu. A non-attainment area is defined as a locality where air pollution levels caused by anthropogenic sources persistently exceed National Ambient Air Quality Standards (NAAQS). According to the DOH, Clean Air Branch, there are no permitted sources within the vicinity of the Proposed Project. Most of the existing airborne pollutants are attributed primarily to vehicle-generated exhaust from the region's roadways.

Potential Impacts and Mitigation Measures

Long-term air quality impacts due to the Proposed Project are not expected. Once the DHHL Residential Community and KS Learning Community are built and occupied/operational, the number of vehicles waiting to enter Farrington Highway are expected to increase, particularly during the morning hours. However, the winds (tradewinds and on-shore breezes) and the short periods that the vehicles stop before entering Farrington Highway should rapidly dissipate any potential impacts from noxious gasses. As part of the consideration regarding air quality, plans are to bus a portion of the students attending the KS Learning Community. This should significantly reduce the number of cars traveling to and from the complex reducing the potential impact from single occupancy vehicles. While the final project layout is still under development, the concept of sustainability is being incorporated into the design. The project is being designed to integrate the KS Learning Community with the DHHL Residential Community, as well as incorporate multi-modal transportation within the project site. Biking and walking greenway are intended to connect the DHHL Residential Community with the KS Learning Community. This provides the residents with opportunities to bike or walk to the mailboxes, country store, community service center and the KS Learning Community reducing potential emissions generated by cars during these short trips. No additional mitigation measures are proposed.

Short-term air quality impacts due to the Proposed Project may result from construction activities. During construction, air quality in the area may be impacted by exhaust generated from construction equipment and fugitive dust. All construction activities will implement best management practices necessary to comply with the provisions of HAR, Chapter 11-60.1, "Air Pollution Control," Section 11-60.1-33, Fugitive Dust and to reduce any negative air quality impacts.

A combination of measures to mitigate potential air quality impacts (i.e., watering exposed soils, grassing, minimizing the amount of disturbed area, and rapidly establishing plant materials) will be implemented as appropriate. The General Contractor is expected to develop standard procedures should dirt be tracked onto the highway, to prevent fugitive dust formation. Exhaust emissions from construction equipment and increased vehicular traffic should not violate State or Federal air quality standards based on the moderate level of existing traffic volumes in the project region.

4.1.11 Visual Resources

The proposed DHHL Residential Community and KS Learning Community project area is set back from Farrington Highway by approximately one mile and cannot be viewed from the Highway.

BWS has indicated that additional storage capacity may not be required. If BWS determines that additional capacity is required, the installation of the new potable water reservoir may result in an additional tank co-located with an existing potable water reservoir at the 525 foot elevation.

The sewer conveyance structure improvement project is located below ground. It is surrounded by buildings of mixed height and mass.

Potential Impacts and Mitigation Measures

The visual appearance of the Proposed Project site is expected to change from vacant land overgrown with weeds, grasses, and shrubbery and a manicured golf course to a KS Learning Community and DHHL Residential Community.

To maintain the visual appearance, the covered structures being planned on the KS Learning Community is expected to cover approximately seven acres, or ten percent of the approximately 70 acre parcel.

The built-up portions of the DHHL Residential Community are expected to occupy approximately 119 acres, or just over fifty percent of the 236 acre DHHL parcels. The actual structures associated with the up to 600 residential units, commercial and community services are expected to cover significantly less than 119 acres. DHHL intends to maintain the remainder as preservation, open space and recreational areas within its Special District, Conservation and Community Use Land designations. The buildings within both the KS Learning Community and DHHL Residential Community are anticipated to be one or two stories high. DHHL plans for the residential structures to be low-scale. With the existing grade of the project area and the low building height, ocean views from residences mauka of the project are not expected to be obstructed. Landscaping should further mitigate the visual impact of rooflines. The WSCP indicates that mauka and makai views are important, but does not specifically recognize any specific view planes encompassing any portion of the Proposed Project area that require consideration and accommodation. As such, the project is not expected to significantly impact public views.

BWS has indicated that additional storage capacity may not be required. If an additional tank is not required, views will not be impacted. If BWS determines that additional capacity is required through the installation of a new potable water reservoir, the additional tank is expected to be clearly visible on the hillside. Plans are to co-locate a new tank similar height and mass with the existing tank. It should not significantly change the existing mauka views.

Upon completion, the sewer conveyance structure improvement project will be located below ground. There for no visual resources should be impacted.

4.1.12 Social & Economic Characteristics

According to the 2000 U.S. Census, the population of CDPs along the Wai‘anae Coast numbered 43,163 individuals, with 9,042 living in Mākaha. Thirty-five percent of the coastal residents were under the age of eighteen. The WSCP estimated that the Wai‘anae

Coast population was over 49,000 in 2008. This exceeds DPP's estimated population projections of 47,800 for 2025, seventeen years early.

Employment and economic opportunities are limited when compared to other areas on Oʻahu. The Waiʻanae Coast has the highest unemployment and poverty rates, and the median household income is reported to be $25,638 per year. According to the WSCP, the per capita income of Waiʻanae community was 61% of the State average, and the economic gap between residents of the Coast and the rest of Oʻahu has been steadily rising since 1980. DPP, in their 2007 annual report on the Status of Land Use on Oʻahu, reported that unemployment has been steadily rising since 1980. DPP, in their 2008 annual report on the Status of Land Use on Oʻahu, projected a decline in coastal employment opportunities between 2000 and 2035, with a net loss of nearly 1,000 jobs.

Only one of the eleven DOE public or charter schools in the Nānākuli-Waiʻanae Complex Area are in good standing with the "No Child Left Behind" (NCLB) program. Eight schools are under restructuring and two schools are in "Year One", for school improvement status. In addition to tracking school accountability through the NCLB program, the DOE also tracks readiness of students entering kindergarten through its Hawaiʻi State School Readiness Assessment. This is a profile that shows the proportion of children entering kindergarten that display characteristics and skills considered important for successful early learning experiences. Based on a review of the data provided for each school, the median score for kindergarten readiness is 3.3, indicating that just over half of the children are prepared for the rigors of kindergarten. A summary of each school's status regarding school accountability and school readiness (if applicable) is shown in Table 4-2. Both of these assessments tell just part of the story of the educational situation on the coast. Many schools have transient populations. Additionally, most of the schools also receive federal title one funds which are based on poverty level. While all of the schools struggle to meet the requirements of NCLB, they are filled with dedicated staff that work hard at educating their pupils.

Table 4-2
School Accountability and School Readiness

School	No Child Left Behind School Accountability				Hawai'i State School Readiness	
	School Year	Adequate Progress Made?	No. of Targets Met	Status for 09-10 School Year	School Year	Mean Rating [14]
Nānāikapono Elementary	08-09	no	9 of 17	restructuring	09-10	3.1
Nānākuli Elementary	08-09	no	8 of 15	restructuring	09-10	3.9
Nānākuli High & Intermediate	08-09	no	6 of 17	restructuring	not applicable	
Leihōkū Elementary	08-09	no	15 of 17	School Improvement year 1		3.9
Mā'ili Elementary	08-09	no	8 of 16	restructuring	09-10	3.4
Mākaha Elementary	08-09	no	10 of 17	In Good Standing[15]	09-10	3.2
Wai'anae Elementary	08-09	no	9 of 15	restructuring	09-10	2.5
Ka Waihona o Ka Na'auao NCPCS	08-09	no	7 of 13	School Improvement year 1	not available	
Kamaile Academy	08-09	no	13 of 19	restructuring	not available	
Wai'anae Intermediate	08-09	no	16 of 19	restructuring	not applicable	
Wai'anae High	08-09	no	0 of 17	restructuring	not applicable	

Potential Impacts and Mitigation Measures

The largest Native Hawaiian population in the world resides between Mākaha Valley and Honokai Hale. The project, as proposed, is anticipated to have a positive impact on this population by providing lower than market cost housing opportunities for native

[14] A score of 1 indicates nearly none of the children consistently display the key characteristics. A score of 5 indicates almost all children consistently display the key characteristics.
[15] A Schools status as "in Good Standing" is affected when adequate progress is not made for two consecutive years.

Hawaiians, improved access to educational opportunities, and opportunities for cultural education from pre-natal through kūpuna. Other positive impacts include the operational jobs generated by the KS Learning Community, Country Store, and various Native Hawaiian social service providers.

According to the DOE, at full buildout, the DHHL Residential Community project is anticipated to generate 420 students (Table 4-3). The addition of students to area schools is expected to occur gradually as the project is constructed (over 15 to 20 years). It is anticipated that many of these students will not be new to the region, but moving along with their family from within the Waiʻanae-Nānākuli Educational Complex. Some of these students need to be accommodated in the nearby DOE schools.

Table 4-3 Student Generation Rates Based on Full Buildout of the Proposed Project[16]

Grade	Number of Students
Elementary, K-6	252
Intermediate, 7-8	92
High School, 9-12	76

The project proponent's recognize the struggles and successes of the Waiʻanae-Nānākuli Educational Complex and have identified this project as an opportunity to work with existing programs and generate new ones to improve the educational success of families, particularly those of Native Hawaiian descent along the Leeward Coast. The Proposed Project's KS Learning Community is being designed based on community input to support, not replace, the varied educational network already in existence on the Waiʻanae Coast. As part of the project's community outreach, the programmatic components of the P-20 KS Learning Community are being developed over the next two years with community consultation. The programming is anticipated to increase the educational opportunities for preschoolers through young adults.

The Proposed Project is expected to generate short-term employment in the construction of on and off site infrastructure improvements as well as onsite building and landscape improvements. At full build out, the KS Learning Community is anticipated to have a staff of approximately 300. In addition, two community centers, one with a small "mom-and-pop store", and another providing Native Hawaiian and other community services that will provide both employment and small business opportunities are being planned. The Proposed Project potentially provides both short- and long-term employment opportunities for community members to work near where they live, reducing the time spent each day during work-related commutes and improving quality of life.

[16] The Proposed Project is expected to be completed in 15 years. However, unforeseen circumstances may extend project completion by five years.

4.1.13 Infrastructure and Utilities

Mitsunaga and Associates, Inc., and engineering firm has been retained to address infrastructure and utility issues as they pertain to the development of the Proposed Project.

4.1.13.1 Water System

Potable Water System
The Proposed Project is located within the Waiʻanae Service Area of the BWS Development Plan for the island of Oʻahu. The Waiʻanae Service Area (potable supply) is estimated to have a water demand of 9.3 million gallons per day (mgd). The wells in the Waiʻanae Service Area contribute approximately 4.8 mgd. The deficit (approximately 4.5 mgd) is pumped to the coast by the Lualualei booster pump from Central Oʻahu.

The existing service zones within the project area in Mākaha Valley include:

- 242 Service Zone: 2 million gallon reservoir and 1/2 million gallon reservoir
- 525 Service Zone: 2 million gallon reservoir

Currently, BWS has a per project limit of 50 single-family homes or 25,000 gallons per day (gpd) limit for all projects west of the Lualualei Pumping Station. An upgrade to the Lualualei booster pump is scheduled to be funded in 2011, and expected to come on line 2012. BWS has indicated that the booster pump will be upgraded from a 5 mgd capacity to 8 mgd. BWS expects that the upgraded booster pump will lift the 50 single-family home equivalent restriction.

Non-Potable Water System
The current occupant of the Proposed Project area, Makaha Valley Country Club, currently has access to two non-potable water sources located in Mākaha Valley.

On-Site Well and Reservoir System. This source is utilized to irrigate the golf course. The Country Club owns this system and has a well permit for 288,000 gpd. The on-site well feeds a 2.7 MG non-potable on-site reservoir.

Glover Tunnel Water Source and Reservoir System. The Makaha Valley Country Club currently has rights to a portion of the non-potable water in this system, owned by BWS less than one-half of a mile from the project site. This system can supply up to 700,000 gpd to the Makaha Valley Resort and Makaha Valley Country Club.

Potential Impacts and Mitigation

The Proposed Project is anticipated to create an increased water demand in Mākaha Valley requiring connection to the BWS system. A transmission system is being designed to provide water service within the proposed development. The water system is expected to meet BWS requirements. Water requirements should be met through BWS connection to the 525 reservoir service zones and use of onsite non-potable water.

The estimated average daily demands (gallons per day) for the Proposed Project based on BWS criteria are as follows:

- 316,000 gpd for the DHHL Residential Community
- 214,000 gpd KS Learning Community
- Estimated irrigation demand for the project is 247,000 gpd
- The total fire flow requirement for the project = 300,000 gallons

Mākaha 525 Service Zone - Potable Water
According to the City and County of Honolulu, Board of Water Supply (BWS) the existing potable water storage system at the 525-foot elevation has adequate storage capacity allocated to service the KS Learning Community property. The DHHL property on TMK 8-4-002:005 does not have storage capacity allocated in the 525 reservoir. However the project may be able to pay storage facilities charges in lieu of building a new reservoir because the existing properties with allocation in the 525 reservoir are not developed at this time. However, if necessary, the capacity of the 525-foot elevation storage system may need to be increased at the request of the BWS.

Onsite Wells and Reservoir - Non Potable Water
Plans to reduce the demand on existing potable water sources, include the use of the existing on-site well and reservoir to provide non-potable water for irrigation of portions of the cultural landscape area, KS Learning Community and recreational areas.

Based on the proposed infrastructure improvements, no additional mitigation measures are required.

Connection to the 242 service zone was also explored as viable options for this project. This is discussed in further detail in Section 5.0, Alternatives.

4.1.13.2 Wastewater System

The Proposed Project is anticipated to connect to the existing wastewater conveyance system at a 10-inch line on Jade Street. The 10-inch line increases to 15 inches along Jade Street. The line capacity continues to increase to 36 inches at Jade Street and Farrington Highway and then again to 42 inches at Farrington Highway and Māiʻuʻu Road. The line reduces backdown to 36 inches at Bayview Street (approximately 4,800 feet before the Waiʻanae WWTP). According to the City and County of Honolulu, Wastewater Branch, the 36-inch sewer from Bayview Street to the treatment plant does not have capacity to accommodate the existing potential capacity of the upstream 42 inch line. The City and the Waiʻanae WWTP provides secondary treatment of the wastewater.

The proposed KS Learning Community site is currently vacant and does not generate wastewater. The proposed DHHL Residential Community site is currently occupied by the Makaha Valley Country Club. Due to the distance between the closest connection point to the municipal sewer system (approximately half a mile away), the Makaha Valley Country Club is connected to an on-site private batch reactor currently operated by International

Wastewater Technologies, LLC. The existing system, is capable of treating approximately 9,000 gpd, however, the current average usage is 1,800 gpd.

Potential Impacts and Mitigation Measures

Based on the parameters of the Proposed Project, the design average wastewater flow per day is estimated at 264,000 gallons. The City and County of Honolulu indicated that the Waiʻanae WWTP has adequate capacity to meet the needs of the project, therefore no mitigation measures are required for treatment of wastewater. However, due to the capacity reduction of the existing lines from Bayview Street to the treatment plant, the capacity of the conveyance system is not adequate to meet the needs of the project. To address the existing conveyance system deficiency, the project proponent evaluated several options. Based on the phasing of the project, two of the options will likely be incorporated.

Option 1 - Install an additional sewer line as required by the City and County of Honolulu by conventional open trench technology within the existing utility right-of-way on Bayview Street, a portion of Waiʻanae Valley Road, Pōkaʻī Bay Street, and a portion of Farrington Highway in order to connect to the City and County of Honolulu wastewater system. When combined with the capacity of the existing 36-inch line, the installation is expected to increase the capacity reducing the conveyance system deficiency. The City and County of Honolulu has indicated that the conveyance system must be upgraded before any connections to the system can be granted.

Option 2 - Makaha Valley Country Club is connected to an on-site private batch reactor currently operated by International Wastewater Technologies, LLC. The existing system, is capable of treating approximately 9,000 gpd, however, the current average usage is 1,800 gpd. The project proponent is working with DOH engineers to ensure the existing system is capable of handling the anticipated increase in sewer demand.

A micro-tunneling option and the installation of a package treatment plan were also explored as viable options for this project. These are discussed in further detail in Section 5.0, Alternatives.

4.1.13.3 Drainage System

DHHL Residential Community and KS Learning Community

A majority of the Proposed Project area can be characterized as relatively flat (less than 5%). Along Kamaileʻunu Ridge, the site has slopes greater than 15 percent. The existing topography directs the majority of the storm water runoff of the eastern portion of the project site toward ʻEku Stream. Storm water runoff in ʻEku Stream ultimately empties into the Pacific Ocean. The western portion of the project site generally flows adjacent to the western property boundary and is conveyed in grass swales.

A cut-off ditch is located along Kamaileʻunu Ridge. The cut-off ditch was designed to divert storm water runoff generated in the residential community mauka of the Proposed Project site, and from the hillside away from the golf course and into ʻEku Stream.

Potable Water Reservoir

The site of the proposed potable water reservoir is located along the lower slopes of the western ridge of Mākaha Valley adjacent to an existing BWS reservoir. Due to the steep slope, water from moderate to heavy rain events sheet flow down gradient with little infiltration into the substrate.

Sewer Conveyance Structure Improvement Site

The proposed sewer conveyance structure improvement site is located within a highly urbanized area along the coast. The proposed sewer conveyance structure improvements will occur entirely within the right-of-ways of the portions of the streets affected. Storm water runoff generally sheet flows to the numerous drainage structures in the area or to the beaches just makai of the project.

Potential Impacts and Mitigation Measures

Within the proposed DHHL Residential Community and KS Learning Community, there will be a net increase in the quantity of storm water runoff generated on site due to an increase in impervious areas. In addition, the quality may be impacted as pollutants are picked up by runoff as it flows over manmade surfaces and landscaped areas. To address the increase in runoff and decrease in storm water quality, the Proposed Project will detain all additional runoff within detention basins located on site as required (Figure 14). A variety of sustainable design features being considered include water quality swales, porous pavements, landscaping and detention basins to limit offsite discharges to pre-development conditions. Best management practices approved by the City and County of Honolulu will be implemented as required. Any increase in impervious surface area as a result of the installation of the proposed potable water reservoir will be addressed during the design phase. As proposed, the sewer conveyance structure improvements will occur entirely within the right-of-ways of the portions of the streets affected. No encroachment outside of the right-of-ways towards the shoreline is anticipated. The proposed sewer conveyance structure is expected to be located approximately 20 feet below ground surface (bgs). Upon completion of the installation, the surface will be returned to pre-construction conditions, therefore no additional runoff is expected.

Storm water runoff has the potential to increase the non-point source pollutant load into the ʻEku Stream, and eventually the Pacific Ocean. ʻEku Stream is not listed as impaired for by the DOH's, *2006 State of Hawaiʻi Water Quality Monitoring and Assessment Report,* as approved by the EPA, Region 9, February 7, 2008. While ʻEku Stream was not listed, two coastal water bodies were found to be impaired. Mākaha Beach is located makai of the Proposed Project area for the DHHL Residential Community and KS Learning Community and potable water reservoir. Pōkaʻī Bay (both oceanic and open coastal areas) is adjacent to a portion of the proposed sewer conveyance structure improvement project. The Total Maximum Daily Load (TMDL) for contaminants in these water bodies have not yet been

developed. According to the assessment report, the priority for development of TMDLs for these water bodies is listed as low.

Table 4-4
Impaired Water Bodies Potentially Impacted by Proposed Construction Activities

Name of Water Body	Contaminants detected in Water Samples
Mākaha Beach	Chlorophyll a, total nitrogen, turbidity
Pōkaʻī Bay (open coastal)	Chlorophyll a, enterococci
Pōkaʻī Bay (oceanic)	Chlorophyll a, enterococci

The Proposed Project is expected to include disturbances of over one acre of land area. Therefore, a NPDES permit will be required. To prevent pollution and protect the environment required BMPs will be implemented. An erosion control plan[17] will be developed and implemented prior to any demolition and/or construction activities as required. Structural BMPs to control silt and sediment will be utilized where necessary. These locations could include drain inlets and along natural and man-made drainage structures.

4.1.13.4 Energy and Communications Systems

Hawaiian Electric Company, Inc.'s (HECO) poles and 12.47 KV three phase overhead lines are installed along Mākaha Valley Road. Telephone and communication service is currently provided to residents and businesses in Mākaha Valley by Hawaiian Telcom. Hawaiian Telcom and Oceanic Time Warner Cable overhead lines are installed on joint poles with HECO overhead lines along Mākaha Valley Road. Hawaiian Homestead communities in other areas on the Island and around the State are serviced by Sandwich Isles Communication (SIC).

Potential Impacts and Mitigation Measures

Electrical and communications improvements necessary to support the development can be served by utility companies, with some off-site work required. The off-site improvements are ongoing activities for the utility companies and should not have an adverse effect on their ability to service other areas. The existing aboveground utilities servicing the valley are expected to remain in place. Within the proposed DHHL Residential Community and KS Learning Community, plans to use cables and ducts suitable for underground applications and tolerant of both wet and dry conditions is anticipated. All electrical and communications utility systems is expected to be constructed (extended from existing facilities adjacent to the Proposed Project) and maintained according to approved utility standards. Proposed underground, on-site facilities are anticipated to have minimal impact on the environment, as noise, aesthetic, and safety considerations should be within normally applied guidelines.

[17] A sediment control plan is expected to be incorporated into the erosion control plan.

In compliance with Chapter 344 (State Environmental Policy) and Chapter 226 (Hawai'i State Planning Act), HRS, State project buildings, activities, and site grounds are anticipated to be designed with energy-saving considerations where feasible. Energy-efficient design practices and technologies will be specifically addressed in the design phase of the Proposed Project.

The existing network of underground utilities could be impacted during construction. The project engineers are expected to coordinate with the various utility companies to insure service interruption is minimized during construction, and all necessary safety precautions area met.

4.1.13.5 Solid Waste

It is the City Department of Environmental Services, Refuse Division's responsibility to collect, recycle, burn and dispose of the Island's solid waste. The proposed KS Learning Community is currently vacant and does not generate waste. The proposed DHHL Residential Community is currently occupied by the Makaha Valley Country Club. Refuse generated by the Country Club is disposed of by Honolulu Disposal Service, Inc., a private refuse service company. Presently, Honolulu Disposal Service, Inc., collects un-recycled solid wastes and transports it to a City Department of Environmental Services, Refuse Division transfer station, for burning at the City's H-POWER facility and eventual disposal in a sanitary landfill.

Potential Impacts and Mitigation Measures

The Proposed Project will likely generate solid waste during construction and after development. Construction wastes are expected to include vegetation, rocks and debris from the grading and grubbing of the project site. The typical range of per capita solid waste from a residential source is 2.0 to 5.0 pounds per capita per day. It is estimated that the DHHL development of the proposed homes will generate approximately 3.6 tons/day (600 x 3 persons/home x 4.0 lbs/person/day / 2000 lbs/ton). It is estimated the KS Learning Community will generate approximately 2.4 tons/day (1600 students & faculty x 3.0 lbs/person/day / 2000 lbs/ton). The composition of the solid waste is expected to be typical for a municipal source. (US EPA 2009)

It is anticipated that refuse generated by the DHHL development will be collected by the City and County of Honolulu Refuse collection service. KS Learning Community refuse is anticipated to be collected by a private refuse company, which will pick up un-recycled solid wastes and transport it to a City Department of Environmental Services, Refuse Division transfer station, for burning at the City's H-POWER facility and eventual disposal in a sanitary landfill.

The project proponent holds sustainability as a project goal. Low-impact development and construction practices are expected to be implemented including recycling and limiting

waste generation. Similarly, waste minimization measures are expected to be implemented in to educational program design as students learn about *mālama ʻāina*.

4.1.14 Public Services and Facilities

Police Protection
The site is located within Honolulu Police Department District 8. The Waiʻanae Police Substation is located at the intersection of Farrington Highway and Waiʻanae Valley Road.

Fire Protection
The Waiʻanae Fire Station is located at 85-645 Farrington Highway and is approximately two miles away from the project area.

Health Care Services
Waiʻanae Coast Comprehensive Health Center, which includes emergency services, is located at 86-260 Farrington Highway, and is approximately four miles from the project area.

Recreational and Cultural Facilities
Recreational facilities near the Proposed Project include Waiʻanae District Park, Waiʻanae Regional Park, Pililāʻau Community Park, Waiʻanae Boat Harbor, Mauna Lahilahi Botanical Gardens, Mākaha Playground, Mākaha Beach Park, and Kāneʻakī Heiau.

Community Facilities
Community services and public facilities in the vicinity of the Proposed Project include the following:

- Churches in Mākaha and Waiʻanae;
- A public library in Waiʻanae;
- Post office in Waiʻanae on Farrington Highway;
- Waiʻanae District Park; and
- Commercial centers in Mākaha and Waiʻanae.

Educational Facilities
The Proposed Project site is within the DOE Nānākuli-Waiʻanae Educational Complex. Public schools in the complex include Kamaile Academy (public charter school), Ka Waihona ʻO Ka Naʻauao (public charter school), Leihōkū Elementary, Māʻili Elementary, Mākaha Elementary, Nānāikapono Elementary, Nānākuli Elementary, Waiʻanae Elementary, Nānākuli High and Intermediate, Waiʻanae Intermediate, and Waiʻanae High. The students residing in the Proposed Project are located within the boundaries for Mākaha Elementary, Waiʻanae Intermediate, and Waiʻanae High. The official enrollments for these schools are shown in the following table.

Table 4-5 2009-2010 Enrollment

School Name	2009-2010 Official Enrollment
Mākaha Elementary	580
Waiʻanae Intermediate	875
Waiʻanae High	1909

Based on historical enrollment, DOE has projected future enrollment for these three schools through year 2014. Enrollment is projected to continue to stabilize at current enrollment or slightly decline as shown in the following Figure 33.

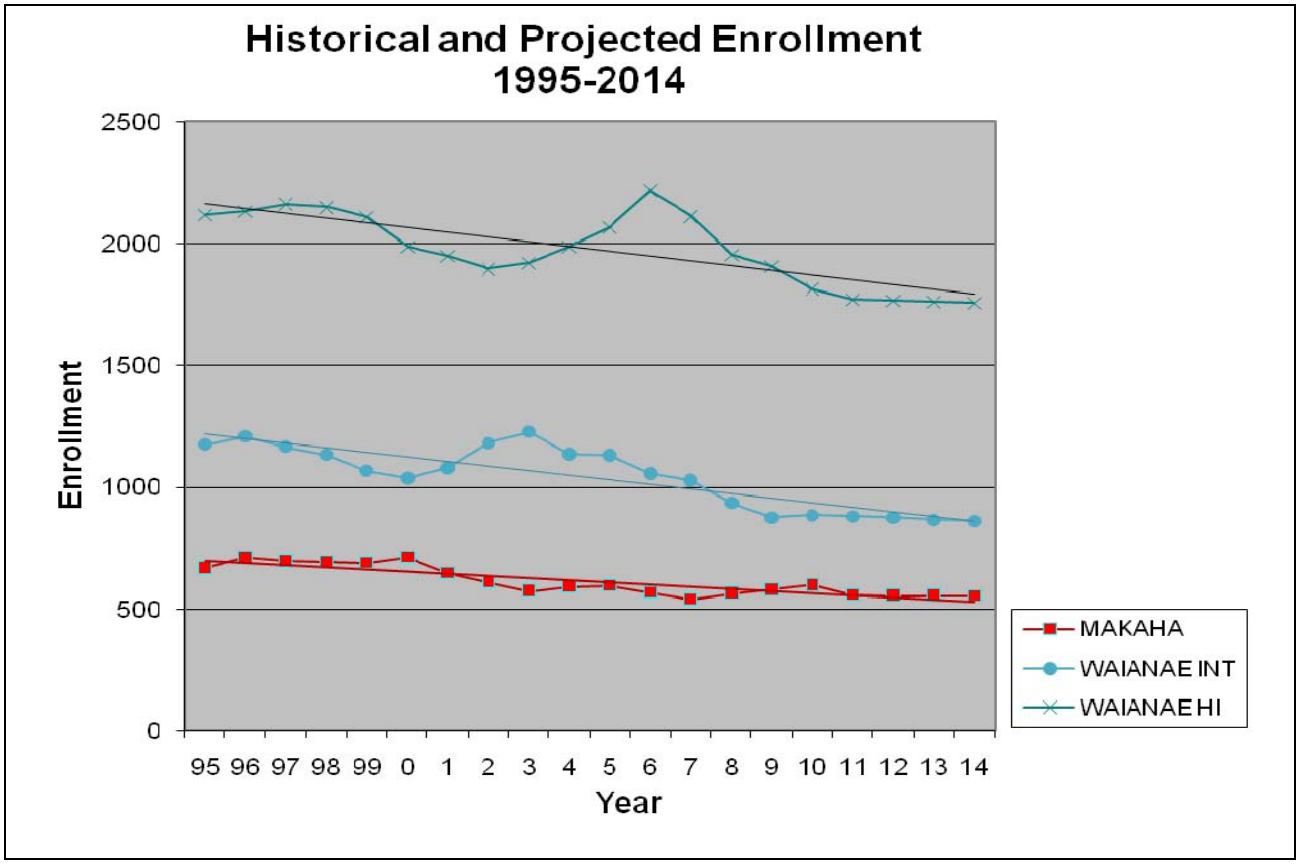


Figure 33- Historical and Projected School Enrollment

There are several public and private schools for children (pre-K through 12th grade) located near the Proposed Project areas. Within the Waiʻanae Community, there are numerous non-traditional educational facilities that partner with the schools or have completely independent programming.

The nearest public school to the proposed:

- KS Learning Community and DHHL Residential Community is Mākaha Elementary School (approximately 0.8 miles away)

- Sewer conveyance structure improvement project is Waiʻanae Elementary School (approximately 0.3 miles away)

The following "traditional" schools are located within one mile of the project area:

- Within one mile of the KS Learning Community and DHHL Residential Community
  - Mākaha Elementary School
  - Waiʻanae Coast Early Childhood
- Within one mile of the KS Learning Community and DHHL Residential Community
  - Adventist Mālama Preschool and Elementary
  - Kamehameha Schools Puʻu Kāhea Preschool

The following educational centers in operation or proposed are located within one mile of the proposed KS Learning Community and DHHL Residential Community project area

- Hoa ʻĀina O Mākaha
- Mākaha Cultural Learning Center
- The Boys and Girls Club(s)

Potential Impacts and Mitigation Measures

Police Protection

The project proponents anticipate an occasional and unavoidable demand for police protection. KS is expected to develop a site specific safety plan for the KS Learning Community. The site is located within minutes of the Waiʻanae Police Substation.

Fire Protection

The project proponents anticipate an occasional and unavoidable demand for fire protection. KS is expected to develop a site specific safety plan for the KS Learning Community. Facilities will include appropriate fire safety features. The site is located within minutes of the Fire Station near the Waiʻanae District Park. The project will be designed and built to include adequate fire flow to support firefighters as required. DHHL is expected to develop a wildfires plan to protect its residents from possible fires from Kamaileʻunu Ridge.

Health Care Services

The project proponents anticipate an occasional and unavoidable demand for emergency health care. The site is located within four miles of the Waiʻanae Coast Comprehensive Health Center.

Recreational and Cultural Facilities

The KS Learning Community is expected to provide recreational facilities to support its students during school hours, DHHL residents, and the general community during non-school hours.

Educational Facilities

According to the DOE, 420 school age children (Table 4-3), may attend local schools as result of the development of a 600 new residences. However, new residents DHHL development, often select homesteads in communities they are familiar with (where they grew up, or the traditional roots of their family) to one that requires moving their families away from their established community support networks. While most applicants on the Oʻahu list do not choose a specific region, approximately 340 on the 2009 list specifically requested homesteads on the Waiʻanae Coast. Therefore, it is likely that many of these children already attend public schools within the Nānākuli-Waiʻanae Complex Area. The project proponent has been in communication with the DOE regarding the impact on area schools. Discussions with DOE are ongoing.

4.2 HUD ENVIRONMENTAL REQUIREMENTS (24 CFR 58)

DHHL is expected to pursue funding in the form of grants and loans from various federal agencies that may include the United States Department of Housing and Urban Development (HUD) and the United States Department of Agriculture (USDA), Rural Development (RD). This EA is prepared to address the impacts of the DHHL Residential Community (including the previously described infrastructure projects that would be funded with federal funding: the sewer conveyance structure improvements, and the new potable water reservoir) in compliance with NEPA policies and procedures listed in 24 CFR 58 and 7 CFR 1794.

4.2.1 Historic Preservation

In December 2009, CSH submitted an intensive AIS for the proposed DHHL Residential Community (and KS Learning Community) to the SHPD, the State Historic Preservation Officer. The findings of AIS closely matched those of previous archaeological studies conducted in the proposed DHHL Residential Community project vicinity. Land clearing activities associated with previous development plans and post-contact agriculture land use significantly disturbed and modified the landscape on the proposed DHHL Residential Community project area and the surrounding area. Despite the disturbances, two historic sites were identified within the proposed DHHL Residential Community project area during the AIS. These are described below:

Site # 50-80-07-875, a **pre-contact or early post-contact agricultural terrace** located on the lower slopes of Kamaileʻunu Ridge in the northeastern portion of the proposed DHHL Residential Community project area. Although the terrace has been disturbed by land clearing and drainage improvement activities over the years, this site is the only remnant of traditional Hawaiian agricultural activities on the project site. Site # 50-80-07-875 was deemed significant under criterion D.

Site # 50-80-07-3325, a **plantation-era irrigation flume**, known as the "Mikilua Flume" was likely constructed in the late 1800s, to provide irrigation water to the extensive sugar cane fields of the Waiʻanae Sugar Company. As evidenced through historic maps, the flume apparently originated at the plantation reservoir near the western edge of the

proposed DHHL Residential Community project area and extended east into neighboring Waiʻanae and Lualualei. This would allow for irrigation water from Mākaha to be transported to the extensive sugar cane fields of the Waiʻanae Sugar Company. This site was also deemed significant under criterion D of the Hawaiʻi Register of Historic Places evaluation criteria.

Of the two sites within the proposed DHHL Residential Community project area, one is a pre-contact (or early post-contact) feature, and the other is plantation era feature. The two sites are described in greater detail in Appendix C.

In January 2010, PBR HAWAII submitted a detailed description and supporting documentation of the Proposed Project including the sewer conveyance structure and potable water reservoir infrastructure improvements to the State Historic Preservation Officer. The proposed sewer conveayance structure is located within urbanized areas within existing road right-of-ways. The proposed reservoir is in an area where previous grubbing and grading has altered the land, along with intensive cultivation.

Potential Impacts and Mitigation Measures

The two pre-modern area features within the proposed DHHL Residential Community project area met significance Criteria D for the Hawaiʻi Register of Historic Places. Criteria D is defined as having yielded, or is likely to yield, information important for research on prehistory or history. This portion of the proposed DHHL Residential Community project may result in 'an adverse effect' (Federal) of these two pre-modern era features. Due to the potential adverse effect on significant historic properties, CSH's project-specific effect recommendation is "effect, with proposed mitigation commitments." Each of the two historic properties identified in the proposed DHHL Residential Community project area was documented with detailed written descriptions, photographs, and accurately located with GPS survey equipment. Scale drawings were made of and limited subsurface testing was conducted at SIHP # 50-80-07-875. CSH determined that sufficient information regarding the location, function, age, and construction methods of the two historic properties has been generated by the current inventory survey investigation to mitigate any adverse effect caused by proposed development activities. CSH proposed to the State Historic Preservation Officer that no further work was required for SIHP #s 50-80-07-875 and -3325. It should be noted that SIHP #s 50-80-07-875 is proposed in a portion of the DHHL Residential Community proposed for "cultural landscape" and thus, can be preserved in place. The following mitigation measures were proposed to the State Historic Preservation Officer by the project proponent's consultant:

> *If, in the unlikely event that subsurface cultural deposits are encountered during the course of development activities, all work in the immediate area should stop and the State Historic Preservation Division should be promptly notified.*

Due to urbanization, location within existing road right-of-ways, cultivation, and previous grubbing/grading of the land, the infrastructure improvements are not anticipated to have historic properties located withth the project boundaries.

The State Historic Preservation Officer's was provided the following:

- the findings of the AIS nor the "effect, with proposed mitigation commitments" for the proposed DHHL Residential Community and Mākaha Valley Road realignment with respect to the requirements of Section 106;

- supplemental information provided in January 2010, recommending that no historic properties are located within the sewer conveyance structure improvements due to (1)residential development/urbanization has altered the land, and (2) other: The project is within existing road right-of-ways"; and

- supplemental information provided in January 2010 recommending that no historic properties are located within the proposed reservoir site due to "intensive cultivation has altered the land and previous grubbing/grading has altered the land."

The Project Proponent has been in communication with the State Historic Preservation Officer's (SHPO) regarding their Section 106 Review.

4.2.2 Floodplain Management

According to the FIRM, the proposed potable water reservoir site is not located within areas of identified flood hazards. The portion of the DHHL Residential Community west of Mākaha Valley Road has been determined to be outside the flood plain. Flood hazards have not been determined for the remainder of the DHHL Residential community (Figure 28). Portions of the Sewer Conveyance Improvement Project are located within two City and County of Honolulu Flood Hazard Districts, Flood Fringe District (Zone AE) and Coastal High Hazard District (Zone VE) (Figure 29).

Potential Impacts and Mitigation Measures

Although the proposed DHHL Residential Community project is likely to increase impervious surface area, drainage improvements required to control runoff will be implemented. The proposed DHHL Residential Community project is expected to detain any additional runoff generated by the increase in impervious surface area, to pre-construction levels before leaving the site.

In 2006, untreated wastewater was released into the Ala Wai Canal. The release was a result of heavy rainwater inflow and infiltration into the sewer conveyance system on Kaiʻolu Street in Waikīkī. While this catastrophic failure has not occurred within the proposed sewer conveyance structure improvement project area, the conveyance system on Kaiʻolu Street was scheduled for upgrade as part of the 1995 Consent Decree. The

catastrophic failure of the Kaiʻolu Street system illustrates the need to upgrade conveyance pipes system-wide to mitigate the impact heavy rains have on the sewer system capacity as required in the Consent Decree. As a by-product of the proposed development in Mākaha Valley, the proposed sewer conveyance structure improvement project as proposed is expected to reduce the deficiency in capacity, thereby reducing potential for catastrophic failure caused by rainwater inflow and infiltration.

The sewer conveyance structure improvement is proposed within the Flood Hazard District of the City and County of Honolulu. The area is regulated under by Chapter 21, Article 9 Special District Regulation of the Revised Ordinance of Honolulu.

The proposed sewer conveyance structure improvement project will comply with development standards as described in section 21-9.10-4, (ROH) particularly:

> (C)(8) *For new or replacement sanitary sewer system and waste disposal system, be designed, located and constructed so as to minimize impairment to them or contamination from them during and subsequent to flooding by regulatory flood.*

In addition, the sewer conveyance structure improvements will comply with the provisions of Sections 21-9.10 through 21-9.10-14, ROH. When required, hydrologic and hydraulic analyses will be performed and a licensed engineer will certify that the proposed encroachment will not cause any increase in regulatory flood elevations during the occurrence of a regulatory flood.

The Flood Fringe District has been identified as a lower risk area than the floodway district allowing the uses allowed in the underlying zoning districts provided such uses, improvements, structures and utilities complies with the provisions of Sections 21-9.10 through 21-9.10-14, ROH. To provide flood protection, the proposed sewer conveyance structure improvement project will also comply with Section 21-9.10-6, ROH.

The Coastal High Hazard District Within the coastal high hazard district, the uses permitted in the underlying zoning district shall be permitted, provided such uses, improvements, structures and utilities are in compliance with the provisions of Sections 21-9.10 through 21-9.10-14, ROH. To provide flood protection, the proposed sewer conveyance structure improvement project will also comply with Section 21-9.10-7, ROH.

4.2.3 Wetlands Protection

No aspect of the proposed DHHL Residential Community project (and KS Learning Community) is located within or adjacent to any wetlands as defined by the ACOE. However, the FWS defines a wetland as an area that exhibits any of the wetland indicators. Based, on this definition, portions of ʻEku Stream and two drainages crossing the sewer conveyance structure improvement project meet the definition of a wetland as defined by the FWS. A detailed discussion of the wetlands assessments conducted in March 2010 was previously described in section 4.1.5.2.

Potential Impacts and Mitigation Measures

Because the DHHL Residential Community and related infrastructure improvements are located within or adjacent to any wetlands as defined by FWS, steps will be taken to ensure sensitive flora and fauna dependent upon the FWS defined wetlands are protected. This can be accomplished through the application of the Standard best Management Practices for aquatic resources as provided by the FWS, and precautionary measures to minimized erosion and sedimentation. The project proponent anticipates completing the 8-step process as required by 24CFR 55.20 and Executive Order 11988 for actions located within a wetland as defined by FWS.

The Proposed Project is not located within or adjacent to any wetlands as defined by the ACOE criteria, therefore, the Proposed Project will have no impact on wetlands and no additional mitigation measures are proposed.

4.2.4 Coastal Zone Management

Congress enacted the Coastal Zone Management Act (CZMA) to assist States in better managing coastal and estuarine environments. The act provides grants to States that develop and implement Federally-approved coastal zone management plans. The State of Hawai'i's CZMA program was enacted pursuant to Chapter 205A, HRS. The program outlines management objectives centered around ten (10) areas: 1) Recreational Resources; 2) Historic Resources; 3) Scenic and Open Space Resources; 4) Coastal Ecosystems; 5) Economic Uses; 6) Coastal Hazards; 7) Managing Development; 8) Public Participation in Coastal Management; 9) Beach Protection; and 10) Marine Resources. All lands within the State of Hawai'i fall within the Coastal Management Zone. The proposed DHHL Residential Community (and Kamehameha Schools Learning Community) and potable water reservoir sites sits far inland from the shoreline and is located outside of the SMA (Figure 10). The sewer conveyance structure improvement portion of the proposed DHHL Residential Community project is located within the SMA (Figure 11). The proposed actions have been assessed and should have little to no negative consequence on the goals set forth in the State's ten management objectives. CZMA Program management objectives and applicability to the proposed DHHL Residential Community project are discussed below:

<u>Recreational Resources</u>

Objective: Provide coastal recreational opportunities accessible to the public.

Policy A: Improve coordination and funding of coastal recreational planning and management; and

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

(i) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;

(ii) Requiring replacement of coastal resources having significant recreational value, including but not limited to surfing sites, fishponds, and sand beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable;

(iii) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;

(iv) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;

(v) Ensuring public recreational uses of County, State, and Federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;

(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;

(vii) Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and

(viii) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, and County authorities; and crediting such dedication against the requirements of section 46-6.

Discussion: The proposed DHHL Residential Community (and KS Learning Community) and potable water reservoir sites will be located inland, away from the shoreline (approximately one mile from the nearest coastline); therefore, it is anticipated that there will be no effect on existing coastal recreational resources.

The proposed sewer conveyance structure improvement project is planned to be located adjacent to the coast. This portion of the proposed DHHL Residential Community project will reduce access from the existing roadways to small segments of the coastline during construction. This is a temporary condition that may ultimately improve the sewer conveyance system, and reduce the potential for catastrophic failure caused by rainwater inflow and infiltration. Access will be returned to pre-construction conditions upon completion of the sewer conveyance structure improvement project. There will be no long-term effect on the existing coastal recreational resources.

Historic Resources

Objective: Protect, preserve and, where desirable, restore those natural and man-made historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.

Policy A: Identify and analyze significant archaeological resources;

Policy B: Maximize information retention through preservation of remains and artifacts or salvage operations; and

Policy C: Support State goals for protection, restoration, interpretation, and display of historic resources.

Discussion: The proposed DHHL Residential Community project proponent's consultant requested a Section 106 Review in a letter dated January 27, 2010. It is anticipated that a response from SHPD, the State Historic Preservation Officer is forthcoming.

An AIS was conducted at the site of the proposed DHHL Residential Community (and KS Learning Community). Two sites were identified within the proposed DHHL Residential Community project area. Both the sites have been assessed as eligible for the State Register of Historic Places under Criterion D.

The AIS reported that sufficient information regarding the location, function, age, and construction methods of the two historic properties has been generated by the current inventory survey investigation to mitigate any adverse effect caused by proposed development activities. CSH proposed to the State Historic Preservation Officer that no further work was required for SIHP #s 50-80-07-875 and -3325. It should be noted that SIHP #s 50-80-07-875 is proposed in a portion of the DHHL Residential Community proposed for "cultural landscape" and thus, can be preserved in place. Should any archaeological or cultural remains be encountered during construction, all work in the immediate vicinity of the find will cease and the SHPD will be contacted for establishment of appropriate mitigation in accordance with Chapter 6E, HRS and Section 106.

Scenic and Open Space Resources

Objective: Protect, preserve and, where desirable, restore or improve the quality of coastal scenic and open space resources.

Policy A: Identify valued scenic resources in the coastal zone management area;

Policy B: Ensure 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;

Policy C: Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources; and

Policy D: Encourage those developments which are not coastal dependent to locate in inland areas.

Discussion: The proposed DHHL Residential Community (and KS Learning Community Project) and potable water reservoir will be located inland, away from the shoreline. Portions of the sewer conveyance structures improvement project are planned to be located adjacent to the coast within the existing road right-of-way. However, once construction is complete, the proposed improvements will be located primarily underground and will not impact the scenic and or open space resources. BMPs will be employed during construction to reduce erosion of soils and fugitive dust during construction, particularly in the vicinity of the drainage structures along the coast. It is anticipated that there will be no effect on the quality of the coastal scenic resources.

Coastal Ecosystems

Objective: Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.

Policy A: Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;

Policy B: Improve the technical basis for natural resource management;

Policy C: Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;

Policy D: 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; and

Policy E: Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.

Discussion: BMPs are planned to be employed during construction to reduce erosion of soils and fugitive dust during construction. Controlling runoff particularly helps to ensure that the construction does not increase inputs of sediment into the drainage outfall of ʻEku Stream nor the drainage structures located along the wastewater conveyance structure improvement project. Since portions of the wastewater conveyance structure improvement project are in close proximity to the ocean, endangered and or threatened marine species may be adversely affect by construction activities. An SPCC plan may be implemented to reduce the risk of contamination of the marine environment. NMFS, ACOE, and USFWS

required best management practices are planned to be implemented. Catastrophic sewer pipe failures have resulted in temporary reduction in water quality affecting the coastal ecosystem on O'ahu. This segment of the wastewater conveyance system is at capacity according to the City and County of Honolulu. By reducing the deficiencies that exist in the conveyance system, the proposed sewer conveyance structure project reduces the potential for catastrophic pipe failure caused by heavy rainfall or other sudden increases in flow. It is anticipated that over the long term the Proposed Project will not have a deleterious effect on the quality of the coastal ecosystems.

Economic Uses

Objective: Provide public or private facilities and improvements important to the State's economy in suitable locations.

Policy A: Concentrate coastal dependent development in appropriate areas;

Policy B: Ensure that coastal dependent development such as harbors and ports, and coastal related development such as visitor industry facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and

Policy 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 dependent development outside of presently designated areas when:

(i) Use of presently designated locations is not feasible;
(ii) Adverse environmental effects are minimized; and
(iii) The development is important to the State's economy.

Discussion: The proposed DHHL Residential Community project does not directly impact the State's coastal-dependent economy, however, during construction it will generate short-term employment (and accompanying State income and excise tax revenue).
In addition, improvement to the wastewater treatment system allows for better segregation of wastewater, and associated pathogens, from the population. This can improve the health of the population, indirectly improving the State's coastal-dependent economy. An adequately functioning, well-maintained sewer system will require fewer service and traffic disruptions for repairs ensuring the economic well-being of small businesses in this urban neighborhood.

Coastal Hazards

Objective: Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence, and pollution.

Policy A: Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and non-point source pollution hazards;

Policy B: Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and non-point source pollution hazards;

Policy C: Ensure that developments comply with requirements of the Federal Flood Insurance Program; and

Policy D: Prevent coastal flooding from inland projects.

Discussion: The proposed DHHL Residential Community (and KS Learning Community) and proposed potable water reservoir sites are not located within the tsunami evacuation zone. However, 'Eku Stream does traverse through the proposed DHHL Residential Community project boundaries. To ensure adequate protection of this ephemeral intermittent drainage way, the area has been designated as open space, with an adequate open space buffer along both sides of the Stream.

The sewer conveyance structure improvement project is located within the coastal hazard zone. However, it is planned to be located entirely underground. This virtually negates any potential detriment to the quality of coastal ecosystems as a result of the sewer conveyance structure improvement project. During construction, BMPs are planned to be employed to reduce non-point source pollution caused by the potential erosion of soils and fugitive dust; particularly in the vicinity of the drainage structures crossing the proposed sewer conveyance structure improvement project area.

Managing Development

Objective: Improve the development review process, communication, and public participation in the management of coastal resources and hazards.

Policy A: Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;

Policy B: Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements; and

Policy 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 public to facilitate public participation in the planning and review process.

Discussion: As with all construction projects that cause soil disturbance, there is the potential for the creation of non-point source pollution. The proposed DHHL Residential Community project and associated infrastructure improvements will include both structural

and non-structural controls to reduce the impact on ʻEku Stream, the drainage structures along Bayview and Pōkaʻī Bay Streets, and the Pacific Ocean. Due to the proposed DHHL Residential Community project's inland location, it should not be considered a "significant coastal development." Its benign location relative to the coastline should not require an involved public participation process concerning coastal effects, although this EA provides an opportunity for input. While a portion of the proposed DHHL Residential Community project, the sewer conveyance structure improvement, is located near the coastline, it is being conducted to improve a portion of the wastewater conveyance system's capacity. By definition, the wastewater conveyance structure improvement project is not considered "development."

Public Participation

Objective: Stimulate public awareness, education, and participation in coastal management.

Policy A: Promote public involvement in coastal zone management processes;

Policy B: Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal issues, developments, and government activities; and

Policy C: Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts.

Discussion: This EA provides a means for public input. In addition, project presentations have been made to various community groups, including DHHL Homestead Associations and the Waiʻanae Coast, Nānākuli-Māʻili and Makakilo-Kapolei-Honokai Neighborhood Boards.

Beach Protection

Objective: Protect beaches for public use and recreation.

Policy A: Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion;

Policy B: Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities; and

Policy C: Minimize the construction of public erosion-protection structures seaward of the shoreline.

Discussion: All above ground structures associated with the proposed DHHL Residential Community (and KS Learning Community project) are located in Mākaha Valley. Due to the distance from the shoreline, no adverse impact to area beaches is anticipated by the structures in Mākaha Valley. While portions of the wastewater conveyance structure improvements are located near the coast, they will be located approximately 20 feet underground. The structures will be appropriately designed to minimize erosion once construction is completed, and will not play a role in the future beach formation/erosion process.

Marine Resources

Objective: Promote the protection, use, and development of marine and coastal resources to assure their sustainability.

Policy A: Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;

Policy B: Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency;

Policy C: Assert and articulate the interests of the State as a partner with Federal agencies in the sound management of ocean resources within the United States exclusive economic zone;

Policy D: Promote research, study, and understanding of ocean processes, marine life, and other ocean resources in order to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources; and

Policy E: Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.

Discussion: The proposed DHHL Residential Community (and KS Learning Community) project site is located approximately one mile inland from the shoreline. Due to the distance from the shoreline, no adverse impact to area beaches is anticipated.

Portions of the proposed sewer conveyance structure improvement project will be located near the coast. The existing capacity of the existing conveyance structure have been determined to be inadequate based on current conditions "upstream" of the project area. As proposed, the sewer conveyance structure improvement project is planned to meet the needs of the proposed DHHL Residential Community project, but also accommodate for the existing capacity deficiency.

By providing this increase in capacity to the portion of the conveyance system that is currently undersized, the proposed sewer conveyance structure improvement project

reduces the potential for catastrophic pipe failures caused by heavy rainfall, helping the City and County of Honolulu to partially fulfill its commitment to protect the environment and public health. The project may also partially fulfill some of the City and County's requirements as described in the 1995 Consent Decree between EPA, the City and County of Honolulu and the State of Hawai'i. As such, the project improves protection of the marine and coastal resources by addressing a portion of the existing deficiencies in the sewer conveyance system, and the potential for future failure.

4.2.5 Sole Source Aquifer

According the EPA's *National Summary of Sole Source Aquifer Designations*, the entire Wai'anae District is located outside of the O'ahu Sole Source Aquifer boundaries. None of the Proposed Project and infrastructure improvements are located within an EPA-designated sole source aquifer area.

Potential Impacts and Mitigation

Due to the project location outside of the O'ahu Sole Source Aquifer boundaries, the proposed DHHL Residential Community project does not have the potential to impact a designated aquifer and no mitigation measures are proposed.

4.2.6 Endangered Species

The Department of Interior list of Endangered Species and Critical Habitats has been reviewed and the proposed DHHL Residential Community project should not affect any listed or proposed endangered or threatened species or critical habitats. The site is not a critical habitat (Figure 26 and 27). The project proponent's consultant requested a list of threatened and endangered species, species proposed for listing and designated critical habitats occurring near the project site in a letter to the USFWS dated January 27, 2010. In a letter dated March 22, 2010, USFWS indicated that the threatened green sea turtle may nest along the beaches within the proposed sewer conveyance structure improvement project. In addition, the letter stated, *"We are not aware of other threatened or endangered species or critical habitat in the project vicinity. However we recommend precautionary conservation measures regarding sea turtles, wildfires and erosion."*

No habitats that could accommodate threatened or endangered plant or animal species are present within the vicinity of the proposed DHHL Residential Community project site. In October 2009, a flora and fauna survey of the proposed DHHL Residential Community (and KS Learning Community) site was conducted by Robert W. Hobdy, Environmental Consultant. In March 2010, Mr. Hobdy returned to the proposed DHHL Residential Community (and KS Learning Community) site in Mākaha Valley to conduct a wetlands assessment. The proposed DHHL Residential Community (and KS Learning Community) project area was dominated by hardy, fire-adapted non-native species. A total of 107 plant species were recorded during the survey. Of the documented species, only four were native. None of the four native species, 'uhaloa (*Waltheria indica*), 'ilima (*Sida fallax*), kou (*Cordia subcordata*), and moa (*Psilotum nudum*) are listed as species of concern,

threatened, or endangered. Eighteen bird species were recorded within the DHHL Residential Community (and KS Learning Community) property boundaries. Seventeen of the eighteen species observed are non-native. Only one native bird species, the Pacific golden-plover (*Pluvialis fulva*), a migratory bird, was observed in the project area. Four mammals were observed, or evidence of their activities was observed. The native Hawaiian Hoary bat was not observed. None of the seven endangered native insects (of any reproductive stage) known to inhabit western Oʻahu were observed. No Federally listed Endangered or Threatened native snails were encountered during the course of the survey nor were any species that are candidate for such status seen.

Mr. Hobdy also conducted a wetlands assessment of the proposed sewer conveyance structure improvement project in March 2010. While the area is urbanized, there are five daylighted storm water conveyance structures within the project areas. It was necessary to assess if these structures were providing wetland habitat for obligate wetland species. The five sewer conveyance structures did not have all three of the essential parameters of a wetland.

Potential Impacts and Mitigation Measures

Vegetation on the proposed DHHL Residential Community (and KS Learning Community) project area primarily consists of numerous non-natives, and several common native species and there are no threatened or endangered plant or animal species present on the site. No evidence or indication of threatened or endangered fauna were observed. The proposed DHHL Residential Community and associated off-site infrastructure improvements are not expected to create conditions that might threaten the survival of threatened or endangered plants or animals, therefore, no mitigation measures are proposed.

4.2.7 Wild and Scenic Rivers

Hawaiʻi has no rivers designated for inclusion in the National Wild and Scenic Rivers System.

Potential Impacts and Mitigation Measures

Because there are no wild and scenic rivers in Hawaiʻi, none will be impacted by the proposed DHHL Residential Community project and no mitigation measures are proposed.

4.2.8 Air Quality

In general, air quality in Hawaiʻi is excellent due to the predominant northeast trade winds. According to the EPA, there are no “non-attainment” sites on Oʻahu. A non-attainment

area is defined as a locality where air pollution levels from anthropogenic sources[18] persistently exceed NAAQS.

Because there are no "non-attainment" sites on O'ahu, the entire island is considered by the EPA to be in attainment for all criteria pollutants. Therefore, the proposed DHHL Residential Community project (and KS Learning Community) site is located within an "attainment area." To ensure that existing air quality continues, both Federal and State standards have been established to identify ambient air quality conditions and potential changes as they may occur in the future.

Potential Impacts and Mitigation Measures

Long-term air quality impacts due to the proposed DHHL Residential Community project (and KS Learning Community) are not expected. Once the DHHL Residential Community (and KS Learning Community) is built and occupied/operational, the number of vehicles waiting to enter Farrington Highway should increase, particularly during the morning hours. However, the persistent winds (both trades and on-shore breezes) and the short periods that the vehicles stop before entering Farrington Highway should rapidly dissipate any potential impacts from noxious gasses. As part of the consideration regarding the air quality impacts from the DHHL Residential Community project (which may involve federal funding for on-site and off-site infrastructure improvements), it is planned that 50 percent of students attending the proposed KS Learning Community will be bussed. This should significantly reduce the number of cars traveling to and from the complex, reducing the potential air pollution impact from the exhausts of personal vehicles. The project is being designed to integrate the DHHL Residential Community with the KS Learning Community, as well as incorporate multi-modal transportation within the proposed DHHL Residential Community project site. A biking and walking greenway is planned to connect the DHHL Residential Community to the KS Learning Community. This provides the residents with opportunities to bike or walk to the mailboxes, country store, community service center and the KS Learning Community reducing potential emissions generated by cars during these short trips.

Short-term air quality impacts due to the proposed DHHL Residential Community project (and KS Learning Community) and associated off-site infrastructure improvement projects may result from construction activities. During construction, air quality in the area surrounding construction sites may be impacted by exhaust generated from construction equipment and fugitive dust. All construction activities are expected to implement best management practices to reduce any negative air quality impacts and comply with the provisions of HAR, Chapter 11-60.1, "Air Pollution Control," Section 11-60.1-33, Fugitive Dust.

A combination of measures to mitigate potential air quality impacts (i.e., watering exposed soils, grassing, minimizing the amount of disturbed area, and rapidly establishing plant

[18] Air pollution from natural sources, like volcanic smog, also known as vog are incorporated in to calculation to determine if an area exceeds NAAQS.

materials) are expected to be implemented around project construction sites as appropriate. The general contractor should develop standard procedures should dirt be tracked onto streets surrounding construction sites, to prevent fugitive dust formation. Exhaust emissions from construction equipment and increased vehicular traffic is not anticipated to violate State or Federal air quality standards based on the moderate level of existing traffic volumes in the project region during non-peak hours.

4.2.9 Farmland Protection

Historically, portions of the proposed DHHL Residential Community (and KS Learning Community) project area may have been utilized for ranching (operations ceased around 1923), an orchard, and sugar cane cultivation (operations ceased between 1946 and 1952). By 2000, aerial photographs provided visual evidence that the area previously identified as an orchard was now covered by dryland scrub. According to a former golf course employee, the water necessary to maintain the orchard was the effluent from the private wastewater treatment plant that was closed in the late 1980s when the area was connected to the municipal sewer system. The orchard likely went out of production soon after removal of the water source. In general, agricultural activities ceased prior to the current operation of the Makaha Valley Country Club (built around 1969).

Potential Impacts and Mitigation Measures

The proposed DHHL Residential Community project and off-site infrastructure improvement projects are not located on Agricultural Lands of Importance to the State of Hawaii", or soils rated as having high productivity by the Land Study Bureau. As such, the proposed DHHL Residential Community project (and proposed KS Learning Community) and areas proposed for necessary infrastructure improvements are not expected to impact the availability of farmland. Therefore, no mitigation measures are proposed for farmland protection.

4.2.10 Noise Abatement and Control

The proposed DHHL Residential Community project (and proposed KS Learning Community), and off-site infrastructure sites are located approximately 7 miles from the nearest airport (Figure 34). The proposed DHHL Residential Community project site is located approximately 4,200 feet off Farrington Highway. Distance from the Farrington Highway and the existing residences in between attenuate any noise generated by traffic on the highway. There are no railroads in Mākaha Valley. The closest active railroad ends in Nānākuli, approximately 10 miles away. Current sources of noise in the vicinity of the proposed DHHL Residential Community project include vehicle traffic, occasional overhead aircraft, natural sounds associated with weather (e.g. wind and rain), and birds. Similarly, the proposed potable water reservoir site would experience noise from similar sources except for vehicle traffic. The areas surrounding the proposed sewer conveyance structure improvement project alignment experience noise from similar sources, but probably higher levels of noise from vehicle traffic.

Potential Impacts and Mitigation Measures

The closest airport (Dillingham Airfield) is located approximately 7 miles away (Figure 34) on the opposite side of the Waiʻanae Mountain range in Mokulēʻia. It is a general aviation airport, but noise from the aircraft landings and takeoffs are attenuated by the Waiʻanae Mountain range. The closest commercial airport is Honolulu International Airport, approximately 20 miles away. According to 24 CFR 51, subpart B, Sec. 51.101(a) (8), "sites with a day-night average sound level (DNL) of 65 and below are acceptable and allowable." According to Honolulu International Airport Master Plan Noise Compatibility Program, typical homes in Hawaiʻi have an outside-to-inside noise reduction factor of approximately five to fifteen decibels less than a mainland house, therefore sites with a DNL or 60 and below are considered acceptable. Due to the proposed DHHL Residential Community project location in Mākaha Valley, the natural topography naturally attenuates noise from the surrounding airports. Additionally, the topography precludes most aircraft (with the exception of helicopters, and light aviation aircrafts) from flying above the proposed DHHL Residential Community project site except in emergency situations.

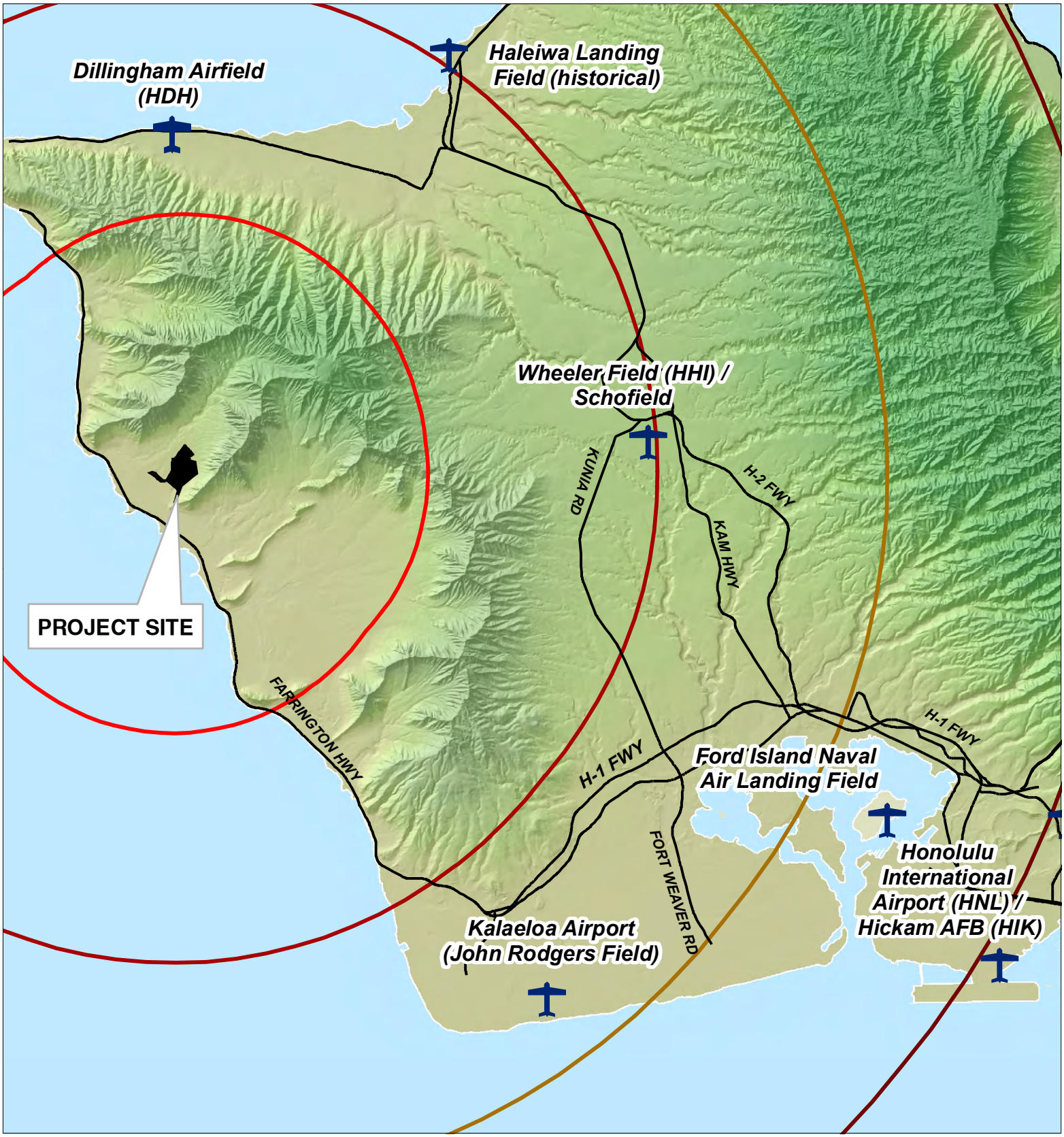
Short-term noise impacts are anticipated to be generated during construction. Proper mitigating measures (such as limiting construction to daylight hours) will be employed to minimize the noise impacts. There are no sensitive land uses, such as hospitals or schools, in the vicinity of the proposed DHHL Residential Community project (and proposed KS Learning Community) and off-site infrastructure improvement sites that would be affected during the construction period. The closest sensitive receptor to the proposed DHHL Residential Community project is Mākaha Elementary School, located approximately 0.8 miles away (and separated by a residential subdivision). All project activities should comply with the DOH's Administrative Rules, Chapter 11-46, and "Community Noise Control" and should be monitored to ensure compliance. Impacts and mitigation measures are discussed in greater detail in section 4.1.10.

Long-term noise levels are expected to be similar to surrounding residential communities, recreational areas, and schools. No additional mitigation measures are required.

4.2.11 Explosive and/or Flammable Operations

The DHHL Residential Community is proposed to be located within the Makaha East Golf Course. Within the Makaha East Golf Course, the golf course maintenance facility maintains two 550 above ground storage tanks (AST) containing diesel and gasoline. The maintenance facility also stores bulk quantities of fertilizer. While the exact chemical make-up of the fertilizers is unknown, many fertilizers are considered oxidizers, and in the presence of a fuel and ignition source may increase the burning rate of a flammable material or possibly create an explosive reaction. Two additional ASTs containing fuel are also located within the proposed DHHL Residential Community project boundaries at the Makaha East Golf Course clubhouse to provide fuel to the kitchen.

An off-site facility handling explosive or fire-prone material is located off-site at the Mākaha Resort. A gasoline and fuel dispensing station is located on the perimeter of the Makaha



LEGEND

- Project Site
- Airports
- 5 Mile Radius
- 10 Mile Radius
- 15 Mile Radius
- 20 Mile Radius
- Major Roads

Source: U.S. Geological Survey
Disclaimer: This graphic has been prepared for general planning purposes only.

FIGURE 34

Distances to Airports

DHHL Residential Community / KS Learning Community

ISLAND OF O'AHU

NORTH

LINEAL SCALE (FEET)
0 7,500 15,000 30,000

PBR HAWAII & ASSOCIATES, INC.

APR 2010

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Resort, northwest and adjacent to the Proposed Project. It is assumed that the gasoline and fuel is stored in USTs, as only the dispensing equipment were visible during a site visit.

Potential Impacts and Mitigation Measures

The fuel tanks located on the Makaha East Golf Course are the property of the current occupant. Prior to development of the proposed DHHL Residential Community, all hazardous, fire prone or explosive materials should be removed from the Makaha East Golf Course. In the unlikely event, that DHHL decides to maintain the on-site ASTs for future use, the tanks will be inspected to ensure they meet current UFC, UPC, and NFPA standards. Similarly, in the unlikely event that DHHL maintains the current occupant's explosive or fire prone materials, the storage facilities will be inspected to ensure they meet current UFC, UPC, and NFPA standards for safe storage. The fuel dispensing stations located at Mākaha Resort are assumed to store the flammable liquid below ground. DHHL will confer with the current dispensing station agent and/or DOH to ensure the facility meets all environmental health and safety requirements.

4.2.12 Toxic Chemicals and Radioactive Materials

A search of available environmental records indicates that there are no nearby dumps, landfills, industrial sites, or other operations with hazardous wastes. Further, the proposed DHHL Residential Community project site is not within one mile of a National Priority List "Superfund" site; or 2,000 feet of a State hazardous materials site; or other known toxic site.

Potential Impacts and Mitigation Measures

A portion of the land proposed for the development of the DHHL Residential Community may have been under cultivation of sugarcane (operations ceased between 1946 and 1952) prior to its development as a golf course. There is a potential that agricultural chemicals applied during sugarcane cultivation nearly 60 years ago may exist in the soil at concentrations in excess of the levels deemed acceptable for unrestricted use.

A portion of the proposed DHHL Residential Community will be located on the site of an existing golf course maintenance facility that stores bulk quantities of hazardous materials including pesticides, herbicides and petroleum products and smaller quantities of other materials regulated under the Emergency Planning and Community Right to Know Act, the Federal Insecticide, Fungicide, and Rodenticide Act, and the Toxic Substances Control Act. From all indications, the chemicals are being stored properly and no releases have been reported, within the area in and around the maintenance facility.

An unlined ditch within a portion of the proposed DHHL Residential Community has been utilized by golf course staff to wash down golf course equipment and lawnmowers. It is likely that a variety of contaminants (pesticides, herbicides, gasoline oils, lubricants, etc.) present on the maintenance equipment was drained into the unlined ditch. Makaha Valley

Country Club is working on a plan for the wash water to be contained and prevented from entering the ditch.

Some of the pesticides/herbicides and fertilizers stored in the maintenance facility have been applied to the golf course as part of the Makaha East Golf Course's landscape maintenance program. From all indications, the applications have been conducted legally, and no releases have been reported.

All of these current and former uses of the proposed DHHL Residential Community project area increase the potential for chemicals to exist in soil at concentrations above the DOH environmental action levels (EAL) for unrestricted land use. To reduce the potential risk resulting from these uses of the facility, the project proponent anticipates removal of hazardous or toxic material not necessary for the operation or maintenance of the proposed facilities prior to occupancy. If necessary, remediation of soil, groundwater, and/or soil vapor may be conducted to ensure concentrations are less that of DOH's EAL for unrestricted use. A soil sampling plan is being developed by the project proponent to assess if contamination above acceptable levels is present in soil from past activities.

The proposed DHHL Residential Community project site does not contain radioactive materials and is not near a dump, or landfill, therefore no impacts from toxic chemicals and radioactive materials are expected from these types of sources, therefore no additional mitigation measures are proposed.

4.2.13 Airport and Runway Clear Zones and Accident Potential Zones

It is the HUD's general policy to prevent unsuited development in areas around civil or military airports. Additional research must be conducted in order to determine whether a proposed development may be incompatible or of concern if it is anticipated near an airport or in the immediate area of landing or approach zones. Upon realizing most aircraft crashes occur during the critical landing or take off phases of flight, the Federal Aviation Administration established zones where the highest probability for crashes were identified. These zones are referred to as *clear zones* or *accident potential zones*.

According to HUD policy (Chapter 24 CFR 51 Subpart D), clear zones are areas which extend beyond 2,500 feet (nearly 0.5 miles) of the end of a civil airport runway or 15,000 feet (2.8 miles) of the end of a military airfield runway. The proposed DHHL Residential Community project (and KS Learning Community project) are located well outside of any airport clear zone. The site is located over seven miles from the nearest airport (Figure 34). The Dillingham Field, a joint-use airfield between the Hawai'i Department of Transportation and the Army, is situated about 7.2 miles north of Mākaha, over the Wai'anae Mountain Range in Mokulē'ia. Wheeler Airfield is located nearly 10 miles away, in Central O'ahu, also on the other side of the Wai'anae Mountain Range from the proposed DHHL Residential Community project. The proposed DHHL Residential Community project (and KS Learning Community project) area is not within a designated Airport Clear Zone, Accident Potential Zone, or Runway Clear Zone.

Potential Impacts and Mitigation Measures

Because the proposed DHHL Residential Community project site is separated from the nearest airport (seven miles away) by the Wai'anae mountain range, there will be no impacts to airport clear zones are anticipated and no mitigation measures are proposed.

4.2.14 Environmental Justice

The proposed DHHL Residential Community project is located along the Wai'anae Coast, a predominantly minority and low-income area. However, the site and the surrounding neighborhood do not suffer from disproportionate adverse environmental effects relative to the community of the Wai'anae Coast at large.

Potential Impacts and Mitigation Measures

The proposed DHHL Residential Community project will help the DHHL to fulfill its mandate to develop and deliver homesteads to native Hawaiians by creating a livable neighborhood. The proposed subdivision should positively affect the economic and social welfare of the native Hawaiian community by providing housing opportunities in close proximity to the proposed KS Learning Community. By co-locating the DHHL Residential Community and KS Learning Community , the newly established native Hawaiian DHHL Residential Community will be able to take advantage of the various educational program developed by Kamehameha Schools, and within walking distance. In addition, the project as proposed will include an area identified as Kauhale Services. The objective of the Kauhale services is to bring together a variety of Native Hawaiian service organizations (to be determined at a later date), into one complex. This allows the beneficiaries to conduct much of their business in one convenient location, and within walking distance.

There are no adverse health and environmental conditions that affect the proposed DHHL Residential Community project because of its location. In addition, there will be no activity that disproportionately affects minority and low-income populations in comparison to the rest of the population based on the siting or purpose of the proposed DHHL Residential Community project. As such, the notion of environmental justice has been evaluated.

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5.0 ALTERNATIVES

In compliance with the provisions of Section 11-200-17(f), HAR and NEPA, an EA must discuss all potential practicable alternatives to the proposed action.

The alternatives considered include:

5.1 NO ACTION

The no-action alternative results in no change in use of the Proposed Project area. Under this alternative, the current occupant, Makaha Valley Country Club could continue to operate, and the existing residential-zoned area may eventually be developed "at its highest and best use" with single-family, "executive golf course lots." A KS Learning Community would not be built and no homes for DHHL beneficiaries would be constructed (over the golf course). No short-term construction jobs or long term KS Learning Community jobs would be generated. While [the] Ka Pua initiative would continue to move forward, the keystone portion of the project, The KS Learning Community project in Mākaha would be absent.

5.2 ALTERNATIVES

Building Alternatives

- *Maximum Build Alternative - 1,150 Homes:* In this alternative, the proposed DHHL Residential Community would be developed to maximize the number homes on the DHHL parcels assuming 5,000 square foot lots.

  This alternative was not selected for the following reasons: While the homes would be of similar height and scale to the preferred alternative, visually, the project would have less open space. This would result in an addition of 550 homes in the valley over the preferred alternative. Approximately 390 additional students would need to be provided services at the neighborhood schools, possibly resulting in the need for a new school. The cultural landscape would be eliminated to accommodate the additional homes. The traffic impact to local roadways and intersections would be nearly double the impacts caused by the preferred alternative (the proposed DHHL Residential Community project of up to 600 residential units). The demands on the existing potable water transmission system would increase necessitating transmission improvements along Jade Street. Potable water storage requirements would likely necessitate the installation of a larger reservoir.

- *Building Alternative - High Density Multi-Family units only:* In this alternative, the proposed DHHL Residential Community will include only multi-family units. With a maximum of 600 units, the proposed DHHL Residential Community structures would have a much smaller footprint leaving more areas as open space. Taller structures may limit accessibility of residential units on higher floors, or require

some type of mechanical access. Clustering homes together could improve the walkability of the project.

This alternative was not selected because: the buildings would be significantly taller and would affect view planes of the surrounding residential communities. This alternative was not chosen based on the information provided by applicants on the DHHL waiting list. Applicants have expressed that the preferred housing product is single-family homes rather than multi-family units.

- *Building Alternative - Low Density Multi-Family units only:* In this alternative, the proposed DHHL Residential Community will include only multi-family units. At a maximum of 600 units, the proposed community would have a much smaller footprint than the preferred alternative, but larger than the high-density multi-family alternative. The buildings would be one to two stories and although there would be more open space, the building density would be higher, possibly resulting in a more significant visual impact when compared to the Proposed Project.

  With all homes clustered in a smaller area, walkability of the project would be improved when compared to the preferred plan.

  This alternative was not chosen based on the information provided by applicants on the DHHL waiting list. Applicants have expressed that the preferred housing product is single-family homes rather than multi-family complexes.

- *Building at an Alternate Location*: In this alternative, the Proposed Project would be sited outside of Mākaha Valley. The impacts to the valley, changes in use, and views would be eliminated. Depending upon the location, off-site infrastructure necessary for the preferred alternative may also be eliminated or the requirements larger, resulting in possibly greater impacts.

  This alternative was not selected because, while impact to the valley and areas of proposed infrastructure improvements would not occur, other impacts associated with an alternate site would need to be addressed. Based on the existing inventory on Oʻahu, DHHL is unable to meet the needs of the native Hawaiians awaiting a homestead on the applicant list. DHHL has worked with a variety of public and private land holders to increase its land holdings on Oʻahu. The preferred location provides DHHL with an opportunity to increase its land holdings and provide more homesteads to native Hawaiians.

  The preferred location includes adequate land for the KS Learning Community. Co-location of the KS Learning Community with the DHHL Residential Community creates the synergy required for the live, work, play and learn environment that is a critical element of the project. An alternate location was not chosen because no locations were found that could accommodate both DHHL's housing requirement while still be adjacent to a parcel large enough for KS needs.

Wastewater Alternatives

- *Pipe Location Alternative:* In this alternative, the alignment of the sewer conveyance improvement project would remain entirely on Farrington Highway. This alternative was explored because it would move the project actions further inland and away from the existing roadway right-of-ways near the coastline, and outside of the coastal high hazard flood district. In this alignment, most of the sewer conveyance improvement project area would be outside of the Special Management Area, and the "Flood Fringe," and "Flood Hazard District." The alignment would also result in a straighter project alignment, shortening the overall project length, which could reduce costs.

  This alternative was rejected because: Farrington Highway is the primary route into and out of the Coast. Construction on Farrington Highway would significantly impact regional traffic, unless all construction occurred during the evening. This alternative would result in construction along approximately 4,000 linear feet of Farrington Highway. The preferred alternative was chosen to reduce traffic impact caused by work along Farrington Highway.

- *Micro-Tunneling and Open Trench Alternative:* This alternative proposes micro-tunnel installation of the sewer conveyance structure under the existing storm water drainage crossings and open trench installation along the remainder of alignment. While the existing storm water drainage structures are man-made features, three are under tidal influence, therefore under the jurisdiction of the ACOE. By utilizing micro-tunneling at near and under the existing drainage structures, the filling, or dredging of the waters of the United States would not be required. As a result, coverage is not required under the Clean Water Act Section 401. Additionally, a DOH water certification would not be required. This option would still require coverage under the Rivers and Harbors Act, Section 10 and possibly the Clean Water Act Section 404 depending upon the ACOE Jurisdictional Determination.

  This alternative was eliminated because it is too costly to implement. At over twice the cost of the proposed preferred construction methodology this alternative does not eliminate the need for ACOE approval.

- *Private On-Site Package Wastewater Treatment Plant Alternative:* This alternative proposes construction of an on-site package wastewater treatment plant. This option would eliminate the need for offsite sewer conveyance system improvements. Currently a 9,000 gpd private system exists on site. The existing system (located within the existing Makaha Valley Country Club) could be utilized to provide wastewater treatment capabilities for a portion of the initial phase of development. However, at full build out the project will generate approximately 264,000 gpd of wastewater. To meet the needs of the project, additional capacity over the existing on-site systems would be required. A modular package treatment plant could be installed to meet the treatment needs of the project. The modular units would be purchased and installed to meet the treatment requirements as the

wastewater treatment demand increases. This is an advantage to the preferred alternative which requires all infrastructure improvements be made and paid for all at once, up front. Another advantage to this system is that individually, each module contains its own holding/treatment tank(s) reducing the size of a single tank and providing redundancy within the system. Based on preliminary cost estimates, the cost to install a package on-site wastewater treatment plant would be comparable to the costs of the proposed sewer conveyance structure improvements. Long-term cost for maintenance would be offset by a reduction of municipal sewer treatment costs. The on-site wastewater system could be designed to yield R-1 recycled water. The R-1 effluent is the highest grade of recycled water and can be utilized for non-potable applications with some restrictions. R-1 effluent is treated to a higher standard than the effluent leaving the existing municipal system. The R-1 recycled water would need to be utilized within the project, or piped to an alternate user (such as Mākaha Resort, local farms, etc.).

This alternative is viewed as less desirable than the proposed sewer conveyance structure improvements because: the use of an on-site package treatment plant may include the need to develop off-site infrastructure to convey R-1 water to off-site end users, and the potential visual impacts of the package plant structures. In addition, the siting of a package on-site wastewater treatment plant may potentially expose surrounding communities to accidental spills, releases or plant failures. Coordination with DOH would be required to ensure compliance with HAR Chapter 11-62 once operational. Both the plant and operator will need to meet DOH certification classification. In addition, this alternative would require DOH approval for construction, operation, and surface discharge.

Water Alternatives

- *Connection to the 242 Service Zone Alternative*

  Water storage and transmission capacities were allocated to the Proposed Project area from the developer of the Mākaha 242 reservoir. Connection to the 242 service zone would be from a water main on Jade Street. Approximately 200 residences units within the DHHL Residential Community would be served by the 242 service zone instead of the 525 service zone. The service limit for this system is the 142-foot elevation. Under this alternative, pressure reduction may not be required.

  This alternative was rejected because: the existing transmission pipes are inadequate to meet the fire flow requirement of 1,000 gpm in addition to the approximately 70 gpm required to meet the average daily demand of 200 residential units. To ensure the Fire Department has adequate water pressure in the event of a fire emergency, approximately 3,000 linear feet of the Jade Street transmission lines would need to upgraded. The existing 8″ water main would need to be upgraded to a 12″ main to accommodate the new development's fire flow requirements. This would likely involve installation of new pipe utilizing traditional open trenching technology. Residents along Jade Street would be significantly impacted as a result of this work. Short-term construction impacts would likely include disruptions in water service,

closure of portions of the roadway, increased noise levels and construction-related air emissions. Because installation of the reservoir tank at the 525 elevation is expected to have excess storage capacity to meet the fire flow needs, the preferred alternative was chosen to reduce the impact this alternative would have on the Jade Street residents.

- *Irrigation Alternative:* In this alternative, the existing onsite non-potable reservoir would be closed and wells would be properly sealed. This would reduce the on-going maintenance and liability costs associated with operating a water supply and storage system.

  This alternative was rejected because: non-potable water requirements (i.e. landscaping) would need to be serviced by the BWS potable water systems. As proposed, irrigation of the KS Learning Community and common areas in the DHHL Residential Community (bike/pedestrian greenway, community/commercial service areas) would require an additional 101,000 gpd be transmitted and supplied by the potable water systems. The project proponent chose to maintain the existing non-potable system to reduce the project impact on potable water supply and reduce the total number of gallons of potable water purchased from BWS.

Preferred Alternative

The preferred alternative would include the following project features:

- Up to 600 homes;
- Approximately 250,000 sq ft covered space in KS Learning Community;
- Open trench construction of the sewer conveyance improvements with installation of approximately 500 linear feet of pipe along Farrington Highway;
- Temporary start up connection to an existing private WWTP;
- Fire flow for entire property supplied by the 525 service zone;
- Domestic potable water supplied by 525 service zone; and
- Use of non-potable water supply for irrigation.

The preferred alternative/Proposed Project was chosen over the alternatives discussed based on an assessment of inconvenience to the general public, visual impacts, cost, and environmental impacts. The impacts and mitigations associated with the preferred alternative/proposed action have been detailed throughout this EA.

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6.0 FINDINGS, SUPPORTING REASONS, AND ANTICIPATED DETERMINATION

To determine whether the DHHL Residential Community and KS Learning Community Project may have a significant impact on the physical and human environment, all phases and expected consequences of the Proposed Project have been evaluated, including potential primary, secondary, short-range, long-range, and cumulative impacts. Based on this evaluation, the Approving Agency (Department of Hawaiian Home Lands) is expected to issue a FONSI for the Proposed Project. The supporting rationale for this anticipated finding is presented in this chapter.

6.1 PROBABLE IMPACT, INCLUDING CUMULATIVE IMPACTS

Cumulative impacts are impacts on the environment that result from the action when added to other past, present, and foreseeable future actions by other agencies or persons. As discussed throughout this document, this project is being proposed to address the housing needs of the native Hawaiian community as well as address some of the educational shortfalls along the Waiʻanae Coast. In addition, as a byproduct of the Proposed Project in Mākaha Valley, the preferred alternative is expected to remediate a portion of the wastewater conveyance system deficiency by increasing capacity which may partially fulfill a portion of the requirements of the Consent Decree agreed upon by City, State and Federal officials. The long-term cumulative impact of this project as presently proposed include: 1) an increase in educational and recreational opportunities within the Waiʻanae Coast; 2) affordable housing available to native Hawaiians; and, 3) a reduction of risk of municipal wastewater spills into the ocean associated with inflow and infiltration particularly during peak wet weather events. The anticipated cumulative impacts are beneficial.

Socio-economic impacts resulting from the Proposed Project are anticipated to be beneficial. The State of Hawaiʻi currently has a shortage of affordable housing available. The Proposed Project is expected to provide up to 600 affordable homes for eligible native Hawaiians. It is anticipated that the Proposed Project will also provide increased educational opportunities for students on the coast. By working with existing DOE programs, the KS Learning Community may help bridge any gaps that exist. Finally, wastewater pipe failures can expose the ocean-going population to numerous pathogens. Construction of this project may reduce the risk of catastrophic pipe failure by increasing capacity where it is currently deemed inadequate due to higher capacity upstream. This ultimately protects the health of residents along the Waiʻanae Coast.

6.2 SIGNIFICANCE CRITERIA

Based upon the previous information presented in this document, the proposed permitting and construction of the DHHL Residential Community and KS Learning Community Project will likely have no significant environmental impacts. This determination is based upon

the Significance Criteria outlined in Chapter 343, HRS, as amended and Title 11 Chapter 200, HAR 1996, discussed below.

(1) *Involves an irrevocable commitment to loss or destruction of any natural or cultural resource;*

The project is located within an existing golf course, and on areas previously developed with plantation agriculture. While the area has undergone numerous ownership changes and land-altering land uses, the project proponent required an intensive archaeological survey be conducted. The AIS and summary of mitigative measures performed by CSH along with the appropriate fees were submitted to the SHPD on December 9, 2009. On January 21, 2010, SHPD found the AIS to be acceptable in satisfying the requirements of the Hawai'i Administrative Rules (HAR) Chapter 13-276-5. In addition, SHPD agreed with mitigation measures completed by CSH and that no further archaeological work was recommended.

(2) *Curtails the range of beneficial uses of the environment;*

The DHHL Residential Community and KS Learning Community Project forecloses other uses, however, residential use of the site would provide affordable housing to native Hawaiians and help to ease the statewide shortage of housing, as residences not on DHHL lands vacated by DHHL beneficiaries may become available to the general population once DHHL beneficiaries move to their homestead lots. In addition, working within the existing educational framework the KS Learning Community is anticipated to strengthen educational resources and programs in the region elevating the level of education and well-being for the entire community. Additionally, cultural use of the property will increase with the KS Learning Community project.

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

The environmental policies enumerated in Chapter 344, HRS promote conservation of natural resources, and an enhanced quality of life for all citizens. The proposed DHHL Residential Community and KS Learning Community Project is consistent with the environmental policies, goals, and guidelines. This EA has addressed such issues as: natural resources conservation (to the extent possible); enhancement of the quality of life; population; land, water, visual, air, and other natural resources; flora and fauna; parks, recreation, and open space; economic development; transportation; energy; community life and housing; education and culture; and citizen participation.

(4) *Substantially affects the economic or social welfare of the community or State;*

The Proposed Project is anticipated to positively affect the economic and social welfare of the native Hawaiian community by providing affordable housing opportunities on O'ahu (up to 600 residential units). The DHHL Residential Community will also positively affect

the economic and social welfare of the State by adding to the statewide inventory of affordable housing. The proposed KS Learning Community also is expected to build upon the strengths of the community schools and educational providers, by providing educational resources, curricula and programs to elevate the level of education of students along the coast, positively affecting social welfare in the region. Improvements to the municipal wastewater system may also reduce the potential of wastewater spills into the ocean, indirectly positively affecting the State economy.

Construction of the Proposed Project may also benefit the State by creating temporary construction and permanent operational jobs on the Waiʻanae Coast. The project as proposed is expected to generate approximately 300 new jobs to staff the KS Learning Community project, and proposed DHHL Residential Community commercial, and community services areas. The project as proposed may also indirectly generate new jobs within the community, providing services to residents, students and staff. Income taxes, and sales taxes from the purchase of construction materials and the expenditure of employees' wages, will be generated as a result of this development.

(5) *Substantially affects public health;*

Construction of the Proposed Project may pose the potential for temporary impacts to noise, air, and water quality levels; however, these potential impacts will be short-term and are not expected to substantially affect public health. All construction activities will comply with applicable regulations and appropriate mitigation measures will be implemented as necessary. After construction, the Proposed Project should have minimal impact on ambient air and water quality. Ambient noise level within the proposed DHHL Residential Community is expected to be similar to the existing surrounding residential subdivision. Ambient noise levels associated with the Learning Community are expected to be similar to other recreational areas and existing schools along the coast. The project as proposed is expected to also positively affect public health through the improvement of the sewer conveyance system. These improvements benefit the public health by reducing the population's exposure to pathogens by safely transporting wastewater. It is anticipated that public health will also be positively affected by the development of recreational areas and bike and walking greenway within the project. Providing additional opportunities for alternative modes of transportation and recreation in close proximity to residences can promote healthy active lifestyles, improving public health.

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

As proposed, the project can provide eligible native Hawaiians with more affordable housing opportunities. According to the *DHHL Applicant Waiting List, 2009*, there are approximately 8,800 applications on file for residential homestead leases on Oʻahu. A majority of applicants for Hawaiian Home Lands would prefer a homestead in a community they are familiar with (where they grew up, or the traditional roots of their family) to one that requires moving their family away from their established community support network. However, most have listed a general preference to the island of Oʻahu to

improve chances of receiving an award. Although requesting a specific location on the island of O'ahu limits award opportunities, approximately 340 applicants specifically requested homesteads on the Wai'anae Coast. While the proposed development will likely introduce some new residents to the Wai'anae Coast, the demand for energy and water, as well as solid waste and wastewater generation, should not increase significantly, either regionally or island-wide. Resources available are adequate to accommodate the increase in demand.

(7) *Involves a substantial degradation of environmental quality;*

The Proposed Project will utilize previously disturbed vacant and golf course land and is not expected to substantially degrade environmental quality of these lands. The property was substantially modified in the past and today lacks any significant natural resources with the exception to water. While the non-potable water resource is significant, the Proposed Project is not expected to degrade this resource as proposed use should not exceed current pumping rates. Potential impacts to the environment resulting from development, and appropriate mitigation measures have been identified throughout this EA.

(8) *Is individually limited but cumulatively has considerable effect on the environment, or involves a commitment for larger actions;*

As proposed, the project is anticipated to result in the disturbance of over one (1) acre of land area. Therefore, a NPDES permit will be required. BMPs should be implemented as required to prevent the potential for water-borne pollution and protect the environment. An erosion control plan should be developed and implemented prior to any demolition and/or construction activities. The plan should include guidance to control sedimentation. Possible structural BMPs should include silt fences at the downstream perimeter of the project site and sediment control filters at drain inlets. Appropriate permits required for waters under the jurisdiction of the ACOE will be acquired. Permit conditions and appropriate BMPs as required will be followed to reduce impacts to streams or drainage ways under the jurisdiction of the ACOE and/or FWS

The proposed action is not expected to have any substantial negative secondary impacts on the environment. The DHHL Residential Community and KS Learning Community Project are consistent with the City's General Plan and should not generate any additional actions having a cumulative effect on the environment. Potential off site impacts (associated with infrastructure improvements) have been identified and addressed throughout this EA. In addition, while the proposed DHHL Residential Community is anticipated to generate approximately 420 school age children, the DOE has indicated a new public school would not be required within the proposed development.

(9) *Substantially affects a rare, threatened or endangered species or its habitat;*

The site contains no habitat for rare, threatened or endangered plant or animal species listed by the USFWS or in the Endangered Species Act.

(10) ***Detrimentally affects air or water quality or ambient noise levels;***

Air Quality: No State or Federal air quality standards should be violated during or after the construction of the Proposed Project.

Water Quality: No State or Federal water quality standards should be violated during or after the construction of the DHHL Residential Community and KS Learning Community Project.

Ambient Noise Levels: Construction activities for the development of the property will inevitably create temporary noise impacts. The City's contractors may employ mitigation measures to minimize those temporary noise impacts including the use of mufflers and implementing construction curfew periods. Pursuant to Chapter 11-46, HAR, the project activities will comply with all community noise controls. Upon completion of the project, noise generated is anticipated to be similar to the surrounding residential communities, recreational areas and schools.

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

Portions of the sewer conveyance structure improvement of the Proposed Project would be located within the flood hazard district. However, due to the subterranean nature of the project, no substantial impacts are anticipated. Additionally, the project may reduce the risk of accidental release or backflow of untreated wastewater from this segment of the conveyance system particularly during peak wet weather events (heavy rain). As such, the project can benefit the environmentally sensitive flood plains, beach and coastal waters by ensuring adequate segregation of wastewater from the environment.

(12) ***Substantially affects scenic vistas and view planes identified in County or State plans or studies; or,***

It is anticipated that the Proposed Project will be designed to conform with City and County of Honolulu building codes. Residential structures are anticipated to be low-rise in character. Structures within the KS Learning Community are also anticipated to be one to two stories tall. Working with the existing topography of the project area and program requirements, buildings will be sited to reduce visual impact. All buildings within the project are low-rise; therefore, ocean views from residences mauka of the project are not expected to be obstructed. Landscaping can further reduce the visual impact of rooflines. The project proponent does not anticipate that scenic vistas or view planes specifically identified in City and County of Honolulu plans will be affected.

The installation of the new potable water reservoir will result in an additional tank on the hillside. The tank will be co-located with the existing tank of similar height and mass. It is not anticipated to significantly change the existing view planes or vistas.

The proposed sewer conveyance structure improvement project will be located below grade. It is not anticipated to affect any view planes or vistas.

(13) ***Requires substantial energy consumption.***

Construction of the Proposed Project is not expected to require more energy than other projects of similar size and scale. It is anticipated that structures will be designed to incorporate energy-saving technologies. Where possible, sustainable features that reduce overall energy consumption should be integrated into the design of both the DHHL Residential Community and KS Learning Community Project. Such features could include orienting structures to maximize capturing tradewind and solar energy, incorporating energy-saving fixtures and appliances, maximizing day lighting, reducing heat island effect, optimizing energy performance and utilizing on-site renewable energy.

6.3 ANTICIPATED DETERMINATION

On the basis of impacts and mitigation measures examined in this document and analyzed under the above criteria, it is anticipated that the DHHL Residential Community and KS Learning Community Project will not have a significant effect on the physical or human environments. Pursuant to Chapter 343, HRS, it is anticipated that the approving agency (Department of Hawaiian Home Lands) will issue a FONSI.

7.0 CONSULTED PARTIES AND PARTICIPANTS IN THE EA PROCESS

Various agencies (or agency documents) were consulted in preparation of this EA. Comments and responses to the pre-consultation request are attached in Appendix F

FEDERAL
U.S. Fish and Wildlife Service, Pacific Islands Contact Office
Department of the Army, Regulatory Branch-CEPOH-EC-R
Department of the Army, Technical Branch-CEPOH-EC-T
US Dept of Commerce, U.S. National Marine Fisheries Service (NOAA)

STATE
Department of Business, Economic Development & Tourism (DBEDT)
DBEDT Land Use Commission
Department of Education
Civil Defense
DOH Environmental Planning Office
Office of Environmental Quality Control
Department of Land and Natural Resources (DLNR)
DLNR, State Historic Preservation Division
Department of Transportation
Office of Hawaiian Affairs

CITY AND COUNTY OF HONOLULU
Board of Water Supply
Department of Community Services
Department of Design and Construction
Department of Environmental Services
Department of Facility Maintenance
Department of Parks & Recreation
Department of Planning & Permitting
Department of Transportation Services
Fire Department
Police Department

UTILITIES
Hawaiian Electric Company, Inc.
Hawaiian Telcom

POLITICAL LEADERSHIP
The Office of Senator Colleen Hanabusa, 21st District
The Office of Senator Mike Gabbard, 19th District
The Office of Representative Maile Shimabukuro, 45th District
The Office of Representative Karen Leinani Awana, 44th District

The Office of Representative Sharon Har, 40th District
Honolulu City Councilmember Todd K. Apo, District 1
Jo Jordan, Waiʻanae Coast Neighborhood Board #24
Patty Teruya, Nānākuli-Māʻili Neighborhood Board #36
Maeda Timson, Makakilo-Kapolei-Honokai Hale Neighborhood Board, #34

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Appendix A

Biological Surveys and Associated Correspondence

FLORA AND FAUNA SURVEY AND ASSESSMENT

for the

Nā Pua – Mākaha Learning Complex and

DHHL Mākaha Homestead Development

MAKAHA VALLEY, LEEWARD O'AHU

by

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ENVIRONMENTAL CONSULTANT
Kokomo, Maui
October 2009

Prepared for: PBR HAWAII

Botanical and Fauna Survey
Nā Pua – Mākaha Learning Complex and
DHHL Mākaha Homestead Development

INTRODUCTION

The Nā Pua Mākaha Learning Complex and DHHL Mākaha Homestead Devlopment Project lies on 302 acres of land in central Makaha Valley in Wai'anae District, Leeward O'ahu (TMK's (1) 8-4-02:005,007,056,057,076, TMK's (1) 8-4-23:014,015, TMK (1) 8-4-24:001. These parcels are surrounded on the north and south sides by residential communities, on the west side by the Makaha Resort and Golf Club, and on the east side by undeveloped lands. This study was initiated by the owners in fulfillment of environmental requirements of the planning process.

SITE DESCRIPTION

The core of this property is a 151 acre golf course that consists of expanses of fairways, greens, sand traps and water hazards that surround a club house and maintenance buildings. The east side of the property has a dry gulch that runs down through it, and moderately sloping lands rising up toward Kamaile'unu Ridge. Elevations range from 400 feet in the upper east corner to 120 feet in the gulch bottom on the southern edge of the property. Soils are in the Ewa and Lualualei series which are alluvial silty clays or clays with an abundance of stones (Foote et al, 1972). Rainfall averages between 25 and 30 inches a year with the bulk falling during the winter months.

BIOLOGICAL HISTORY

Originally this area would have been a dry native forest/shrubland with such trees as wiliwili *(Erythrina sandwicensis),* 'ohe makai *(Reynoldsia sandwicensis)* and hao *(Rauvolfia sandwicensis),* shrubs such as 'a'ali'i *(Dodonaea viscosa),* ma'o *(Gossypium tomentosum),* 'ilima *(Sida fallax)* and grasses and vines such as pili *(Heteropogon contortus),* kawelu *(Eragrostis variabilis),* huehue *(Cocculus orbiculatus)* and 'āwikiwiki *(Canavalia galeata)).*

For the past 150 years this valley has been grazed by cattle. A portion of the lower valley was used for growing sugar cane. These uses greatly reduced the native forests and species diversity. Feral pigs and goats inhabit the valley and the adjoining ridges today. Over the decades fires have repeatedly burned the dry vegetation. Charred stumps were encountered throughout the undeveloped portions of the property. Today few native plant species remain and the habitat is reduced primarily to a few hardy, fire-adapted, non-native species.

SURVEY OBJECTIVES

This report summarizes the findings of a flora and fauna survey of the proposed Nā Pua Mākaha Learning Complex and DHHL Mākaha Homestead Development which was conducted in October 2009. The objectives of the survey were to:

1. Document what plant, bird and mammal species occur on the property or may likely occur in the existing habitat.

2. Document the status and abundance of each species.

3. Determine the presence or likely occurrence of any native flora and fauna, particularly any that are Federally listed as Threatened or Endangered. If such occur, identify what features of the habitat may be essential for these species.

4. Determine if the project area contains any special habitats which if lost or altered might result in a significant negative impact on the flora and fauna in this part of the island.

5. Note which aspects of the proposed development pose significant concerns for plants or for wildlife and recommend measures that would mitigate or avoid these problems.

BOTANICAL SURVEY REPORT

SURVEY METHODS

A walk-through botanical survey method was used following routes to ensure maximum coverage of this large property. Areas most likely to harbor native or rare plants such as gulches or rocky outcroppings were more intensively examined. Notes were made on plant species, distribution and abundance as well as terrain and substrate.

DESCRIPTION OF THE VEGETATION

Three non-native plant species were abundant on the property. Bermuda grass (*cynodon dactylon*) makes up the bulk of the fairways and greens on half of the property and is maintained in its typical closely mowed condition. Guinea grass (*Panicum maximum*) is the dominant grass on the undeveloped acreage. Growing with the Guinea grass are dense stands of koa haole (*Leucaena leucocephala*). Three additional non-native species are common on the undeveloped land. Kiawe (*Prosopis pallida*) trees are scattered throughout the brushlands and forms denser growth in the dry gulch. Klu (*Acacia farnesiana*) grows throughout the koa haole and kiawe habitat. Slender mimosa (*Desmanthus pernambucanus*) is also common here.

A total of 107 plant species were recorded during the course of the survey. Of these, four were common native species: ‘uhaloa (*Waltheria indica*), ‘ilima (*Sida fallax*), kou (*Cordia subcordata*), and moa (*Psilotum nudum*). All of these are indigenous in Hawaii as well as in other parts of the Pacific.

Had the survey been done during the wet months, more plant species would likely have been found, mostly ephemeral, annual non-native species that either wither during the summer heat or are consumed by pigs or goats. No rare native species would be expected to sprout in this area.

DISCUSSION AND RECOMMENDATIONS

The vegetation throughout the project area is dominated by six non-native plant species: Bermuda grass, Guinea grass, klu, koa haole, kiawe and slender mimosa. Two native Hawaiian plant species recorded, ‘ilima and ‘uhaloa are widespread and common in Hawaii and the Pacific. The other two native species, kou and moa, were found in the golf course landscape.

No Federally listed Endangered or Threatened native plants (USFWS, 2009) were encountered during the course of the survey nor were any species that are candidate for such status seen. No special native plant habitats were seen on the property.

Because the vegetation is dominated by non-native plants, and no rare or protected species occur on or adjacent to the property, there is little of botanical concern and the proposed land uses are not expected to have a significant negative impact on the botanical resources in this part of Oahu.

It is recommended that native dryland plants known to occur in this area be incorporated into the landscape design of the completed project. Local native plant specialists can be consulted for ideas.

PLANT SPECIES LIST

Following is a checklist of all those vascular plant species inventoried during the field studies. Plant families are arranged alphabetically within each of three groups: Ferns, Monocots and Dicots. Taxonomy and nomenclature of the Ferns follow Palmer (2003). Taxonomy and nomenclature of the Monocots and Dicots are in accordance with Wagner et al. (1999) and Staples and Herbst (2005).

For each species, the following information is provided:

1. Scientific name with author citation.

2. Common English or Hawaiian name.

3. Bio-geographical status. The following symbols are used:

   endemic = native only to the Hawaiian Islands; not naturally occurring anywhere else in the world.

   indigenous = native to the Hawaiian Islands and also to one or more other geographic area(s).

   non-native = all those plants brought to the islands intentionally or accidentally after western contact.

   polynesian = all those plants brought to the islands by the Hawaiians during the course of their migrations.

4. Abundance of each species within the project area:

   abundant = forming a major part of the vegetation within the project area.

   common = widely scattered throughout the area or locally abundant within a portion of it.

   uncommon = scattered sparsely throughout the area or occurring in a few small patches.

   rare = only a few isolated individuals within the project area.

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
FERNS			
NEPHROLEPIDACEAE (Sword Fern Family)			
Nephrolepis brownii (Desv.) Hovenkamp	Asian sword fern	non-native	rare
POLYPODIACEAE (Polypody Fern Family)			
Phymatosorus grossus (Langsdon & Fisch) Brownlie	*laua'e*	non-native	rare
PSILOTACEAE (Whisk Fern Family)			
Psilotum nudum (L.) P. Beauv.	*moa*	indigenous	rare
CONIFERS			
ARAUCARIACEAE (Araucaria Family)			
Araucaria columnaris G.Forst.) J.D. Hooker	Cook pine	non-native	uncommon
MONOCOTS			
ARECACEAE (Palm Family)			
Cocos nucifera L.	niu, coconut	Polynesian	uncommon
Ptychosperma macarthurii (Veitch) J.D. Hooker	Macarthur palm	non-native	rare
Veitchia merrillii (Beccari) H.E. Moore	Manila palm	non-native	rare
Washingtonia robusta H. Wendland	Mexican featherduster palm	non-native	rare
CYPERACEAE (Sedge Family)			
Cyperus gracilis R.Br.	McCoy grass	non-native	rare
Cyperus rotundus L.	nut sedge	non-native	rare
Kyllingia brevifolia Rottb.	*kilio'opu*	non-native	rare
POACEAE (Grass Family)			
Cenchrus ciliaris L.	buffelgrass	non-native	uncommon
Chloris barbata (L.) Sw.	swollen fingergrass	non-native	rare
Chloris divaricata R. Br.	stargrass	non-native	rare
Cynodon dactylon (L.) Pers.	Bermuda grass	non-native	abundant
Eleusine indica (L.) Gaertn.	wiregrass	non-native	rare
Eragrostis pectinacea (Michx.) Nees	Carolina lovegrass	non-native	rare
Panicum maximum Jacq.	Guinea grass	non-native	abundant
Paspalum conjugatum Bergius	Hilo grass	non-native	rare
Paspalum fimbriatum Kunth	Panama grass	non-native	rare
Sporobolus indicus (L.) R. Br.	Indian dropseed	non-native	rare
Urochloa mutica (Forssk.) T.Q. Nguyen	California grass	non-native	rare
STRELITIZIACEAE (Bird-of-paradise Family)			
Strelitzia reginae Dryander	bird-of-paradise	non-native	rare
DICOTS			
ACANTHACEAE (Acanthus Family)			
Dicliptera chinensis (L.) Juss.	----------	non-native	rare
AIZOACEAE (Fig-marigold Family)			
Trianthema portulacastrum L.	----------	non-native	rare
AMARANTHACEAE (Amaranth Family)			

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
Alternanthera pungens Kunth	khaki weed	non-native	rare
Amaranthus viridis L.	slender amaranth	non-native	rare
ANACARDIACEAE (Mango Family)			
Mangifera indica L.	mango	non-native	rare
Schinus terebinthifolius Raddi	Christmas berry	non-native	rare
ANNONACEAE (Custard Apple Family)			
Annona muricata L.	soursop	non-native	rare
APOCYNACEAE (Dogbane Family)			
Calotropis gigantea (L.) W.T. Aiton	crown flower	non-native	rare
Nerium oleander L.	oleander	non-native	uncommon
Plumeria obtusa L.	Singapore plumeria	non-native	uncommon
Plumeria rubra L.	plumeria	non-native	uncommon
Stapelia gigantea N.E. Brown	giant toad flower	non-native	rare
Thevetia peruvaiana (Persoon) K. Schumann	be-still tree	non-native	rare
ARALIACEAE (Ginseng Family)			
Schefflera actinophylla (Endl.) Harms	octopus tree	non-native	rare
ASTERACEAE (Sunflower Family)			
Calyptocarpus vialis Less.	----------	non-native	uncommon
Pluchea carolinensis (Jacq.) G. Don	sourbush	non-native	rare
Sonchus oleraceus L.	*pualele*	non-native	rare
Sphagneticola trilobata (L.) Pruski	wedelia	non-native	uncommon
Synedrella nodiflora (L.) Gaertn.	nodeweed	non-native	rare
Tridax procumbens L.	coat buttons	non-native	rare
BIGNONIACEAE (Bignonia Family)			
Spathodea campanulata P. Beauv.	African tulip tree	non-native	uncommon
Tabebuia aurea (Silva Manso) S. Moore	silver trumpet tree	non-native	rare
Tabebuia donnell-smithii Rose	gold tree	non-native	rare
Tabebuia heterophylla A.P. de Candolle	pink tecoma	non-native	uncommon
BORAGINACEAE (Borage Family)			
Cordia sebestena L.	geiger tree	non-native	rare
Cordia subcordata Lamarck	*kou*	indigenous	rare
Heliotropium procumbens Mill.	fourspike heliotrope	non-native	rare
CACTACEAE (Cactus Family)			rare
Cereus uruguayanus R. Kiesling	hedge cactus	non-native	rare
CARICACEAE (Papaya Family)			
*Carica papay*a L.	papaya	non-native	rare
CLUSIACEAE (Clusia Family)			
Clusia rosea N. Jacq.	autograph tree	non-native	uncommon
CONVOLVULACEAE (Morning Glory Family)			
Ipomoea cairica (L.) Sweet	*koali 'ai*	non-native	rare

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
Ipomoea obscura (L.) Ker-Gawl	----------	non-native	rare
CRASSULACEAE (Stonecrop Family)			
Bryophyllum fedschenkoi (Raymond-Hamet & Perrier) Lauzac-Marchal	----------	non-native	rare
CUCURBITACEAE (Gourd Family)			
Coccinia grandis (L.) Voigt	ivy gourd	non-native	rare
Momordica charantia L.	bitter melon	non-native	rare
EUPHORBIACEAE (Spurge Family)			
Chamaesyce hirta (L.) Millsp.	hairy spurge	non-native	rare
Chamaesyce hypericifolia (L.) Millsp.	graceful spurge	non-native	rare
Codiaeum variegatum (L.) Blume	croton	non-native	rare
Ricinus communis L.	Castor bean	non-native	rare
FABACEAE (Pea Family)			
Acacia farnesiana (L.) Willd.	klu	non-native	common
Cassia fistula L.	golden shower	non-native	rare
Cassia x nealiae H.S. Irwin & Barneby	rainbow shower	non-native	uncommon
Crotalaria assamica Benth.	----------	non-native	rare
Crotalaria incana L.	fuzzy rattlepod	non-native	rare
Delonix regia (W.J. Hooker) Rafinesque	royal poinciana	non-native	rare
Desmanthus pernambucanus (L.) Thellung	slender mimosa	non-native	common
Indigofera hendecaphylla Jacq.	creeping indigo	non-native	rare
Leucaena leucocephala (Lam.) de Wit	*koa haole*	non-native	abundant
Macroptilium lathyroides (L.) Urb.	wild bean	non-native	rare
Neonotonia wightii (Wight & Arnott) Lackey	glycine	non-native	rare
Peltophorum pterocarpum (A.P. de Candolle) K. Heyne	yellow poinciana	non-native	rare
Prosopis pallida (Humb. & Bonpl. ex Willd.) Kunth	*kiawe*	non-native	common
Samanea saman (N. Jacquin) Merrill	monkeypod	non-native	uncommon
LAMIACEAE (Mint Family)			
Hyptis pectinata (L.) Poit.	comb hyptis	non-native	rare
Leonotis nepetifolia (L.) R. Br.	lion's ear	non-native	rare
LYTHRACEAE (Crape-myrtle Family)			
Lagerstroemia speciosa (L.) Persoon	giant crape-myrtle	non-native	rare
MALVACEAE (Mallow Family)			
Abutilon grandifolium (Willd.) Sweet	hairy abutilon	non-native	rare
Abutilon incanum (Link) Sweet	hoary abutilon	non-native	rare
Hibiscus rosa-sinensis L.	Chinese hibiscus	non-native	uncommon
Malvastrum cormandelianum (L.) Garcke	false mallow	non-native	uncommon
Sida ciliaris L.	----------	non-native	uncommon
Sida fallax Walp.	*'ilima*	indigenous	rare
Sida rhombifolia L.	Cuban jute	non-native	rare
Sida spinosa L.	prickly sida	non-native	rare

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
Waltheria indica L.	'uhaloa	indigenous	uncommon
MELIACEAE (Mahogany Family)			
Melia azedarach L.	pride-of-India	non-native	rare
MORACEAE (Mulberry Family)			
Artocarpus heterophyllus Lamarck	jackfruit	non-native	rare
Ficus microcarpa L.f.	Chinese banyan	non-native	rare
MYRTACEAE (Myrtle Family)			
Melaleuca quinquenervia (Cav.) S.T. Blake	paperbark	non-native	rare
Syzygium cumini (L.) Skeels	Java plum	non-native	rare
NYCTAGINACEAE (Four-o'clock Family)			
Boerhavia coccinea Mill.	scarlet spiderling	non-native	uncommon
Bougainvillea spectabilis Willd.	bougainvillea	non-native	uncommon
OLEACEAE (Olive Family)			
Ligustrum japonicum Thunberg	Japanese privet	non-native	rare
ONAGRACEAE (Evening Primrose Family)			
Ludwigia octovalvis (Jacq.) Raven	primrose willow	non-native	rare
OXALIDACEAE (Wood Sorrel Family)			
Oxalis corniculata L.	*'ihi*, yellow wood sorrel	Polynesian	rare
PHYTOLACCACEAE (Pokeweed Family)			
Rivina humilis L.	coral berry	non-native	rare
PORTULACACEAE (Purslane Family)			
Portulaca oleracea L.	pigweed	non-native	rare
Portulaca pilosa L.	----------	non-native	rare
RUBIACEAE (Coffee Family)			
Gardenia taitensis A.P. de Candolle	*tiare*	non-native	rare
Ixora chinensis Lamarck	Chinese ixora	non-native	rare
RUTACEAE (Citrus Family)			
Citrus reticulata Blanco	tangerine	non-native	rare
Murraya paniculata (L.) W. Jack	mock orange	non-native	rare
SALICACEAE (Willow Family)			
Salix babylonica L.	weeping willow	non-native	rare
SOLANACEAE (Nightshade Family)			
Brugmansia x candida Persoon	*nana honua*, angel's trumpet	non-native	rare

FAUNA SURVEY REPORT

SURVEY METHODS

A walk-through survey method was conducted in conjunction with the botanical survey. All parts of the project area were covered. Field observations were made with the aid of binoculars and by listening to vocalizations. Notes were made on species abundance, activities and location as well as observations of trails, tracks scat and signs of feeding. In addition an evening visit was made to the area to record crepuscular activities and vocalizations and to see if there was any evidence of occurrence of the Endangered Hawaiian hoary bat *(Lasiurus cinereus semotus)* in the area.

RESULTS

MAMMALS

Two mammal species were observed on the property during the survey and sign of two additional species were identified during three site visits. Taxonomy and nomenclature follow Tomich (1986).

Mongoose *(Herpestes auropunctatus)* - A few mongoose were seen around the clubhouse and in the margins of dense vegetation where they hunt for rodents and birds.

Cat (*Felis catus)* – Three cats were seen around the clubhouse during the evening survey. They are likely feral animals that feed around rubbish containers and hunt for birds and rodents.

Pig (*Sus scrofa*) – Signs of pig rooting and tracks were seen in the small gulch to the east of the golf course. Pigs from the upper valley occasionally come down close to human habitations and activities.

Rats (*Rattus spp.)* - Signs of rat feeding were observed on some kiawe trees. Rats strip the succulent bark off new growth for food and moisture.

Other mammals that are likely to utilize this area include wild goats that occasionally come down from the rocky slopes of Kamaile'unu Ridge during dry weather and are observed by maintenance personnel.

A special effort was made to look for the native Hawaiian hoary bat by making an evening survey at two locations on the property. These bats are known to occur sporadically in rural parts of Oahu but are considered rare. When present in an area they can be easily identified as they forage for insects, their distinctive flight patterns clearly visible in the glow of twilight. No evidence of such activity was observed though visibility was excellent and plenty of flying insects were seen. In addition a bat detecting device was employed (Batbox IIID) set to the frequencies of 27,000 to 28,000 hertz these bats are known to use. No bats were detected using this device.

BIRDS

There were moderate numbers of a diverse array of birds on the property. Seventeen species of non-native birds were recorded. Taxonomy and nomenclature follow American Ornithologists' Union (2005).

Zebra dove (*Geopelia striata*) – Small flocks of these small doves were seen and heard on all parts of the property in trees and feeding in ground clearings.

Spotted dove (*Streptopelia chinensis*) – Several individuals of these large doves were seen in trees or in flight over the property.

Red-vented bulbul (*Pycnonotus cafer*) – These dark birds were seen throughout the property. Their distinctive warbling calls were frequently heard.

Common myna (*Acridotheres tristis*) – Mynas, mostly in pairs, were seen in much of the property.

Red-crested cardinal (*Paroaria coronata*) – A few small groups of these bright red-headed birds were seen in kiawe trees bordering the fairways.

Chicken (*Gallus gallus*) – Two families of chickens were seen scratching under the kiawe trees and on the edges of the fairways.

Gray francolin (*Francolinus pondicerianus*) – Several families of these francolins were seen in clearings in the grasslands and along fairway margins.

House sparrow (*Passer domesticus*) – Groups of noisy sparrows were seen around structures on the property and nearby trees.

House Finch (*Carpodacus mexicanus*) – A few of these finches were seen in kiawe trees in the gulch habitat.

Erckel's francolin (*Francolinus erckelii*) – Five of these large francolins were seen in the brush near the parking lot and in clearings in the forest.

Common waxbill (Estrilda astrild) – One flock of these tiny birds was seen feeding in grassy brushlands and resting in a tree.

Japanese white-eye (*Zosterops japonicus*) – A few of these small green birds were seen feeding in kiawe trees and making their high-pitched chattering calls.

Northern cardinal (*Cardinalis cardinalis*) – Three of these red cardinals were seen and heard making their high-pitched chipping calls.

White-rumped shama (*Copsychus malabaricus*) – Two of these long-tailed songsters were heard calling in dense kiawe forest in the gulch.

Pacific golden-plover (*Pluvialis fulva*) – Two plovers were seen feeding on golf course fairways.

Northern mockingbird (*Mimus polyglottos*) – Three of these mockingbirds were seen and heard calling from the tops of kiawe tree snags in the brushlands in the lower parts of the property.

Mallard (*Anas platyrhynchos*) – A group of mallards were seen in a water hazard in the golf course during the evening survey.

A few other non-native birds might be expected to be found in this area such as hwamei (*Garrulax canorus*), cattle egret (*Bubulcus ibis*), chestnut mannikin (*Lonchura Malacca*), Java sparrow (*Padda oryzivora*) and perhaps others. This habitat, however, is unsuitable for Oahu's native forest birds that presently survive in native forests at higher elevations beyond the range of mosquitos and the avian diseases they carry.

A long-time golf course maintenance person shared some historical information about two native birds, the pueo (*Asio flammeus sandwichensis*) and the ae'o or black-necked stilt (*himantopus mexicanus knudseni*). He said the pueo used to be seen infrequently in the past hunting over the brushlands and the upper valley, but is now rarely seen since the upper valley has been developed. The ae'o appears infrequently in small numbers in a settling pond on the upper part of the property. Neither of these were seen during the survey.

INSECTS

While insects in general were not tallied, they were abundant throughout the area and fueled the bird life observed. One native Sphingid moth, Blackburn's sphinx moth (*Manduca blackburni*) has been put on the Federal Endangered species list and this designation requires special focus (USFWS 2000). Blackburn's sphinx moth was known previously to occur in parts of Leeward Oahu but is not anymore known from here. Its native host plants are species of 'aiea (*Nothocestrum spp.*) and non-native alternative host plants are tobacco (*Nicotiana tabacum*) and tree tobacco (*Nicotiana glauca*). None of these host plants were found on the property and no Blackburns sphinx moths or their larvae were seen.

Six species of native picture wing flies (*Drosophila spp.*) are listed as Endangered on Oahu. These all inhabit native habitats at higher elevations in the Ko'olau and Wai'anae Ranges. None of these were seen during the survey.

SNAILS

Forty one species of native tree snails (*Achatinella* spp.) are listed as Endangered on Oahu. Like the picture wing flies these species all live in native habitats in the Ko'olau and Wai'anae Ranges. They do not occur in the dry non-native lowlands such as are found on this property and none of these snails were seen.

DISCUSSION AND RECOMMENDATIONS

The landscape and habitats of this property and its surrounding environs are overwhelmingly non-native in character, the result of over a century of agriculture and grazing uses and the effects of numerous fires. No native mammals, birds, insects or snails were encountered during the survey. No Endangered fauna species were observed and no special wildlife habitats were encountered.

The potential, infrequent to rare occurrence of such Endangered bird species as the pueo and the ae'o deserves some discussion. The pueo is listed by the State as Endangered on Oahu, and upper Makaha Valley is one of the palces it has historically been known to frequent. This property is on the lower fringe of its preferred habitat and the pueo's use of this area has already greatly diminished due to human developments that have isolated this area from a continuum of habitat with the upper valley. The development of this property would somewhat diminish this marginal habitat for the pueo, but it would also dramatically reduce an expanse of dry flammable fuels that seriously threatens adjacent homes every time this area burns.

The ae'o is federally listed as Endangered and it carries this designation with it wherever it goes. The ae'o is a wide-ranging opportunist that exploits suitable habitats, even temporary or ephemeral ponds that may appear following rains. The ae'o are attracted to golf course settling ponds and water hazards, and wouldn't come if they weren't there. These ponds are thus created habitats that benefit these Endangered birds. It is recommended that golf course personnel and golfers be educated about these protected birds so that no harm will befall the birds whenever they show up. This can be accomplished in provided literature and the placement of unobtrusive signage near water features.

The proposed development of this property is not expected to have a significant negative impact on the native fauna resources in this part of Oahu.

ANIMAL SPECIES LIST

Following is a checklist of the animal species inventoried during the field work. Animal species are arranged in descending abundance within two groups: Mammals and Birds. For each species the following information is provided:

1. Common name
2. Scientific name
3. Bio-geographical status. The following symbols are used:
   - endemic = native only to Hawaii; not naturally occurring anywhere else in the world.
   - indigenous = native to the Hawaiian Islands and also to one or more other geographic area(s).
   - migratory = all species that spend part of their annual life cycle in Hawaii and part of it elsewhere. Migrant birds typically spend their spring and summer months breeding in the arctic and their fall and winter months in Hawaii.
   - non-native = all those animals brought to Hawaii intentionally or accidentally after western contact.
4. Abundance of each species within the project area:
   - abundant = many flocks or individuals seen throughout the area at all times of day.
   - common = a few flocks or well scattered individuals throughout the area.
   - uncommon = only one flock or several individuals seen within the project area.
   - rare = only one or two seen within the project area.

COMMON NAME	SCIENTIFIC NAME	STATUS	ABUNDANCE
MAMMALS			
Mongoose	*Herpestes auropunctatus*	non-native	uncommon
Cat	*Felis catus*	non-native	uncommon
Pig	*Sus scrofa*	non-native	rare
Rats	*Rattus spp.*	non-native	rare
BIRDS			
Zebra dove	*Geopelia striata*	non-native	common
Spotted dove	*Streptopelia chinensis*	non-native	common
Red-vented bulbul	*Pycnonotus cafer*	non-native	common
Common myna	*Acridotheres tristis*	non-native	uncommon
Red-crested cardinal	*Paroaria coronata*	non-native	uncommon
Chicken	*Gallus gallus*	non-native	uncommon
Gray francolin	*Francolinus pondicerianus*	non-native	rare
House sparrow	*Passer domesticus*	non-native	rare
House finch	*Carpodacus mexicanus*	non-native	rare
Erckel's francolin	*Francolinus erckelii*	non-native	rare
Common waxbill	*Estrilda astrild*	non-native	rare
Japanese white-eye	*Zosterops japonicus*	non-native	rare
Northern cardinal	*Cardinalis cardinalis*	non-native	rare
White-rumped shama	*Copsychus malabaricus*	non-native	rare
Kolea, Pacific golden-plover	*Pluvialis fulva*	migrant	rare
Northern mockingbird	*Mimus polyglottos*	non-native	rare
Mallard	*Anas platyrhynchos*	non-native	rare

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Appendix B

Wetland Surveys

DHHL RESIDENTIAL COMMUNITY AND

KAMEHAMEHA SCHOOLS LEARNING COMPLEX

WETLAND ASSESSMENT

by: Robert W. Hobdy
Kokomo, Maui
March 2010

for: PBR Hawaii & Associates, Inc.

INTRODUCTION

The ‘Eku Stream Wetlands Assessment of the DHHL Residential Community and Kamehameha School Learning Complex project is situated on rural lands in Makaha Valley, Waianae, Oahu. The project site is located in a small gulch just south of the Makaha Valley Country Club, principally on TMKs (1) 8-4-02:005 and 057 which total just over 185 acres. The area is bordered by the golf course lands on the north and by undeveloped lands at the base of Kamaile’unu Ridge on the south. This project was initiated by the prospective owners to assess whether the ‘Eku Gulch and its stream course contained wetland aquatic features under guidelines and standards established by the U.S. Army Corps of Engineers.

SITE DESCRIPTION

‘Eku Gulch is a small gulch that drains the slopes of Kamaile’unu Ridge on the south side of Lower Makaha Valley. Several rocky gullies run down from the steep ridge, then turn west, joining to become ‘Eku Gulch, which flows to the sea south of Makaha Valley Road. Elevations range from 400 feet at the foot of the ridge down to 80 feet at the lower edge of the property. Soils are classified as Lualualei Extremely Stony Clay, 3 – 35% slopes (LPE) which is a very dark gray, sticky, plastic, stony soil that is underlain by a layer of old coral (Foote et al, 1972). Rainfall averages between 20 inches and 25 inches per year, the bulk of which falls during the winter months. Vegetation consists of dense grasslands of Guinea grass (*Panicum maximum*) and buffel grass (*Cenchrus ciliaris)* with many scattered shrubs such as koa haole (*Leucaena leucocephala*) and klu (*Acacia farnesiana*) as well as many kiawe trees (*Prosopis pallida*).

METHODS

After studying the layout of ‘Eku Stream and observing its aquatic characteristics, three sites along the stream were selected for assessment. The first of these was at the bottom of the property where the stream course is largest and well defined (see Figure 1). The second was in the first tributary just above its junction with the main stream near the driving range. The third was in the second tributary just south of the 18th fairway. Transects across each site were established. Where warranted 18 inch deep soil pits were dug to assess soil characteristics and hydrology, and the vegetation was analyzed for hydrophytic affinities. U.S. Army Corps of Engineers Routine Wetland Determination Data Forms were filled out and are attached.

RESULTS AND DISCUSSION

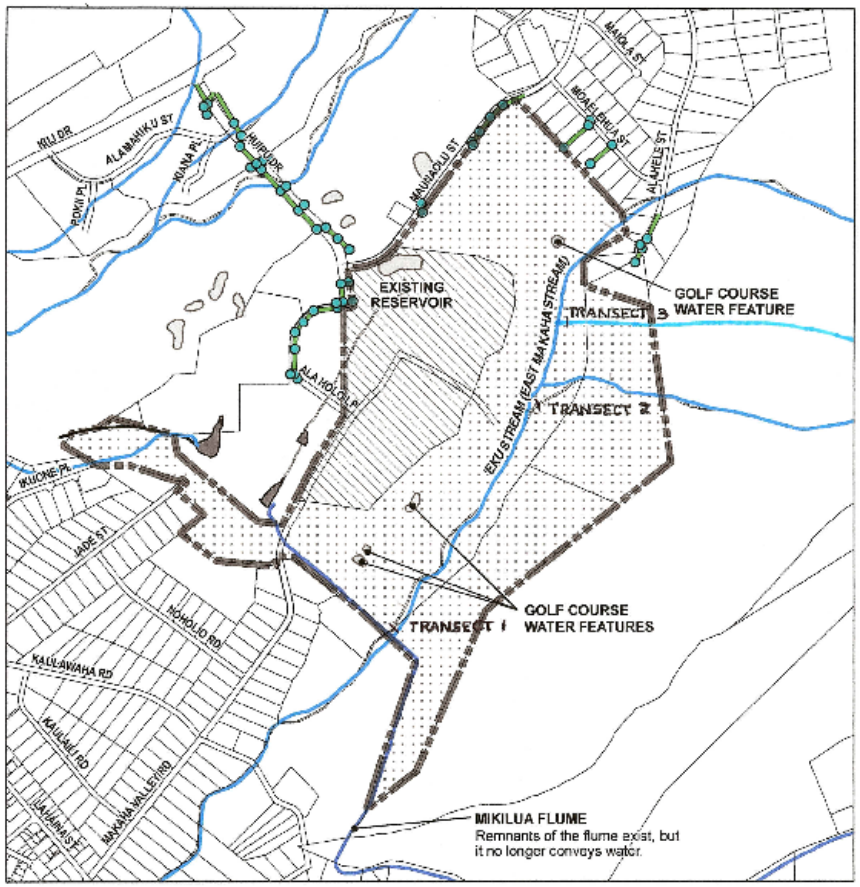
‘Eku Stream on Transect 1 at the bottom of the property had a shallow gravel stream bed that was about 15 feet wide with scattered boulders (see Figure 2). While quite dry at the time of the study there was evidence that this stream can carry a good flow of water. Dry grass and storm debris was deposited on tree trunks to a height of at least 4 feet and smaller shrubs were bent over from the force of the water (see Figure 3). Two plots were established on the stream margins, each about 4 feet from the edge of the Ordinary High Water Mark (OHWM) but well within the larger inundation zone. Plot 1 was on the northern margin and Plot 2 on the southern margin. Both plots had wetland hydrology based on the prominent drift lines, but otherwise had no wetland indicators in the vegetation and soil parameters. Overall they were both rated as upland sites. While this stream carries substantial amounts of water, it comes in freshets of short duration. The water flows off the land and does not accumulate or pond.

The stream on Transect 2 is a tributary of ‘Eku Stream. It has a smaller stream bed and flows on a steeper gradient (See Figure 4). The stream channel is about 4 feet wide, is very rocky and has steep sides (see Figure 5). Vegetation is denser and more robust than in Transect 1. Storm debris drift lines were observed that showed a 3 foot height of water. One bank of the stream had been scraped of soil and vegetation to open the area up. While lacking older vegetation and nearly 2 feet of top soil, this area presented an opportunity to observe deeper layers of soils and hydrology. One plot was established in this area. This plot had a layer of loamy clay over a thick layer of dense, sticky clay. This soil did not have indicators of hydric soil, although it did have wetland hydrology because of the drift lines and marginally hydrophytic vegetation. Overall it did not qualify as a wetland. The east bank of the tributary had a sheer, 2 foot high bank that was clearly well drained and dry thoughout. This area was judged visually as an upland site and the establishment of a plot here deemed unnecessary.

Transect 3 was a short distance from the 18th fairway on the golf course. It was a dry, rocky stream course with a steep gradient and high rocky walls (see Figures 6,7,8,9). This whole transect was visually judged to be an ephemeral, intermittent stream that was an upland site.

‘Eku Stream and its tributaries have been determined to be a Freshwater Forested/Shrub Wetland, a U.S. Fish and Wildlife Service designation produced through their National Wetlands Inventory mapping program which gives them oversight status in site-specific planning and management activities on these aquatic features. The Corps of Engineers, however, had not determined that ‘Eku Stream was a jurisdictional resource. These two federal agencies utilize the same system for analyzing aquatic resources, making a study of each of the three parameters of vegetation, soils and hydrology. The difference in the results each arrives at lies in the interpretation of these data. To be determined a wetland, USFWS requires the presence of positive wetland indicators in any <u>one</u> of the three parameters, while the Corps of Engineers requires that there be positive wetland indicators in all <u>three</u> parameters.

Following USFWS guidelines, ‘Eku Stream and its tributaries are determined to be within their wetland classification system because each transect had a positive indicator of wetland hydrology (i.e. drift line deposits). This determination applies to the stream itself and not to the adjacent lands.



LEGEND

- Stormwater Structure
- Stormwater Conduit
- Freshwater Pond
- Freshwater Forested/Shrub Wetland
- Freshwater Emergent Wetland
- Project Site
- DHHL
- Kamehameha Schools

Source: National Wetland Inventory Maps, U.S. Fish and Wildlife Service (1978)
City and County of Honolulu
Disclaimer: This graphic has been prepared for general planning purposes only.

FIGURE # 1

Wetlands and Man-made Conveyance / Detention Structures

Ka Pua

ISLAND OF OAHU

NORTH

LINEAL SCALE (FEET)
0 250 500 1,000 2,000

DEC 2009

Figure 1 - Project area showing locations of three transects

Figure 2 – Transect 1 showing dry, gravelly stream bed.

Figure 3 – Transect 1 showing debris drift line deposits and shrubs bent over from the force of the flowing water.

Figure 4 – Transect 2 showing a dry rocky streambed, dense vegetation, and debris drift deposits

Figure 5 Transect 2 showing the steep stream bank with dry, well-drained soil.

Figure 6 – Transect 3 A dry rocky gulch with a steep gradient visually determined to be an upland site.

Figure 7 – A steep well-drained bank.

Figure 8 – Transect 3 Gully with a steep extremely rocky bank.

Figure 9 – Transect 3 Stream course is steep, rocky and dry.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Na Pua Mākaha Project/Mākaha Valley, Waianae, Oahu
Application/Owner: Mākaha Homestead Development / DHHL
Investigator: Robert Hobdy

Date: March 3, 2010
County: C&C of Honolulu
State: Hawaii

	Yes	No
Do normal circumstances exist on the site?	☒	☐
Is the site significantly disturbed (Atypical Situation)?	☐	☒
Is the area a potential problem area? (If needed explain on reverse side)	☐	☒

Community ID: TMK(1) 8-4-02:005
Transect ID: 1
Plot ID: 1

VEGETATION

%	r%	Dominant Plant Species	Stratum	Indicator	%	r%	Dominant Plant Species	Stratum	Indicator
75	92	Panicum maximum	H	FAC/D					
5	6	Cenchrus ciliaris	H	FACU					
1	1	Leonotis nepetifolia	H	FACU					
1	1	Ipomoea obscura	H	FAC					
45	100	Leucaena leucocephala	S	UPL/D					
20	100	Prosopis Pallida	T	FACU/D					

Percent Dominant species that are OBL, FACW, FAC (excluding FAC-) 33%

Remarks: The per cent of hydrophytic dominant species does not exceed 50% Vegetation is not hydrophytic.

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
- ☐ Stream, Lake, or Tide Gauge
- ☒ Aerial photographs
- ☒ Other Waianae USGS Quad map

No recorded data available

Field Observations

Depth of Surface Water:	— (inches)
Depth to Free Water in Pit:	— (inches)
Depth to Saturated Soil:	— (inches)

Wetland Hydrology Indicators

Primary Indicators:
- ☐ Inundated
- ☐ Saturated in upper 12 inches
- ☐ Water Marks
- ☒ Drift Lines
- ☐ Sediment Deposits

Secondary Indicators (2 or more required):
- ☐ Oxidized Root Channels in Upper 12 inches
- ☐ Water Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test

Other (Explain in Remarks):

Remarks: The soil is dry down 18 in. to the bottom of the pit. However, dry grass and debris lodged against tree trunks indicate that 'Eku Stream ran at least 4 ft. deep within the past few months. This flow must have been of short duration and the stream returned to a dry moisture regime because there is no indication of long-term hydrology at the site. Never the less one Primary wetland hydrology indicator yields a positive wetland hydrology rating.

Map Unit Name: Lualualei Extremely Stony Clay
(Series and Phase): 3-35% Slopes

Drainage Class: Well drained

Taxonomy (Subgroup): Typic Chromusterts

Field Observations Confirmed Mapped Type? Yes ☒ No ☐

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions Structure, etc.
0-10	A	10YR 3/1	—	—	Soft, loose, dry alluvium very dark gray, sand grains
10-18	B	10YR 3/2	—	—	Soft, loose, dry alluvium silty clay with small cobble

Hydric Soil Indicators:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List

Other (Explain in Remarks):

Remarks: This soil has no hydric soil indicators. This is not a hydric soil.

WETLAND DETERMINATION

	Yes	No
Hydrophytic Vegetation Present?	☐	☒
Wetland Hydrology Present?	☒	☐
Hydric Soils Present?	☐	☒

Is this Sampling Point Within a Wetland? Yes ☐ No ☒

Remarks: 'Eku Stream is a small intermittent stream throughout its entire length and probably flows no more than 10 days a year following spates of heavy rain. These spates can produce strong flows such as was observed here but probably only for a few hours at a time. The soil dries out following these spates because moisture does not remain at high enough levels to create hydrophytic vegetation, wetland hydrology or hydric soils. This plot is not a wetland.

Transect 1 Plot 1A – Site has dense Guinea grass and koa haole

Transect 1 Plot 1B – Soil is dry and loose with no structure.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Na Pua Makaha Project/Makaha Valley, Waianae, O'ahu
Application/Owner: Makaha Homested Development/DHHL
Investigator: Robert Hobdy

Date: March 3, 2010
County: City of Honolulu
State: Hawaii

	Yes	No
Do normal circumstances exist on the site?	☒	☐
Is the site significantly disturbed (Atypical Situation)?	☐	☒
Is the area a potential problem area? (If needed explain on reverse side)	☐	☒

Community ID: TMK(1) 8-4-02:005
Transect ID: 1
Plot ID: 2

VEGETATION

%	r%	Dominant Plant Species	Stratum	Indicator	%	r%	Dominant Plant Species	Stratum	Indicator
80	95	Panicum maximum	H	FAC/D					
50	100	Leucaena leucocephala	S	UPL/D					
1	1	Desmanthus pernambucanus	H	FACU					
2	3	Neonotonia wightii	H	UPL					
1	1	Leonotis nepetifolia	H	FACU					

Percent Dominant species that are OBL, FACW, FAC (excluding FAC-) 50%

Remarks: The percent of hydrophytic dominant species does not exceed 50%. The vegetation is not hydrophytic.

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial photographs
☒ Other USGS Waianae Quad map

No recorded data available

Field Observations

Depth of Surface Water: — (inches)
Depth to Free Water in Pit: — (inches)
Depth to Saturated Soil: — (inches)

Wetland Hydrology Indicators

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☒ Drift Lines
☐ Sediment Deposits

Secondary Indicators (2 or more required):
☐ Oxidized Root Channels in Upper 12 inches
☐ Water Stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
Other (Explain in Remarks):

Remarks: The soil was dry down to a layer of dense cobble that could not be penetrated. However, dry grass and debris lodged against tree trunks indicate that 'Elu Stream ran at least 4 ft. deep within the last few months. This flow must have been of short duration followed by drying because there is no indication of long-term hydrology at this location. Nevertheless, one primary wetland hydrology indicator yields a positive wetland hydrology rating.

Map Unit Name: Lualualei Extremely Stony Clay
(Series and Phase): 3-35% Slopes

Drainage Class: Well drained

Taxonomy (Subgroup): Typic Chromusterts

Field Observations Confirmed Mapped Type? Yes ☒ No ☐

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions Structure, etc.
0-4	A	10YR 3/1	—	—	dry, loose, with sand grains dark gray silty clay
4-12	B1	10YR 3/2	—	—	dark gray, dry silty clay with abundant small cobble
12 +	B2		—	—	dense impenetrable cobble

Hydric Soil Indicators:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List
- Other (Explain in Remarks):

Remarks: This soil has no hydric indicators
This is not a hydric soil

WETLAND DETERMINATION

	Yes	No
Hydrophytic Vegetation Present?	☐	☒
Wetland Hydrology Present?	☒	☐
Hydric Soils Present?	☐	☒

Is this Sampling Point Within a Wetland? Yes ☐ No ☒

Remarks: This plot gets inundated for short periods two to three times a year but water does not accumulate on the soil for long enough to create hydrophytic vegetation, hydric soils or wetland hydrology. This plot is not a wetland.

Transect 1 Plot 2A – Site has dense Guinea grass and koa haole

Transect 1 Plot 2B – Soil is dry and loose with abundant cobble, substrate is impenetrable cobble

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Na Pua Mākaha Project / Mākaha Valley, Wai'anae, O'ahu
Application/Owner: Mākaha Homestead Development / DHHL
Investigator: Robert Hobdy

Date: March 3, 2010
County: C&C of Honolulu
State: Hawaii

	Yes	No
Do normal circumstances exist on the site?	☐	☒
Is the site significantly disturbed (Atypical Situation)?	☒	☐
Is the area a potential problem area? (If needed explain on reverse side)	☐	☒

Community ID: TMK(1) 8-4-02:005
Transect ID: 2
Plot ID: 1

VEGETATION

%	r%	Dominant Plant Species	Stratum	Indicator	%	r%	Dominant Plant Species	Stratum	Indicator
15	33	Panicum maximum	H	FAC/D					
25	54	Momordica charantia	H	FAC/D					
5	100	Leucaena leucocephala	S	UPL/D					
2	5	Chamaesyce hypenicifolia	H	FACU					
2	4	Sonchus oleraceus	H	FACU					
2	4	Neonotonia wightii	H	UPL					

Percent Dominant species that are OBL, FACW, FAC (excluding FAC-) 67%

Remarks: This side of the gully was cleared of vegetation in the past, removing some of the surface soil in the process. Vegetation was in the process of recolonizing. The vegetation on this plot was classified as hydrophytic. The application of the FAC Neutral Test, however, would yield upland vegetation.

HYDROLOGY

☐ Recorded Data (Describe in Remarks):

☐ Stream, Lake, or Tide Gauge

☒ Aerial photographs

☒ Other USGS Wai'anae Quad map

No recorded data available

Field Observations

Depth of Surface Water: — (inches)

Depth to Free Water in Pit: — (inches)

Depth to Saturated Soil: — (inches)

Wetland Hydrology Indicators

Primary Indicators:
- ☐ Inundated
- ☐ Saturated in upper 12 inches
- ☐ Water Marks
- ☒ Drift Lines
- ☐ Sediment Deposits

Secondary Indicators (2 or more required):
- ☐ Oxidized Root Channels in Upper 12 inches
- ☐ Water Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test

Other (Explain in Remarks):

Remarks: The soil was moist but no standing water or saturated soil was found. Drift lines of dried grass, however, were observed against tree trunks to a depth of 3ft, indicating a substantial flow of water during this past winter. This primary indicator of wetland hydrology gives this plot a positive wetland hydrology rating.

Map Unit Name: Lualualei Extremely Stony Clay
(Series and Phase): 3-35% slopes

Drainage Class: well drained

Taxonomy (Subgroup): Typic Chromusterts

Field Observations Confirmed Mapped Type? Yes ☒ No ☐

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions Structure, etc.
0-8	A	5YR 3/2	—	—	dark reddish brown clay loam sand grains
8-18	B	10YR 3/1	—	—	dark gray mineral clay compact, hard, sticky, plastic

Hydric Soil Indicators:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List

Other (Explain in Remarks):

Remarks: The compact clay layer is a typical subsurface feature for this soil series. No hydric soil indicators were found in this plot. This is not a hydric soil.

WETLAND DETERMINATION

	Yes	No
Hydrophytic Vegetation Present?	☒	☐
Wetland Hydrology Present?	☒	☐
Hydric Soils Present?	☐	☒

Is this Sampling Point Within a Wetland? Yes ☐ No ☒

Remarks: The vegetation is marginally hydrophytic on this site and there is one wetland hydrology indicator present, but the soil is clearly not a hydric soil. This plot is properly rated as an upland site.

Transect 2 Plot 1A – Site was previously cleared of vegetation and surface soil.

Transect 2 Plot 1B – Soil is a reddish-brown clay loam over a dense, sticky mineral clay.

DHHL Residential Community and
Kamehameha Schools Learning Complex
OFF-SITE SEWER IMPROVEMENTS - WETLAND ASSESSMENT

INTRODUCTION

The DHHL Residential Community and Kamehameha Schools Learning Complex, Off-Site Sewer Improvements project encompasses five existing storm drain outlets on the coast in the town of Waianae, Oahu (see Figure 1). Improvements are being considered for these outlets and the planning process requires the environmental assessment of these aquatic features. This study analyzes the structure and function of these channels to determine if federally jurisdictional wetland resources are present.

SITE DESCRIPTION

The area under consideration is a 0.6 mile section of the coast between Bayview Street on the north and Leihoku Street on the south, and between Farrington Highway and the shore. The area is a coastal plain that is under 10 feet in elevation. These five storm drains receive their waters from small watersheds of 150 acres and 440 acres that include mostly residential and commercial properties. No streams pass through this area and virtually all runoff comes from streets and commercial hardscapes and drains through a network of underground culverts to the five outlets along the shore line. Soils consist of welldrained clay loams or clays that overlay sandy or old coral substrates. Annual rainfall in this area averages 20 inches with the bulk falling during the winter months.

BACKGROUND INFORMATION

The five storm drains are each a little different in structure and length but each follows a course that was designed and engineered, and are not natural features. Each is described sequentially from north to south.

Bay Street Outlet – This outlet exits an underground 24 inch cement culvert on the upper beach below the Lualualei Beach Park bathrooms at the south end of Pokai Bay. It then flows in a small swale 150 feet across the beach to the ocean (see Figures 2 & 3).

Glenmonger Street Outlet – This outlet exits an underground box culvert at Farrington Highway, flows 450 feet down an open, cement-lined channel to Pokai Bay Street, flows through another box culvert under the road, and into a 150 foot long natural channel through a sandstone shoreline to the ocean (see Figures 4, 5 & 6).

Ala Poko Street North Outlet – This outlet exits an underground box culvert at Farrington Highway, flows 350 feet down an open 20 foot wide unlined channel to Pokai Bay Street, flows through another box culvert under the road, and 100 feet across the beach to the ocean (see Figures 7, 8 & 9).

Ala Poko Street South Outlet – This outlet exits an underground box culvert at Farrington Highway, flows 200 feet down an open 20 foot wide unlined channel to Pokai Bay Street, flows through another box culvert under the road, and 200 feet across the beach in an unlined channel to the ocean (see Figures 10, 11 & 12).

Leihoku Street Outlet – Two outlets exit an underground box culvert as well as an adjacent 36 inch cement culvert at Farrington Highway and flow 150 feet across the beach to the ocean (see Figures 13 & 14).

For each of the above aquatic features the systematic analysis process of the U.S. Army Corps of Engineers Approved Jurisdictional Determination Form was applied. The results of these analyses are included in the appendix.

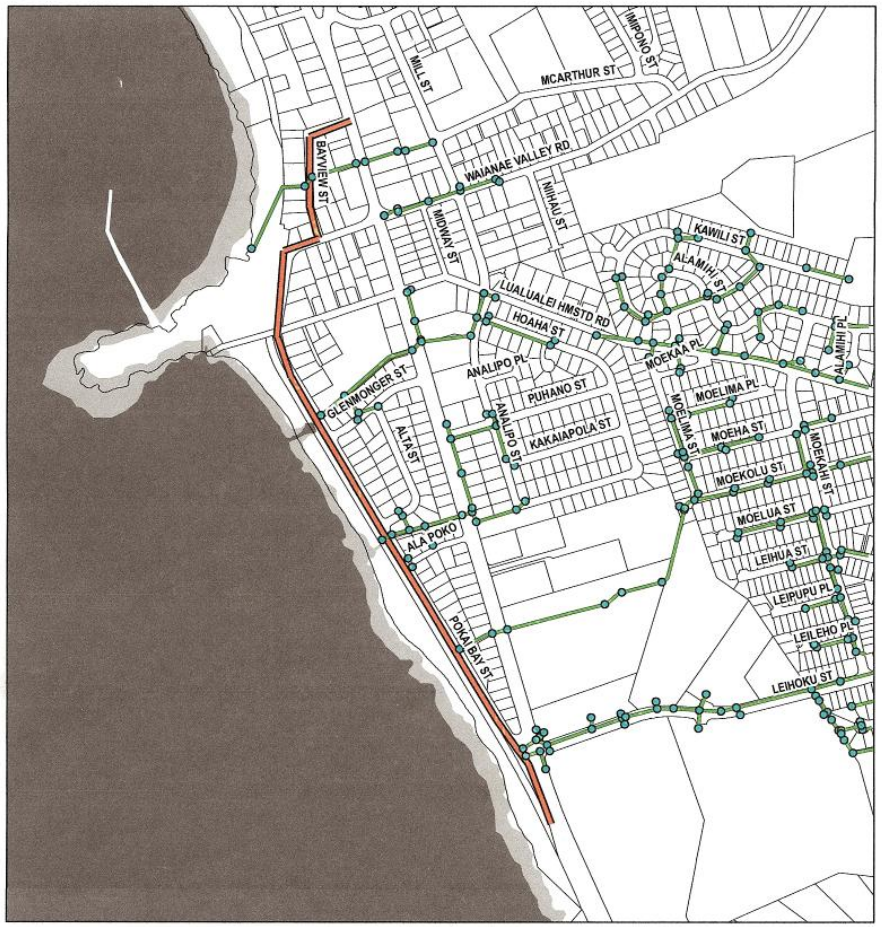
DISCUSSION

Each of these storm drain channels was analyzed from where it emerged from an underground conduit and became an open channel. All of these outlets had natural, un-engineered channels from the top of the beach to the ocean. Three, however, had open manmade channels that extended above Pokai Bay Street up to Farrington Highway.

It was found that each of these five channels had a direct connection with a Traditional Navigable Water (TNW), in this case the Pacific Ocean. Furthermore, it was found that all of these channels had the capability of transporting pollutants and storm waters to the TNW. This creates a significant nexus between each of these channels, which are otherwise ephemeral, intermittent waters, and the Pacific Ocean TNW. No wetlands are associated with these channels.

CONCLUSIONS

By these findings it is determined that each of the subject channels qualifies as a jurisdictional Waters of the U.S. over the entirety of the length where it is exposed to the surface. The specifics regarding each channel is addressed in its respective Approved Jurisdictional Determination Form in the appendix.



LEGEND

- Storm Water Structure
- Storm Water Conduit
- Estuarine and Marine Wetland
- Estuarine and Marine Deepwater
- Sewer Line for Improvement

Source: National Wetland Inventory Maps, U.S. Fish and Wildlife Service (1978)
City and County of Honolulu
Disclaimer: This graphic has been prepared for general planning purposes only.

FIGURE # 1

Wetlands / Storm Water Structures

Ka Pua
Offsite Sewer Improvement

ISLAND OF OAHU

NORTH

LINEAL SCALE (FEET)
0 150 300 600 1,200

PBR HAWAII & ASSOCIATES, INC.
DEC 2009

FIGURE 1

U.S. ARMY CORPS OF ENGINEERS
APPROVED JURISDICTIONAL DETERMINATION FORM

BAYVIEW STREET OUTLET

SECTION 1: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION:

B. DISTRICT OFFICE, FILE NAME, AND NUMBER:

C. PROJECT LOCATION AND BACKGROUND INFORMATION:
State: Hawaii
County: City & County of Honolulu
City: Waianae

Center coordinates of site: Lat. 21° 26′ 30” N, Long. 158° 11′ 20” W
Name of nearest water body: Pacific Ocean
Name of nearest TNW: Pacific Ocean
Name of Watershed: Pu’u Pahe’ehe’e / South Waianae

- A map is attached
- Other offsite mitigation sites are associated with this action and are recorded on a separate JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION

- Office Determination Date:
- Field Determination Date:

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISTICTION.
Not applicable

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.
1. Waters of the U.S.
   a. This is a Non – RPW that flows directly into a TNW.
   b. Identify size of Waters of the U.S. in the review area:
      Non-Wetland Waters: 150 lineal feet length, 10 feet width
   c. Limits of jurisdiction: Not applicable (OHWM not discernible).
2. Non-regulated Waters/Wetlands: Not applicable

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO WETLANDS
Not applicable

B. CHARACTERISTICS OF NON-TNW TRIBUTARY AND ADJACENT WETLANDS:
1. Characteristics of non-TNWs that flow directly into a TNW
   (i) General Area Conditions:
   - Watershed size: 150 acres (portion)
   - Drainage area: Lower Waianae Valley Road (residential housing/commercial properties)
   - Average annual rainfall: 20 inches
   - Average annual snowfall: not applicable

   (ii) Physical characteristics:
      a. Relationship with TNW:
         Tributary flows directly into a TNW

b. General Tributary Characteristics:

- Tributary is a man-made but unlined gravity-flow channel to the ocean.
- Tributary properties: At maximum flow it may run at 10 feet wide and 1 foot deep with 20" side slopes.
- Primary tributary substrate: Sand
- Tributary geometry is a gently sloping swale with no clear banks.
- Tributary condition: Stable
- Tributary gradient is an even 2% to 3%

c. Flow:

- Tributary flows 5 – 10 times a year usually for a few hours but never more than 2 days duration for each event. Volume of flow is limited by the capacity of the 24 inch diameter drain pipe.
- Subsurface flow: not applicable
- Tributary has no discernible bed, banks or OHWM.

(iii) Chemical Characteristics:

- Tributary flow was not observed during this study but the outlet drains residential properties, streets, commercial properties and parking lots which would contribute pollutants such as fuels, oils, fertilizers and pesticides at some level.

(iv) Biological characteristics:

- The channel had no discernible riparian corridor, wetland fringe or wildlife habitat.

2.&3. Characteristics of adjacent wetlands: not applicable

C. SIGNIFICANT NEXUS DETERMINATION

1. Significant nexus determination for a non-RPW that has no adjacent wetlands and flows directly into a TNW:
   This tributary has the capacity to carry residential, street, commercial and parking lot pollutants as well as flood waters directly into the Pacific Ocean. This tributary is therefore determined to have a significant nexus with this TNW.

D. DETERMINATION OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS ARE:

3. A non-RPW that flows directly into a TNW.
   - The tributary is 150 feet long from the outlet to the ocean and has a width of about 10 feet. No wetlands are associated with this tributary.

E. ISOLATED WATERS

Not applicable

F. NON-JURISDICTIONAL WATERS

Not applicable

SECTION IV: DATA SOURCES

A. SUPPORTING DATA

- G.I.S. area map with property boundaries and storm water structures
- U.S.G.S. Waianae Quadrangle Map, scale 1:24,000
- U.S.D.A., N.R.C.S., Soil Survey. Islands of Kauai, Oahu, Maui, Molokai, Lanai and Hawaii, State of Hawaii
- U.S.F.W.S. National Wetlands Inventory Maps

Figure 2 Bayview Street Outlet – Looking mauka below the Lualualei Beach Park bathrooms. This culvert is buried underground above this outlet.

Figure 3 Bayview Street Outlet – Looking makai 150 feet down a grassy swale and across the beach to Pokai Bay.

U.S. ARMY CORPS OF ENGINEERS
APPROVED JURISDICTIONAL DETERMINATION FORM

GLENMONGER STREET OUTLET

SECTION 1: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION:

B. DISTRICT OFFICE, FILE NAME, AND NUMBER:

C. PROJECT LOCATION AND BACKGROUND INFORMATION:
State: Hawaii
County: City & County of Honolulu
City: Waianae

Center coordinates of site: Lat. 21° 26′ 40" N, Long. 158° 11′ 20" W
Name of nearest water body: Pacific Ocean
Name of nearest TNW: Pacific Ocean
Name of Watershed: Pu'u Ma'ili'ili / North Lualualei

- A map is attached
- Other offsite mitigation sites are associated with this action and are recorded on a separate JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION

- Office Determination Date:
- Field Determination Date:

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISTICTION.
Not applicable

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.
1. Waters of the U.S.
   a. This is a Non – RPW that flows directly into a TNW.
   b. Identify size of Waters of the U.S. in the review area:
      Non-Wetland Waters: 600 lineal feet length, 10 feet width
   c. Limits of jurisdiction: OHWM discernible at a height of about 36 inches on cement wall.
2. Non-regulated Waters/Wetlands: Not applicable

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO WETLANDS
Not applicable

B. CHARACTERISTICS OF NON-TNW TRIBUTARY AND ADJACENT WETLANDS:
1. Characteristics of non-TNWs that flow directly into a TNW
   (i) General Area Conditions:
   - Watershed size: 440 acres (portion)
   - Drainage area: Lower Lualualei Homestead Road (residential housing/commercial properties)
   - Average annual rainfall: 20 inches
   - Average annual snowfall: not applicable

   (ii) Physical characteristics:
      a. Relationship with TNW:
         Tributary flows directly into a TNW
      b. General Tributary Characteristics:
      - Tributary is a 450 feet long and 10 feet wide and 10 feet deep cement lined channel in its upper portion between Farrington Highway and Pokai Bay Street, and a 150 foot unlined channel from Pokai Bay Street to the ocean.
      - Tributary properties: At maximum flow it may run at 5 feet deep for short periods.
      - Tributary substrate is cement above Pokai Bay Street and sand and sandstone below it.
      - Tributary condition is stable
      - Tributary geometry is an open-topped, boxed cement channel above Pokai Bay Street and a natural channel to the sea below it.
      - Tributary gradient is an even 2% to 3%

      c. Flow:
      - Tributary flows 5 – 10 times a year usually for a few hours but never more than 2 days duration for each event.
      - Subsurface flow: not applicable
      - Tributary has OHWM at about 36 inches height on the cement wall.

   (iii) Chemical Characteristics:
      - Tributary flow was not observed during this study but the outlet drains residential properties, streets, commercial properties and parking lots which would contribute pollutants such as fuels, oils, fertilizers and pesticides at some level.

   (iv) Biological characteristics:
      - The channel had no discernible riparian corridor, wetland fringe or wildlife habitat.

2.&3. Characteristics of adjacent wetlands: not applicable

C. SIGNIFICANT NEXUS DETERMINATION
1. Significant nexus determination for a non-RPW that has no adjacent wetlands and flows directly into a TNW:
   This tributary has the capacity to carry residential, street, commercial and parking lot pollutants as well as flood waters directly into the Pacific Ocean. This tributary is therefore determined to have a significant nexus with this TNW.

D. DETERMINATION OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS ARE:
3. A non-RPW that flows directly into a TNW.
   - The tributary is 600 feet long from Farrington Highway to the ocean and has a width of 10 feet. No wetlands are associated with this tributary.

E. ISOLATED WATERS
Not applicable

F. NON-JURISDICTIONAL WATERS
Not applicable

SECTION IV: DATA SOURCES

A. SUPPORTING DATA
- G.I.S. area map with property boundaries and storm water structures
- U.S.G.S. Waianae Quadrangle Map, scale 1:24,000
- U.S.D.A., N.R.C.S., Soil Survey. Islands of Kauai, Oahu, Maui, Molokai, Lanai and Hawaii, State of Hawaii
- U.S.F.W.S. National Wetlands Inventory Maps

Figure 4 Glenmonger Street Outlet – Looking mauka up the 10 ft. wide by 450 ft. long cement-lined channel extending to Farrington Highway. Note Ordinary High Water Mark at 3 ft. height on cement wall.

Figure 5 Glenmonger Street Outlet – Looking makai from Pokai Bay Street 150 ft, to the ocean.

Figure 6 Glenmonger Street Outlet – Looking mauka at the Pokai Bay Street culvert from the beach.

U.S. ARMY CORPS OF ENGINEERS
APPROVED JURISDICTIONAL DETERMINATION FORM

ALA POKO STREET NORTH OUTLET

SECTION 1: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION:

B. DISTRICT OFFICE, FILE NAME, AND NUMBER:

C. PROJECT LOCATION AND BACKGROUND INFORMATION:
State: Hawaii
County: City & County of Honolulu
City: Waianae

Center coordinates of site: Lat. 21° 26′ 30" N, Long. 158° 11′ 18" W
Name of nearest water body: Pacific Ocean
Name of nearest TNW: Pacific Ocean
Name of Watershed: Pu'u Ma'ili'ili / North Lualualei

- A map is attached
- Other offsite mitigation sites are associated with this action and are recorded on a separate JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION

- Office Determination Date:
- Field Determination Date:

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISTICTION.
Not applicable

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.
1. Waters of the U.S.
   a. This is a Non – RPW that flows directly into a TNW.
   b. Identify size of Waters of the U.S. in the review area:
      Non-Wetland Waters: 450 lineal feet length, 20 feet width
   c. Limits of jurisdiction: OHWM is not discernible on the banks.
2. Non-regulated Waters/Wetlands: Not applicable

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO WETLANDS
Not applicable

B. CHARACTERISTICS OF NON-TNW TRIBUTARY AND ADJACENT WETLANDS:
1. Characteristics of non-TNWs that flow directly into a TNW
   (i) General Area Conditions:
   - Watershed Size: 440 acres (portion)
   - Drainage area: Lower Lualualei Homestead Road (residential housing/commercial properties)
   - Average annual rainfall: 20 inches
   - Average annual snowfall: not applicable

   (ii) Physical characteristics:
   a. Relationship with TNW:
      Tributary flows directly into a TNW

   b. General Tributary Characteristics:
   - Tributary is a 450 feet long and 20 feet wide unlined channel extending from Farrington Highway down past Pokai Bay Street to the ocean.
   - Tributary properties: At maximum flow it may run at 5 feet deep for short periods.
   - Tributary substrate is soil and cobble with bordering trees between Farrington Highway and Pokai Bay Street, and is sand between there and the ocean.
   - Tributary condition is stable
   - Tributary geometry is a broad V-shaped channel with moderately sloping banks.
   - Tributary gradient is an even 2% to 3%

   c. Flow:
   - Tributary flows 5 – 10 times a year usually for a few hours but never more than 2 days duration for each event.
   - Subsurface flow: not applicable
   - Tributary has no discernible OHWM on the banks.

   (iii) Chemical Characteristics:
   - Tributary flow was not observed during this study but the outlet drains residential properties, streets, commercial properties and parking lots which would contribute pollutants such as fuels, oils, fertilizers and pesticides at some level.

   (iv) Biological characteristics:
   - The channel had no discernible riparian corridor, wetland fringe or wildlife habitat.

2.&3. Characteristics of adjacent wetlands: not applicable

C. SIGNIFICANT NEXUS DETERMINATION
1. Significant nexus determination for a non-RPW that has no adjacent wetlands and flows directly into a TNW:
   This tributary has the capacity to carry residential, street, commercial and parking lot pollutants as well as flood waters directly into the Pacific Ocean. This tributary is therefore determined to have a significant nexus with this TNW.

D. DETERMINATION OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS ARE:
3. A non-RPW that flows directly into a TNW.
   - The tributary is 450 feet long from Farrington Highway to the ocean and has a width of 20 feet. No wetlands are associated with this tributary.

E. ISOLATED WATERS
Not applicable

F. NON-JURISDICTIONAL WATERS
Not applicable

SECTION IV: DATA SOURCES

A. SUPPORTING DATA
- G.I.S. area map with property boundaries and storm water structures
- U.S.G.S. Waianae Quadrangle Map, scale 1:24,000
- U.S.D.A., N.R.C.S., Soil Survey. Islands of Kauai, Oahu, Maui, Molokai, Lanai and Hawaii, State of Hawaii
- U.S.F.W.S. National Wetlands Inventory Maps

Figure 7 Ala Poko Street North Outlet – Looking mauka up a 20 ft. wide by 350 ft. long unlined channel from Pokai Bay Street toward Farrington Highway. Channel lined by small Milo trees.

Figure 8 Ala Poko Street North Outlet – Looking makai 100 ft. from Pokai Bay Street toward the ocean

Figure 9 Ala Poko Street North Outlet – Looking mauka toward Pokai Bay Street culvert from the beach.

U.S. ARMY CORPS OF ENGINEERS
APPROVED JURISDICTIONAL DETERMINATION FORM

ALA POKO STREET SOUTH OUTLET

SECTION 1: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION:

B. DISTRICT OFFICE, FILE NAME, AND NUMBER:

C. PROJECT LOCATION AND BACKGROUND INFORMATION:
State: Hawaii
County: City & County of Honolulu
City: Waianae

Center coordinates of site: Lat. 21° 26′ 20" N, Long. 158° 11′ 16" W
Name of nearest water body: Pacific Ocean
Name of nearest TNW: Pacific Ocean
Name of Watershed: Pu'u Ma'ili'ili / North Lualualei

- A map is attached
- Other offsite mitigation sites are associated with this action and are recorded on a separate JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION

- Office Determination Date:
- Field Determination Date:

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISTICTION.
Not applicable

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.
1. Waters of the U.S.
   a. This is a Non – RPW that flows directly into a TNW.
   b. Identify size of Waters of the U.S. in the review area:
      Non-Wetland Waters: 400 lineal feet length, 20 feet width
   c. Limits of jurisdiction: OHWM is not discernible on the vegetated banks.
2. Non-regulated Waters/Wetlands: Not applicable

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO WETLANDS
Not applicable

B. CHARACTERISTICS OF NON-TNW TRIBUTARY AND ADJACENT WETLANDS:
1. Characteristics of non-TNWs that flow directly into a TNW
   (i) General Area Conditions:
   - Watershed size: 440 acres (portion)
   - Drainage area: Lower Lualualei Homestead Road (residential housing/commercial properties)
   - Average annual rainfall: 20 inches
   - Average annual snowfall: not applicable

   (ii) Physical characteristics:
      a. Relationship with TNW:
         Tributary flows directly into a TNW
      b. General Tributary Characteristics:
      - Tributary is a 400 feet long by 20 feet wide unlined channel extending from Farrington Highway down past Pokai Bay Street to the ocean.
      - Tributary properties: At maximum flow it may run at 5 feet deep for short periods.
      - Tributary substrate is soil with grass between Farrington Highway and Pokai Bay Street, and is sand between there and the ocean.
      - Tributary condition is stable
      - Tributary geometry is a broad V-shaped channel with moderately sloping banks.
      - Tributary gradient is an even 2% to 3%

      c. Flow:
      - Tributary flows 5 – 10 times a year usually for a few hours but never more than 2 days duration for each event.
      - Subsurface flow: not applicable
      - Tributary has no discernible OHWM on the vegetated banks.

   (iii) Chemical Characteristics:
   - Tributary flow was not observed during this study but the outlet drains residential properties, streets, commercial properties and parking lots which would contribute pollutants such as fuels, oils, fertilizers and pesticides at some level.

   (iv) Biological characteristics:
   - The channel had no discernible riparian corridor, wetland fringe or wildlife habitat.

2.&3. Characteristics of adjacent wetlands: not applicable

C. SIGNIFICANT NEXUS DETERMINATION
1. Significant nexus determination for a non-RPW that has no adjacent wetlands and flows directly into a TNW:
   This tributary has the capacity to carry residential, street, commercial and parking lot pollutants as well as flood waters directly into the Pacific Ocean. This tributary is therefore determined to have a significant nexus with this TNW.

D. DETERMINATION OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS ARE:
3. A non-RPW that flows directly into a TNW.
   - The tributary is 400 feet long from Farrington Highway to the ocean and has a width of 20 feet. No wetlands are associated with this tributary.

E. ISOLATED WATERS
Not applicable

F. NON-JURISDICTIONAL WATERS
Not applicable

SECTION IV: DATA SOURCES

A. SUPPORTING DATA
- G.I.S. area map with property boundaries and storm water structures
- U.S.G.S. Waianae Quadrangle Map, scale 1:24,000
- U.S.D.A., N.R.C.S., Soil Survey. Islands of Kauai, Oahu, Maui, Molokai, Lanai and Hawaii, State of Hawaii
- U.S.F.W.S. National Wetlands Inventory Maps

Figure 10 Ala Poko Street South Outlet – Looking mauka up an unlined 20 ft. wide by 200 ft. long channel from Pokai Bay Steet toward Farrington Hwy. Note adjacent property owners have built their own retaining walls.

Figure 11 Ala Poko Street South Outlet – Looking makai 200 ft. from Pokai Bay Street toward the ocean. Channel is partially excavated.

Figure 12 Ala Poko Street South Outlet – Looking mauka at Pokai Bay Street culvert from the beach.

U.S. ARMY CORPS OF ENGINEERS
APPROVED JURISDICTIONAL DETERMINATION FORM

LEIHOKU STREET OUTLET

SECTION 1: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION:

B. DISTRICT OFFICE, FILE NAME, AND NUMBER:

C. PROJECT LOCATION AND BACKGROUND INFORMATION:
State: Hawaii
County: City & County of Honolulu
City: Waianae

Center coordinates of site: Lat. 21° 26′ 15" N, Long. 158° 11′ 15" W
Name of nearest water body: Pacific Ocean
Name of nearest TNW: Pacific Ocean
Name of Watershed: Pu'u Ma'ili'ili / North Lualualei

- A map is attached
- Other offsite mitigation sites are associated with this action and are recorded on a separate JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION

- Office Determination Date:
- Field Determination Date:

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISTICTION.
Not applicable

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.
1. Waters of the U.S.
   a. This is a Non – RPW that flows directly into a TNW.
   b. Identify size of Waters of the U.S. in the review area:
      Non-Wetland Waters: 150 lineal feet length, 20 feet width
   c. Limits of jurisdiction: Not applicable (OHWM not discernible).
2. Non-regulated Waters/Wetlands: Not applicable

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO WETLANDS
Not applicable

B. CHARACTERISTICS OF NON-TNW TRIBUTARY AND ADJACENT WETLANDS:
1. Characteristics of non-TNWs that flow directly into a TNW
   (i) General Area Conditions:
   - Watershed size: 440 acres (Portion)
   - Drainage area: Lower Lualualei Homestead Road (residential housing/commercial properties)
   - Average annual rainfall: 20 inches
   - Average annual snowfall: not applicable

   (ii) Physical characteristics:
   a. Relationship with TNW: Tributary flows directly into a TNW.
   b. General Tributary Characteristics:
   - Tributary is a natural, unlined channel to the ocean.
   - Tributary properties: At maximum flow it may run at 20 feet wide and 2 feet deep with low indistinct banks.
   - Tributary substrate: Sand
   - Tributary geometry is a gently sloping swale with no clear banks.
   - Tributary condition: Stable
   - Tributary gradient is an even 2% to 3%

   c. Flow:
   - Tributary flows 5 – 10 times a year usually for a few hours but never more than 2 days duration for each event.
   - Subsurface flow: not applicable
   - Tributary has no discernible bed, banks or OHWM.

   (iii) Chemical Characteristics:
   - Tributary flow was not observed during this study but the outlet drains residential properties, streets, commercial properties and parking lots which would contribute pollutants such as fuels, oils, fertilizers and pesticides at some level.

   (iv) Biological characteristics:
   - The channel had no discernible riparian corridor, wetland fringe or wildlife habitat.

2.&3. Characteristics of adjacent wetlands: not applicable

C. SIGNIFICANT NEXUS DETERMINATION
1. Significant nexus determination for a non-RPW that has no adjacent wetlands and flows directly into a TNW:
   This tributary has the capacity to carry residential, street, commercial and parking lot pollutants as well as flood waters directly into the Pacific Ocean. This tributary is therefore determined to have a significant nexus with this TNW.

D. DETERMINATION OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS ARE:
3. A non-RPW that flows directly into a TNW.
   - The tributary is 150 feet long from the double outlet to the ocean and has a width of about 20 feet. No wetlands are associated with this tributary.

E. ISOLATED WATERS
Not applicable

F. NON-JURISDICTIONAL WATERS
Not applicable

SECTION IV: DATA SOURCES

A. SUPPORTING DATA
- G.I.S. area map with property boundaries and storm water structures
- U.S.G.S. Waianae Quadrangle Map, scale 1:24,000
- U.S.D.A., N.R.C.S., Soil Survey. Islands of Kauai, Oahu, Maui, Molokai, Lanai and Hawaii, State of Hawaii
- U.S.F.W.S. National Wetlands Inventory Maps

Figure 13 Leihoku Street Outlet – Looking makai 150 feet from Farrington Highway down a natural channel to the ocean.

Figure 14 Leihoku Street Outlet – Looking mauka from the beach at the double culverts under Farrington Highway. These culverts are buried underground mauka of the highway.

Appendix C

Archaeological Report and Associated Correspondence

Final
Archaeological Inventory Survey for the Proposed Ka Pua - Mākaha Learning Complex and DHHL Mākaha Homestead Development Project, Mākaha Ahupuaʻa, Waiʻanae District, Oʻahu Island
(TMK: [1] 8-4-002:005, 007, 056, 057, 070 por., 076; 8-4-023:014, 015; 8-4-024:001)

Prepared for

PBR Hawaii & Associates, Inc.

Prepared by

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(Job Code: MAKAHA 7)

November 2009

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Management Summary

Reference	Archaeological Inventory Survey for the Proposed Ka Pua - Mākaha Learning Complex and DHHL Mākaha Homestead Development Project, Mākaha Ahupuaʻa, Waiʻanae District, Oʻahu Island (TMK: [1] 8-4-002:005, 007, 056, 057, 070 por., 076; 8-4-023:014, 015; 8-4-024:001) (Tulchin, O'Hare, Shideler, and Hammatt 2009)
Date	November 2009
Project Number (s)	Cultural Surveys Hawaiʻi, Inc. (CSH) Job Code: MAKAHA 7
Investigation Permit Number	The fieldwork component of the archaeological inventory survey investigation was carried out under archaeological permit number 09-20, issued by the Hawaiʻi State Historic Preservation Division/Department of Land and Natural Resources (SHPD/DLNR), per Hawaiʻi Administrative Rules (HAR) Chapter 13-282.
Project Location	The project area is located in the eastern portion of Mākaha Valley, approximately 1.3 km (0.8 mi.) *mauka* (inland) of Farrington Highway. The project area consists of lands at the base of the valley, including the Makaha Valley Country Club, and lands along the lower slopes of the Kamaileʻunu Ridge. The project area is depicted on the U. S. Geological Survey 7.5-Minute Series Topographic Map, Waianae Quadrangle (1998).
Land Jurisdiction	Private: Ko Olina Makaha East, LLC / Honolulu Limited
Agencies	State Historic Preservation Division / Department of Land and Natural Resources (SHPD/DLNR)
Project Description	The proposed Ka Pua Project includes development of an approximately 67-acre Kamehameha Schools learning complex and an approximately 112-acre Department of Hawaiian Home Lands (DHHL) Mākaha Homestead residential community. The Kamehameha Schools learning complex is currently envisioned as including a preschool, educational learning lab, multimedia center, learning halls, residence halls, multi-function sports fields, community gathering area, and *loʻi* (irrigated agricultural field). The DHHL Mākaha Homestead development is currently envisioned as including approximately 600 single-family residential lots and a community center. The current conceptual plan also includes approximately 124 acres of open space that is not proposed for development. Minimally, land disturbing activities associated with the proposed project would include: grubbing and grading; excavations for building foundations and subsurface utilities; and excavations for associated infrastructure improvements.
Project Acreage	Approximately 303 acres

Area of Potential Effect (APE) and Survey Acreage	The project’s area of potential effect (APE) is defined as the entire approximately 303-acre project area. The survey area for the current study included the entire approximately 303-acre APE.
Historic Preservation Regulatory Context	This document was prepared to support the planned project’s historic preservation review under Hawai‘i Revised Statutes (HRS) Chapter 6E-42 and Hawai‘i Administrative Rules (HAR) Chapter 13-13-284. In consultation with the Hawai‘i State Historic Preservation Division (SHPD), the archaeological inventory survey investigation was designed to fulfill the State requirements for an archaeological inventory survey per HAR Chapter 13-13-276.
Fieldwork Effort	The CSH field crew included: Todd Tulchin, B.S.; Jane Drengson, B.S.; Douglas Thurman, B.A.; Rosanna Runyon, B.A.; Ena Sroat, B.A.; Michelle Pammer, B.A.; Angela Fa‘anunu, M.S.; David W. Shideler, M.A.; Mindy Simonson, M.A.; and Kuhio Vogeler, Ph.D.; under the general direction of Hallett H. Hammatt, Ph.D. Fieldwork was conducted between September 9 and September 30, 2009, and required 20 person-days to complete.
Number of Historic Properties Identified	Five historic properties, comprised of six archaeological features, were documented within the project area.
Historic Properties Recommended Eligible to the Hawai‘i Register of Historic Places (Hawai‘i Register)	SIHP # 50-80-07-875, pre-contact or early post-contact agricultural terrace, recommended Hawai‘i Register-eligible under Criterion D. SIHP # 50-80-07-3325, plantation-era irrigation flume known as the “Mikilua Flume,” recommended Hawai‘i Register-eligible under Criterion D. SIHP # 50-80-07-7749, two concrete slab building foundations, recommended Hawai‘i Register-eligible under Criterion D. SIHP # 50-80-07-7750, plantation-era irrigation ditch, recommended Hawai‘i Register-eligible under Criterion D.
Historic Properties Recommended Ineligible to the Hawai‘i Register	SIHP # 50-80-07-4818, stone mound, evaluated as not significant under the Hawai‘i Register evaluation criteria.
Effect Recommendation	This archaeological inventory survey identified five historic properties in the project area. SIHP #s 50-80-07-875, -3325, -4818, -7749, and -7750 may be affected by the proposed project. Due to the potential adverse effect on significant historic properties, CSH’s project-specific effect recommendation is “effect, with proposed mitigation commitments.”

Mitigation Recommendation	Each of the five historic properties identified in the project area was documented with detailed written descriptions, photographs, and accurately located with GPS survey equipment. Scale drawings were made of SIHP # 50-80-07-875, -4818, and -7749, and limited subsurface testing was conducted at SIHP # 50-80-07-875 and -4818. Sufficient information regarding the location, function, age, and construction methods of the five historic properties has been generated by the current inventory survey investigation to mitigate any adverse effect caused by proposed development activities. No further work is recommended for SIHP #s 50-80-07-875, -3325, -4818, -7749, and -7750. If, in the unlikely event that subsurface cultural deposits are encountered during the course of development activities, all work in the immediate area should stop and the State Historic Preservation Division should be promptly notified.

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Section 1 Introduction

1.1 Project Background

At the request of PBR Hawaii & Associates, Inc., Cultural Surveys Hawai‘i, Inc. (CSH) completed an archaeological inventory survey for the proposed Ka Pua - Mākaha Learning Complex and DHHL Mākaha Homestead Development Project, Mākaha Ahupua‘a, Wai‘anae District, O‘ahu Island (TMK: [1] 8-4-002:005, 007, 056, 057, 070 por., 076; 8-4-023:014, 015; 8-4-024:001). The approximately 303-acre project area is located in the eastern portion of Mākaha Valley, approximately 1.3 km (0.8 mi.) *mauka* (inland) of Farrington Highway (Figures 1-3). The project area consists of lands at the base of the valley, including the Makaha Valley Country Club, and lands along the lower slopes of the Kamaile‘unu Ridge. The project area is depicted on the U. S. Geological Survey 7.5-Minute Series Topographic Map, Waianae Quadrangle (1998).

The project area is privately owned by Ko Olina Makaha East, LLC / Honolulu Limited. The proposed Ka Pua Project includes development of an approximately 67-acre Kamehameha Schools learning complex and an approximately 112-acre Department of Hawaiian Home Lands (DHHL) Mākaha Homestead residential community (Figure 4). The Kamehameha Schools learning complex is currently envisioned as including a preschool, educational learning lab, multimedia center, learning halls, residence halls, multi-function sports fields, community gathering area, and *lo‘i* (irrigated agricultural field). The DHHL Mākaha Homestead development is currently envisioned as including approximately 600 single-family residential lots and a community center. The current conceptual plan also includes approximately 124 acres of open space that is not proposed for development. Minimally, land disturbing activities associated with the proposed project would include: grubbing and grading; excavations for building foundations and subsurface utilities; and excavations for associated infrastructure improvements. The project’s area of potential effect (APE) is defined as the entire approximately 303-acre project area. The survey area for the current study included the entire approximately 303-acre APE.

This document was prepared to support the planned project’s historic preservation review under Hawai‘i Revised Statutes (HRS) Chapter 6E-42 and Hawai‘i Administrative Rules (HAR) Chapter 13-13-284. In consultation with the Hawai‘i State Historic Preservation Division (SHPD), the archaeological inventory survey investigation was designed to fulfill the State requirements for an archaeological inventory survey, per HAR Chapter 13-13-276.

1.2 Scope of Work

The following scope of work satisfies State and County requirements for an archaeological inventory survey, per HAR 13-13-276. The scope of work included:

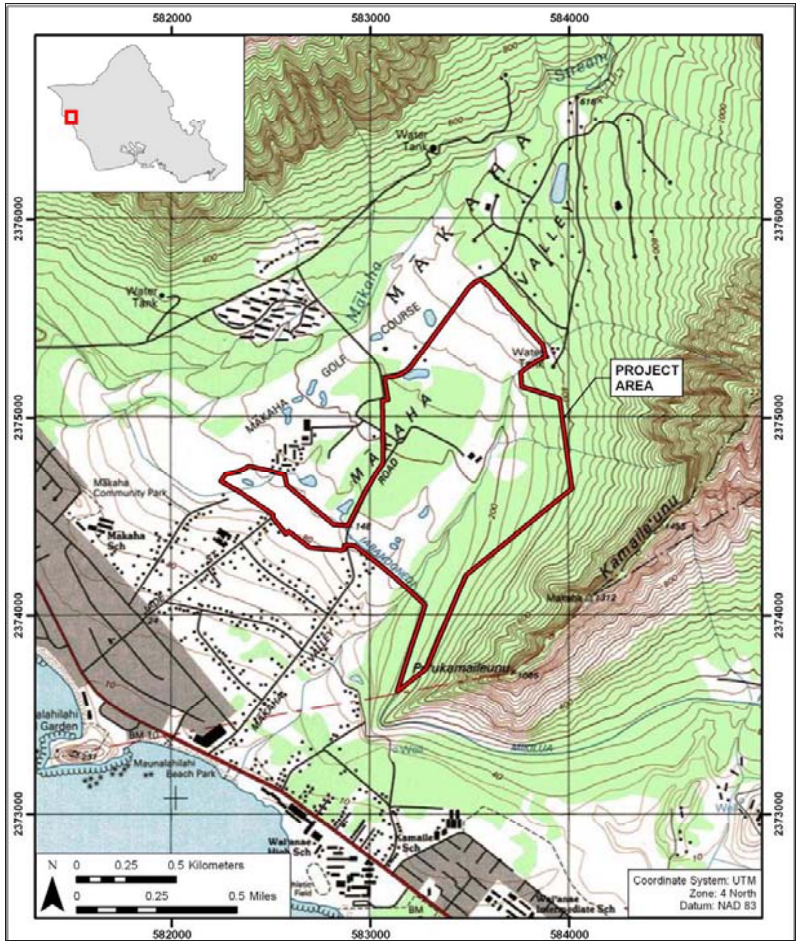

Figure 1. U. S. Geological Survey 7.5-Minute Series Topographic Map, Waianae Quadrangle (1998), showing the location of the project area

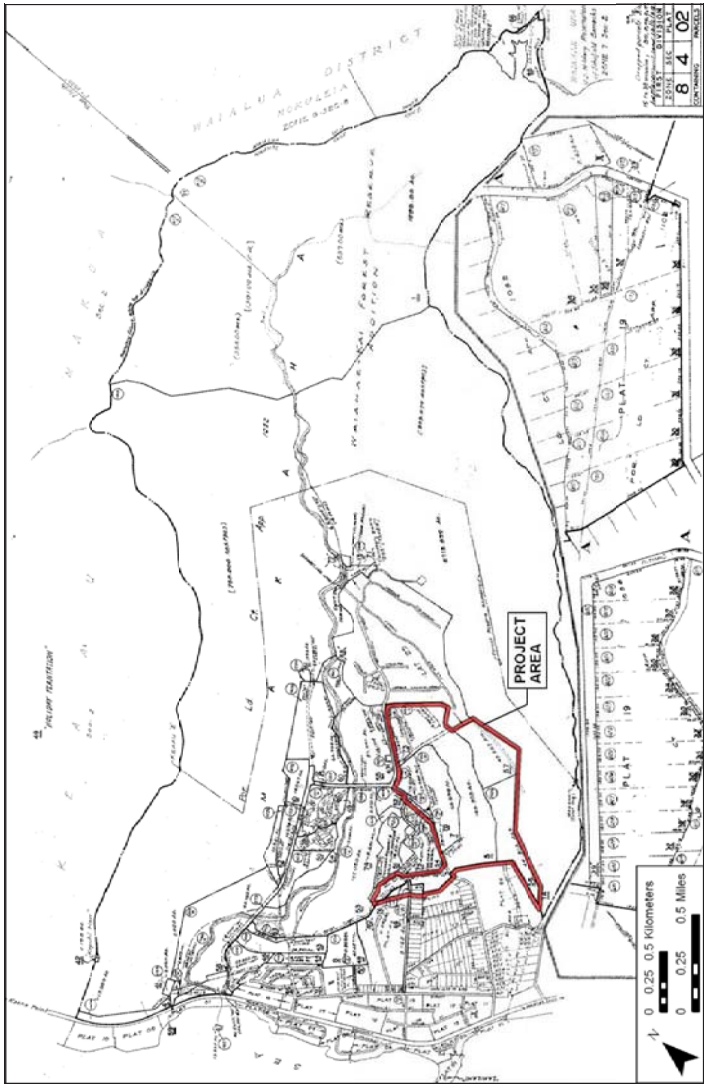

Figure 2. Tax Map Key [1] 8-4-02, showing the location of the project area

Figure 3. Aerial photograph (source: U. S. Geological Survey Orthoimagery 2005), showing the location of the project area

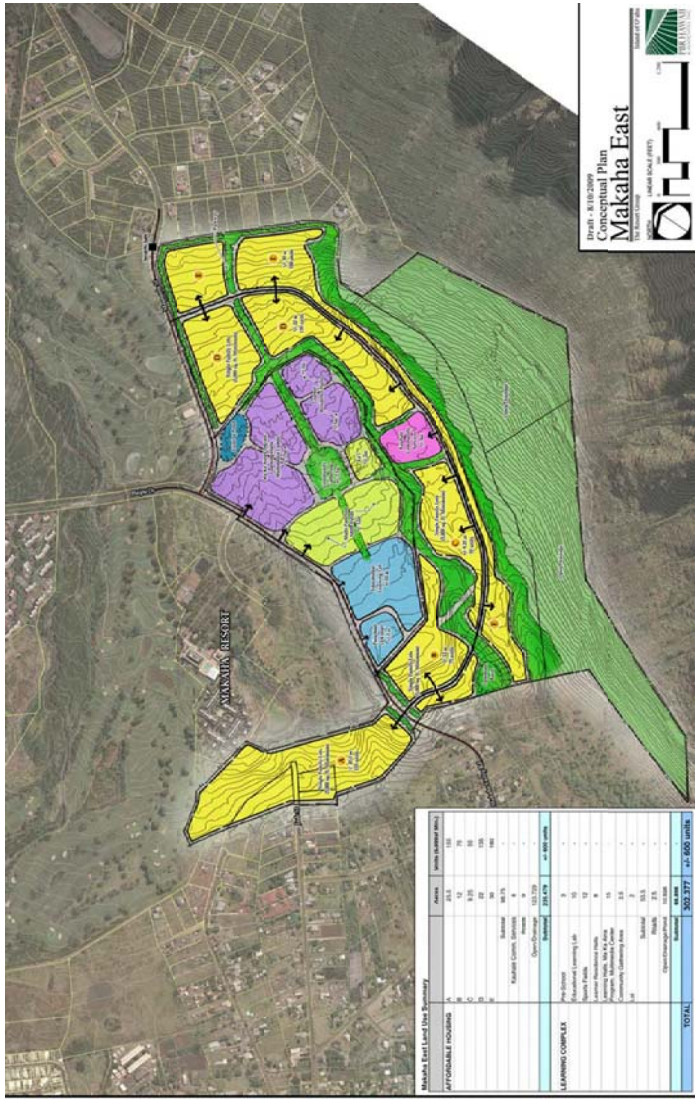

Figure 4. Client-provided Conceptual Plan for the Ka Pua Project

1) Historic and archaeological background research, including a search of historic maps, written records, Land Commission Award documents, and the reports from prior archaeological investigations. This research focused on the specific project area's past land use, with general background on the pre-contact and post-contact settlement patterns of the *ahupua‘a* and district. This background information was used to compile a predictive model for the types and locations of historic properties that could be expected within the project area.
2) A complete (100%) systematic pedestrian inspection of the project area to identify any potential surface historic properties. Surface historic properties were recorded with an evaluation of age, function, interrelationships, and significance. Documentation included photographs, scale drawings, and, if warranted, limited controlled excavation of select sites and/or features. Each historic property was assigned a Hawai‘i State Inventory of Historic Properties number.
3) Consultation with knowledgeable individuals regarding the project area's history, past land use, and the function and age of the historic properties documented within the project area.
4) Preparation of this inventory survey report, including the following:
   a) A project description;
   b) A section of a U.S.G.S. topographic map showing the project area boundaries and the locations of all recorded historic properties;
   c) Historical and archaeological background sections summarizing prehistoric and historic land use of the project area and its vicinity;
   d) Descriptions of all historic properties, including selected photographs, scale drawings, and discussions of age, function, laboratory results, and significance;
   e) A section concerning cultural consultations;
   f) A summary of historic property categories, integrity, and significance based upon the Hawai‘i Register of Historic Places criteria;
   g) A project effect recommendation;
   h) Treatment recommendations to mitigate the project's adverse effect on any historic properties identified in the project area that are recommended eligible to the Hawai‘i Register of Historic Places.

This scope of work also includes full coordination with the State Historic Preservation Division and the City & County of Honolulu relating to archaeological matters. This coordination takes place after consent of the landowner or representatives.

1.3 Environmental Setting

1.3.1 Natural Environment

The approximately 303-acre project area consists of level to gently sloping lands at the base of Mākaha Valley, and moderate to steep sloping lands along the lower slopes of the Kamaile‘unu Ridge. The seasonal ‘Eku Stream channel bisects the project area, separating the valley floor from the adjacent ridge. No running water was observed in the stream channel during the current study, though periodic flooding was evident. Elevations within the project area range from approximately 25-130 m (80-430 ft.) above mean sea level.

Soils within the project area consist of Ewa Stony Silty Clay (EwA, EwB), Lualualei Stony Clay (LvB), Lualualei Extremely Stony Clay (LPE), and Stony Land (rST) (Figure 5). Soils of the Ewa Series consist of "well drained soils in basins and on alluvial fans…developed in alluvium derived from basic igneous rock" (Foote et al. 1972:29). Soils of the Lualualei Series consist of "well drained soils on the coastal plains, alluvial fans, and on talus slopes…developed in alluvium and colluvium" (Foote et al. 1972:84). Stony Land "occurs in valleys and on side slopes of drainageways" and consists of "a mass of boulders and stones deposited by water and gravity" (Foote et al. 1972:120)

The project area receives an average of approximately 600-800 mm (24-32 in.) of annual rainfall, with rainfall increasing with distance from the coast (Giambelluca et al. 1986). Vegetation within the undeveloped portions of the project area includes *koa haole* (*Leucaena leucocephala*), *kiawe* (*Prosopis pallida*), *klu* (*Acacia farnesiana*), autograph tree (*Clusia rosea*), and exotic weeds and grasses. Vegetation in the golf course portion of the project area includes bougainvillea (*Bougainvillea sp.*), Cook pine (*Araucaria columnaris*), *kiawe*, and golf course grasses.

1.3.2 Built Environment

Approximately one half of the project area consists of the Makaha Valley Country Club. The country club includes an 18-hole golf course, club house, maintenance buildings, reservoir, and associated infrastructure. The remaining lands in the project area are undeveloped. The surrounding area is primarily rural. Development in the surrounding area includes: the Mauna ‘Olu Estates residential subdivision *mauka* (inland) of the project area; agricultural subdivisions *makai* (seaward) of the project area; and the Makaha Resort and Golf Club west of the project area. Structures in the vicinity of the project area include single-family homes and resort-type infrastructure.

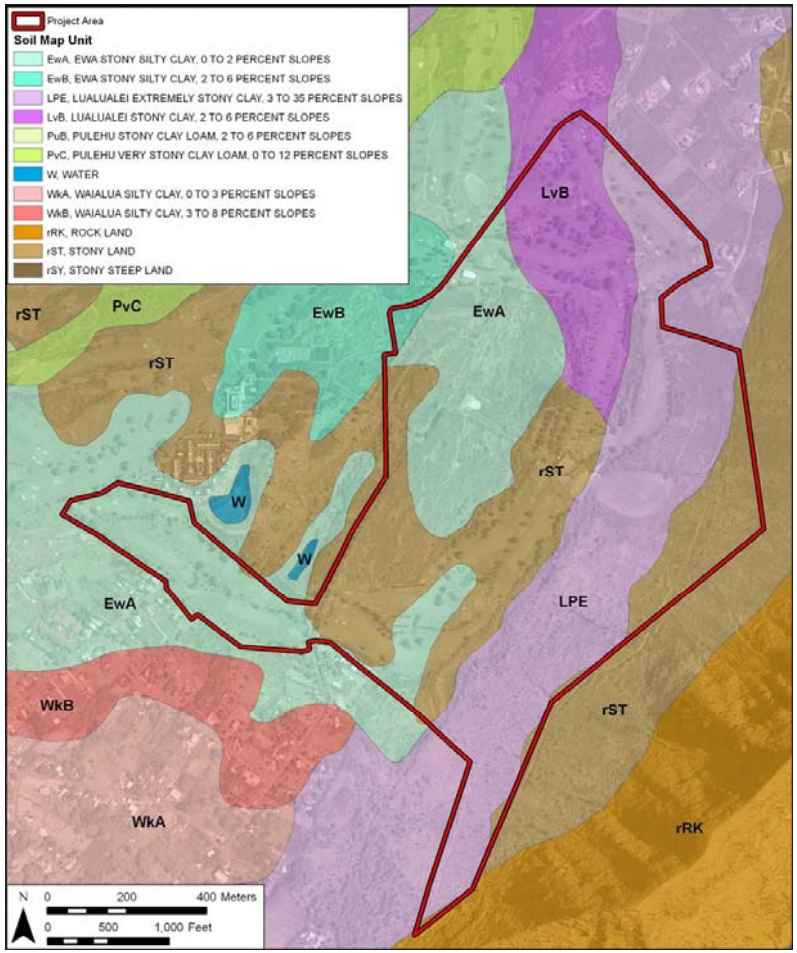

Figure 5. Overlay of the Soil Survey of Hawai‘i (Foote et al. 1972), indicating sediment types within the project area

Section 2 Methods

2.1 Field Methods

The fieldwork component of the archaeological inventory survey investigation was carried out under archaeological permit number 09-20, issued by the Hawai‘i State Historic Preservation Division / Department of Land and Natural Resources (SHPD/DLNR), per Hawai‘i Administrative Rules (HAR) Chapter 13-282. The CSH field crew included: Todd Tulchin, B.S.; Jane Drengson, B.S.; Douglas Thurman, B.A.; Rosanna Runyon, B.A.; Ena Sroat, B.A.; Michelle Pammer, B.A.; Angela Fa‘anunu, M.S.; David W. Shideler, M.A.; Mindy Simonson, M.A.; and Kuhio Vogeler, Ph.D.; under the general direction of Hallett H. Hammatt, Ph.D. Fieldwork was conducted between September 9 and September 30, 2009, and required 20 person-days to complete.

Fieldwork consisted of a complete pedestrian inspection of the approximately 303-acre project area and limited subsurface testing at selected archaeological features. The pedestrian inspection of the project area was accomplished through systematic sweeps. The interval between the archaeologists was generally 5-10 m. All historic properties encountered were recorded and documented with a written field description, scale drawings, photographs, and each site was located using Garmin GPSmap 60 CSx GPS survey technology (accuracy 3-5 m).

Subsurface testing consisted of the partial excavation, by hand, of selected surface archaeological features located during the pedestrian survey. The purpose of the subsurface testing was to aid in determining the function of located surface sites, as well as to possibly obtain datable materials for later radiocarbon dating. All excavated material was sifted through a 1/8 in. wire mesh screen to separate out the soil matrix, then all cultural material was collected for analysis in the lab. Each test excavation was documented with a scale section profile, photographs, and sediment descriptions. Sediment descriptions included characterizations of Munsell color designations, compactness, texture, structure, inclusions, cultural material present, and boundary distinctness and topography.

2.2 Document Review

Historic and archival research included information obtained from the UH Mānoa Hamilton Library, the State Historic Preservation Division Library, the Hawai‘i State Archives, the State Land Survey Division, and the Archives of the Bishop Museum. Previous archaeological reports for the area were reviewed, as were historic maps and primary and secondary historical sources. Information on Land Commission Awards was accessed through Waihona ‘Āina Corporation’s Māhele Data Base (www.waihona.com).

2.3 Community Consultation

A community consultation effort was undertaken as a component of this archaeological inventory survey investigation. The consultation was made in association with a companion Cultural Impact Assessment (CIA) for the current project. Per HAR Chapter 13-13-276, the community consultation effort for the archaeological inventory survey involved “notifying

interested organizations and individuals that a project could affect historic properties of interest to them; seeking their views on the identification, significance evaluations, and mitigation treatment of these properties; and considering their views in a good faith and appropriate manner during the review process.”

In general, Hawaiian organizations, agencies, and community members were contacted in order to identify potentially knowledgeable individuals with cultural expertise and/or knowledge of the project area and the vicinity. The reader is referred to the CIA, titled *Cultural Impact Assessment for the Proposed Ka Pua - Mākaha Learning Complex and DHHL Mākaha Homestead Development Project, Mākaha Ahupua‘a, Wai‘anae District, O‘ahu Island (TMK: [1] 8-4-002:005, 007, 056, 057, 070 por., 076; 8-4-023:014, 015; 8-4-024:001)* (Vogeler and Hammatt, in progress), for detailed information regarding the methods and full results of the consultation effort.

Section 3 Background Research

3.1 Traditional and Historic Background

3.1.1 Place names

The project area is located within the *ahupua‘a* of Mākaha, which extends from the crest of the Wai‘anae Mountain Range to the coast, situated between Wai‘anae Ahupua‘a to the southeast and Kea‘au and Mākua Ahupua‘a to the northwest. Prominent place names of Mākaha are indicated on Figure 6, a 1932 Land Court Application map. The place names indicated on the map were collected from the following sources: 1998 U.S. Geological Survey 7.5-Minute Series Topographic Map, Wai‘anae Quadrangle; a map of coastal place names in Clark’s (1977:90) *Beaches of O‘ahu*; a map drawn for the Makaha Valley Historical Project (Green 1980:22); an 1860 map of Kea‘au by J. W. Makalena (Hawai‘i Land Survey Division, Registered Map No. 95); and an undated (ca. 1875-1900) map of Wai‘anae by M. D. Monsarrat (Hawai‘i Land Survey Division, Registered Map No. 600).

There are different interpretations of the place name Mākaha. Pukui et al. (1974:139) translates Mākaha as “fierce,” in reference to the inhabitants of the land. Alexander (1902, in Sterling and Summers 1978:60) interprets Mākaha as “robbery,” in reference to a story about cannibal robbers who threatened travelers on the coastal trail through the Wai‘anae District. Another interpretation of Mākaha concerns the dispersal of people after Kamehameha I conquered the island of O‘ahu in 1795.

> After the rout of the army of Kalanikupule, the king of Oahu at Nuuanu, April 29, 1795 by the invading army of Kamehameha Nui, the conquered Oahuans were driven from their homes, their lands seized and divided amongst the friends of Kamehameha -- the despoiled people in large numbers fled to Waianae and settled there. This part of Oahu being hot, arid, isolated, with little water, was not coveted by the invaders…romance and sentiment hovers round Mount Kaala (the mount of Fragrance), and three valleys extending from its western base to the Waianae shore, Makaha, the valley of robbery; Po-kai, the valley of the dark sea; Lualualei, the valley of the flexible wreath… [Mouritz 1934:128, in Sterling and Summers 1978:68]

At the coast, the dividing line between Mākaha and Kea‘au is at Ka Lae o Mākaha, or Mākaha Point. The area, noted for a rocky, raised reef good for pole fishermen, was also called “Takato” in the historic period, probably named for a resident or fisherman (Clark 1977:94). The point is on the western side of a high ridge called Kepuhi, extending out into the ocean and ending at Kepuhi Point, or Ka Lae o Kepuhi. The word *kepuhi* translates as “to blow”, and the Kepuhi Point was probably named for the numerous “blowholes” found along the reef in this area (Clark 1977:93). Pu‘u Kepuhi was known as a “Guard’s Peak” (Poe, to Kekahuna n.d.:1), probably in reference to a legend of robbers in Mākaha who watched from the ridge for unwary travelers (see Section 3.1.2: Mythological and Traditional Accounts). On Kepuhi Ridge was the legendary cave used by robbers, Malolokai (“low tide”). Above the coastal trail that led from

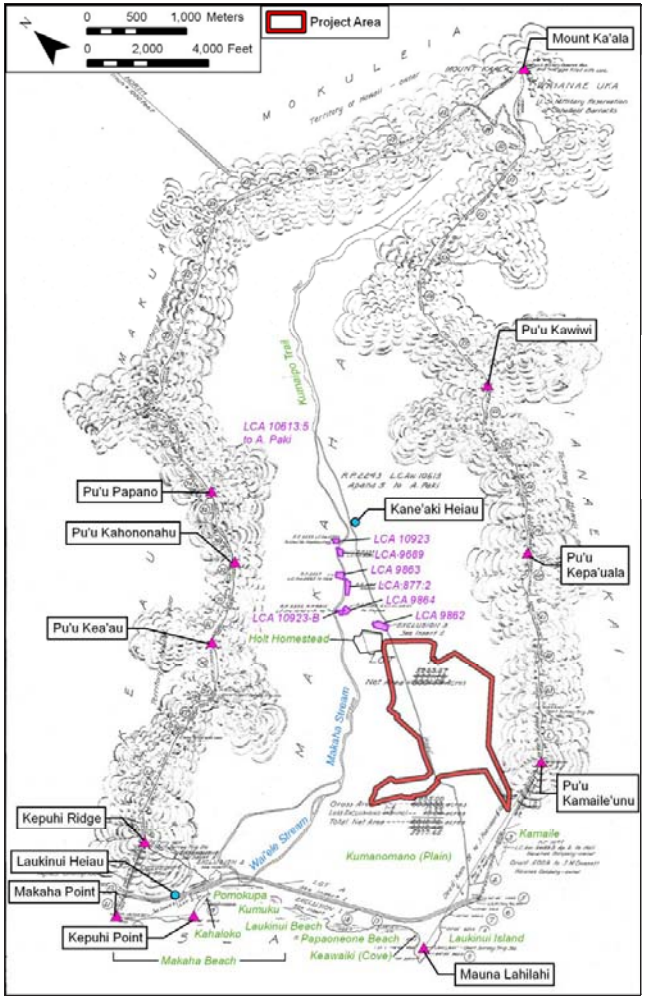

Figure 6. 1932 Map of Waianae Company Lands in Mākaha (Hawai‘i Land Survey Division, Land Court Application 1052), with the addition of place name information

Mākaha to Kea‘au were two *pōhaku* (stones), Pōhaku o Kanaloa (“stone of the god Kanaloa”) on the Kea‘au side and Pōhaku o Kāne (“stone of the god Kāne”) on the Mākaha side (McAllister 1933:121-122; Site 174). Clark (1977:94) indicates the stone on the Mākaha side was Pāpale o Kāne, the “hat of Kāne,” and that it was above the Hawaiian Electric booster station at the base of the cliffs. McAllister (1933:121) placed Malolokai Cave near Mākaha Point.

To the east of Kepuhi Ridge, near the intersection of Lawa‘i‘a Street and Farrington Highway, was a *pōhaku* (stone) called Pōhaku o Kīkēkē (“clapping, or knocking rock”). If a person stood four or five feet away and clapped his hands, the stone would produce an echo of the sound (Clark 1977:94). Residents believed that there was a hollow area below the stone, perhaps a lava tube, which created the unusual sound. A long-time resident, Henry Poe, called the rock Pōhaku Pa‘ipa‘i (“clapping stone”), where “a person would hide under this stone and slap it to attract attention” (Poe, to Kekahuna n.d.:2). McAllister (1933:121) wrote of a large rock (Site 173), that was “once an object of worship,” according to an 1839 visitor to the Wai‘anae coast. This may be a reference to the same “clapping rock.” He places this rock east of Malolokai Cave, thus suggesting that the *pōhaku* associated with the robbers and the “clapping rock” *pōhaku* are different stones. Other ethnographers suggest that the two stones are the same. A note in an 1899 Hawaiian language newspaper describes Malolokai as: “A famous hill at which there is a talking stone” (*Kuokoa*, August 11, 1988, p. 4, cited in Sterling and Summers 1978:79).

South of Kepuhi Ridge was a long sandy beach called Kahaloko (“the pond”) (Poe n.d.:2). Streams from the upland areas ended in this area at a marsh or pond near the beach. Clark (1977:92) says the pond was called Mākāhā**,** named for a *mākāhā*, the Hawaiian word for a sluice gate used to keep the larger fish in the pond. This pond was later filled-in during construction of the O‘ahu Railway and Land Co. (O.R. & L.) railroad through coastal Mākaha. There was once a small settlement near the beach, which can be seen as a coconut grove on a drawing made by the missionary Hiram Bingham in 1826 (Figure 7). John Papa ‘Ī‘ī (1959:98) mentioned the settlement as being adjacent to the coastal trail: “There were many houses at Makaha, where a fine circle of sand provided a landing place for fleets of fishing canoes.” South of the mouth of Wai‘ele Stream, the beach was known as Pōmokupā**,** and the rocky area just south of the sandy beach was called Kumukū. Clark (2002:204) suggests that Kumukū may translate as “school of red goatfish.” Today the entire coastal area from Kahaloko to Kumukū is known as Mākaha Beach, famous for championship surfing contests.

Laukīnui Beach extends south of Kūmuku around Laukīnui Point. *Laukīnui* translates as “large *kī* leaf.” The ti leaf, *lau kī*, was worn around the neck as a charm against evil spirits, especially by *kahuna*, or priests. There was once a *heiau* called Laukīnui in this area (McAllister 1933:123), and the Laukīnui place name may refer to the *heiau* or its priests. The Holt family, who owned most of Mākaha in the late nineteenth and early twentieth centuries, used this coastal area to pasture cows, and thus the area was referred to by fisherman as Pipi, or “beef” (Clark 1977:91). Continuing south, the next beach was known as Papaoneone (“sandy shelf”). Modern names include Lahilahi Crescent, Turtle Beach, or Keawaiki Beach. At the southern end of the beach, adjacent to Mauna Lahilahi, was a small cove known as Keawaiki (“the little bay”). Poe (n.d.:6) said that Keawaiki Beach was a net-fishing place (*ku‘una*) where *honu* (turtles), *kala* (surgeonfish, unicorn fish), ‘*enenue* (pilot fish), *pualu* (surgeonfish*)*, and *uhu* (parrotfish) were caught.

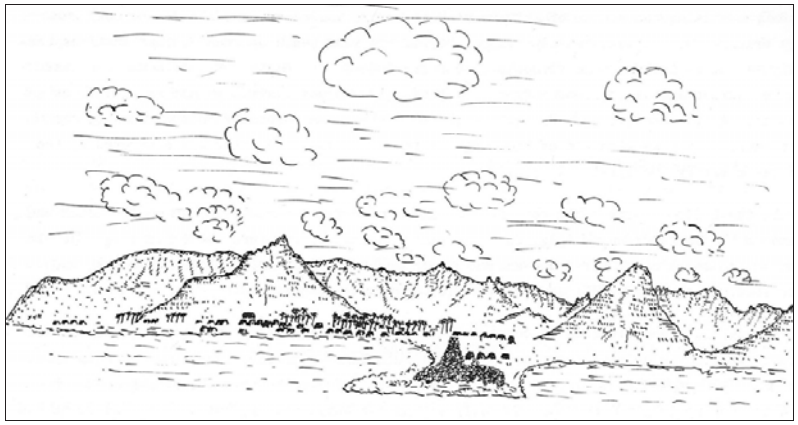

Figure 7. 1826 sketch of Wai‘anae and Mākaha Ahupua‘a by the missionary Hiram Bingham (original sketch in the Hawaiian Mission Children’s Society Library; reprinted in Green 1980:9). Places shown are: Kāne‘īlio Point on the right side; Mauna Lahilahi and Kamaile‘unu Ridge in the center; Kepuhi Point at the left; the small settlement and coconut grove in Mākaha at the base of Kepuhi Point is shown at the far left.

The southern boundary of Mākaha Ahupua‘a is dominated by the high, thin promontory called Mauna Lahilahi (“thin mountain”). Mauna Lahilahi is shown on an 1884 sketch (Figure 8) made during George Jackson’s survey of the Wai‘anae Coast. The line dividing Mākaha Ahupua‘a from Wai‘anae Ahupua‘a runs along the center of the promontory. Noted ethnographer Mary Kawena Pukui (cited in Sterling and Summers 1978:77) says of the feature: “This hill is very thin as though it had been sliced with a knife and so it was called Mauna Lahilahi.” The hill was regarded as sacred to many residents and visitors, who walked over or around the promontory to get to Turtle (Papaoneone) Beach to fish or collect *limu* (seaweed) from the shore (Ahlo 1986:4). Several residents noted that in accessing Turtle Beach from the east, you should travel around the shore, circling clockwise around the promontory. However, to return you should travel a different way, on either one of two inland trails, *mauka* of Lahilahi. One resident remembered that her great-aunt said that there were once three *heiau* on top of Mauna Lahilahi. These may have been *ko‘a* (fishing shrines), as fishermen often climbed to the top of Lahilahi to spot schools of fish (Ahlo 1986:2).

Offshore of the promontory (on the Wai‘anae side) is a small islet today known as Shark Island (Ahlo 1986:6) (Figure 8). The ancient name of the island was Laukīnui**,** which translates as “large united family.” The island was known as the mother of the family, the reefs “following

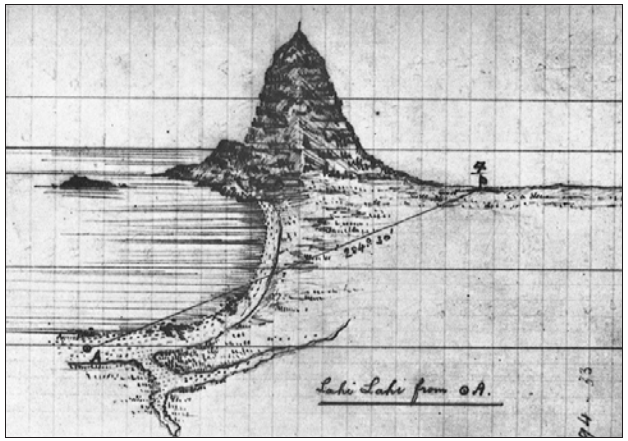

Figure 8. 1884 Sketch of Mauna Lahilahi and Laukinui Island from Kamaile, drawn by George Jackson during his survey of the Wai‘anae Coast (Jackson notebook 1884)

the shore line in scallops” were known as the children (Tutu Ana Kahawai, Nov. 1954, Waianae, cited in Sterling and Summers 1978:77). Pukui (cited in Sterling and Summers 1978:77) indicates the name of the islet was Laukianui, meaning “large concentration.”

Mauka of the Mauna Lahilahi promontory is the ridge that separates Mākaha from Wai‘anae, called Kamaile‘unu (“the striped *maile* vine”), with the highest point of the ridge called Pu‘u Kamaile. There was also a settlement called Kamaile, watered by a coastal freshwater spring, below the eastern edge of the ridge, within Wai‘anae Ahupua‘a. The flat, arid land (*kula*) inland of the Mākaha beaches to Kamaile was known as Ke Kula o Kumanomano (“stand in greatness” Kelsey n.d.:2). An 1889 visitor to Mākaha noted:

> We rode to the plain of Kumanomano…and it is said of the place, the teeth of the sun is sharp at Kumanomano. Makaha rose above like a rain cloud. We passed in front of a famous hill Malolokai. We saw the talking stone standing there. [Haleiwa Hotele [*sic*], *Kuokoa*, August 11, 1899, cited in Sterling and Summers 1978:79]

Along the ridge separating Wai‘anae and Mākaha Ahupua‘a, there are two named *pu‘u*, or peaks: Pu‘u Kēpa‘uala (“red gum hill”; Soehren 2009) and Pu‘u Kawiwi. The northern, *mauka* point of Mākaha is at Mount Ka‘ala (possibly “laughter”, Thrum 1922:635, or “fragrance,” Sterling and Summers 1978:68). With an elevation of 4,040 ft. above sea level, Ka‘ala is the highest peak on O‘ahu. Along the ridge separating Mākaha from Kea‘au Ahupua‘a, there are three named *pu‘u*: Pu‘u o Papano (“dark hill”), Pu‘u o Kahononahu, and Pu‘u Kea‘au.

Mākaha Ahupua‘a is watered by the perennial Mākaha Stream, which carved a broad lower valley and a narrow upper valley 2.5 miles inland. The stream extends from the slopes of Mount Ka‘ala down to the northern portion of the Mākaha shoreline. The mouth of the stream was a marsh or *muliwai* (backshore pond). On early maps of Mākaha, there is only one stream that reaches the shore, called Kahawai (the Hawaiian word for stream) or Mākaha. Modifications to the stream for plantation irrigation later changed the flow pattern and volume of the stream. On other historic maps, Mākaha Stream is shown as dividing near the shore into two streams, Mākaha Stream and Wai‘ele Stream (“dug water”). Irrigated taro patches and associated permanent house sites have been recorded near the junction of the lower and upper valleys along Mākaha Stream. Poe (n.d.:5) noted that at Mākaha Stream “in time of heavy rain the water would wash the sand of the beach into the sea, and before it returned small *‘ama‘ama* [mullet], *awa* [milkfish], and *ahole* [flagtail] would come, grow big, and be caught by the people.”

There was also a second stream channel, now a dry gully, that extended along the northern side of Kamaile‘unu Ridge. This stream drained into a swampy area on the Kamaile shore in Wai‘anae Ahupua‘a, in the area now known as Mauna Lahilahi Beach Park. This stream may have been called ‘Eku Stream (“to root, as does a pig”; Clark 1977:907). Poe (n.d.:3) said, “Eku Stream, now called Ke-aupuni Stream. At its mouth in the sea is Kau-puni. It runs from Kāne-wai Mountain to the shore of Honus (?).” There is a question mark after this quote, suggesting that the editor, James Kekahuna, could not locate or confirm some of these place names.

There were at least two *heiau* located in Mākaha. The primary *heiau*, Laukīnui (“large ti leaf”) Heiau, was located at the coast along Laukīnui Beach, and Kāne‘ākī (“hair switch Kāne) Heiau is located at the junction of the lower and upper valleys. Mitchell (1930:174, cited in Soehren 2009) claimed that there might be a third *heiau*, or possibly a coastal *ko‘a* (fishing shrine) on Kepuhi Point. Mitchell said that the Hawaiian Government Survey established a triangulation station in 1875 on Kepuhi Point “on a stone platform said to be an ancient *heiau*.”

Because of the low number of Land Commission Awards, there are only a few known ‘*ili* (subdivisions of *ahupua‘a*) names in Mākaha Ahupua‘a. From the Land Commission testimony, Soehren (2009) lists nine ‘*ili*, suggesting meanings for several of the ‘*ili* based on translations in the *Hawaiian Dictionary* (Pukui and Elbert 1986). The ‘*ili* are Ahakea, Kahihi, Kahueiki (“the small gourd”), Kapua‘a (“the pig”), Kekio, Laukīnui (“large ti leaf”), Laulauwa‘e (“laua‘e fern frond”), Maka, and Waikani (“sounding water”).

3.1.2 Mythological and Traditional Accounts

The following background sections of this study present a broad review of historical and traditional accounts concerning the general area in order to ascertain the specific history of the land within the project area boundaries. Although there are many traditional accounts detailing the pre-contact period of other portions of the Wai‘anae District, few exist for Mākaha Ahupua‘a. Nevertheless, the shores fronting the beautiful Mākaha Valley were known for their abundant marine resources. Edward Iopa Kealanahele’s account “How Makaha got its name” (Kealanahele 1975) highlights the varied and abundant ocean resources:

> Long ago, there lived in this valley a handsome young chief named Makaha. His skill as a fisherman gained island-wide attention, which eventually reached the

> ears of Ke Anuenue [the rainbow], the goddess of rain, who lived in upper Manoa Valley.
>
> She was so intrigued that she sent her trusted winged friend, Elepaio, to investigate Makaha. Elepaio returned with exciting stories of Makaha’s daring and skills.
>
> The next morning, Ke Anuenue created an awe-inspiring double rainbow which arched from Manoa Valley to this valley, from where she and her retinue could watch Makaha perform his daring feats at the ocean.
>
> The people of the Wai‘anae Valley were petrified by that magnificent rainbow that ended in this unnamed valley where Makaha lived.
>
> Knowing that Ke Anuenue was watching, they prayed that she would bring them the much needed gentle rains and not the harsh storms she could create when displeased.
>
> Makaha, aware of her presence, scaled Mauna Lahilahi and called loudly to his aumakua [his ancestral spirit] Mano ai Kanaka, the most vicious of man-eating sharks. As Mano ai Kanaka glided in from the ocean, Makaha dived from the rocky pinnacle, emerged on Mano ai Kanaka’s back and rode with regal grandeur.
>
> As the two disappeared into the depths, the sea became calm. Suddenly Makaha seemed to be everywhere along the rocky coast gracefully tempting death. Then, just as suddenly, Makaha seemed to skim the ocean as Mano ai Kanaka carried him to shore.
>
> Makaha then carried his entire catch to the rainbows end deep in the valley and offered it to Ke Anuenue. Deeply touched, she sent gentle rains to the parched earth of the great Wai‘anae Valley. She was impressed by the selection of seafood that was offered her but was disappointed by the quality of the poi, mai‘a [banana] and uala [sweet potato] which were dry and stringy. She demanded to know why since she was so accustomed to good quality fruits. She was told that it was because of the lack of rainfall in the valley.
>
> Ke Anuenue became enamored with Makaha and from then on her double rainbow would appear in Makaha’s kuleana [land area] and gentle rains would fall on Wai‘anae so the people could enjoy lush bananas and an abundance of taro.
>
> The people built a heiau in honor of Ke Anuenue and Makaha but Ke Anuenue refused the honor and named the entire valley, Makaha, by which it is now known.

Mākaha residents may have owed their successful exploitation of marine resources to more than just skill. Harry George Poe, born in Makua Valley in 1882, recounted in his diary that robbers threw their victims into a pit that went underground to the ocean (McGrath et al. 1973:11). He explains, “The reason is, they wants a man’s legs without no hair on to make [an] aku [tuna] fishhook. They believed in those days that the human leg is best, lucky hook for aku” (McGrath et al. 1973:11). Such an account supports the definition given by Mary Kawena Pukui et al. (1974:139) for “Mākaha” as “fierce” and especially the suggestion by Roger C. Green

(1980:5) that the translation refers to the “fierce or savage people” who once inhabited the valley.

Green (1980:5) mentions “…the ‘Ōlohe people, skilled wrestlers and bone-breakers, by various accounts [who] lived in Mākaha, Mākua, and Kea‘au, where they often engaged in robbery of passing travelers.” One legend concerning the fierceness of Mākaha involves robbers and cannibals:

> Long ago there lived here a group of people who are said to have been very fond of human flesh. At high altitude on each side of the ridge [separating Mākaha from Kea‘au], guards were stationed to watch for people crossing this narrow stretch of land between the mountains and the sea. On the Makaha side, they watched from a prominent stone known as Pohaku o Kane, on the Kea‘au side, from a stone known as Pohaku o Kanaloa. The individual who passed here was in constant danger of death, for on each side of the trail men lay in wait for the signal of the watcher. If a group of persons approached, too many to be overcome by these cannibalistic peoples, the guards called out to the men hidden below, “Moanakai” (high tide); but if, as frequently happened, only two or three people were approaching the watchers called “Mololokai” (low tide). The individuals were then attacked and the bodies taken to two small caves on the seaside of the road. Here the flesh is said to have been removed and the bones, skin, and blood left in the holes, which at high tide, were washed clean by the sea.
>
> For many years these people preyed upon the traveler until at one time men from Kauai, hairless men [‘*Ōlohe*] came to this beach. They were attacked by these cannibals but defeated them, killing the entire colony. Since then the region has been safe for traveling. [McAllister 1933:121-2]

In a different version, the robbers called out, *Mololo kai e, mololo kai*! for only one traveler, and when a large party passed, *Nuinui kai e,* or, *Kaiko‘o kai e, kaiko‘o*! (“strong, rough seas”; Pukui and Elbert 1986:166) (Poe, to Kekahuna n.d.:2). Theodore Kelsey (n.d.:1) says it was the daughter of the robbers who called out the warnings, a short *Mololo-kai e*, if a small party approached, or the phrase “*Kaiko‘o –a-a-a-a-he-a*”, in a long chanting style for a large party.

Lua, often referred to as the “art of *lua*” or the Hawaiian martial art, literally means “hand-to-hand fighting” that includes bone-breaking (Pukui and Elbert 1986:213). This art was tied to a particular cave within Mākaha Valley, Malolokai. The art of *lua* is reportedly taught only to the *ali‘i* and their guards, as it was a long-standing familial secret and could only be passed down through relatives. In the early 1920s, the *kapu* (tabu) was broken, and the Hawaiian martial art of *lua* was taught to other people outside of the bloodline. *Lua* had an array of weapons used in combat, which were made of different types of hardwood, such as *kauwila* and *kawa‘u*, found throughout the Hawaiian Islands. Marine resources were also used to make weapons, such as the knifelike *leiomano*, which incorporates shark teeth, or the marlin (swordfish) bill. A brief account (*Kuokoa*, July 12, 1923, in Sterling and Summers 1978:79) of the cave mentioned above states: “…Malolokai lies below [beyond] the hill of Maunalahilahi close to a cliff. Below, in the level land of Waihokaea are the bones of the travelers who were killed by skilled *lua* fighters.”

The hero Kawelo took his canoe to the Wai‘anae coast to try to capture the supernatural parrotfish called Uhumakaikai. While there, he was informed that his family on Kaua‘i were

being persecuted by ‘Aikanaka, the chief of that island. He landed on the Wai‘anae Coast to present an offering at a *heiau* before travelling to Kaua‘i to challenge ‘Aikanaka. In some versions, this *heiau* was Kāneikapua‘a at Kamaile, in Wai‘anae Ahupua‘a. In other versions, it was at Kāne‘āki Heiau in Mākaha (Westervelt 1963:183).

In Hi‘iaka’s “Address to Cape Kaena,” she mentioned Mākaha as she traveled along the sunny coast. As she stood at the top of the Pōhākea Pass, looking back she sang the following song (Emerson 1965:157):

Kunihi Kaena, Holo i ka Malie;	Kaena’s profile fleets through the calm,
Wela i ka La ke alo o ka pali;	With flanks ablaze in the sunlight-
Auamo mai i ka La o Kilauea;	A furnace-heat like Kilauea;
Ikiiki i ka La na Ke-awa-ula	Ke-awa-ula swelters in heat;
Ola i ka makani Kai-a-ula Kohola‘ lele-	Kohola‘-lele revives in the breeze
He makani ia no lalo.	That breath from the sea, Kai-a-ulu.
Haoa ka Loa i na Makua;	Fierce glows the sun of Makua;
Lili ka La i Ohiki-lolo	How it quivers at Ohiki-lele-
Ha‘a-hula le‘a ke La i ke kula,	‘Tis the Sun-god’s dance o‘er the plain,
Ka Ha‘a ana o ka La i Makaha;	A riot of dance at Makaha.
Oi ka niho o ka La i Ku-manomano;	The sun-tooth is sharp at Kumano;
Ola Ka-maile i ka huna na niho	Life comes again to Maile ridge,
	When the Sun-god ensheaths his fang.
Mo‘a wela ke kula o Walio;	The Plain Walio‘ is sunburned and scorched;
Ola Kua-iwa i ka malama po	Kua-iwa revives with the nightfall;
Ola Waianae i ka makani Kai-a-ulu	Waianae is consoled by the breeze
Ke hoa aku la i ka lau o ka niu	Kai-a-ulu and waves its coco fronds;
Uwe’ o Kane-pu-niu i ka wela o ka La;	Kane-pu-niu’s fearful of sunstroke
Alaila ku‘u ka luhi, ka malo‘elo‘e,	A truce, now, to toil and fatigue:
Auau aku i ka wai i Lua-lua-lei	We plunge in the Lua-lei water
Aheahe Kona, Aheahe Koolau wahine,	And feel the kind breeze of Kona,
	The cooling breath of the goddess,
Ahe no i ka lau o ka ilima.	As it stirs the leaves of ilima.
Wela, wela i ka La ka pili i ka umauma,	The radiant heat scorches the breast
I Pu‘u-li‘ili‘i, i Kalawalawa, i Pahe-lona,	While I sidle and slip and climb
A ka pi‘i‘na i Wai-ko-ne-ne’-ne;	Up one steep hill then another;
Hoomaha aku i Ka-moa-ula;	Thus gain I at last Moa-ula,
A ka luna i Poha-kea	The summit of Poha-kea.
Ku au, nana i kai o Hilo:	There stand I and gaze oversea
	To Hilo, where lie my dewy-cold
Ke ho‘omoe a‘e la i ke kehau	Forest preserves of lehua
O a‘u hale lehua i kai o Puna,	That reach to the sea in Puna-
O a‘u hale lehua i kai o Ku-ki‘i.	My lehuas that enroof Kuki‘i.

Emerson translated the verse on Mākaha as “A riot of dance at Makaha.” In three other versions of this chant, the verse concerning Mākaha has been translated as “The sun dances over Mākaha,” “The dance of the sun at Mākaha,” and “The sun dances upon Mākaha’s lands” (Ho‘oulumāhiehie 2006:263-265).

3.1.3 Trails and Storied Places

John Papa ‘Ī‘ī describes a network of Leeward O‘ahu trails (Figure 9), which in early historic times provided access to the Wai‘anae District from Central O‘ahu via the Pōhākea and Kolekole passes through the Wai‘anae Range, and from the coast via Pu‘u Kapolei in the south and Ka‘ena Point in the north. ‘Ī‘ī also describes a trail that traversed Mākaha Valley, called Kūmaipō:

> There was a long cliff trail called Elou from Kalena and Haleauau on the east side of [Mount] Kaala coming down to Waianae. There was also a trail called Kumaipo which went up and then down Makahauka.
>
> Below Kumaipo trail in the olden days was a stronghold named Kawiwi. At the time of a battle, a boy was posted there as a guard every night. He was often hungry, for the lord of the stronghold did not supply him with food. This caused him to change his allegiance and give the place over to the rebels. This he did by calling out…The boy kept up the cry until the stronghold was filled with men, and its lords were taken captive by the rebels…
>
> The stronghold of Kawiwi was part of a mountain ridge lying between Waianae and Makaha and overlooking Kamaile. The trail Kumaipo, went down to the farms of Makaha and the homes of that land. A branch trail which led up Mount Kaala and looked down on Waialua and Mokuleia could be used to go down to those level lands. It was customary to have dwelling places along the mountain trails that led downward from here into Kamaile, as well as along the beach trail of Makaha.
>
> There were many houses at Makaha, where a fine circle of sand provided a landing place for fleets of fishing canoes. The trail which passed by this sandy bar was the one from Puu o Kapolei, which had joined the beach trail from Puuloa and from Waimanalo. [‘Ī‘ī 1959:96-98]

Kawiwi (“the thin one”), was a stronghold as early as the fourteenth century, when O‘ahu was united under one ruler, La‘akona, and his descendants. This family of ‘Ewa chiefs held power until the cruel ruler, Haka, was overthrown by other O‘ahu chiefs. Haka fled to the fort of Waewae on the Kawiwi Ridge, but he was captured, betrayed by the boy mentioned above (Kamakau 1991:53-54). A different line of chiefs, who moved their ruling center to Waikīkī, became the rulers of O‘ahu, including Wai‘anae. Kawiwi was the place of refuge during war for all of O‘ahu (Thrum 1909:152). The *menehune*, the legendary Hawaiian race of little people, built a *heiau* in Mānoa called Mau‘oki, using stones from far off Kawiwi, and “there was so many Menehune that each brought one stone, and Mau‘oki was completed” (Kamakau 1976:144).

As noted earlier, the coastal trail is referenced in a *mo‘olelo* (story) telling of cannibals waylaying travelers in Mākaha. This trail has evolved through the horse-and-buggy era to the present Farrington Highway. It should also be noted that ‘Ī‘ī’s description of “many houses at Makaha” contradicts other accounts of sparse settlements in pre-contact Mākaha.

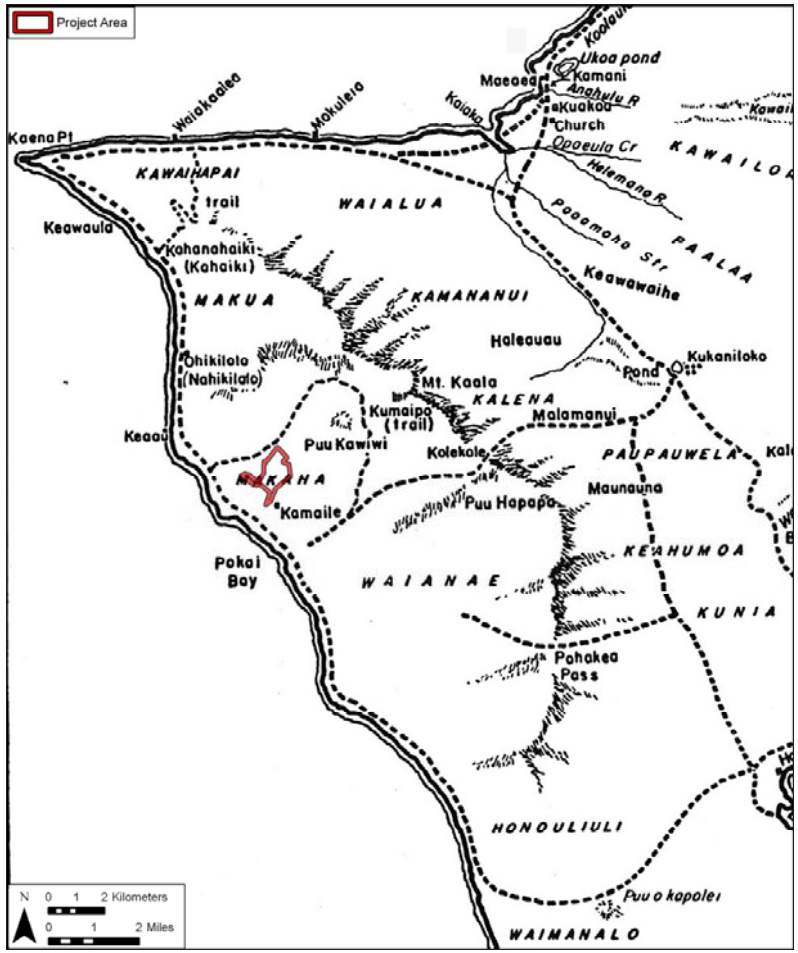

Figure 9. Trails of Leeward O‘ahu, ca. 1810, map by Paul Rockwood (reprinted in ‘Ī‘ī 1959:96)

At the boundary between Mākaha Ahupua‘a and Wai‘anae Ahupua‘a lies Mauna Lahilahi, a striking pinnacle jutting out of the water. Vancouver described Mauna Lahilahi as “a high rock, remarkable for its projecting from a sandy beach.” Vancouver also described a village located south of Mauna Lahilahi, situated in a grove of coconuts (Vancouver 1798:219). The village is Kamaile, which Green (1980: 8) likens to a miniature *ahupua‘a* “with the beach and fishery in front and the well-watered taro lands just behind.” A fresh-water spring, Keko‘o, gave life to this land and allowed for the existence of one of the largest populations on the Wai‘anae Coast.

Levi Chamberlain, a member of the first party of missionaries to the Hawaiian Islands, probably traveled along this coastal trail on a tour of O‘ahu in 1826. Chamberlain traveled clockwise around the island, stopping wherever the population was large enough to support a school for teaching reading, writing, and religious instruction. He examined two schools in Wai‘anae, indicating a large population for that *ahupua‘a*, and next traveled to Mākaha, where he stopped to give a sermon:

> We travelled till about 5 o’ck when we arrived at Makaha the land of Kanepaiti [Kanepaiki] the Chief of Pearl River. Shortly after our arrival the people assembled to hear the word of God…The people to the number of 50 or 60 listened with breathless attention to what was said… [Chamberlain 1956a:8]

In 1828, Chamberlain made a second tour of O‘ahu, this time travelling counterclockwise along the coast. His party reached the settlement of Mākaha at sunset and spent the night.

> Having given out word last night that I would inspect the school in the morning, after attending prayers & eating breakfast, I took a walk along the sea shore to view the rocks & search for curious shells, I thus passed the time away till nine o-clock, and began to be impatient, when the scholars were discovered going down the valley walking in procession. They proceeded to a small enclosure near the beach partly shaded by a few cocoanut trees, under which they sat down; and thither I repaired to attend to the examination… [Chamberlain 1956b:38]

Chamberlain was somewhat disappointed in the number of scholars in the Wai‘anae District. In the most populous *ahupua‘a*, Wai‘anae, he found only 16 scholars. Boki, and later his wife, Liliha, who were in charge of the Wai‘anae District were hostile to the missionaries, which probably explains the low number of students receiving language and religious instruction (Bishop 1916:43).

3.1.4 Early Historic Period to 1850

3.1.4.1 Wai‘anae District

The origin of the name Wai‘anae is thought to be connected to the richness of the waters off the district’s coast, with *wai* meaning “water” and *‘anae* meaning “large mullet” (Sterling and Summers 1978). Several accounts attest to the abundance of fish from Wai‘anae waters (Wilkes 1845; Pukui et al. 1974). In 1840, Wilkes commented: “the natives are much occupied in catching and drying fish, which is made a profitable business, by taking them to Oahu, where they command a ready sale” (Wilkes 1845:81-82).

Wai‘anae has been portrayed traditionally as a land of dual purpose: a refuge for the dispossessed and a hideout for the rebellious and outlawed. Certain landmarks in Wai‘anae attest to this dichotomy. Priests dedicated Kawiwi, a mountain between Wai’anae and Mākaha Ahupua’a, as a refuge during times of war (McAllister 1933). Pōka‘ī Bay was used as a school administered by the exiled high-class priests and *kahuna* who took refuge in Wai‘anae after Kamehameha I gained control of O‘ahu (in Sterling and Summers 1978:68). It was also near Pōka‘ī Bay, at a place named Pu‘u Kāhea, that the eighteenth-century prophet and *kahuna nui* of O‘ahu, Ka‘opulupulu, made his last famous prophecy before he was killed in Po‘olua (in Sterling and Summers 1978:71).

The harsh environmental conditions along the Wai‘anae Coast may have played a part in shaping the Wai‘anae people. Captain George Vancouver (1798:217), the first explorer to describe this coast in 1793, saw the Wai‘anae Coast as “…composed of one barren rocky waste, nearly destitute of verdure, cultivation or inhabitants...” The *‘ōku‘u* epidemic of 1804 (thought to be cholera) had a major effect on the native population, not only in Wai‘anae, but throughout Hawai‘i. John Papa ‘Ī‘ī (1959:16) relates that the *‘ōku‘u* (disease) “broke out, decimating the armies of Kamehameha I [on O‘ahu].” Other diseases also took their toll. The combined census for the Wai‘anae and ‘Ewa Districts in 1831-1832 was 5,883 (Schmitt 1977:12). Twenty years later, the combined census for the two districts was 2,451.

A visitor to the Wai‘anae District in 1839, described the district as:

> …about 1,600 inhabitants…less advanced in improvement than the inhabitants of any other portions of the island…rocky and barren; still, the arable land is not all cultivated…shallow basins in its [white rock] surface are used by the natives as vats for the solar evaporation of sea water…[Hall 1839:100-101]

A foreign-introduced activity of the early historic period, which greatly impacted Hawaiian culture and the traditional lifestyle, was the sandalwood trade. In an effort to acquire western goods, ships, guns, and ammunition, the *ali‘i* (chiefs) incurred massive debts to the American merchants (‘Ī‘ī 1959:155). These debts were paid off in shiploads of sandalwood harvested by *maka‘āinana* (commoners) for the *ali‘i.* When Kamehameha found out how valuable the sandalwood trees were, he ordered the people not to let the felled trees crush the young saplings, to ensure their protection for future trade (Kamakau 1992:209-210).

3.1.4.2 Mākaha Ahupua‘a

Earliest accounts specific to Mākaha describe a good-sized inland settlement and a smaller coastal settlement. Green (1980:20-21) describes Mākaha’s coastal settlement as “…restricted to a hamlet in a small grove of coconut trees on the Kea‘au side of the valley, some other scattered houses, a few coconut trees along the beach, and a brackish water pool that served as a fish pond, at the mouth of the Mākaha Stream.” This small coastal village, within a coconut grove, is shown on an 1884 map of the Wai‘anae coast by the surveyor George Jackson (Figure 10). Laukīnui Heiau was located near the coastal settlement, and was described by McAllister (1933:121) as “so old as to be accredited to the menehunes.”

The primary early historic settlement in Mākaha was inland, associated with irrigated taro fields along Mākaha Stream. Associated with the inland settlement was the principal *heiau* of Mākaha, Kāne‘ākī Heiau. The perennial Mākaha Stream supported traditional wetland

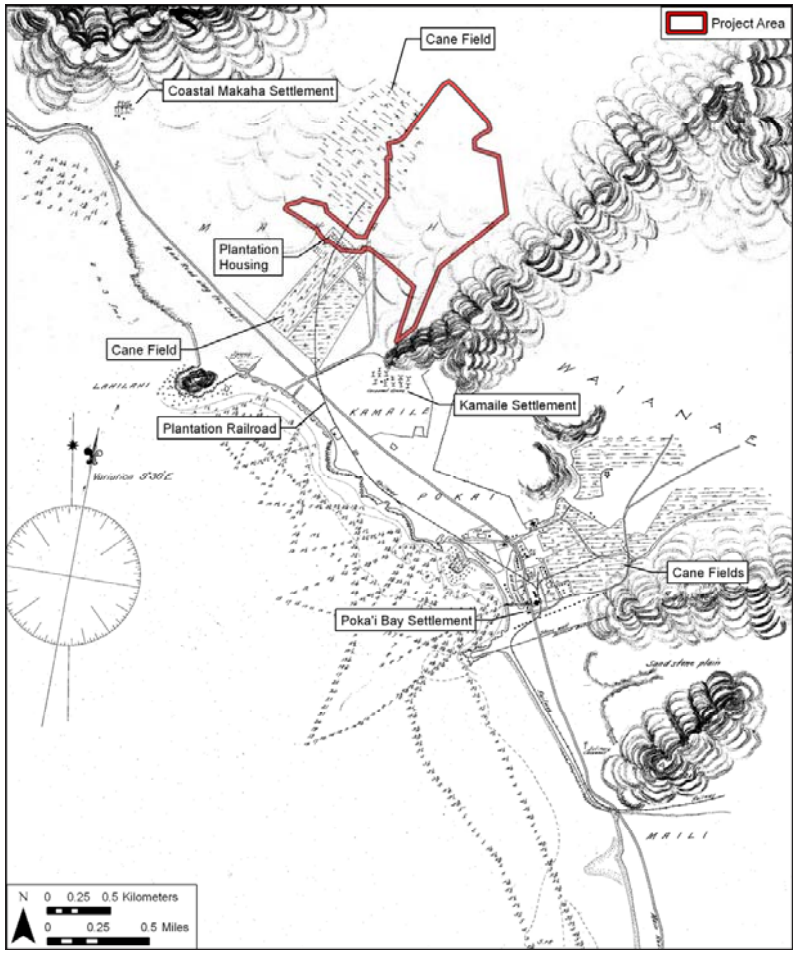

Figure 10. 1884 Hawaiian Government Survey Map of Waianae and Adjacent Coast, O‘ahu, George E. G. Jackson Surveyor (Hawai‘i Land Survey Division, Registered Map 1348), showing the location of the project area

agriculture - taro in the pre-contact and early historic periods and later sugar cane. Increased rainfall in the inland areas of Mākaha Valley would have also supported seasonal dryland cultivation of crops such as sweet potatoes.

One well-known chief during the early historic period was Boki, governor of O‘ahu under Kamehameha I, and nephew to Ka‘ahumanu. Boki had a residence in Wai‘anae Village; he appointed the chiefs Aua and Kanepaiki to oversee the Wai‘anae and ‘Ewa Districts, respectively. Control of Wai‘anae was later given to Kanepaiki as well (Bingham 1847:296; Chamberlain 1956b:38).

The first Catholic missionaries arrived in the Hawaiian Islands in 1825. They found a ready patron in Boki, who had been baptized in 1819 by a French Catholic priest on the French ship *Uranie* under Captain Freycinet. The *ali‘i*, who were generally aligned with the Protestant missionaries, sought to stop the conversion of Native Hawaiians to Catholicism. They persecuted the converts and priests in Honolulu, and as a result, many of these new Catholics fled to isolated areas of the island. Originally, Boki supported the Protestant missionaries and agreed with the breaking of *kapu* (taboos). However, out of growing resentment of the power of Ka‘ahumanu and her missionary advisors, Boki ceased to support the Protestants.

Among his other business ventures, Boki was also a supporter of the sandalwood trade. In 1829, he heard of a South Pacific island covered with sandalwood:

> Boki fitted out two ships, the *Kamehameha* and the *Becket*, put on board some five hundred of his followers, and sailed south. Somewhere in the Fiji group the ships separated. Eight months later the *Becket* limped back to Honolulu with only twenty survivors aboard…Boki and two hundred and fifty of his men apparently died at sea when the *Kamehameha* burned in 1830, possibly when gunpowder stored in the hold blew up as a result of careless smoking. [Day 1984:14]

Also in 1829, supporters of Boki and his wife Liliha, along with traders and sea captains, attempted to overthrow Ka‘ahumanu. This attempt was known as the Pahikaua War and was supported by quite a few people of the Wai‘anae District, but ended when Ulumaheihei talked his daughter, Liliha, into ending the war.

The Wai‘anae District was a favored area for displaced Catholics, since Liliha, the widow of Boki, was sympathetic to the Catholic converts (Schoofs 1978:3). In 1839, the Wai‘anae Catholics built a chapel in the mid-valley area of Mākaha in the native style, and in the 1840s or 1850s, it was replaced with a stone chapel. In 1881, the chapel was rebuilt and dedicated to St. Philomena. The construction was funded by the Holts, a Catholic family who controlled most of Mākaha Valley, and who lived near the church. The location of the Holt family homestead is shown on a 1932 Land Court Application map (see Figure 6). After about 1896, few records mention the Mākaha Catholic church, and it is not shown on any twentieth century maps. The Mākaha church probably never had a very large congregation, and in the twentieth century worship seems to have shifted to the Sacred Heart Catholic Church in Wai‘anae Ahupua‘a (Schoofs 1978:113-115).

After Boki’s death, Liliha gave the entire *ahupua‘a* of Mākaha to Kuho‘oheihei (Abner) Pākī, father of Bernice Pauahi (Green 1980:14-15). Soon after Pākī was Christianized, and by the time Liliha died in 1839, the majority of people in Mākaha had accepted Christianity. Although

several individuals are recorded as having charge over Mākaha at various times, including Aua, Kanepaiki “chief of the Pearl River”, and the present “King,” Pākī claimed the entire *ahupua‘a* of Mākaha.

3.1.5 Māhele and Land Commission Award Documentation

In 1845, the Board of Commissioners to Quiet Land Titles, also called the Land Commission, was established “for the investigation and final ascertainment or rejection of all claims of private individuals, whether natives or foreigners, to any landed property” (Chinen 1985:8). This led to the Māhele, the division of lands between the king of Hawaii, the *ali‘i*, and the common people, which introduced the concept of private property into the Hawaiian society. Kamehameha III divided the land into four divisions: certain lands to be reserved for himself and the royal house were known as Crown Lands; lands set aside to generate revenue for the government were known as Government Lands; lands claimed by *ali‘i* and their *konohiki* (supervisors) were called Konohiki Lands; and habitation and agricultural plots claimed by the common people were called *kuleana* (Chinen 1985:8-15).

In 1848, the crown and the *ali‘i* received their land titles. *Kuleana* awards for individual parcels within the *ahupua‘a* were subsequently granted in 1850. Mākaha Ahupua‘a had 13 Land Commission claims, eight of which were awarded (Table 1). Seven of the Land Commission Awards (LCA) are *kuleana* awards located in a cluster along Mākaha Stream, in the mid-valley area of Mākaha Ahupua‘a (see Figure 6). The location of the LCA cluster corresponds to the aforementioned inland settlement area. In the vicinity of the inland settlement are the Holt Homestead and Kāne‘āki Heiau. The remaining unclaimed lands in Mākaha were awarded to Abner Paki (LCA 10613:5). It is suggested Pākī was able to wield a certain amount of control over the residents of Mākaha during the Māhele, resulting in the limited number of applications for Land Commission Awards. Taxpaying adult males in 1855 numbered 39, suggesting there were more families living and working the Mākaha lands than was reflected in Māhele awards (Barrere 1970: 7).

Land use information for the Mākaha LCAs is sparse. As the LCAs are clustered along Mākaha Stream, multiple *lo‘i* (irrigated gardens) were located within many of the *kuleana* parcels. *Kula* lands (non-irrigated lands used for dryland crops or pasture) and house lots are also mentioned. Aside from these general land specifications, it is noted that a large quantity of *ma‘o* was growing on *kula* land in the Kamaile area near the boundary between Mākaha and Wai‘anae Ahupua‘a. *Ma‘o* (*Gossypium tomentosum*), a native species of “cotton,” was used traditionally in making *kapa* (cloth).

The LCA information supports other historical documents indicating Mākaha’s primary settlement was inland, where waters from Mākaha Stream could support *lo‘i* and sufficient rainfall was available for *kula* cultivars. Most of the coastal land was too dry for cultivation, in contrast with the nearby coastal village of Kamaile, which had ample spring water. Although there is evidence for settlement along the shore, this was for the most part limited to scattered, isolated residents focused on procurement of marine resources. The only “cluster” of habitation structures seems to have been concentrated at Mākaha Beach, near the boundary between Kea‘au and Mākaha Ahupua‘a, where there is also reference to a fishpond at the mouth of Mākaha Stream.

Table 1. Land Commission Claims in Mākaha Ahupua‘a.

Land Claim #	Claimant	‘Ili	Land Use	Awarded*
877:2	Kaana/ Kuaana for Poomano	Kapuaa	--	1 *‘āpana,* 1.6 ac.
8228	Inoaole	Laukinui	*Kula*, house lot	No
8763	Kanakaa	Hoaole	--	No
9689	Nahina	Kekio	16 *lo‘i*	1 *‘āpana,* 1.0 ac.
9859	Napoe	Aheakai, Mooiki	17 *lo‘i*, *kula*, house lot	No
9860	Kalua	Luulauwaa (Laulauwaa)	House lot	No
9861	Nahina, see above	Kekio	--	No
9862	Kanehaku	Kekio, Mooiki	5 *lo‘i*, *kula*	1 *‘āpana,* 2.4 ac.
9863	Kala	Waikani	House lot	1 *‘āpana,* 1.3 ac.
9864	Kapea	Laukinui	19 *lo‘i*, *kula*	1 *‘āpana,* 1.2 ac.
10613	Pākī, Abner	Ahupua‘a	--	*‘Āpana* 5, 4,933 ac.
10923	Uniu	--	--	1 *‘āpana,* 0.5 ac.
10923B	Alapai	Kapuaa	7 *lo‘i, kula*	1 *‘āpana,* 0.5 ac.

‘āpana - parcel; ac. - acres

3.1.6 1850 to 1900

By ancient custom, the sea for a mile offshore belonged to the *ahupua‘a* as part of its resources. The ruling chief could prohibit the taking of a certain fish or he could prohibit all fishing at specific times. Pākī filed two such prohibitions on the Mākaha fishery, one in 1852 for the taking of *he‘e* (octopus) and the other in 1854 for the taking of *‘ōpelu* (mackerel) (Barrere 1970:7).

In 1855, Chief Pākī died, and to clear his debts the administrators of his estate sold his Mākaha lands to James Robinson and Co. In 1862, upon the death of Robert Holt, one of the partners in the Mākaha endeavor, the Mākaha lands were acquired by the Holt estate, who “placed the lands in trust for the Holt legatees and their heirs” (Barrere 1970:7). The Holt family dominated the economic, land-use, and social scene in Mākaha from this time until the end of the nineteenth century. Owen Jones Holt, son of Robert Holt leased the family’s Mākaha lands and developed a commercial ranch, known as Makaha Ranch. The successful ranch was in operation

for 40 years, with activities including: raising pigs, cattle, horses, sheep, chickens, and turkeys; planting rice, coffee, fruit trees, and watermelons; and selling firewood. It is also noted that peacocks were bred at the ranch from birds given to Kamehameha V in 1865 by the Japanese government (Barrere 1970:7). Owen Jones Holt also developed a large residence on Makaha Ranch, known as the “country seat.” The location of the Holt homestead is indicated on a 1932 Land Court Application map (see Figure 6). The homestead is adjacent to the northwestern portion of the current project area. Associated ranching activities likely occurred within the project area during this period.

Owen Jones Holt began leasing Mākaha lands to non-family members in 1880. Bowser (1880:491) observed the Mākaha land *makai* (seaward) of the Holt house and described it as:

> A stretch of splendid land about a mile in length by three-quarters of a mile wide. The surface, however is in some places stony, but a little trouble would render all of it fit for the plough, and from the character of the soil, there can be no doubt it would repay any pain taken with it.

Owen Jones Holt subsequently leased portions of these lands for sugar cane cultivation. An 1884 map of the Wai‘anae coast (see Figure 10) shows sugar cane fields in areas immediately west and *makai* (southwest) of the current project area. The map also indicates a plantation railroad accessing the cane fields, as well as two clusters of houses for plantation workers, one of which is located within the current project area.

3.1.7 1900 to Present

In the early 1900s, the Holt family began to sell their Mākaha lands. The Waianae Sugar Company, incorporated in 1880, expanded into Mākaha circa 1908. The plantation utilized large tracts of land in Lualualei, Wai‘anae and Mākaha Ahupua‘a for sugar cane cultivation. By 1923, virtually all the lands of lower Mākaha Valley were used for sugarcane cultivation. Water to irrigate the growing plantation was supplied by Mākaha Stream, with reservoirs and ditches constructed to divert, store, and distribute the water to the cane fields. Little water remained for irrigation of taro *lo‘i*, contributing to the demise of traditional agriculture in Mākaha and displacement of the native population.

A map of Waianae Sugar Company’s cane fields (Figure 11) shows the extent of plantation development in Mākaha, which is generally shown as *makai* of the current project area. In addition to the cane fields, a 1919 U.S. War Department map (Figure 12) shows additional plantation infrastructure in the vicinity of the project area, including: a reservoir near the western boundary of the project area; a ditch running through the eastern and northern portions of the project area; and the Mikilua Flume near the *makai* boundary of the project area. The Mikilua Flume extends from Makaha, through Wai‘anae, and into Lualualei, transporting needed irrigation water for the Waianae Sugar Company. Also shown on the 1919 map is the Holt homestead, located near the northern tip of the project area. The 1928 U. S. Geological Survey map (Figure 13) shows additional plantation infrastructure within and in the vicinity of the current project area, including reservoirs, ditches and flumes. The additional irrigation infrastructure was needed to supply the growing plantation. Also shown on the map are several fence lines and enclosures, indicating ranching remained prevalent in the mid- and upper valley areas, with the plantation cane fields primarily located *makai* of the current project area.

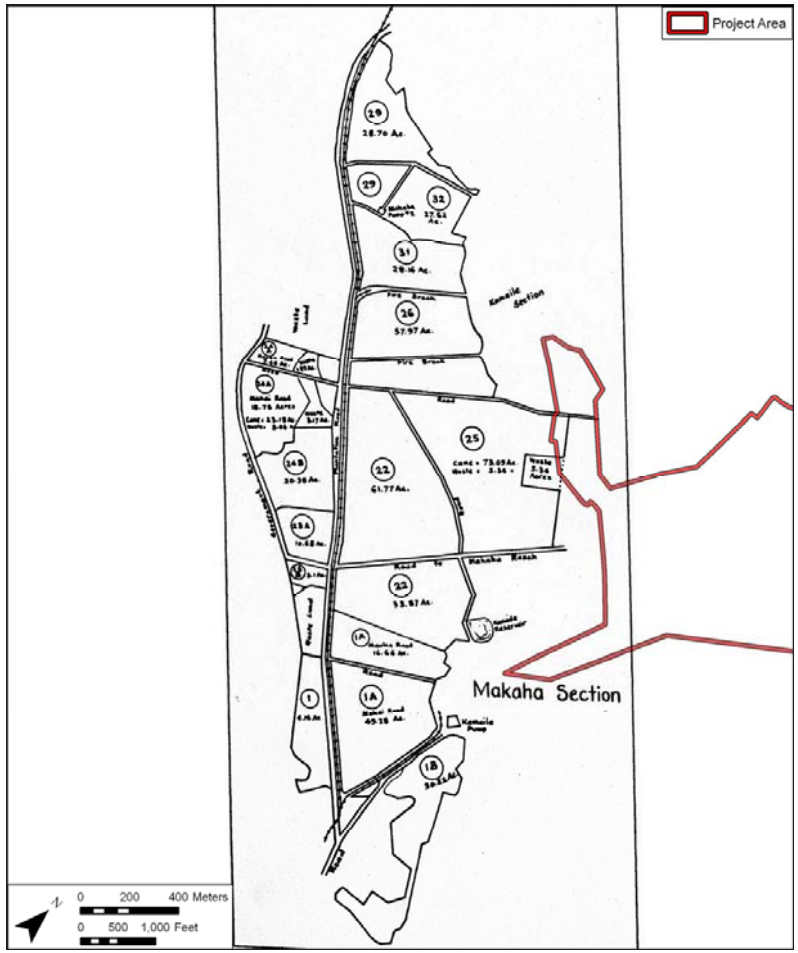

Figure 11. Map of the Waianae Sugar Company cane lands, Mākaha Section (no date), showing the extent of sugar cane cultivation in the vicinity of the project area

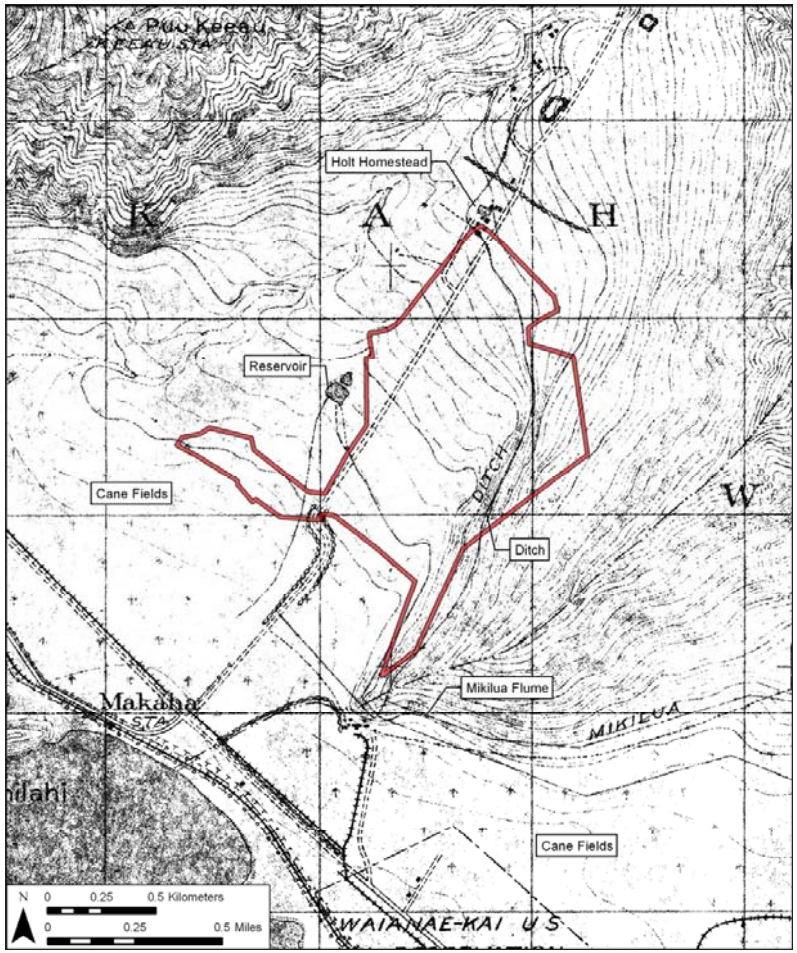

Figure 12. 1919 U.S. War Department Fire Control Map, Waianae Quadrangle, showing the location of the project area and features discussed in the text

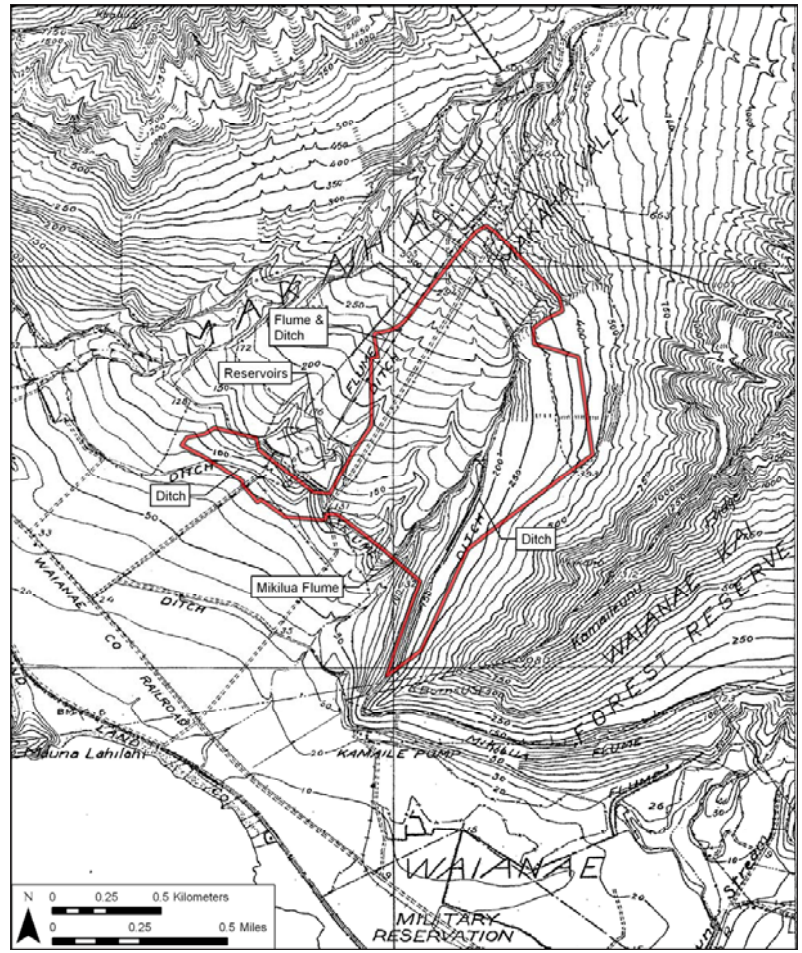

Figure 13. 1928 U.S. Geological Survey Topographic Map, Kaena Quadrangle, showing the location of the project area and features discussed in the text

Limited water resources played a role in Waianae Sugar Company’s low profitability and eventual demise. In the mid-1930s, Waianae Sugar Company was sold to American Factors, Ltd. (Amfac). Along with the plantation lands, Amfac acquired “all of the Makaha lands that had formerly belonged to Abner Paki and the to the Holt estate” (Green 1970:9). In an attempt to increase the amount of water available for irrigating sugar cane fields, Amfac commissioned a geologic study to determine if groundwater in the upper valley areas of Mākaha and Wai‘anae could be utilized. The study indicated that tunneling for water would be successful. However, with the onset of World War II, the planned tunneling was put on hold (Green 1970:13).

The 1943 U.S. War Department map (Figure 14) shows little additional development in the vicinity of the project area through the early 1940s. Land use in lower Mākaha Valley and along the coast continued to be dominated by plantation sugar cane cultivation. In 1945, Amfac contracted the firm of James W. Glover, Ltd. to tunnel into a ridge in the back of Mākaha Valley. The completed tunnel, known as the “Glover Tunnel” was 4,200 feet long with a daily water capacity of 700,000 gallons.

The use of the “Glover Tunnel” water for irrigating sugar cane fields would be short lived, as Amfac announced in 1946 that its plantation operations were no longer profitable and it planned to liquidate its nearly 10,000 acres of land. News of the impending sale was spread among the investors at the Honolulu Stock Exchange. One of the investors was Chinn Ho:

> The unorthodox Ho had started his Capital Investment Company only the year before with a bankroll of less than $200,000, much of it the life savings of plantation workers. He was known as a friend of the little man, an eager disciple of economic growth, and an upstart among his powerful haole competitors. [McGrath et al. 1973:145]

Chinn Ho managed to broker the deal, with the Capital Investment Company purchasing 9,150 acres of land in the Wai‘anae District for $1,250,000 (McGrath et al. 1973:145). The optimistic Ho believed a large increase in population along the Wai‘anae Coast would create a demand for land, and therefore a large return on the investment:

> His intention was to attract new residents by offering fee simple land at prices everyone could afford. The first increment would be 340 lots on the beach at Makaha. [McGrath et al. 1973:148]

By 1952, over 1,600 house and farm lots were sold along the Wai‘anae Coast. A 1956 U.S. Army Mapping Service map (Figure 15) shows the extensive development of the former cane lands in coastal Mākaha, with a network of roads and many house structures. Some of the former plantation irrigation infrastructure in the vicinity of the project area, including ditches and reservoirs, remained in-place. The Mikilua Flume is indicated to have been abandoned by this time. Portions of the plantation water system were likely converted for use by the growing residential community, as well as for small scale farming operations. The 1956 map also indicates a cluster of structures within the western portion of the current project area.

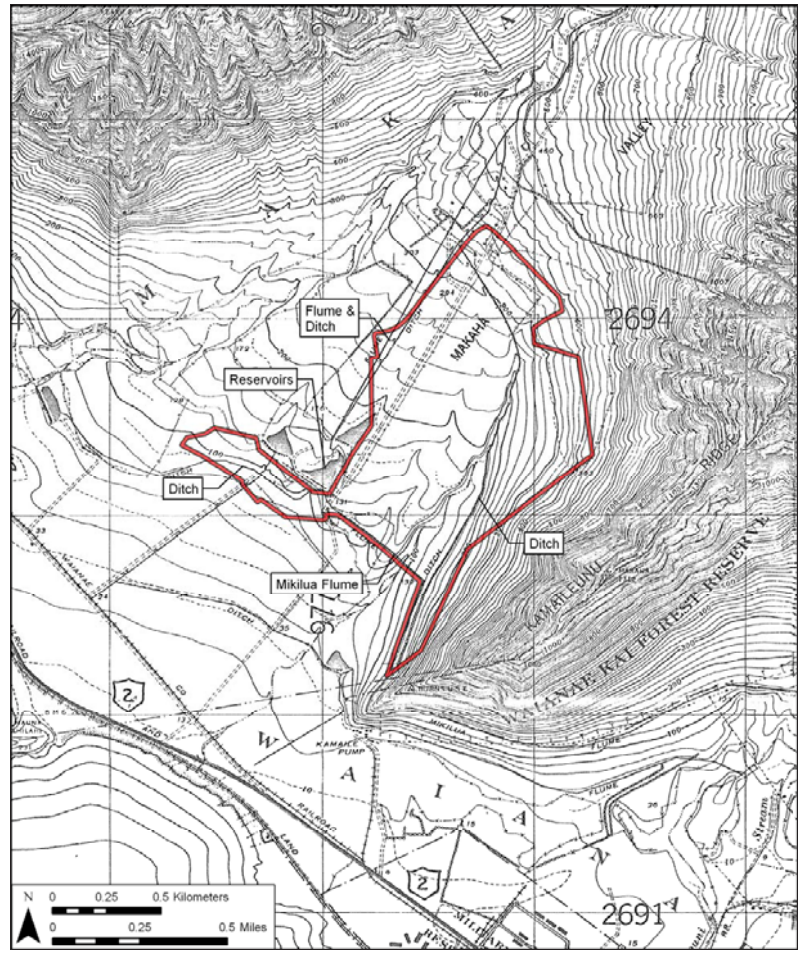

Figure 14. 1943 U.S. War Department Topographic Map, Waianae Quadrangle, showing the location of the project area and features discussed in the text

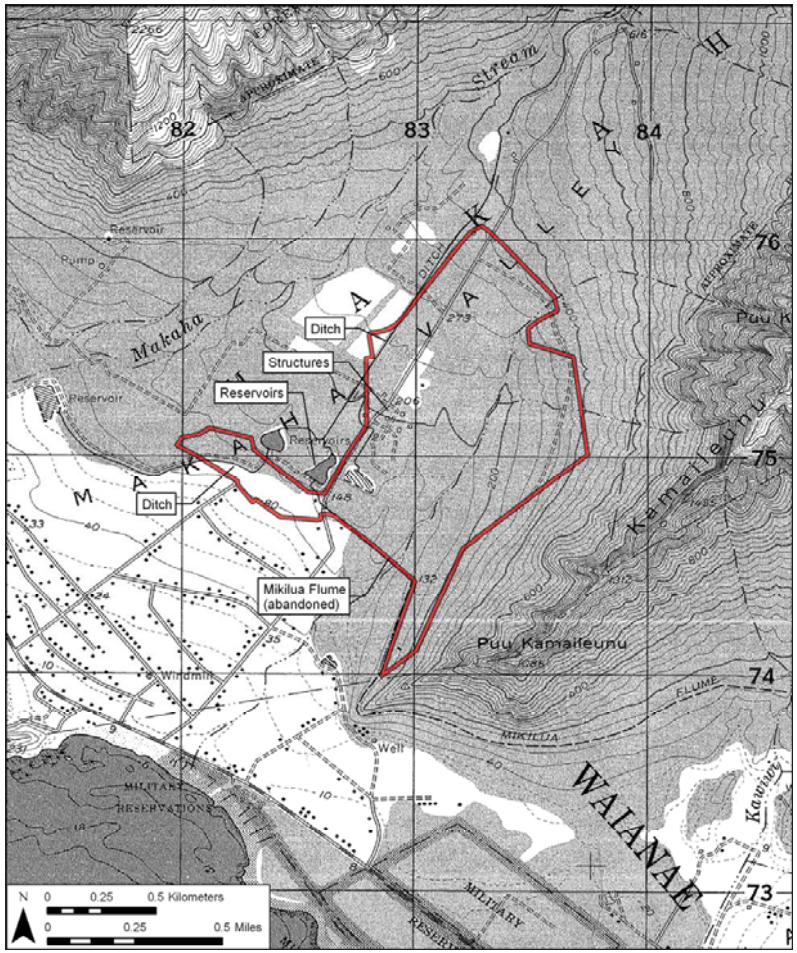

Figure 15. 1956 U.S. Army Mapping Service Topographic Map, Waianae Quadrangle, showing the location of the project area and features discussed in the text

In the mid-1960s, Chin Ho envisioned Mākaka as a tourist destination rivaling Waikīkī:

> He discussed using helicopters and hydrofoils to transport visitors from Waikiki, a kiddies hotel where guests could leave their children to be supervised, a mountain lodge restaurant to be reached only by cable car. [McGrath et al. 1973:59]

Construction of the Makaha Inn, a 200 room luxury hotel, was completed in 1969. Along with the hotel construction, associated resort development included recreational facilities, two golf courses and both low- and high-rise condominiums. A 1978 aerial photograph (Figure 16) shows the extent of development in the lower valley, in the vicinity of the current project area, and coastal areas. Approximately half of the project area consists of a golf course.

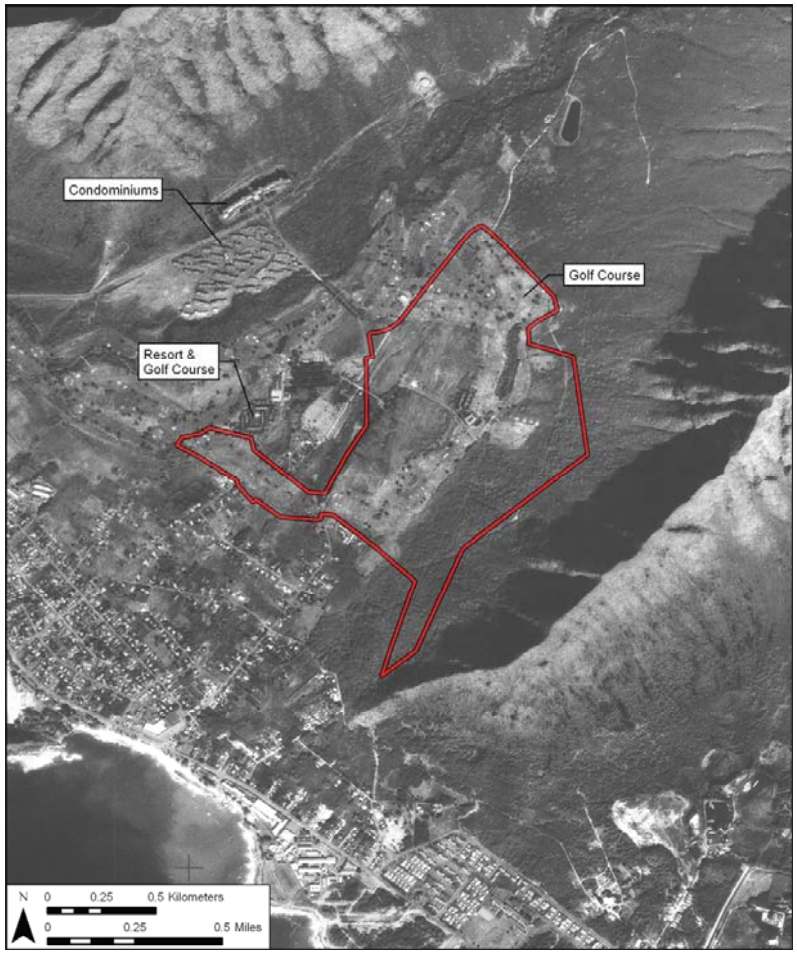

Figure 16. 1978 U.S. Geological Survey Orthophotograph, Waianae Quadrangle, showing the location of the project area and features discussed in the text

3.2 Previous Archaeological Research

Previous archaeological studies in Mākaha Ahupua‘a are summarized in Table 2. Studies in the vicinity of, and pertinent to the current project area, are indicated on Figure 17 and described in detail below.

3.2.1 Early Archaeological Studies

3.2.1.1 Island-Wide Survey by McAllister

Archaeological research in Mākaha Ahupua‘a began with McAllister’s island-wide survey in the early 1930s. McAllister (1933) described seven historic properties in Mākaha Ahupua‘a (i.e. Sites 169 through 175). Sites 173 through 175 are located in coastal Mākaha, and Sites 169 through 172 are located in the mid- and upper-valley areas.

Site 173 is “a large rock, that was once the object of worship, and to which sacrifices were offered in former times” (Hall in McAllister 1933:121). Site 174 is Laukīnui Heiau, described as “so old as to be accredited to the menehunes and is said to have been the important one in Makaha Valley” (McAllister 1933:121). Site 175 consists of two pits along the coast, known as Mololokai. According to traditional accounts (see Section 3.1: Traditional and Historic Background) cannibal robbers would place bodies in the caves to remove the flesh from the bones.

McAllister’s Sites 169 through 172 are located in Mākaha Valley, *mauka* (inland) of the current project area. Site 169 is a series of “rock-faced terraces, said to have been used for taro cultivation” (McAllister 1933:119). Site 170 is Kāne‘ākī Heiau, described as:

> One of the best-preserved heiaus on Oahu. Consists of two main inclosed platforms and numerous terraces and adjoining spaces also inclosed. The upper platform has a raised terrace at one end upon which is an altar or possible oracle tower site. Massive walls inclose this platform on three sides; the fourth is open to the other platform, which is 6 feet lower. Three narrow steps connect these two platforms. The other inclosures are not so well delineated… [McAllister 1933:119]

Kāne‘ākī *Heiau* was restored in 1970 and again in 1996. The 1996 restoration efforts were documented in a report by Fields Masonry (Pagliaro 1997), which indicated the *heiau* was originally an agricultural *heiau*, but was later modified into a *luakini* (sacrificial) *heiau*.

McAllister’s Sites 171 and 172 are located near Mākaha Stream, approximately 0.6 km (0.4 mi.) north of the current project area, in the area of the aforementioned cluster of Land Commission Awards (LCAs) (see Section 3.1.5 Māhele and Land Commission Award Documentation). Site 171 was described as a series of taro terraces:

Table 2. Previous Archaeological Studies in Mākaha Ahupua‘a

Author	Location	Type of Study	Findings
McAllister 1933	Island-wide	Island-Wide Survey	Described 7 sites in Mākaha, including: 169 - terrace complex; 170 - Kāne‘ākī Heiau; 171 - terrace complex; 172 - platform; 173 - legendary stone; 174 - Laukīnui Heiau; 175 - Mololokai pits.
Green 1969, 1970, 1980; Ladd and Yen 1972; and Ladd 1973	Mākaha Valley	Mākaha Valley Historical Project	Documented over 600 archaeological features in the upper valley and 1,131 features in the lower valley. Provided evidence of permanent pre-contact inland settlement in Mākaha Valley.
Bordner 1981, 1983	Corridor for “Makaha Wells” in Upper Mākaha Valley	Archaeological Inventory Survey	Documented numerous features, consisting primarily of agricultural terrace complexes. Features also included: possible agricultural *heiau*, temporary shelters, boundary walls, historic road, and possible habitation platform.
Kennedy 1983	Upper Mākaha Valley, “Well IV”	Archaeological Monitoring	No evidence of buried features or artifacts observed.
Neller 1984	Lower Mākaha Valley, Site Area 997	Archaeological Reconnaissance Survey	Relocated features and identified additional features in Site Area 997 of the Makaha Valley Historical Project. Features included a shrine, small cemetery, historic church ruins, agricultural terrace complex, small *heiau*, platforms, and historic house sites including the Holt Homestead. Area noted to have been disturbed by bulldozing.
Hammatt et al. 1985	Northern Portion of Lower Mākaha Valley, Mid-Valley Well Site	Archaeological Reconnaissance Survey	Identified 10 historic properties, interpreted to be related primarily to dryland agriculture and possibly habitation. Features included possible habitation terraces, agricultural mounds and terraces, and a historic cattle wall.

Author	Location	Type of Study	Findings
Barrera 1986	Northern Portion of Lower Mākaha Valley, Mid-Valley Well Site	Archaeological Inventory Survey	Identified 4 historic properties comprised of 7 features, including 4 platforms, a U-shaped habitation enclosure, a terrace, and a wall. Excavated 17 test pits, yielding charcoal flecks.
Kennedy 1986	Coastal Mākaha, Mauna Lahilahi	Archaeological Inventory Survey	Identified 5 historic properties, including a possible shrine, a *ko‘a* (fishing shrine), linear mound, and enclosure.
Komori 1987	Coastal Mākaha, Mauna Lahilahi	Archaeological Inventory Survey	Relocated 5 historic properties identified by Kennedy (1986) and identified an additional 11 historic properties, including petroglyphs, enclosures, terraces, rock shelters, midden scatters, and lithic scatters. Subsurface testing yielded eight radiocarbon dates, clustered tightly in the A.D. 1300 to 1650 period.
Bordner & Cox 1988	Upper Mākaha Valley	Archaeological Mapping Project	Conducted detailed mapping of historic properties previously identified by the Makaha Valley Historical Project. Findings suggest that the importance of dryland agriculture had been previously underestimated.
Davis 1988	Lower Mākaha Valley, Makaha Valley Resort	Archaeological Reconnaissance Survey	Identified five historic properties, including three plantation reservoirs, a plantation irrigation ditch, and a railroad berm.
Donham 1990	Lower Mākaha Valley, Makaha Valley Country Club	Archaeological Inventory Survey	Identified a terrace for dryland agriculture and/or habitation.
Kawachi 1990	Coastal Mākaha, Mauna Lahilahi	Burial Report	Documented remains of 2+ individuals recovered from a crevice in Mauna Lahilahi.
Hammatt & Robins 1991	Lower Mākaha Valley	Archaeological Inventory Survey	Identified a single historic property, consisting of a linear earthen berm along the south bank of Mākaha Stream. The berm was interpreted to be associated with commercial sugar cane cultivation, functioning as a field boundary or as an improvement to the stream bank. Subsurface testing in the study corridor yielded nothing of archaeological significance.

Author	Location	Type of Study	Findings
Kawachi 1992	Coastal Mākaha, Kepuhi Point	Burial Report	Documented human remains eroding from a sand bank following Hurricane ‘Iniki. The burial was reported to have included staghorn coral at major joints and a possible shell *niho palaoa* (pendant worn by the *ali‘i*).
Moore & Kennedy 1994	Northern Portion of Lower Mākaha Valley	Archaeological Inventory Survey	No historic properties identified.
Cleghorn 1997	Coastal Mākaha, Mākaha Beach Park	Archaeological Inventory Survey	Identified remains of O. R. & L. railroad infrastructure and subsurface testing revealed a cultural layer and a pond/wetland area. Radiocarbon dating of the cultural layer yielded a date range of A.D. 1440-1690.
Pagliaro 1997	Kāne‘ākī Heiau	*Heiau* Restoration Report	Documentation of *heiau* restoration work.
Elmore et al. 2000	Northern Portion of Lower Mākaha Valley	Archaeological Inventory Survey	Identified one historic property, comprised of three features, including a bi-faced wall, a pavement, and a platform. Subsurface testing within the features yielded traditional Hawaiian artifacts. Features were interpreted to be related to dryland agriculture and habitation.
Moore & Kennedy 2000	Northern Portion of Lower Mākaha Valley	Archaeological Inventory Survey	Identified one historic property, comprised of two features, including a remnant wall and a stone mound/boulder alignment. Subsurface testing did not yield any cultural material. Features were interpreted to be related to dryland agriculture and habitation.
Bush et al. 2002	Lower Mākaha Valley, Mauna ‘Olu Estates	Archaeological Monitoring Report	No cultural material was observed during monitoring.
Kailihiwa & Cleghorn 2003	Coastal Mākaha, 10 Streets	Archaeological Monitoring Report	Identified 3 historic properties, comprised of 5 features. Features included a pit, concrete flume, two fire pits, and a charcoal deposit.

Author	Location	Type of Study	Findings
Tulchin & Hammatt 2003	Coastal Mākaha, Mākaha Beach Park	Archaeological Inventory Survey	No historic properties identified.
Tulchin & Hammatt 2004	Coastal Mākaha, Farrington Highway	Archaeological Monitoring Report	No cultural material was observed during monitoring.
McDermott & Tulchin 2006	Coastal Mākaha, Farrington Highway Mākaha Bridges 3 and 3A	Archaeological Inventory Survey	Identified 5 historic properties, including two historic bridges, remnants of the O. R. & L. railroad, and a subsurface cultural layer containing previously disturbed human skeletal remains.
Hammatt et al. 2007	Lower Mākaha Valley	Archaeological Inventory Survey	Identified 4 historic properties, comprised of 15 features. Features included a plantation-era irrigation ditch and associated retaining walls, a ranch-related cattle wall, a traditional Hawaiian agricultural terrace, and a historic habitation complex containing walls, terraces, a mound, and an enclosure. The historic house site was identified as a former residence of members of the Holt family. Subsurface testing yielded a radiocarbon date range of A. D. 1430-1650).
Hazlett & Hammatt 2007	Coastal Mākaha, Farrington Highway Mākaha Bridge 3	Archaeological Monitoring Report	No cultural material was observed during monitoring.
McElroy 2008	Coastal Mākaha, Kepuhi Point	Archaeological Monitoring Report	No cultural material was observed during monitoring.

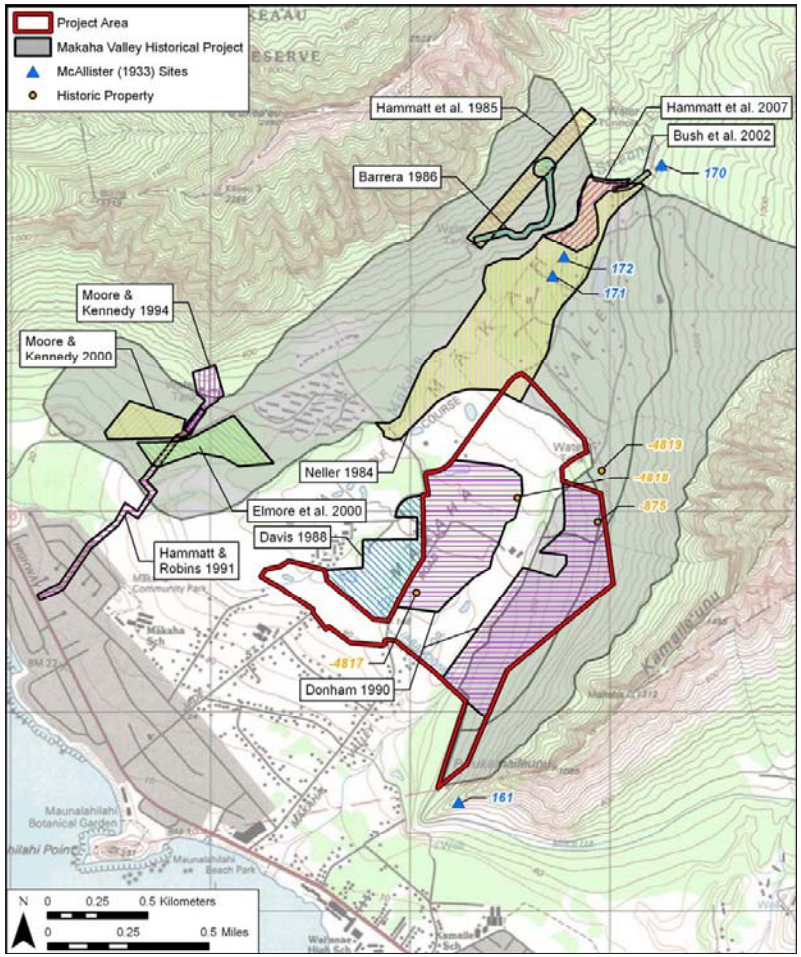

Figure 17. U. S. Geological Survey 7.5-Minute Series Topographic Map, Waianae Quadrangle (1998), showing the locations of previous archaeological studies in lower Mākaha Valley

> The terraces average from 20 to 50 feet in width and are of varying lengths, sometimes several hundred feet long. Rock facings from 1 or 2 feet to 6 feet in height separate the terraces. The stones of these facings are evenly piled at a slight slope with the upper side flush with the earth. Water was brought by irrigation ditches now destroyed. It is probable that the plantation flume which is just above the last terrace followed the old Hawaiian ditch. These terraces have been in use up to recent years. [McAllister 1933:119]

Site 172 was described as a stone platform that “may have been a small family shrine with the central stone used as an akua [idol]” (McAllister 1933:121).

In addition to the seven historic properties in Mākaha Ahupua‘a, McAllister documented Site 161, Kamaile Heiau, on the Kamaile‘unu Ridge that separates Mākaha and Wai‘anae valleys. The *heiau* is located approximately 100 m south of the current project area. McAllister provided the following description of Kamaile Heiau:

> The heiau is a single terrace, built of large, sharp lava rocks. The facings of the terrace are surprisingly even and were carefully fitted. The heiau was formerly paved with small bits of coral, giving it the appearance of fine, white gravel. The amount of such coral is surprising…Thrum offers the following information: “A medium sized heiau of platform character and pookanaka class, still in fair condition, to be seen from the road on the bluff above the pipe line of the electric pumping station.” [McAllister 1933:114]

Kamaile Heiau is a component of the SIHP # 50-80-07-1181 “Wai‘anae Complex,” which was placed on the National Register of Historic Places in 1974. The complex also includes Kuka‘auau cave (SIHP # 50-80-07-1185) and a habitation complex (SIHP # 50-80-07-1190).

3.2.1.2 Makaha Valley Historical Project

The Makaha Valley Historical Project (Green 1969, 1970, 1980; Ladd and Yen 1972; and Ladd 1973) consisted of a large-scale archaeological survey undertaken by the Bernice P. Bishop Museum (BPBM) that included nearly all of Mākaha Valley. The project was privately funded and was conducted without legal compulsion. In addition to areas of potential development, the survey also included nearly all of the remaining undisturbed lands in the valley. The coastal strip and the central portion of the lower valley were not included in the survey due to prior development. Fieldwork for the project was conducted between 1968 and 1970. Though Neller (1984:1) notes that identified historic properties were consolidated into large geographical districts, most of which were surveyed at a reconnaissance level, the investigations nevertheless covered parts of the valley outside those due for development and documented over 600 archaeological features in the upper valley and 1,131 features in the lower valley.

The study undertook excavations at 30 separate structural features including: ten field shelters, four stone mounds, three stepped-stone platforms, three house enclosures, two storage pits, a clearing, a feature thought to be a shrine, a *heiau*, a pond field terrace system, a habitation feature, two historic house platforms, and a modern curbed foundation. Radiocarbon dating indicated settlement as early as the 13th century, with settlement focused near the primary water source, Mākaha Stream. Subsequently, increased population expansion into *kula* lands occurred,

and by the 16th century, the trend had spread to the "upper valley," where dryland farming was largely replaced with an irrigated agricultural system (i.e. *lo‘i*) (Green 1980:75).

The "lower valley" portion of the study area was divided into six geographic survey areas (Ladd 1969:29). Survey Areas 4 and 5 are located within with the eastern portion of the current project area. A single feature (BPBM # 50-Oa-C4-102), described as a poorly preserved platform, was identified in Survey Area 4. Two features were identified in Survey Area 5, including a mound (BPBM # 50-Oa-C4-113) and an historic terrace (BPBM # 50-Oa-C4-125). It was also noted that Survey Area 5 had been previously disturbed. No detailed descriptions of the identified features or specific locations of the features within the survey areas were provided.

In summary, Green (1980) indicates that, contrary to the typical pre-contact *ahupua‘a* settlement pattern of population concentrated on the coast, Mākaha Ahupua‘a's focus of settlement was inland:

> The main addition to the Mākaha data considered previously, yet never well documented, is the existence of substantial evidence for permanent housing in the inland part of the lower valley, together with a group of larger permanent structures for various religious and social purposes that might be expected as a part of such a settlement. In this respect, it is also suggested that the development of irrigated taro plots was not confined solely to the upper valley, but had begun along a main ditch leading from the seaward end of the upper valley down into Area 997 [Survey Area 2] of the lower valley…Finally, although the definition of the upper and lower valley has been revised, the most important religious structure of the valley, Kāne‘ākī Heiau, is still considered to be at the midpoint of that division. [Green 1980:70]

The State Historic Preservation Division (Neller 1984) conducted an additional archaeological reconnaissance survey at Site Area 997 of the Makaha Valley Historical Project, located in lower Mākaha Valley. The study was conducted due to the ongoing destruction of archaeological features by subdivision development and the lack of detailed documentation of the features by the Makaha Valley Historical Project. The area was noted to have been disturbed by bulldozing, with several archaeological features having been destroyed. Neller relocated features and identified additional features in the study area, including a shrine, small cemetery, historic church ruins, agricultural terrace complex, small *heiau*, platforms, and historic house sites including the Holt Homestead. Neller also produced a map showing the spatial relationships of the features in the study area.

3.2.2 Archaeological Studies in the Vicinity of the Current Project Area

3.2.2.1 Makaha Mid-Valley Well Site

Cultural Surveys Hawai‘i (CSH) conducted an archaeological reconnaissance survey of an approximately 3,000 ft. long and 300 ft. wide corridor along the northern slopes of lower Mākaha Valley for a pipeline associated with the Makaha Mid-Valley Well Site (Hammatt et al. 1985). The study identified 10 historic properties, interpreted to be related primarily to dryland agriculture and possibly habitation. Features included possible habitation terraces, agricultural mounds and terraces, and a historic cattle wall.

Barrera (1986) carried out an additional archaeological survey for the Makaha Mid-Valley Well Site, including an approximately 2,000 ft. long and 100 ft. wide corridor for a road and a 300 ft. diameter area for the well site. The study identified 4 historic properties comprised of 7 features, including 4 platforms, a U-shaped habitation enclosure, a terrace, and a wall. 17 test pits were excavated at the well site, yielding scant charcoal flecking.

3.2.2.2 Makaha Valley Resort Expansion

International Archaeological Research Institute, Inc. (IARII) conducted an archaeological reconnaissance survey of an approximately 36-acre parcel in lower Mākaha Valley, adjacent to the western portion of the current project area (Davis 1988). Five historic properties were identified, including three plantation reservoirs, a plantation irrigation ditch, and a railroad berm. Each of the historic properties was interpreted to be associated with sugar cane cultivation. The author noted the study area had been heavily modified by prior development activities.

3.2.2.3 Lower Mākaha Valley Water System Improvements

Cultural Surveys Hawai‘i (CSH) conducted an archaeological inventory survey of an approximately 4,600 ft. long corridor at the base of lower Mākaha Valley for a proposed water line (Hammatt and Robins 1991). A single historic property was identified along the south bank of Mākaha Stream. The feature was described as "a linear earthen berm…buttressed along its stream side with waterworn cobbles and boulders" (Hammatt and Robins 1991:18). The berm was interpreted to be related to sugar cane cultivation, functioning as a field boundary or as an improvement to the stream bank. Subsurface testing was also conducted within the study corridor, yielding nothing of archaeological significance.

Archaeological Consultants of Hawai‘i (ACH) conducted an archaeological inventory survey for a proposed water tank on the northern slope of lower Mākaha Valley (Moore and Kennedy 1994). No historic properties were identified.

Archaeological Consultants of the Pacific (ACP) conducted an archaeological inventory survey in lower Mākaha Valley for a sediment disposal site associated with the construction of a water tank (Moore and Kennedy 2000). One historic property, comprised of two features, was identified. Features included a remnant wall and a stone mound/boulder alignment. Subsurface testing at the features did not yield any cultural material. Features were interpreted to be related to dryland agriculture. Heavy disturbance was noted throughout the study area.

Cultural Surveys Hawai‘i (CSH) conducted archaeological monitoring for replacement of 800 ft. of water lines immediately *mauka* (inland) of the Mauna ‘Olu Estates Subdivision in lower Mākaha Valley (Bush et al. 2002). The study area was located approximately 200 ft. *makai* (seaward) of Kāne‘ākī Heiau. No cultural material was observed during monitoring.

3.2.2.4 Lower Mākaha Valley Proposed Residential Development

Archaeological Consultants of the Pacific (ACP) conducted an archaeological inventory survey in lower Mākaha Valley for a proposed residential development (Elmore et al. 2000). One historic property, comprised of three features, was identified. Features included a bi-faced wall, a pavement, and a platform. Subsurface testing within the features yielded basalt flakes, a coral cobble, a broken awl, a sinker stone, and a drilled *Thaididae* shell. Features were interpreted to

be related to dryland agriculture and habitation. Heavy disturbance was noted throughout the study area.

3.2.2.5 Mākaha Cultural Learning Center

Cultural Surveys Hawai‘i (CSH) conducted an archaeological inventory survey for a proposed cultural learning center in lower Mākaha Valley, adjacent to Mākaha Stream (Hammatt et al. 2007). Four historic properties, comprised of 15 features were identified, including a plantation-era irrigation ditch and associated retaining walls, a ranch-related cattle wall, a traditional Hawaiian agricultural terrace, and a historic habitation complex containing walls, terraces, a mound, and an enclosure. The historic house site was identified as a former residence of members of the Holt family. Subsurface testing yielded a radiocarbon date range of A. D. 1430-1650).

3.2.3 Archaeological Study within the Current Project Area

3.2.3.1 Mākaha Valley Planned Housing Development and Golf Course Expansion

Paul H. Rosendahl, Inc. (PHRI) conducted an archaeological inventory survey of two discrete parcels in lower Mākaha Valley, within the current project area (Donham 1990). The eastern portion of the study area consisted of an approximately 85-acre parcel along the lower slopes of Kamaile‘unu Ridge, described as the Plan Review Use (PRU) area. The western portion of the study area consisted of an approximately 70-acre parcel at the base of Mākaha Valley, described as the Planned Development-Housing (PD-H) area. The survey report author noted heavy land disturbance in both portions of the study area had occurred prior to the survey. The following information was provided describing the land disturbance in the eastern, PRU study area:

> At least three distinguishable “phases” of earth moving and disturbance were observed in the PRU project area. The earliest, and most difficult to detect without vegetation clearing, was a series of dozed paths which formed a grid-like pattern across the hillside, between the property line and major dozed path which paralleled the boundary c. 150 m downslope. Some of the paths had been deeply cut, others reflected surface grubbing only. It is assumed that these paths were present in 1968, when the area was surveyed by Bishop Museum during the Makaha Valley Historical Project. Ladd (1969:30) described the area (Survey Area 5) as being previously disturbed. The boulder piles created by these activities were somewhat weathered, and obviously were produced by machines that were much smaller than modern dozers. The extent of disturbance created at that time was, however, considerable.
>
> A second earth moving phase consisted of relatively extensive trenching and ditch construction across the area, with grubbing of numerous access roads. A major ditch was cut along portions of the southeast property line, necessitating the construction of a massive berm along the downslope side, within the project area. Additional ditches were cut downslope from the main ditch toward ‘Eku Stream, and considerable grubbing was conducted along all sides of these ditches. In addition, soil grubbing and leveling was evident along the north and south sides of the existing driving range, and along the east side of the 18th fairway…

> The most recent phase of earth moving occurred on the south side of the driving range, and affected nearly all of the remaining ‘Eku Stream bottomlands that had not been previously landscaped with the golf course. Major dozer paths, up to 30.0 m wide, were grubbed through the area in order to permit a soil auger truck access to various locales. This grubbing had occurred weeks prior to the survey, and was clearly the most destructive of the earth moving activities in the stream bottomlands.
>
> Taken together, the various episodes of earth moving that occurred in the PRU project area affected nearly 100% of the land surface in the southern portion and 70-80% in the northern portion. [Donham 1990:4-5]

The author also described the heavy land disturbance in the western, PD-H study area:

> The PD-H project area also exhibited evidence of extensive earth moving and land modification. Prior to its sale to NITTO Hawaii, Ltd., the PD-H area to the west of Makaha Valley Road was used as a plant nursery. The ground surface in this area appeared to have been grubbed flat in preparation for the nursery. At the extreme western end of the PD-H area was a relatively large depressed area that appeared to be an old borrow pit. Immediately west of Makaha Valley Road, the ground had been leveled and was being used to store large stockpiles of sand. To the east of the road was what appeared to be an active construction site, although no earth moving was being conducted at the time of the survey. Grubbed dozer paths, and leveled and filled areas covered an estimated 90% of the PD-H project area. As with the PRU area, it was evident that the disturbances had occurred over a period of years, and that a considerable amount of the disturbance, particularly in the portion east of Makaha Valley Road, was quite recent. [Donham 1990:5]

The author also noted that Bordner observed construction activities within the study areas in the early 1980s:

> Though not within the project area, there is, at present, extensive construction underway in the lower Makaha Valley. This involves extensive road networks being bulldozed and a series of large flood-diversion channels being dug across the valley. [Bordner 1983:16 in Donham 1990:5]

One historic property was identified in the eastern, PRU portion of the study area. SIHP # 50-80-07-875 is a terrace that was previously identified by the Makaha Valley Historical Project (Ladd 1969). A 1.0 by 0.5 m test excavation was made in the terrace, with no significant finds. The terrace was interpreted to have had an agricultural function. Two additional features were indentified by the Makaha Valley Historical Project in the PRU portion of the study area. These features were not relocated by Donham (1990) and were believed to have been destroyed by land clearing activities.

Two historic properties were identified in the western, PD-H portion of the study area. SIHP # 50-80-07-4817 is a boulder alignment surrounded by bulldozer push-piles. Subsurface testing indicated the boulder alignment was likely the result of land clearing activities. SIHP # 50-80-07-4818 consists of two rock mounds. Subsurface testing at one of the mounds indicated the

feature was a modern construction. Heavy machinery scarring of stones within the other mound indicated it was also a modern construction.

In addition to the three historic properties identified in the study areas, Donham (1990) recorded a historic property north of the eastern, PRU study area. SIHP # 50-80-07-4819 is a complex comprised of 10 terraces, seven modified outcrops, two walls, and one platform. The complex was interpreted to be a permanent habitation site with associated agricultural features.

3.3 Background Summary and Predictive Model

Archaeological data suggest that a significant and rather substantial pre-contact population once occupied Mākaha Valley. Roger C. Green, in his summary of the findings of the Makaha Valley Historical Project (Green 1980) proposed that the earliest Hawaiian settlement was probably focused along the coast at the mouth of Mākaha Stream. Following this initial settlement, exploitation of the surrounding *kula* lands prompted an expansion into the surrounding lower valley. Subsequently, as the population increased, expansion into the upper valley occurred along with the development of *lo‘i* (irrigated taro fields) fed by Mākaha Stream. Increased rainfall in the inland areas of Mākaha Valley would have also supported seasonal dryland cultivation of crops such as sweet potatoes. Following the development of the extensive agricultural system in the upper valley, the inland areas of Mākaha Valley became the focus of settlement, contrary to the typical pre-contact *ahupua‘a* settlement pattern of having the population concentrated on the coast. Associated with the inland settlement was the principal *heiau* of Mākaha, Kāne‘ākī Heiau.

By the mid-1800s, the traditional Hawaiian way of life in Mākaha was in decline. The sandalwood trade, which ended circa 1829, undoubtedly had a negative effect on the Native Hawaiian population and the lands that supported them. Land Commission Awards of the mid-1800s were located in a cluster along Mākaha Stream, in the mid-valley area of Mākaha Ahupua‘a. The location of the LCA cluster corresponds to the aforementioned inland settlement area. The Holt family dominated the economic, land-use, and social scene in Mākaha from the mid- to late 1800s. The family’s Mākaha lands were developed into a commercial ranch, known as Makaha Ranch. In the late 1800s, the Holt Estate began to lease lands in the *makai* (seaward) potions of Makaha Valley for sugar cane cultivation.

In the early 1900s, the Waianae Sugar Company expanded into Mākaha and placed large portions of the lower valley under sugar cane cultivation. Water to irrigate the growing plantation was generally supplied by Mākaha Stream, with reservoirs and ditches constructed to divert, store, and distribute the water to the cane fields. Little water remained for irrigation of taro *lo‘i*, contributing to the demise of traditional agriculture in Mākaha and displacement of the native population.

Following the sale of the Waianae Sugar Company in the mid-1930s and the end of sugar cultivation in 1946, the Capital Investment Company, led by Chinn Ho, purchased the Mākaha lands with plans to develop the area. Along with the sale of residential and agricultural lots in the coastal areas of Makaha, Ho began resort development in the lower valley area, including a hotel, recreational facilities, two golf courses and condominiums. Much of the lands in the lower valley were disturbed by development activities at this time.

Prior to the widespread land disturbance that occurred in lower Makaha Valley by the late 1980s, lands in the vicinity of the project area may have contained remnants of traditional Hawaiian *kula* (dryland) agriculture and habitation. Remnants of plantation agriculture, including irrigation infrastructure were also located in the project area and vicinity. However, based on observations of heavy land disturbance in the project area by previous archaeological studies, much of the cultural landscape was likely removed.

Section 4 Results of Fieldwork

4.1 Survey Findings

A complete pedestrian inspection of the approximately 303-acre project area was accomplished. The findings of the survey are discussed based on the three proposed project development phases (Figure 18). The Phase 1 portion of the project area consists of undeveloped lands at the base of Mākaha Valley. The Phase 2 portion of the project area consists of the existing Makaha Valley Country Club and ‘Eku Stream gully at the base of Mākaha Valley. The Phase 3 portion of the project area consists of undeveloped lands along the lower slopes of the Kamaile‘unu Ridge. Historic properties identified in the project area are listed in Table 3 and indicated on Figure 19 and Figure 20.

Phase 1 (TMK: [1] 8-4-002:007 & 070 por.)

The Phase 1 portion of the project area has been heavily disturbed by prior land clearing (i.e. bulldozing) and dumping/material stockpiling activities (Figure 21). Large piles of soil, boulders, construction debris, etc. were observed scattered throughout the parcel. Abandoned construction equipment was also observed. The disturbed nature of this portion of the project area was documented in a previous study by PHRI in 1990 (Donham 1990) (see Section 3.2: Previous Archaeological Research). It appeared that additional land disturbing activities had also taken place between the 1990 study and the current study.

Despite the extensive land modification, three historic properties were identified within the Phase 1 portion of the project area. A previously identified stone mound (SIHP # 50-80-07-4818) was relocated in the northeastern portion of the Phase 1 parcel. Donham (1990) reported on two stone mounds, though only one was relocated during the current study. The second mound may have been removed by recent land disturbing activities. In addition to the previously identified mound, two concrete structure foundations (SIHP # 50-80-07-7749 Features A and B) and a portion of a plantation-era irrigation ditch (SIHP # 50-80-07-7750) were identified in the southern, western, and northern portions of the Phase 1 portion of the project area, respectively.

Additional remnants of plantation irrigation infrastructure were observed within the various bulldozer push piles in the Phase 1 portion of the project area (Figure 22). As these remnants of plantation infrastructure are not intact or in their original location, they are not considered historic properties. Remnant barbed wire fencing was also observed, indicative of former ranching activities in the area.

Phase 2 (TMK: [1] 8-4-002:005 & 076; 8-4-023:014, 015; 8-4-024:001)

The Phase 2 portion of the project area is almost entirely occupied by the Makaha Valley Country Club golf course (Figure 23). The 18-hole golf course includes heavily modified and landscaped grounds, maintenance buildings, parking lot, and clubhouse. No historic properties were observed within the golf course. Pedestrian inspection of the undeveloped areas of the Phase 2 portion of the project area, consisting of the ‘Eku Stream gully, revealed heavy land

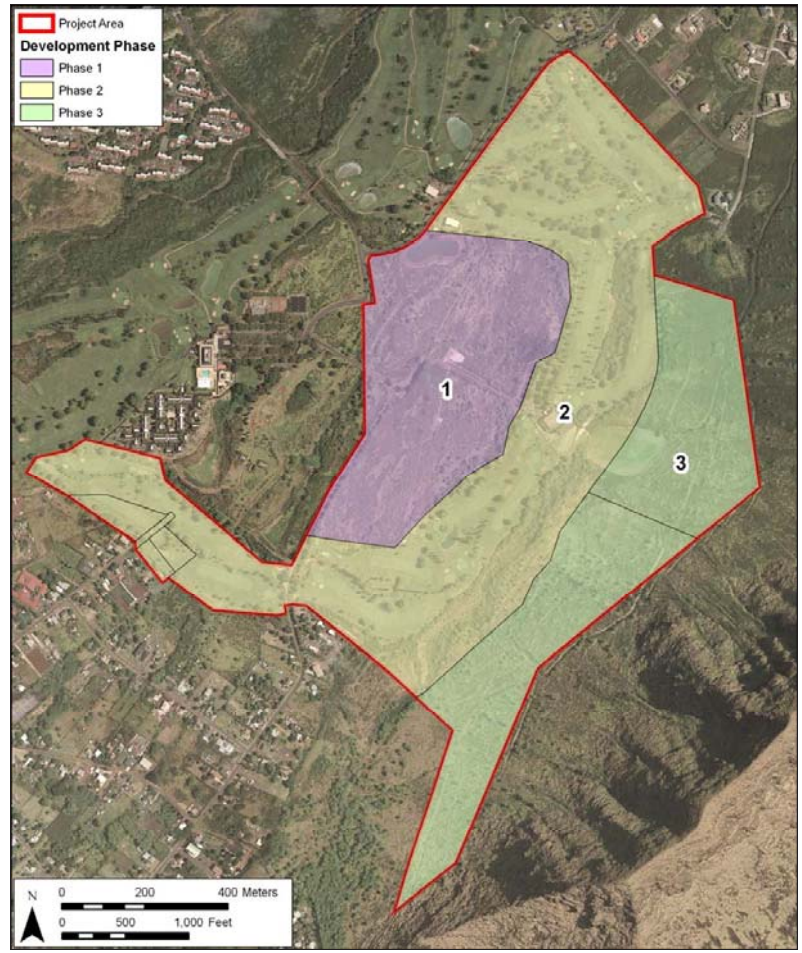

Figure 18. Aerial Photograph (source: U. S. Geological Survey Orthoimagery 2005) showing the proposed project development phases

Table 3. Historic Properties Identified in the Project Area

SIHP # (50-80-07)	Site Type	Features	Probable Age	Function	Significance Criteria	Mitigation Recommendations
875	Terrace	1	Pre-Contact	Agricultural	D	No Further Work
3325	Flume (Mikilua Flume)	1	Post-Contact	Agricultural (Plantation Irrigation)	D	No Further Work
4818	Mound	1	Post-Contact	Land Clearing	None	No Further Work
7749	Concrete Slab Foundation	2	Post-Contact	Building Foundation	D	No Further Work
7750	Irrigation Ditch	1	Post-Contact	Agricultural (Plantation Irrigation)	D	No Further Work

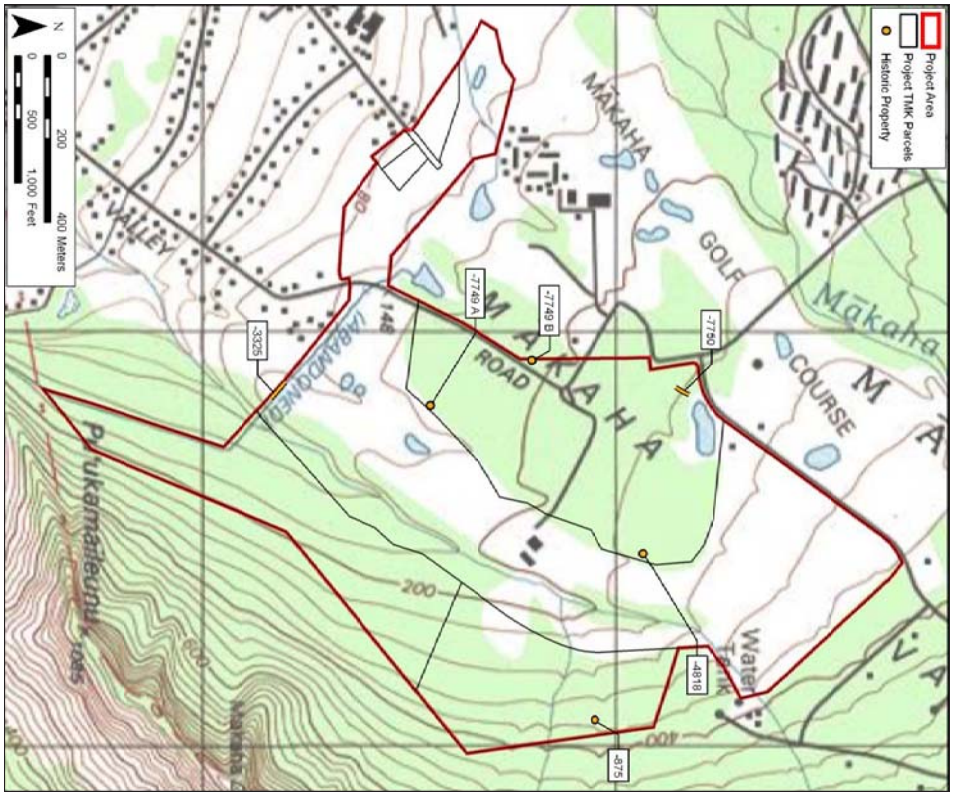

Figure 19. U. S. Geological Survey 7.5-Minute Series Topographic Map, Waianae Quadrangle (1998), showing the locations of historic properties identified in the project area

Figure 20. Aerial photograph (source: U. S. Geological Survey Orthoimagery 2005), showing the locations of historic properties identified in the project area

Figure 21. General view of the Phase 1 portion of the project area, view to north

Figure 22. Pile of plantation irrigation piping within a bulldozer push pile, view to east

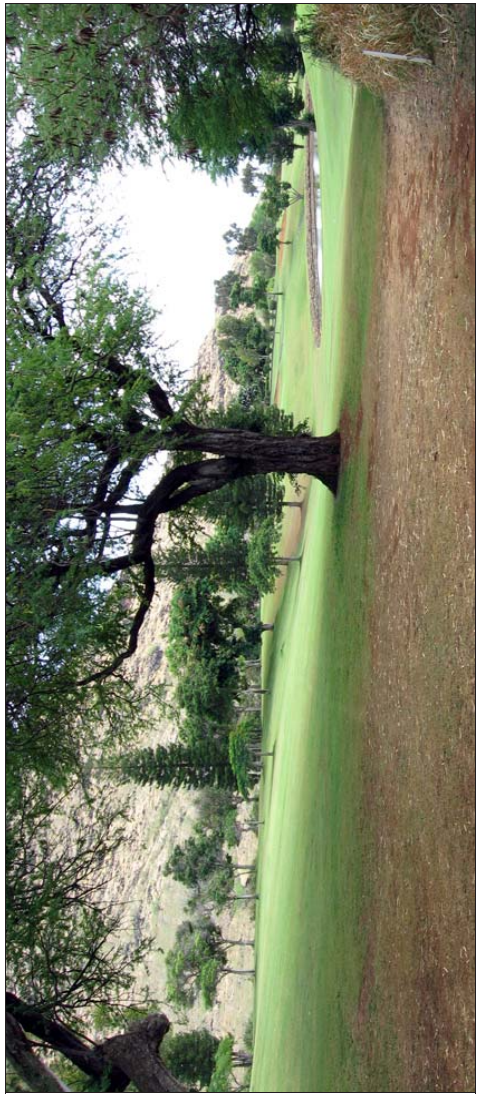

Figure 23. General view of the Phase 2 portion of the project area, view to southeast

disturbance associated with golf course construction and other land disturbing activities, as well as periodic flooding. A large portion of the 'Eku Stream gully was reportedly bulldozed in the weeks prior to PHRI's survey in 1990 (Donham 1990) (see Section 3.2: Previous Archaeological Research).

A single historic property was identified in the undeveloped areas of the Phase 2 portion of the project area. A portion of a plantation-era irrigation flume (SIHP # 50-80-07-3325), known as the "Mikilua Flume," was identified on a bluff along the western edge of the 'Eku Stream gully.

Phase 3 (TMK [1] 8-4-002:056, 057)

The Phase 3 portion of the project area was also observed to have been heavily disturbed by prior land clearing (i.e. bulldozing) activities (Figure 24). The prior land disturbance was reported in detail by PHRI in 1990 (Donham 1990) (see Section 3.2: Previous Archaeological Research). Large piles of soil and boulders, as well as bulldozer paths, were observed scattered throughout the parcel. Large water diversion ditches and berms were observed along the *mauka* property boundary (Figure 25 and Figure 26). These ditches appear to function in diverting water descending the slope into a single channel that enters the 'Eku Stream gully. Bordner (1983) observed the ongoing construction of these water diversion ditches in the early 1980s. Two abandoned bulldozers, equipped with spools of heavy cables for "chain-dragging" (a method of land clearing), were also observed within the Phase 3 portion of the project area (Figure 27).

A single historic property was identified in the Phase 3 portion of the project area. The previously identified SIHP # 50-80-07-875 terrace was relocated in the northern portion of the Phase 3 area. Historic maps indicate that a plantation ditch and the SIHP # 50-80-07-3325 "Mikilua Flume" were located in the southern portion of the Phase 3 area. The ditch was observed to have been filled and used as a bulldozer path (Figure 28), and as such does not retain the integrity to be considered a historic property. No intact portions of the "Mikilua Flume" were observed in the Phase 3 portion of the project area. Remnant sections of the flume structure were observed scattered throughout the southern portion of the Phase 3 area, typically within bulldozer push-piles.

Figure 24. General view of the Phase 3 portion of the project area, view to east

Figure 25. Drainage infrastructure within the Kamaile‘unu Ridge portion of the project area, view to east

Figure 26. Excavated drainage channel in the Kamaile‘unu Ridge portion of the project area, view to south

Figure 27. Abandoned bulldozer located in the Kamaile‘unu Ridge portion of the project area, view to southeast. Note the cable assembly on the rear of the machine used for “chain dragging”

Figure 28. Former ditch that was filled-in and used as a bulldozer path, view to south

4.2 Historic Property Descriptions

4.2.1 SIHP #: **50-80-07-875**

SITE TYPE: Terrace
FUNCTION: Agricultural
FEATURES: 1
DIMENSIONS: 7.3 m E/W by 3.5 m N/S
CONDITION: Fair
PROBABLE AGE: Pre-Contact
TAX MAP KEY: [1] 8-4-002:057

DESCRIPTION:

SIHP # 50-80-07-875 is a terrace located on the lower slopes of the Kamaile‘unu Ridge, in the northeastern portion of the project area (see Figure 19 and Figure 20). The Makaha Valley Historical Project (Ladd 1969) reported on a poorly preserved platform (BPBM # 50-Oa-C4-102) located within their Survey Area 4. Paul H. Rosendahl, Inc. (PHRI) subsequently relocated the feature, describing SIHP # 50-80-07-875 as a terrace:

> The terrace appears to have been roughly rectangular in plan; however, an unknown portion of the feature was cut away during construction of the adjacent drainage ditch. It is constructed with a loosely defined perimeter of large cobbles and boulders, and filled and paved with smaller weathered basalt cobbles. The terrace surface was relatively regular at the time of survey; however, it sloped gently to the west, possibly an effect of disturbance. Immediately to the south and east of the terrace was a concentration of machinery-pushed boulders, apparently deposited at the time of ditch construction. A few loose boulders were scattered on the terrace from this source. Evidence of a recent brush fire was also apparent on the site. [Donham 1990:14, 17]

SIHP # 50-80-07-875 terrace was relocated during the current study. The written description and plan-view diagram (Figure 29) were field-checked and found to be accurate. The terrace and surrounding area (Figure 30) were found to be in the same condition as documented by PHRI in 1990.

PHRI conducted limited subsurface testing at SIHP # 50-80-07-875:

> A 0.50 by 1.00 m test unit was excavated into the terrace, in order to better determine its function and period of construction. The cobble paving was found to extend from 0.17 to 0.33 m below surface, and overlie a layer of larger cobbles in a dark reddish-brown silty clay matrix. A former ground surface, with organic duff material, was observed at the top of this layer. The density of stone increased with depth in the test unit, and became impenetrable at 0.57 to 0.73 m below surface. Charcoal flecks were observed in the upper levels of excavation, and

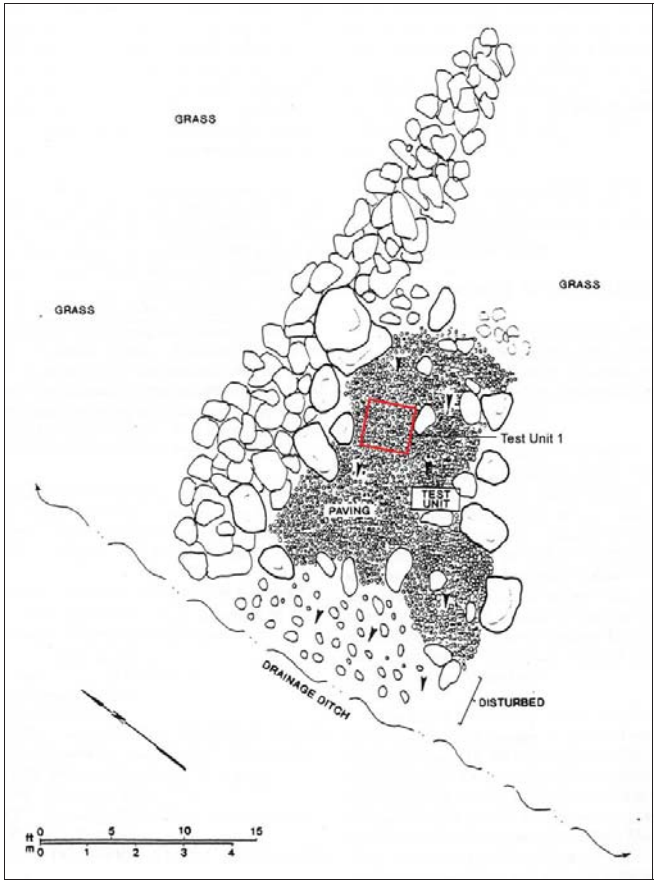

Figure 29. Plan-view diagram of SIHP # 50-80-07-875 terrace (Donham 1990:16), with the addition of Test Unit 1 of the current study

Figure 30. SIHP # 50-80-07-875 terrace, view to northeast

> were attributed to recent brush fires. Scattered charcoal was also observed in very minute quantities along root channels in sterile soil, to a depth of 0.53 below surface. This material likewise appeared to be derived from former local brush fires.
>
> No portable remains indicating human occupation of the feature for habitation or shelter were encountered, and no cultural deposit was observed. It therefore appears that the terrace was utilized for agricultural purposes. [Donham 1990:17]

An additional test excavation was made within the SIHP # 50-80-07-875 terrace during the current study (see Section 4.3 Test Excavation Findings). No cultural material was recovered from the test excavation.

SIHP # 50-80-07-875 is interpreted to be a pre-contact or early post-contact agricultural terrace. Subsurface testing indicated the terrace may have been constructed by modifying a natural accumulation of stones along the talus slope. SIHP # 50-80-07-875 is in fair condition. The terrace and surrounding area have been disturbed by land clearing and drainage improvement activities. SIHP # 50-80-07-875 is assessed as significant under Criteron D (have yielded, or may be likely to yield information important in prehistory or history) of the Hawai‘i Register of Historic Places evaluation criteria.

4.2.2 SIHP #: 50-80-07-3325

SITE TYPE: Mikilua Flume
FUNCTION: Agricultural (Plantation Irrigation)
FEATURES: 1
DIMENSIONS: Approximately 52 linear m intact in the project area
CONDITION: Poor
PROBABLE AGE: Post-Contact
TAX MAP KEY: [1] 8-4-002:005
DESCRIPTION:

SIHP # 50-80-07-3325 is a plantation-era irrigation flume, known as the “Mikilua Flume.” Historic maps indicate the flume extended approximately 11 km from Mākaha, through Wai‘anae, and into Lualualei, connecting the extensive sugar cane fields of the Waianae Sugar Company. An approximately 2 km portion of the SIHP # 50-80-07-3325 flume was documented in Wai‘anae by Paul H. Rosendahl, Inc. (PHRI) (Shapiro and Rosendahl 1988). Historic maps indicate an approximately 1 km portion of the flume was formerly located in the current project area (see Figures 12-15). The flume alignment is indicated have rounded the Kamaile‘unu Ridge in the south, bordered the *makai* (seaward) edge of the project area, and terminated at a plantation reservoir near the western edge of the project area.

Much of the former flume alignment within the project area has been removed by land clearing activities. Several metal flume sections were observed within bulldozer push-piles in the southern portion of the project area (Figure 31). An approximaltey 52 m long portion of the SIHP # 50-80-07-3325 flume is intact within the project area (see Figure 19 and Figure 20). The intact portion of the flume is situated on a bluff along the western edge of the ‘Eku Stream gully. This portion of the flume is situated within an excavated ditch across the higher elevation bluff area. The flume consists of an approximately 40 cm diameter metal half-pipe resting at the base of the 2.8 m wide and 1.2 m deep earthen ditch (Figure 32). An in situ collapsed portion of the flume was observed at the edge of the ‘Eku Stream gully (Figure 33). The flume section consists of metal half-pipe sections that are riveted together. The metal flume sections were likely supported by a wooden trestle. However, only burnt wood fragments remain of the trestle, likely due to frequent brush fires in the area.

SIHP # 50-80-07-3325 is a plantation-era irrigation flume, known as the “Mikilua Flume,” attributable to the Waianae Sugar Company. The flume is indicated on a 1902 map of Wai‘anae by M.D. Monsarrat (Registered Map 2108) as originating at the Kamaile Well in Wai‘anae, extending east through Wai‘anae, and terminating at a plantation reservoir in the Mikilua area of Lualualei. The flume was later extended west, through the project area, to a plantation reservoir in Mākaha, as indicated on the 1919 War Department map (see Figure 12). The 1956 Army Mapping Service map indicates the flume was abandoned by the early 1950s, following the closing of the Waianae Sugar Company. The “Mikilua Flume” was an important component of the Waianae Sugar Company’s irrigation system. The portion of SIHP # 50-80-07-3325 within the project area is in poor condition, though portions of the flume may remain intact in Wai‘anae or Lualualei. SIHP # 50-80-07-3325 is assessed as significant under Criteron D (have yielded, or may be likely to yield information important in prehistory or history) of the Hawai‘i Register of Historic Places evaluation criteria.

Figure 31. Disturbed section of SIHP # 50-80-07-3325 Mikilua Flume within a bulldozer push-pile, view to east

Figure 32. Intact portion of SIHP # 50-80-07-3325 Mikilua Flume at base of ditch, view to southeast

Figure 33. Collapsed portion of SIHP # 50-80-07-3325 Mikilua Flume at edge of ‘Eku Stream gully, view to west

4.2.3 SIHP #: 50-80-07-4818

SITE TYPE: Mound
FUNCTION: Land Clearing
FEATURES: 1
DIMENSIONS: 3.8 m N/S by 3.2 m E/W
CONDITION: Good
PROBABLE AGE: Modern
TAX MAP KEY: [1] 8-4-002:007

DESCRIPTION:

SIHP # 50-80-07-4818 is a stone mound located in the central portion of the project area, situated at the base of a shallow drainage channel (see Figure 19 and Figure 20). SIHP # 50-80-07-4818 was previously identified and documented by Paul H. Rosendahl, Inc. (PHRI) (Donham 1990). The following descriptions and plan-view diagram (Figure 34) were provided for the two mounds (i.e. Features A and B) identified by PHRI:

> This nearly circular rock mound [Feature A] is constructed from weathered basalt boulders and cobbles that are loosely piled in a conical formation, with maximum height at the center. No evidence of facing or formal stacking was apparent. At the time the feature was cleared and mapped, it appeared to have been constructed by hand. The stones exhibited weathered surfaces with no machinery scarring. It was tentatively interpreted as an agricultural clearing mound…
>
> Feature B was located 10.30 m southwest (325 degrees Az) from Feature A. It is constructed of small to large vesicular basalt cobbles and boulders that are loosely piled in a conical formation, with no facing or formal stacking. The size, shape, and construction technique for this feature is nearly identical with Feature A. [Donham 1990:14]

PHRI conducted limited subsurface testing at SIHP # 50-80-07-4818 Feature A:

> A 1.00 by 3.50 m test trench was excavated across the center of the mound, in order to better determine function and period of construction. Beneath the surface stones in the mound, a number of machinery-scarred stones were located, in addition to relatively fresh vegetation and recently disturbed soil. Modern plastic was encountered at the center of the mound at a depth of 1.04 m below surface, which correlated with the original ground surface beneath the mound. The findings of the test excavation indicated that the feature was of modern construction. [Donham 1990:14]

Based on the results of subsurface testing at Feature A, Feature B was also interpreted to be a modern construction:

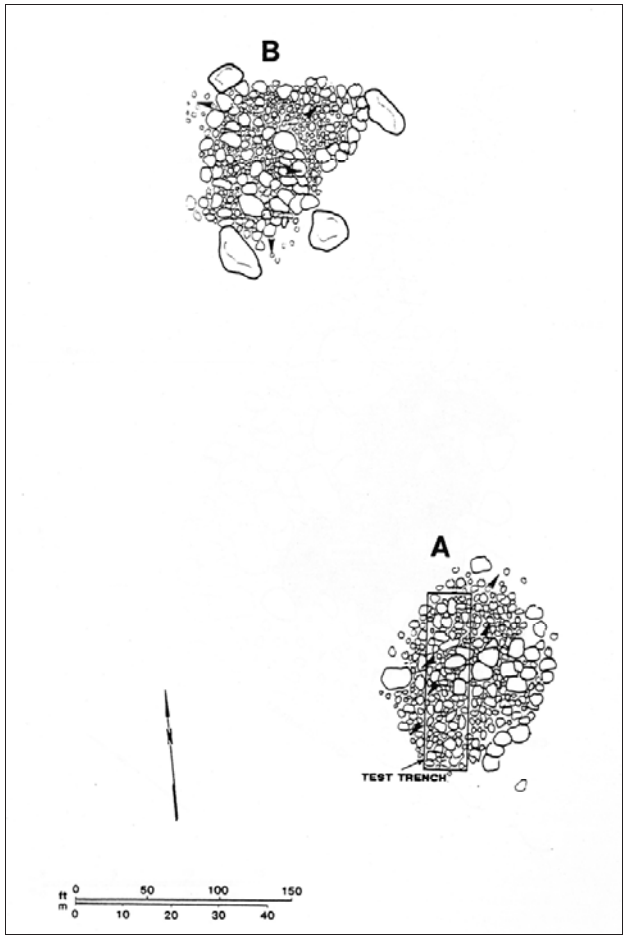

Figure 34. Plan-view diagram of SIHP # 50-80-07-4818 Features A and B mounds (Donham 1990:15)

> Feature B was cleared of vegetation and mapped prior to the testing of Feature A. Subsequent to the findings of the Feature A testing, Feature B was closely examined and found to also contain buried stones with heavy machinery scarring. It was determined that this feature was also of modern construction. It should be noted, however, that the stones comprising the surfaces of the mounds were not subjected to major machinery disturbance and were definitely not recently removed from a subsurface context by machines. They appear to have been removed from a pre-existing surface feature or features and placed on piles that were produced by machinery. [Donham 1990:14]

A single feature of SIHP # 50-80-07-4818 was relocated during the current study. Attempts to relocate the second mound documented by PHRI were unsuccessful. Land clearing activities between the time of the 1990 PHRI study and the current study may have removed or disturbed the mound beyond recognition. The mound identified during the current study is likely the Feature B mound documented by PHRI. The description of the Feature B mound was field-checked and found to be accurate. A plan-view diagram (Figure 35) of the Feature B mound was drawn to document the current condition of the feature and surroundings. A large bulldozer push-pile is located adjacent to the western edge of the mound (Figure 36). A test excavation was made within the Feature B mound during the current study (see Section 4.3 Test Excavation Findings). No cultural material was recovered from the test excavation.

SIHP # 50-80-07-4818 was interpreted by PHRI (Donham 1990) to be a modern construction associated with land clearing activities. The results of subsurface testing at Feature B during the current study are in accord with the findings of PHRI. SIHP # 50-80-07-4818 is assesed as not significant under the Hawai‘i Register of Historic Places evaluation criteria.

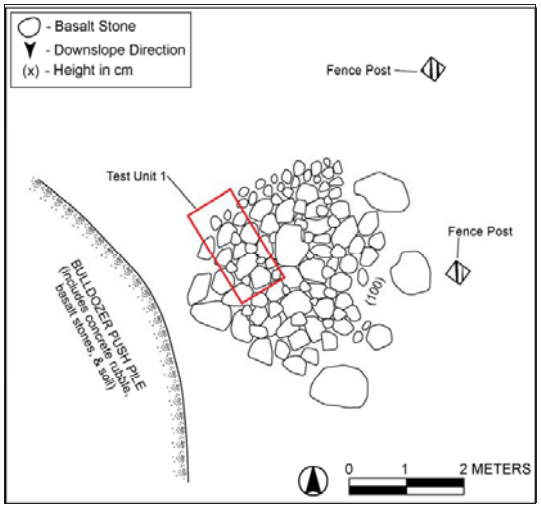

Figure 35. Plan-view diagram of SIHP # 50-80-07-4818 Feature B mound

Figure 36. SIHP # 50-80-07-4818 Feature B mound, view to west. Note large bulldozer push-pile in background.

4.2.4 SIHP #: **50-80-07-7749**

SITE TYPE: Concrete Slab Foundations
FUNCTION: Building Foundations
FEATURES: 2
DIMENSIONS: Feature A: 4.7 m NW/SE by 4.1 m NE/SE; Feature B: 19.8 m NE/SW by 9.7 m NW/SE
CONDITION: Fair
PROBABLE AGE: Post-Contact
TAX MAP KEY: [1] 8-4-002:007
DESCRIPTION:

SIHP # 50-80-07-7749 consists of two concrete slab foundations, located in the western portion of the project area (see Figure 19 and Figure 20). Feature A is a concrete slab foundation situated at the edge of the golf course, adjacent to the 2nd tee box. The foundation consists of a rectangular slab, measuring 4.7 m by 4.1 m wide, with two interior square foundations that are raised 5 cm above the slab (Figure 37 and Figure 38). The edges of the interior foundations are bordered on three sides by asphalt, which smoothes the edges of the interior foundations with the slab foundation. Pieces of bent rebar are exposed on the top surface of the interior foundations. The edges of the slab foundation are rough, as the foundation appears to have been run over by a bulldozer. Concrete rubble, along with basalt stones and soil, are located within a bulldozer push-pile adjacent to the northwestern edge of the slab. A rectangular concrete box is located approximately 12 m east of the slab foundation (Figure 39). The box measures 0.8 m square with a height of 0.7 m and 10 cm thick walls. The box appears contemporaneous to and associated with the concrete slab. However, as the box is located within the golf course, it is likely not in situ.

Feature B is a concrete slab foundation located near the western boundary of the project area, west of Mākaha Valley Road. The foundation consists of a rectangular slab, measuring 19.8 m by 9.7 m wide, with a maximum height of 35 cm above the surrounding ground surface (Figure 40 and Figure 41). The southern portion of the foundation is bordered by a 15-20 cm high curb along the south, west, and north edges. There is also an interior curb that partitions the southern portion of the foundation. The eastern edge of the foundation is flush with the ground surface. The northern portion of the foundation is 35 cm higher than the southern portion, and includes a sloping ramp that is flush with the ground surface along the eastern edge.

SIHP # 50-80-07-7749 Features A and B are interpreted to be foundations for buildings or other structures. The function of Feature A is unclear. Feature B may have been the foundation for a vehicle shed or garage, based on the curbing and having one edge flush with the ground surface. No dates were observed in the concrete of either foundation. The 1956 U.S. Army Mapping Service Topographic Map (see Figure 15) indicates a cluster of structures in the vicinity of SIHP # 50-80-07-7749 Features A and B. These structures may have been related to post-plantation agricultural activities. SIHP # 50-80-07-7749 is in fair condition. The concrete foundations have been disturbed by land clearing and golf course development activities. SIHP # 50-80-07-7749 is assessed as significant under Criteron D (have yielded, or may be likely to yield information important in prehistory or history) of the Hawai‘i Register of Historic Places evaluation criteria.

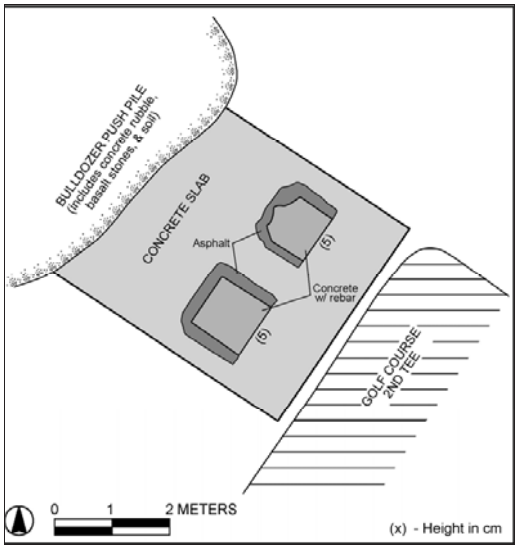

Figure 37. Plan-view diagram of SIHP # 50-80-07-7749 Feature A concrete slab building foundation

Figure 38. SIHP # 50-80-07-7749 Feature A concrete slab building foundation, view to northeast

Figure 39. Concrete box near SIHP # 50-80-07-7749 Feature A concrete slab building foundation, view to east

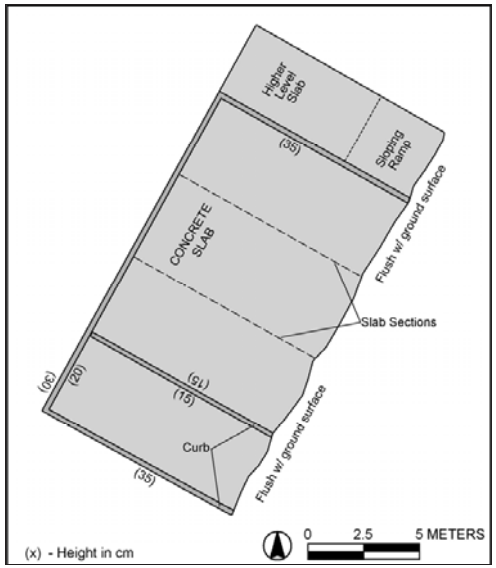

Figure 40. Plan-view diagram of SIHP # 50-80-07-7749 Feature B concrete slab foundation

Figure 41. SIHP # 50-80-07-7749 Feature B concrete slab foundation, view to southwest

4.2.5 SIHP #: 50-80-07-7750

SITE TYPE: Irrigation Ditch
FUNCTION: Agricultural (Plantation Irrigation)
FEATURES: 1
DIMENSIONS: Approximately 38 linear m
CONDITION: Poor
PROBABLE AGE: Post-Contact
TAX MAP KEY: [1] 8-4-002:007

DESCRIPTION:

SIHP # 50-80-07-7750 is a remnant portion of an irrigation ditch, located in the northwestern portion of the project area (see Figure 19 and Figure 20). The intact portion of the ditch is oriented *mauka*/*makai* (northeast-southwest), and measures approximately 38 m long. The northern and southern ends of the ditch have been removed by land clearing activities. The concrete-lined ditch is U-shaped, with a flat base and vertical side walls (Figure 42). The interior of the ditch measures 0.7 m wide and 0.8 m deep. The side walls of the ditch are 10-15 cm thick. A remnant barbed-wire fence line runs parallel to and approximately 3 m east of the ditch. A remnant road runs parallel to and approximately 2 m west of the ditch. The road is paved with asphalt and coral gravel, and measures 3 m wide (Figure 43).

SIHP # 50-80-07-7750 is a plantation-era irrigation ditch, attributable to the Waianae Sugar Company. The ditch is indicated on historic maps as early as 1928 (see Figure 13). The ditch originated at Mākaha Stream, approximately 1.1 km northeast of the project area, and terminated at a plantation reservoir near the western edge of the project area. The ditch functioned in diverting water from Mākaha Stream to the plantation reservoir, where the water could be stored and distributed to plantation sugar cane fields in lower Mākaha Valley. SIHP # 50-80-07-7750 is in poor condition. Much of the ditch has been damaged or removed by land clearing activities. SIHP # 50-80-07-7750 is assessed as significant under Criteron D (have yielded, or may be likely to yield information important in prehistory or history) of the Hawai‘i Register of Historic Places evaluation criteria.

Figure 42. SIHP # 50-80-07-7750 irrigation ditch, view to south

Figure 43. Remnant paved road running parallel to the SIHP # 50-80-07-7750 irrigation ditch, view to south

4.3 Test Excavation Findings

4.3.1 SIHP # 50-80-07-875

A 1 m by 1 m test excavation was made within the central portion of the SIHP # 50-80-07-875 terrace to better determine the age, function, and method of construction of the feature (see Figure 29). The test excavation was located in a well-constructed and minimally disturbed portion of the terrace. This area was thought to have the highest likelihood of containing intact cultural material.

The sloping surface of the test excavation consisted of a rough pavement of basalt cobbles. The excavation revealed a 60 cm thick layer of unsorted basalt cobbles and small boulders with increasing amounts of sediment mixed with the stones at greater depths (Figure 44). Stratum I consisted of a mixed soil and stone matrix extending to the base of excavation. The test excavation was terminated at clearly sterile sediments. No cultural material was observed through the test excavation. The test excavation indicates the terrace may have been constructed by modifying the surface of a natural accumulation of stones along the talus slope.

Following the test excavation, the excavated area was reconstructed as closely as possible to its original state. Detailed sediment descriptions are as follows:

Strata	Depth (cmbd)	Description
Stratum I	60-BOE	10YR 3/3 dark brown sandy clay; weak, fine crumb structure; dry, loose consistency; slightly plastic; no cementation; terrestrial origin; includes leaf litter at soil surface, 50% basalt pebbles and cobbles; Lower Boundary (LB) is below Base of Excavation (BOE).

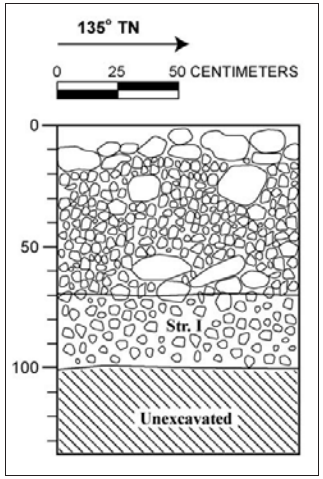

Figure 44. Photograph (above) and stratigraphic profile (below) of the northeast wall of SIHP # 50-80-07-875 Test Unit 1

4.3.2 SIHP # 50-80-07-4818

A 2 m by 1 m test excavation was made within the SIHP # 50-80-07-4818 mound to better determine the age and function the feature (see Figure 35). The test excavation was located in the northwestern portion of the feature, extending from the center to the edge of the mound.

The sloping surface of the test excavation consisted of piled basalt boulders and cobbles. Deconstruction of the mound revealed the stones were loosely piled 0.8-1.1 m above the current soil surface (Figure 45). The stones comprising the mound structure were unsorted, with boulders and cobbles distributed throughout the construction. Several stones within the mound were observed to have been scarred or fractured, likely by machines. An abundance of soil pockets was also observed within the mound construction. Stratum I consisted of a mixed soil and stone matrix extending 10 cm below the soil surface. Stratum II consisted of sterile soil extending to the base of excavation. The test excavation was terminated at clearly sterile sediments.

Following the test excavation, the excavated area was reconstructed as closely as possible to its original state. Detailed sediment descriptions are as follows:

Strata	Depth (cmbd)	Description
Stratum I	110-120	10YR 3/3 dark brown sandy clay; weak, fine crumb structure; dry, loose consistency; slightly plastic; no cementation; terrestrial origin; includes leaf litter at soil surface, charcoal flecking, 50% basalt cobbles; Lower Boundary (LB) is clear, smooth.
Stratum II	120-BOE	10YR 3/4 dark yellowish brown silty clay; weak, fine crumb structure; dry, hard consistency; slightly plastic; no cementation; terrestrial origin; includes 10% basalt cobbles; Lower Boundary (LB) is below Base of Excavation (BOE).

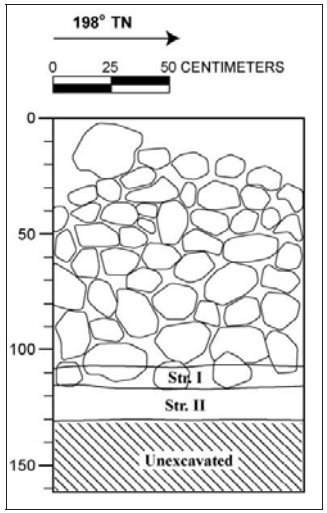

Figure 45. Photograph (above) and stratigraphic profile (below) of the southeast wall of SIHP # 50-80-07-4818 Test Unit 1

Section 5 Summary and Interpretation

The findings of the current study are in accordance with those of previous archaeological studies that were conducted within portions of the project area (i.e. Ladd 1969 and Donham 1990). The project area has been heavily disturbed by land clearing activities associated with plans to develop lower Mākaha Valley. Prior to the widespread land disturbance that occurred by the late 1980s, lands in the project area likely contained remnants of traditional Hawaiian *kula* (dryland) agriculture and habitation, historic ranching, and plantation agriculture. Despite the extensive land modification, five historic properties were identified in the project area, representing traditional Hawaiian agriculture, plantation agriculture, and post-plantation agriculture. In addition to the identified historic properties, remnant barbed wire fences were observed in the project area, indicative of former ranching activities in the area.

A single remnant of traditional Hawaiian agricultural activities was identified. SIHP # 50-80-07-875 is interpreted to be a pre-contact or early post-contact agricultural terrace, located on the lower slopes of the Kamaile‘unu Ridge. The terrace has been disturbed by land clearing and drainage improvement activities.

Remnants of historic plantation agriculture, attributable to the Waianae Sugar Company, were identified. SIHP # 50-80-07-7750 is a plantation-era irrigation ditch located in the northwestern portion of the project area. Historic maps indicate the ditch originated at Mākaha Stream, approximately 1.1 km northeast of the project area, and terminated at a plantation reservoir near the western edge of the project area. The ditch functioned in diverting water from Mākaha Stream to the plantation reservoir, where the water could be stored and distributed to plantation sugar cane fields in lower Mākaha Valley. SIHP # 50-80-07-3325 is a plantation-era irrigation flume, known as the “Mikilua Flume.” Historic maps indicate the flume orginated at the plantation reservoir near the western edge of the project area and extended east into neighboring Wai‘anae and Lualualei, allowing irrigation water from Makaha to be transported to the extensive sugar cane fields of the Waianae Sugar Company. The flume once bordered much of the *makai* (seaward) edge of the project area. However, only an approximately 50 m long portion of the flume is extant. The remaining portions of the flume were removed by land clearing activites.

SIHP # 50-80-07-7749 consists of two concrete slab building foundations. Historic maps indicate these features were likely constructed in the late 1940s or early 1950s, and may have been related to post-plantation agricultural activities. SIHP # 50-80-07-4818 is a stone mound, interpreted to be related to modern land clearing activities.

Section 6 Significance Assessments

Each historic property identified by the current study was evaluated for significance according to the broad criteria established for the Hawai‘i Register of Historic Places (see Table 3). The five criteria are:

- A Associated with events that have made an important contribution to the broad patterns of our history;
- B Associated with the lives of persons important in our past;
- C Embodies the distinctive characteristics of a type, period, or method of construction, represents the work of a master, or possesses high artistic value;
- D Have yielded, or is likely to yield information important for research on prehistory or history;
- E Have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property, or due to associations with traditional beliefs, events or oral history accounts – these associations being important to the group’s history and cultural identity.

SIHP # 50-80-07-875 is a pre-contact or early post-contact agricutural terrace, located in the northeastern portion of the project area. SIHP # 50-80-07-875 is assessed as significant under Criteron D of the Hawai‘i Register of Historic Places evaluation criteria.

SIHP # 50-80-07-3325 is a plantation-era irrigation flume, known as the “Mikilua Flume,” attributable to the Waianae Sugar Company. Historic maps indicate the flume was likely constructed in the late 1800s, to provide irrigation water to the extensive sugar cane fields of the Waianae Sugar Company. SIHP # 50-80-07-3325 is assessed as significant under Criteron D of the Hawai‘i Register of Historic Places evaluation criteria.

SIHP # 50-80-07-4818 is a stone mound located in the central portion of the project area. SIHP # 50-80-07-4818 was interpreted by PHRI (Donham 1990) to be a modern construction associated with land clearing activities. The results of subsurface testing at Feature B during the current study are in accordance with the findings of PHRI. SIHP # 50-80-07-4818 is assesed as not significant under the Hawai‘i Register of Historic Places evaluation criteria.

SIHP # 50-80-07-7749 consists of two concrete slab building foundations, located in the western portion of the project area. Historic maps indicate the features were likely constructed in the late 1940s or early 1950s may have been related to post-plantation agricultural activities. SIHP # 50-80-07-7749 is assessed as significant under Criteron D of the Hawai‘i Register of Historic Places evaluation criteria.

SIHP # 50-80-07-7750 is a remnant plantation-era irrigation ditch, attributable to the Waianae Sugar Company, located in the northwestern portion of the project area. The ditch functioned in diverting water from Mākaha Stream to the plantation reservoir, where the water could be stored and distributed to plantation sugar cane fields in lower Mākaha Valley. SIHP # 50-80-07-7750 is assessed as significant under Criteron D of the Hawai‘i Register of Historic Places evaluation criteria.

Section 7 Project Effect and Mitigation Recommendations

The following project effect discussion and cultural resource management recommendations are intended to facilitate project planning and support the proposed project's required historic preservation consultation. This discussion is based on the results of this archaeological inventory survey investigation and CSH's communication with agents for the project proponents regarding the project's potential impacts to the cultural resources described in the Results of Fieldwork section, above.

7.1 Project Effect

The proposed Ka Pua Project includes development of an approximately 67-acre Kamehameha Schools learning complex and an approximately 112-acre Department of Hawaiian Home Lands (DHHL) Mākaha Homestead residential community (see Figure 4). The Kamehameha Schools learning complex is currently envisioned as including a preschool, educational learning lab, multimedia center, learning halls, residence halls, multi-function sports fields, community gathering area, and *lo‘i* (irrigated agricultural field). The DHHL Mākaha Homestead development is currently envisioned as including approximately 600 single-family residential lots and a community center. The current conceptual plan also includes approximately 124 acres of open space that is not proposed for development. Minimally, land disturbing activities associated with the proposed project would include: grubbing and grading; excavations for building foundations and subsurface utilities; and excavations for associated infrastructure improvements. The project's area of potential effect (APE) is defined as the entire approximately 303-acre project area.

This archaeological inventory survey investigation identified the following five historic properties in the project area. These historic properties may be affected by the proposed project:

1. SIHP # 50-80-07-875, pre-contact or early post-contact agricultural terrace, evaluated as significant under Criterion D of the Hawai‘i Register of Historic Places evaluation criteria. The proposed project may have an adverse effect on the terrace.
2. SIHP # 50-80-07-3325, plantation-era irrigation flume known as the "Mikilua Flume," evaluated as significant under Criterion D of the Hawai‘i Register of Historic Places evaluation criteria. The proposed project may have an adverse effect on the flume.
3. SIHP # 50-80-07-4818, stone mound, evaluated as not significant under the Hawai‘i Register of Historic Places evaluation criteria. The proposed project may have an adverse effect on the mound.
4. SIHP # 50-80-07-7749, two concrete slab building foundations, evaluated as significant under Criterion D of the Hawai‘i Register of Historic Places evaluation criteria. The proposed project may have an adverse effect on the foundations.
5. SIHP # 50-80-07-7750, plantation-era irrigation ditch, evaluated as significant under Criterion D of the Hawai‘i Register of Historic Places evaluation criteria. The proposed project may have an adverse effect on the ditch.

Due to the potential adverse effect on significant historic properties, CSH's project-specific effect recommendation is "effect, with proposed mitigation commitments."

7.2 Mitigation Recommendations

Each of the five historic properties identified in the project area was documented with detailed written descriptions, photographs, and accurately located with GPS survey equipment. Scale drawings were made of SIHP # 50-80-07-875, -4818, and -7749, and limited subsurface testing was conducted at SIHP # 50-80-07-875 and -4818. Sufficient information regarding the location, function, age, and construction methods of the five historic properties has been generated by the current inventory survey investigation to mitigate any adverse effect caused by proposed development activities. No further work is recommended for SIHP #s 50-80-07-875, -3325, -4818, -7749, and -7750.

If, in the unlikely event that subsurface cultural deposits are encountered during the course of development activities, all work in the immediate area should stop and the State Historic Preservation Division should be promptly notified.

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Appendix D

Cultural Impact Assessment

Draft for Review

Cultural Impact Assessment for the Proposed KS Learning Community and DHHL Mākaha Residential Community Project Mākaha Ahupuaʻa, Waiʻanae District, Island of Oʻahu TMK: (1) 8-4-002:005, 007, 056, 057, 070, 76; 8-4-023:014, 015;8-4-024:001

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DRAFT

Management Summary

Reference	Cultural Impact Assessment (CIA) for the Proposed KS Learning Community and DHHL Mākaha Residential Community Project, Mākaha Ahupuaʻa, Waiʻanae District, Oʻahu Island (TMK: (1) 8-4-002:005, 007, 056, 057, 070, 76; 8-4-023:014, 015; 8-4-024:001) (Vogeler, O'Hare, Monahan, Uyeoka and Hammatt 2010)
Date	April 2010
Project Number(s)	Cultural Surveys Hawaiʻi (CSH) Job Code: MAKAHA 8
Project Location	The proposed Project is located in lower Mākaha Valley, approximately 1.3 km (0.8 mi.) *mauka* (inland) of the Farrington Highway in Mākaha Ahupuaʻa Waiʻanae District on Oʻahu Island, TMK: TMK: (1) 8-4-002:005, 007, 056, 057, 070, 76; 8-4-023:014, 015; 8-4-024:001. The Project area is depicted on the U.S. Geological Survey 7.5-Minute Series Topographic Map, Waiʻanae Quadrangle (1998) (see Figure 1).
Land Jurisdiction	The Project area is privately owned.
Agencies	State of Hawaiʻi Department of Land and Natural Resources / State Historic Preservation Division (DLNR / SHPD); State Office of Environmental Quality Control (OEQC)
Project Description	The proposed KS Learning Community Project includes development of an approximately 67-acre Kamehameha Schools (KS) learning complex including a preschool, educational learning lab, multimedia center, learning halls, multi-function sports fields and a community gathering area; and an approximately 112-acre Department of Hawaiian Home Lands (DHHL) Mākaha Homestead residential community including up to 600 homes and a community center. The current conceptual plan also includes large expanses of open space that are not proposed for development. Minimally, land disturbing activities associated with the proposed Project would include grubbing and grading; excavations for building foundations and subsurface utilities; and excavations for associated infrastructure improvements.
Project Acreage	Approximately 306 acres
Area of Potential Effect (APE)	The APE includes the approximately 306-acre Project area in Mākaha Ahupuaʻa (land division from upland to the sea), Waiʻanae Moku (District) and other places on Oʻahu and beyond (e.g., Kauaʻi Island) that may be traditionally associated with or currently connected to the Project area.
Document Purpose	The Project requires compliance with the State of Hawaiʻi environmental review process (Hawaiʻi Revised Statutes [HRS] Chapter 343), which requires consideration of a proposed Project's effect on cultural practices and resources. At the request of PBR

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	Hawaii & Associates, Inc. (PBR), CSH is conducting this Draft CIA. Through document research and ongoing cultural consultation efforts, this report provides information pertinent to the assessment of the proposed Project's impacts to cultural practices and resources (per the *Office of Environmental Quality Control's Guidelines for Assessing Cultural Impacts*) which may include Traditional Cultural Properties (TCP) of ongoing cultural significance that may be eligible for inclusion on the State Register of Historic Places, in accordance with Hawai‘i State Historic Preservation Statute (Chapter 6E) guidelines for significance criteria (HAR §13-284) under Criterion E. The document is intended to support the Project's environmental review and may also serve to support the Project's historic preservation review under HRS Chapter 6E-42 and Hawai‘i Administrative Rules (HAR) Chapter 13-284.
Community Consultation	Hawaiian organizations, agencies and community members were contacted in order to identify individuals with cultural expertise and/or knowledge of the Project area and the vicinity. The consulted organizations included the SHPD, the Office of Hawaiian Affairs (OHA), the O‘ahu Island Burial Council (OIBC), and community and cultural organizations including Hui Mālama I Nā Kūpuna O Hawai‘i Nei and the Hawaiian civic clubs.
Results of Background Research	Background research yielded the following results: 1. A wide variety of religious shrines and natural landscape features used for spiritual practices has been documented near the current Project area, including large sacrificial *heiau* (pre-Christian place of worship) dedicated (or re-dedicated) to the war god Kū, agricultural and other fertility shrines dedicated to Lono or Kāne, fishing shrines along the coast such as *ko‘a* or *kū‘ula*, and personal or family "god stones" such as *pōhaku o Kāne*. Two of the largest and most prominent nearby *heiau,* Kāne‘aki and Kamaile, are still largely intact. 2. The proposed Project is located about a mile from a sizeable pre-Contact and early historic village between the proposed Project and Kāne‘aki Heiau, a mile to the north. Another important settlement area was located a short distance to the south, just on the other side of the base of Kamaile Ridge, centered around the famous *pūnāwai* (fresh water spring) known as Keko‘o or Kīko‘o. 3. *Kahuna* (priest, sorcerer, magician, wizard, minister, expert in any profession) dedicated Kawiwi, a mountain between Wai'anae and Mākaha Ahupua‘a, as a refuge during times of war (McAllister 1933). Thus, O‘ahu *kahuna* took refuge in the Wai‘anae Moku after Kamehameha I conquered the island. Pōka‘ī Bay was used as a school administered by exiled

	kahuna who took refuge in Wai‘anae after Kamehameha I gained control of O‘ahu (in Sterling and Summers 1978:68). 4. Historical documents including Land Commission Awards indicate that Mākaha's primary settlement was inland, where waters from Mākaha Stream could support *lo‘i* and sufficient rainfall was available for *kula* (plain, field, pasture) cultivars. 5. Sugarcane cultivation dominated Mākaha Valley by 1923, and little water remained for irrigation of taro *lo‘i*, contributing to the demise of traditional agriculture in Mākaha and displacement of the native population. By the mid-1930s, sugar cultivation in Mākaha Valley diminished, due in part to limited water resources. 6. The Makaha Valley Historical Project (Green 1969, 1970, 1980; Ladd and Yen 1972; Ladd 1973) recorded more than 600 archaeological features in the upper valley and 1,131 features in the lower valley. 7. Donham (1990) conducted an archaeological inventory survey of two discrete parcels for a total of approximately 130 acres in the south-central portion of Mākaha Valley, including portions of the Project area (see Figure 27). In the eastern portion of Donham's survey, a platform was designated site SIHP 50-80-07-875. Donham also recorded a complex (SIHP 50-80-07-4819), possibly a pre-Contact or early post-Contact house site, which was comprised of 10 terraces, seven modified outcrops, two walls, and one platform. 8. CSH conducted an archaeological inventory survey of the KS Learning Community project site in 2009. This archaeological inventory survey identified five historic properties in the project area. SIHP #s 50-80-07-875, -3325, -4818, -7749, and -7750 may be affected by the proposed project. Due to the potential adverse effect on significant historic properties, CSH's project-specific effect recommendation is "effect, with proposed mitigation commitments."
Summary of Consultation Efforts	*Kama‘āina* and *kūpuna* with knowledge of the proposed Project and study area participated in interviews for this CIA. Interviews for this study were conducted in January and March, 2010, and are ongoing. CSH attempted to contact 42 individuals for this CIA (see Table 3). Twenty-eight *kūpuna* (elders) and/or *kama‘āina* (native born) participated in a total of 11 interviews for more in-depth contributions to the CIA. Ten of these interviews were formal interviews. One of these interviews, which included a total of 16 individuals—only some of whom contributed their *mana‘o*—was not a *formal* interview but more accurately an *ad hoc* opportunity to speak with multiple elders simultaneously about the project (see Section 7.7 above). At the

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	present time, 10 of the 11 interviews have been reviewed and approved by the participants for inclusion in this CIA Draft Report; approval for the last interview (with Mr. Fred Cachola) is pending.
Results of Community Consultation	Participants expressed a broad range of comments, and none are against the Project. Individually, four community participants spoke of their excitement about the Project. Others also expressed their desire that this Project succeed. However, the primary concern of the community participants is to encourage KS and DHHL to incorporate Native Hawaiian culture in the development of the project and educational programs. Specifically, these participants want KS and DHHL to consult with community leaders and residents of the Waianae Coast, as well as work with existing educational providers. Community consultation yielded the following recommendations: 1. **Spend Time in Mākaha, Working, Observing and Listening.** Participants explained that cultural education, regarding the Wai‘anae Moku and Mākaha Ahupua‘a, requires a paradigm shift, from seeing the project as a KS and DHHL project placed in Mākaha Ahupua‘a to seeing this Project as cultural education from the people of Mākaha Ahupua‘a and Wai‘anae Moku for KS and DHHL, as well as the students and residents of KS Learning Community. With this cultural shift in mind, the learning process begins now, by participating with the Mākaha community. Participants warned about trying to create a community without having participation from the people of Mākaha Ahupua‘a. The main recommendation from all of the participants is that, before breaking ground, KS and the DHHL should spend time in Mākaha Ahupua‘a observing and learning about the valley, and the history and culture of people who live there. There is a common sentiment among participants that they are not being involved in the project and plans adequately. They perceive that KS has already planned the project even though the community itself has not been consulted or informed of it. Aunty Lucy expressed it as, “Get off the hill and come out here!” Uncle Eric Enos believes that KS should participate in a cultural tour of Mākaha before proceeding with any discussion about KS Learning Community. Puanani Burgess advised, “Don’t start buildings, but start with the stories, and see where the strong, healthy stories are.” Similarly, Uncle Gigi recommends: “Kamehameha Schools should come to Mākaha to listen to the people without having an agenda and then shape their plans around what the community wants.” 2. **Inspire the Community to become involved in the planning process through Non-Traditional Outreach.** Out of the 17

	people that participated in the group interview, only one person, Aunty Alice Greenwood had heard about the KS Learning Community project. This concerned many of them, that they had not been informed by KS or DHHL about this substantial development plan. Aunty Arviella Keli’s suggestion is more specific about how to do this. She recommends, “Someone well-known at Kamehameha Schools should come out here, into the community, to inform us on what their plans are. And it shouldn’t be through [neighborhood board] meetings because people don’t go to meetings. People argue and fight at meetings, and nothing ever gets done, so it should be through other means.” The group interviewed at Leeward Community College in Wai‘anae expressed the notion that “KS needs to do more community outreach through non-traditional means.” Aunty Keala Card recommended that KS should hold a *lū‘au* (feast), or some other type of informal gathering, where there is food and music, and people feel comfortable and get to know each other. Aunty Lucy suggested that KS utilize its network of alumni to get into the community. “Kamehameha Schools can’t be so separated from us; they need to come out here and get to know us.” 3. **Collaborate with a Committee of Dedicated People from Mākaha Area.** Only after working, observing and listening, the community recommends that KS and DHHL should engage the community in discussions about planning the project. Uncle Gigi recommends getting dedicated individuals and groups together to discuss their vision of the future of Mākaha. Eric Enos advises KS and DHHL to consult: William Ailā, Gigi Cocquio, Dalani Tanahy, and Landis Ornellas so they can share their mana‘o (thoughts, beliefs, opinions) and discuss the future of Mākaha as a *hui* (club, association, organization). Uncle Eric is adamant that this has to be a collective effort, not something that is decided by one individual, organization, or institution. 4. **Integrate and Collaborate with Existing Programs that already have experience and community support.** Uncle Eric emphasizes that the learning center needs to be integrated with what already exists in Wai‘anae. For instance, KS can use this new development plan to pull together a network of community groups and individuals who have been successful in carrying out place based education initiatives in Wai‘anae, and further support those programs through additional resources. In addition to recommendations about *how* to go about the

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	process of planning the Project, participants also had specific suggestions for Project activities. 5. **Hire Residents of Wai‘anae Moku (District).** Ms. Salmon notes that there are very few jobs in Mākaha, and she recommends that KS should strive to provide jobs for Mākaha residents at the KS Learning Community. The layoffs from the Maunaolu East Golf Course resulting from the proposed Project concern current employees and their families. Specifically, Mrs. Suckoll and Mrs. Abaro (both faculty at Mākaha Elementary whose husbands currently are employed at the Golf Course but are expecting to lose their jobs) recommend that Mr. Stone work with KS to help find jobs for those affected. 6. **Educate the Whole ‘Ohana (Family).** Mr. Rapoza advises strengthening the physical and educational "infrastructure" in Wai‘anae Moku by expanding the Project focus from "only children" to also include the whole *‘ohana* and the whole *ahupua‘a*. 7. **Consider the relationship of the Homes, Learning Community, and larger community.** Mrs. Burgess explains that, "The homes should be a learning center, and the learning center should be a place where people feel safe and welcome. Whether they are learning things that can be applied back in their home, in their family, in their counties, in their workplace." Integrate the KS Learning Community project with the Mākaha Community. Ka‘iulani Kauihou described the KS Learning Community project as being disconnected from the Mākaha Community: > When I was looking at this map I noticed that the DHHL land is totally surrounding the KS lands, and it kind of gives a feeling of separation between the DHHL community that they're building and the existing community. Also, how it's surrounding the KS project, it's almost like it's their project and I think that's a problem out here when people want to get involved in different programs or organizations but they feel like it belongs to this certain *ahupua‘a* so they don't want to go. And that's kind of the feeling I get by looking at how the map layout is set up. And yet Dalani Tanahy described the KS Learning Community project as "a nice bridge … between the ghetto that is down here and the upscale community that is up in the

	mountains."
Site Specific Impacts	(The following wording in this section has been provided by the client.) Approximately half of the project area consists of one of the two aforementioned golf courses (Makaha East Golf Course), the remainder is not occupied by any residents and is overgrown. The portion along the lower slopes of Kamaile‘unu Ridge) is both steep and overgrown, and shows signs of being used for agriculture. While there are significant cultural resources off-site (Mauna Lahilahi, Kamaile Heiau, Kāne‘aki Heiau), the proposed project is not sited such that it restricts access to these sites or cultural religious practices. There are several individuals, including Eric Enos, Walterbea Aldeguer, Landis Ornellas and Dalani Tanahy that were involved in the restoration of Kāne‘aki Heiau. Landis Ornellas has also served as *kahu* for the Kāne‘aki Heiau for the last 27 years. He is also a member of Hui Mālama o Kāne‘aki, a community group that cares for the heiau. It is reported that *lauae*, *ti* leaf and *kukui* in Mākaha Valley is being gathered by some *hula halau*, but it is unlikely that it is being gathered on the project site. Construction of the proposed project is unlikely to negatively impact any Hawaiian cultural practices that may be occurring on the project site, such as gathering of materials for *lei* making. There are only two native species, *‘ilima* and *‘uhaloa*, that occur in their natural environment, within the project site. Both species are common throughout the region Once in operation, the proposed project is anticipated to have a positive impact on cultural use of the project site. Recognizing that learning does not need to occur under a roof, a majority of the proposed KS Learning Community (roughly 50 acres) is being planned to allow for outdoor learning opportunities. Indigenous and educational gardens are expected to be incorporated within the KS Learning Community so students and the community can learn about, cultivate and gather endemic, Polynesian-introduced and other plants of cultural and economic value to Hawai‘i. CSH believes the cultural practices of Mākaha Valley will be impacted by the construction and implementation of these teaching programs.

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	Subsequent to the completion of the interviews, CSH learned that ultimate plans for the KS Learning Community will be developed after a two-year effort of meeting with many residents and educators who live and work along the Wai‘anae Coast. CSH also learned that over a span of six months (September 2009 to April 2010), KS has briefed more than 35 groups/organizations on the Mākaha KS Learning Community informing/updating more than 900 people. KS acknowledges it has much to learn, not only about the educational needs of Wai‘anae Coast residents, but also about how best to preserve and enhance the cultural resources of Mākaha Valley. DHHL plans to further to refine the sustainable design concepts from its recent Kaupuni subdivision project in Wai‘anae Valley, to its DHHL Residential Community on the project site. This may include aquaponics gardening that was developed for the DHHL Kaupuni project, that included input from Wai‘anae Coast residents such as Eric Enos, to make new DHHL homes not only energy efficient, but provide a level of food security as well.
Overall Recommendations From CSH	Based on the information gathered from the community consultation efforts as well as the archaeological and archival research documented in this report, CSH proposes the following recommendations. The recommendations presented below are suggested to minimize the impact of the proposed Project on Hawaiian historical, natural and cultural resources and practices in and adjacent to Mākaha. A good faith effort to address these recommendations may help mitigate the potentially adverse effects the proposed Project may have on Hawaiian cultural practices, beliefs and resources in and near the Project area. 1. Demonstrate to the Mākaha Community that KS and DHHL understand the cultural significance of Mākaha Ahupua‘a and Waianae Moku. In the interviews, the community expressed in many ways that they feel their *mana‘o* and culture are not valued for the KS Learning Community project. Participants asked KS to spent time in Mākaha; work the land of Mākaha; send important people to Mākaha; hold *lū‘au* in Mākaha; visit the sites in Mākaha; and learn about the culture of Mākaha. People know when they are being valued, and the Mākaha community does not seem to have experienced this with regard to the KS Learning Community Project. 2. Utilize recognized community members, such as those contacted for this study, to create a committee, which will coordinate the cultural development of the KS Learning Community project. Uncle Gigi recommends getting dedicated individuals and groups together to discuss their vision of the future of Mākaha. For the KS Learning Community project to work, KS and DHHL must base the cultural development of

	this project on the people and culture of Mākaha Ahupua‘a and Waia‘nae Moku. This Project must be an integral part of the Mākaha community, not a separate community within the Mākaha Ahupua‘a. 3. Learn about cultural sites in Mākaha and integrate knowledge of these sites with the instruction at the learning center. One community participant is concerned that construction and its accompanying large equipment can endanger cultural resources. If the sites are part of the learning experience, then they will be protected. Moreover, especially with early settlements and trails near the Project area, personnel involved in development activities in the Project area should be informed of the possibility of inadvertent cultural finds, including human remains. Should cultural or burial sites be identified during ground disturbance, all work should immediately cease, and the appropriate agencies notified pursuant to applicable law.

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Section 1 Introduction

1.1 Project Background

At the request of PBR Hawaii & Associates, Inc. (PBR), Cultural Surveys Hawai‘i, Inc. (CSH) conducted a Cultural Impact Assessment (CIA) for the KS Learning Community and DHHL Mākaha Residential Community Project. The proposed Project consists of development of a Kamehameha Schools (KS) Learning Community and a Department of Hawaiian Home Lands (DHHL) residential community in Mākaha Ahupua‘a, Wai‘anae District, on the island of O‘ahu (TMK: (1) 8-4-002:005, 007, 056, 057, 070, 76; 8-4-023:014, 015; 8-4-024:001) (TMK:[1] 8-4-002:005, 007, 056, 057, 070; 8-4-023:014, 015; 8-4-024:001) (Figure 1 to Figure 4).

The approximately 306-acre Project area is located in the lower, eastern portion of Mākaha Valley, approximately 1.3 km (0.8 mi.) *mauka* (inland) of the Farrington Highway, as depicted on the U.S. Geological Survey 7.5-Minute Series Topographic Map, Wai‘anae Quadrangle (1998) (see Figure 1). The Project area consists of lands at the base of the valley, including the Makaha Country Club and Golf Course, and lands along the lower slopes of the Kamaile‘unu Ridge. The Project area is privately owned by Ko Olina Makaha East, LLC / Honolulu Limited.

The proposed KS Learning Community Project includes development of an approximately 70-acre KS Learning Community and an approximately 118-acre DHHL Mākaha Homestead residential community. The KS Learning Community is currently envisioned as including a preschool, educational learning lab, multimedia center, learning halls, multi-function sports fields and community gathering area. The DHHL Mākaha Residential Community is currently envisioned as including up to 600 homes and a community center.

The current conceptual plan also includes large expanses of open space that are not proposed for development. Minimally, land disturbing activities associated with the proposed Project would include the following: grubbing and grading; excavations for building foundations and subsurface utilities; and excavations for associated infrastructure improvements.

The Project’s area of potential effects (APE) is defined as the entire 306-acre Project area, within the larger context of Mākaha Ahupua‘a. The APE also includes the Project area’s relationship with the rest of the *moku* (district) of Wai‘anae, the island of O‘ahu, and other islands, as these relate to Hawaiian beliefs (e.g., *mo‘olelo*, or oral-historical accounts, and *wahi pana*, or legendary places), resources and practices.

1.2 Document Purpose

The Project requires compliance with the State of Hawai‘i environmental review process (Hawai‘i Revised Statutes [HRS] Chapter 343), which requires consideration of a proposed Project’s effect on cultural practices. CSH is conducting this CIA at the request of PBR. Through document research and ongoing cultural consultation efforts this draft report provides information pertinent to the assessment of the proposed Project’s impacts to cultural practices and resources (per the *Office of Environmental Quality Control’s Guidelines for Assessing Cultural Impacts*), which may include Traditional Cultural Properties (TCP) of ongoing cultural

significance that may be eligible for inclusion on the State Register of Historic Places, in accordance with Hawai‘i State Historic Preservation Statute (Chapter 6E) guidelines for significance criteria (HAR §13–284–6) under Criterion E which states to be significant an historic property shall:

> Have an important value to the Native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group’s history and cultural identity.

The document is intended to support the Project’s environmental review and may also serve to support the Project’s historic preservation review under HRS Chapter 6E–42 and Hawai‘i Administrative Rules Chapter 13–284.

1.3 Scope of Work

The scope of work for this CIA includes:

1. Examination of cultural and historical resources, including Land Commission documents, historic maps, and previous research reports, with the specific purpose of identifying traditional Hawaiian activities including gathering of plant, animal, and other resources or agricultural pursuits as may be indicated in the historic record.
2. Review of previous archaeological work at and near the subject parcel that may be relevant to reconstructions of traditional land use activities; and to the identification and description of cultural resources, practices, and beliefs associated with the parcel.
3. Consultation and interviews with knowledgeable parties regarding cultural and natural resources and practices at or near the parcel; present and past uses of the parcel; and/or other practices, uses, or traditions associated with the parcel and environs.
4. Preparation of a report that summarizes the results of these research activities and provides recommendations based on findings.

1.4 Environmental Setting

1.4.1 Natural Environment

The Project area is located on the eastern side of the lower portion of Mākaha Valley on the leeward side of the Wai‘anae Mountains less than one mile inland from the seashore. The eastern portion of the Project area consists of the base of the steep slope leading up to Kamaile‘unu Ridge, which divides Mākaha Valley and Ahupua‘a from Wai‘anae Valley and Ahupua‘a to the southeast. Most of the terrain within the Project area is a relatively level or gently sloping alluvial terrace. Moderate to steep sloping terrain exists immediately to the east of the Project area (Juvik and Juvik 1998).

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Elevation in the Project area varies from approximately 80 feet (ft.) (24.4 meters [m]) above mean annual sea level (amsl) in the southwest to 400 ft. (121.9 m) amsl in the northeast and east. The Project area receives an average of approximately 800–1000 millimeters (31–39 inches) of annual rainfall (Giambelluca et al. 1986). The valley's primary drainage, known as Mākaha Stream, is located outside of the Project area approximately one-third of a mile to the west-northwest; this perennial stream in traditional times was used to irrigate *lo‘i* (pondfield garden plots) in the upper reaches of the valley well *mauka* of the Project area. Another stream, known as ‘Eku or Keaupuni Stream, once flowed through the east-southeastern portion of the Project area, near the base of the slope leading up to Kamaile‘unu Ridge, and emptying into the sea near Mauna Lahilahi. This drainage is now a dry gully, and several water-retention reservoirs are located within and immediately west-northwest of the Project area.

Soils within the Project area consist of Ewa Stony Silty Clay, 0–2 % slopes (EwB), Ewa Stony Silty Clay, 2–6 % slopes (EwA), Lualualei Stony Clay, 2–6 % slopes (LvB), Lualualei Extremely Stony Clay, 3–35 % slopes (LPE), and Stony Land (rST) (Figure 4). The Ewa series consists of deep, well-drained soils that formed in alluvium weathered from basaltic rock, and which washed down from the adjacent uplands. These soils are used for irrigated sugarcane and pasture. Commonly-occurring vegetation in these soils includes *kiawe* (*Prosopis* spp.), *koa haole* (*Leucaena leucocephala*), *klu* (*Acacia farnesiana*), finger grass (*Chloris* spp.), and bristly foxtail (*Setaria verticillata*). The Lualualei series consists of deep, well-drained soils that formed in alluvium and colluvium from basalt and volcanic ash. These soils are primarily used for pasture or for urban and military use. Commonly-occurring vegetation in these soils includes *kiawe*, *koa haole*, *klu*, *fingergrass*, and lantana (*Lantana camara*). Stony Land (rST) is found in valleys and on the side slopes of drainage ways in O‘ahu. The land consists of a mass of boulders and stones deposited by water and gravity on slopes from 5 to 40 percent. The stones and boulders cover 15 to 30 percent of the ground surface. Commonly-occurring vegetation in these soils includes *kiawe*, *koa haole*, lantana, bermudagrass, and annuals (Foote et al. 1972).

1.4.2 Built Environment

Approximately half of the Project area is undeveloped, while the other half contains portions of the Makaha Country Club and Golf Course. The Mākaha Valley Road, which leads up to the restored Kāne‘aki Heiau *mauka* of the Project area, crosses a portion of the southwestern corner of the Project area and forms much of its western boundary. Other elements of the built environment include several water-retention and storage features and older, abandoned irrigation infrastructure. The residential community of Mākaha is located immediately south-southwest of the Project area.

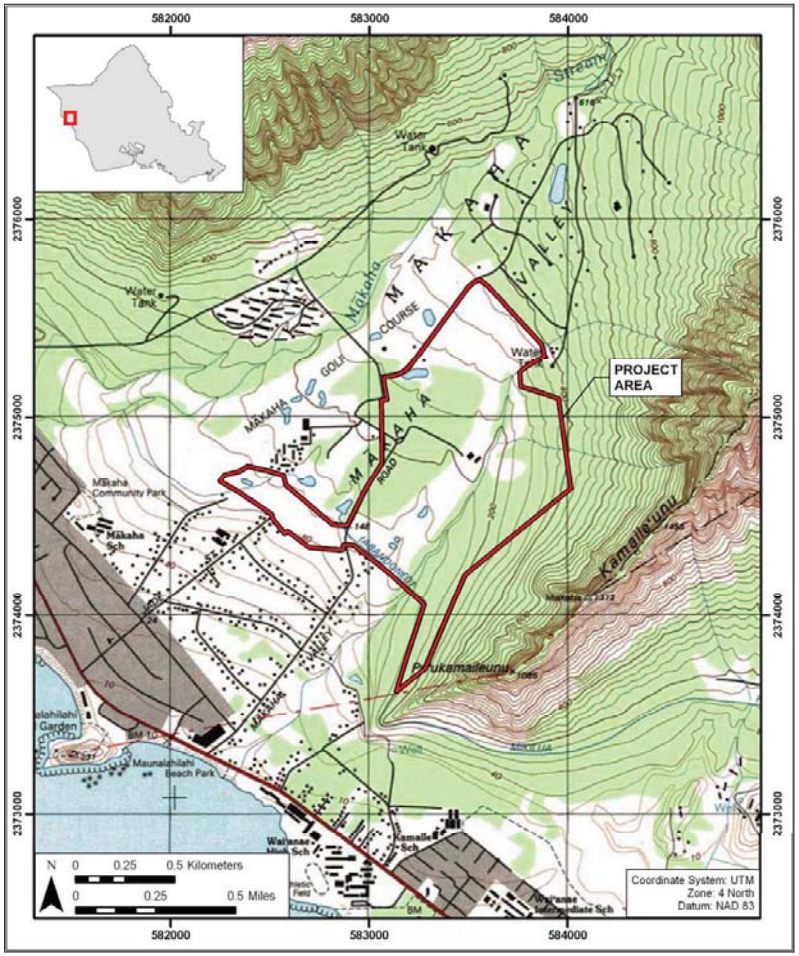

Figure 1. U.S. Geological Survey 7.5-Minute Series Topographic Map, Wai‘anae Quadrangle (1998), showing the location of the Project area

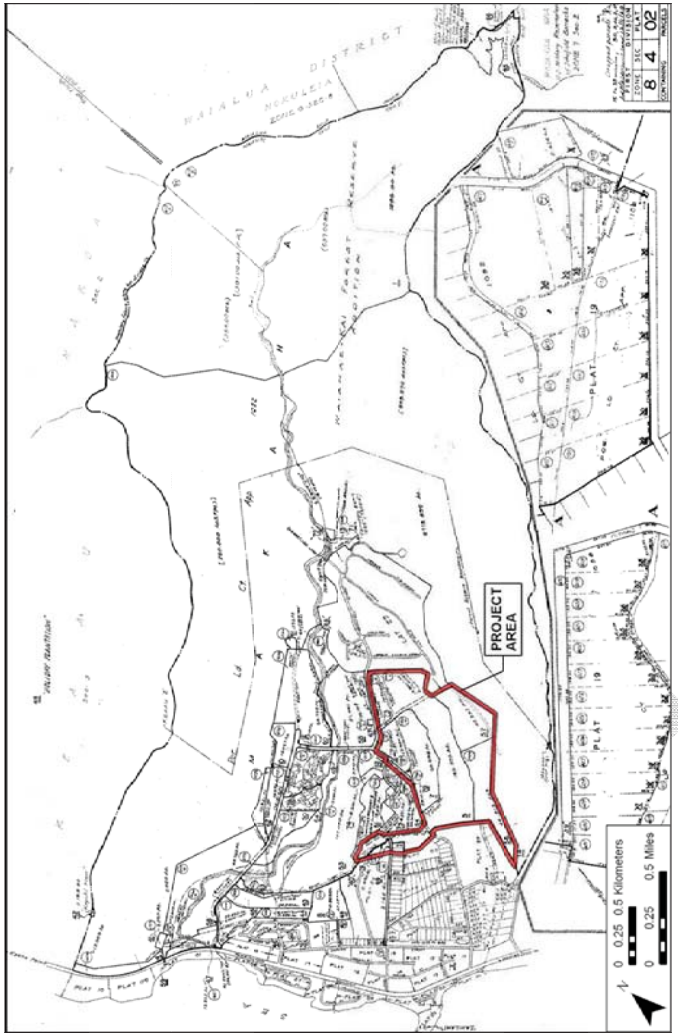

Figure 2. Tax Map Key (TMK) [1] 8-4-002, island of O'ahu, showing Project area

Figure 3. Aerial photograph (source: U.S. Geological Survey Orthoimagery 2005), showing the location of the Project area

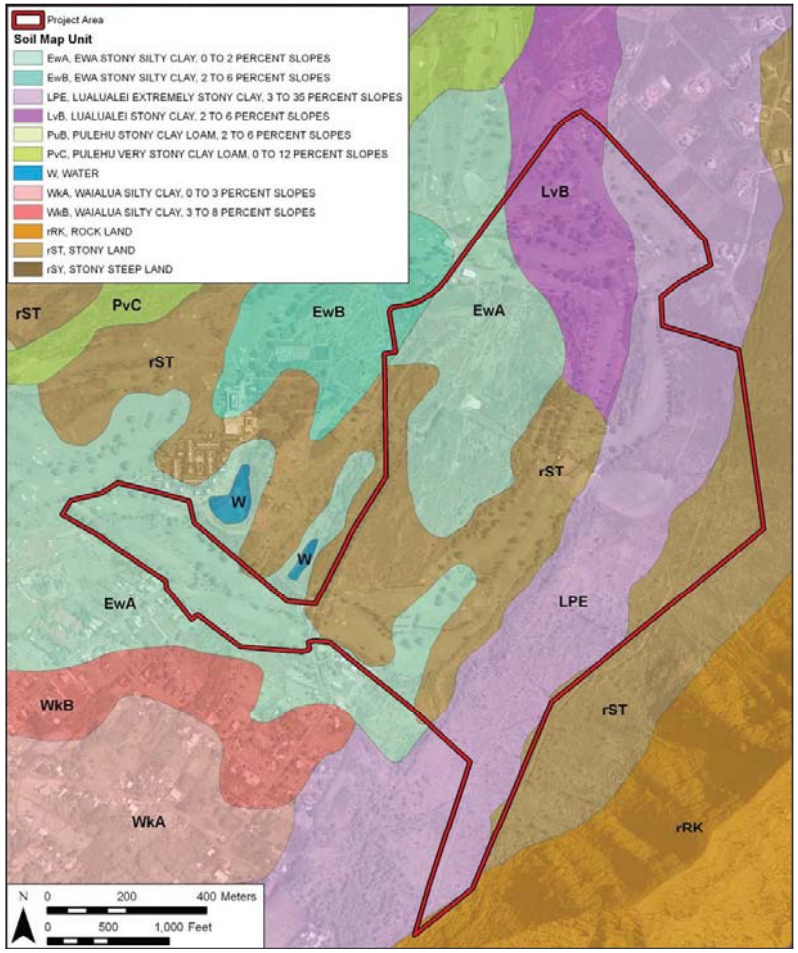

Figure 4. U.S. Geological Survey 7.5 Minute Series topographic map, Wai‘anae Quadrangle (1998), showing soils in relation to Project location (soil map from Foote et al. 1972)

Section 2 Methods

2.1 Archival Research

Historical documents, maps and existing archaeological information pertaining to Mākaha Ahupua‘a, Wai‘anae Moku and the Project area vicinity were researched at the CSH library and other archives including the University of Hawai‘i at Mānoa’s Hamilton Library, the State Historic Preservation Division (SHPD) library, the Hawai‘i State Archives, the State Land Survey Division, and the archives of the Bishop Museum. Previous archaeological reports for the area were reviewed, as were historic maps and photographs and primary and secondary historical sources. Information on Land Commission Awards (LCAs) was accessed through Waihona ‘Aina Corporation’s Māhele Data Base (www.waihona.com) as well as a selection of CSH library references.

The definitive source for Hawaiian place names is Pukui et al.’s (1974) *Place Names of Hawai‘i*, but additional place-name translations and interpretations were also gleaned from Soehren’s “Hawaiian Place Names” database on the internet (http//www.ulukau.org), historical maps, Land Commission documents available at the Hawai‘i State Archives or on the internet at http://waihona.com, and from other place-name texts such as Clark (1977) and Thrum (1922). Prominent place names of Mākaha—discussed in the next section—were gathered from the following sources: 1998 U.S. Geological Survey 7.5-Minute Series Topographic Map, Wai‘anae Quadrangle; a map of coastal place names in Clark (1977:90); a map drawn for the Makaha Valley Historical Project (Green 1980:22); an 1860 map by J. W. Makalena of Kea‘au (State Land Survey Division, Registered Map No. 95); and an undated (ca. 1875–1900) map of Wai‘anae by M. D. Monsarrat (State Land Survey Division, Registered Map No. 600).

For cultural studies, research for the Traditional Background section centered on Hawaiian activities including: religious and ceremonial knowledge and practices; traditional subsistence land use and settlement patterns; gathering practices and agricultural pursuits; as well as Hawaiian place names and *mo‘olelo*, *mele* (songs), *oli* (chants), *‘ōlelo no‘eau* (proverbs) and more. For the Historic Background section research focused on land transformation, development and population changes beginning in the early post–European Contact era to the present day (see Scope of Work above).

2.2 Community Consultation

2.2.1 Sampling and Recruitment

A combination of qualitative methods, including purposive, snowball, and expert (or judgment) sampling, were used to identify and invite potential participants to the study. These methods are used for intensive case studies, such as CIAs, to recruit people that are hard to identify, or are members of elite groups (Bernard 2006:190). Our purpose is not to establish a representative or random sample. It is to “identify specific groups of people who either possess characteristics or live in circumstances relevant to the social phenomenon being studied….This approach to sampling allows the researcher deliberately to include a wide range of types of

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informants and also to select key informants with access to important sources of knowledge" (Mays and Pope 1995:110).

We began with purposive sampling informed by referrals from known specialists and relevant agencies. For example, we contacted the SHPD, Office of Hawaiian Affairs, O‘ahu Island Burial Council (OIBC), and community and cultural organizations in Mākaha and Wai‘anae for their brief response/review of the Project and to identify potentially knowledgeable individuals with cultural expertise and/or knowledge of the Project area and vicinity, cultural and lineal descendants, and other appropriate community representatives and members. Based on their in-depth knowledge and experiences, these key respondents then referred CSH to additional potential participants who were added to the pool of invited participants. This is snowball sampling, a chain referral method that entails asking a few key individuals (including agency and organization representatives) to provide their comments and referrals to other locally recognized experts or stakeholders who would be likely candidates for the study (Bernard 2006:192). CSH also employs expert or judgment sampling which involves assembling a group of people with recognized experience and expertise in a specific area (Bernard 2006:189–191). CSH maintains a database that draws on over two decades of established relationships with community consultants: cultural practitioners and specialists, community representatives and cultural and lineal descendants. The names of new potential contacts were also provided by colleagues at CSH and from the researchers' familiarity with people who live in or around the study area. Researchers often attend public forums (e.g., Neighborhood Board, Burial Council and Civic Club meetings) in (or near) the study area to scope for participants. Please refer to Table 3, Section 6, for a complete list of individuals and organizations contacted for this CIA.

CSH focuses on obtaining in-depth information with a high level of validity from a targeted group of relevant stakeholders and local experts. Our qualitative methods do not aim to survey an entire population or subgroup. A depth of understanding about complex issues cannot be gained through comprehensive surveying. Our qualitative methodologies do not include quantitative (statistical) analyses, yet they are recognized as rigorous and thorough. Bernard (2006:25) describes the qualitative methods as "a kind of measurement, an integral part of the complex whole that comprises scientific research." Depending on the size and complexity of the Project, CSH reports include in-depth contributions from about one-third of all participating respondents. Typically this means three to twelve interviews.

2.2.2 Informed Consent Protocol

An informed consent process was conducted as follows: (1) before beginning the interview the CSH researcher explained to the participant how the consent process works, the Project purpose, the intent of the study and how his/her information will be used; (2) the researcher gave him/her a copy of the Authorization and Release Form to read and sign (Appendix C); (3) if the person agreed to participate by way of signing the consent form *or* by providing oral consent, the researcher started the interview (see interview questions in Appendix B); (4) the interviewee received a copy of the Authorization and Release Form for his/her records, while the original is stored at CSH; (5) after the interview was summarized at CSH (and possibly transcribed in full), the study participant was afforded an opportunity to review the interview notes (or transcription) and summary and to make any corrections, deletions or additions to the substance of their testimony/oral history interview; this was accomplished primarily via phone, post or email

follow-up and secondarily by in-person visits; (6) participants received the final approved interview, photographs and the audio-recording and/or transcripts their interview if it was recorded. They were also given information on how to view the draft report on the OEQC website and offered a hardcopy of the report once the report is a public document.

If an interviewee agreed to participate on the condition that his/her name be withheld, procedures were taken to protect his/her confidentiality (see Protection of Sensitive Information below).

2.2.3 Interview Techniques

To assist in discussion of natural and cultural resources and cultural practices specific to the study area, CSH initiated semi–structured interviews (as described by Bernard 2006) asking questions from the following broad categories: gathering practices and *mauka* (upland, mountain) and *makai* (lowland, ocean) resources, burials, trails, historic properties and *wahi pana* (storied place/s). The interview protocol is tailored to the specific natural and cultural features of the landscape in the study area identified through archival research and community consultation. These interviews and oral histories supplement and provide depth to consultations from government agencies and community organizations that may provide brief responses, reviews and/or referrals gathered via phone, email and occasionally face-to-face commentary.

2.2.3.1 In-depth Interviews and Oral Histories

Interviews were conducted initially at a place of the study participant's choosing (usually at the participant's home or at a public meeting place) and/or—whenever feasible—during site visits to the Project area. Generally, CSH's preference is to interview a participant individually or in small groups (two–four); occasionally participants are interviewed in focus groups (six–eight). Following the consent protocol outlined above, interviews may be recorded on tape or a digital audio device and in handwritten notes, and the participant photographed. The interview typically lasts one to four hours, and records the "who, what, when and where" of the interview. In addition to questions outlined above, the interviewee is asked to provide biographical information (e.g., connection to the study area, genealogy, professional and volunteer affiliations, etc.).

2.2.3.2 Field Interviews

Field interviews are conducted with individuals or in focus groups comprised of *kūpuna* (elders) and *kama‘āina* (native born) who have a similar experience or background (e.g., the members of an area club, elders, fishermen, *hula* dancers) who are physically able and interested in visiting the Project area. In some cases, field visits are preceded by an off-site interview to gather basic biographical, affiliation and other information about the participant. Initially, CSH researchers try to visit the Project area to become familiar with the land and recognized (or potential) cultural places and historic properties in preparation for field interviews. All field activities are performed in a manner so as to minimize impact to the natural and cultural environment in the Project area. Where appropriate, Hawaiian protocol may be used before going on to the study area and may include the offering of *ho‘okupu* (offering, gift), *pule* and *oli*. All participants on field visits are asked to respect the integrity of natural and cultural features of the landscape and not remove any cultural artifacts or other resources from the area.

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Building on open-ended and semi-structured approaches, field interviews included the structured methods enumerated in the above section. In some cases, participants may create a community resource map by surveying the Project area with the researcher/s in order to identify significant cultural and natural features of the landscape. If the participant was comfortable sharing the location of resources; they were geo-referenced using GPS and included on the cultural resource map. If the participant preferred to keep the location private or to only identify its general location, the specific location was *not* recorded.

2.2.4 Protection of Sensitive Information

It is sometimes the case that participants in cultural studies agree to contribute their comments or be interviewed for a study on the condition that their names are withheld from the report. Their reasons for doing so vary from concern about protecting the identity of resource collectors and/or revealing the precise location of certain natural and cultural resources to opposition to the proposed Project. For the interviewee who agrees to participate on the condition that his/her name is withheld from public disclosure, CSH takes all precautions to make sure his/her contribution remains confidential. The confidentiality of subjects is maintained via protected files. For this reason, CIA reports sometimes include a subsection of Summaries of Kama‘āina “Talk-Story” Interviews entitled, Additional Statements.

2.3 Compensation and Contributions to Community

Many individuals and communities have generously worked with CSH over the years to identify and document the rich natural and cultural resources of these islands for cultural impact, ethno–historical and, more recently, TCP studies. CSH makes every effort to provide some form of compensation to individuals and communities who contribute to cultural studies. This is done in a variety of ways: individual interview participants are compensated for their time in the form of a small honorarium and/or other *makana* (gift); community organization representatives (who may not be allowed to receive a gift) are asked if they would like a donation to a Hawaiian charter school or nonprofit of their choice to be made anonymously or in the name of the individual or organization participating in the study; contributors are provided their transcripts, interview summaries, photographs and—when possible—a copy of the CIA report; CSH is working to identify a public repository for all cultural studies that will allow easy access to current and past reports; CSH staff do volunteer work for community initiatives that serve to preserve and protect historic and cultural resources (for example in, Lāna‘i and Kaho‘olawe). Generally our goal is to provide educational opportunities to students through internships, share our knowledge of historic preservation and cultural resources and the State and Federal laws that guide the historic preservation process, and through involvement in an ongoing working group of public and private stakeholders collaborating to improve and strengthen the Chapter 343 environmental review process.

Section 3 Traditional Background

3.1 Overview

Wai‘anae Moku (District), in general, and Mākaha Ahupua‘a, in particular, are frequently portrayed in historical and archaeological reports as “barren,” “dry,” “desolate” and many other negative adjectives that stress the relative impoverishment of the area. Likewise, the people who lived and live in Wai‘anae and Mākaha are often referred to, even by some other Hawaiians and in some oral-historical traditions and accounts from the nineteenth and twentieth centuries, as “robbers” or “cannibals” or fierce outlaws living outside the bounds of civilized society, be it Hawaiian or otherwise.

One of the objectives of this section is to bring a sense of balance to the typical characterization of Mākaha and its environs as a culturally or economically deficient place. For example, as discussed below in Section 3.4 (Settlement and Subsistence), it is clear that the entire valley was utilized and intensively modified by Native Hawaiians starting at least several centuries ago. Inland and upland portions of the Project area are located near a pre-Contact and early historic-era settlement area centered around Mākaha Stream. Another important settlement area was located just south and southeast of the lower-elevation portions of the Project area at the base of Kamaile Ridge. Thus, far from being an arid wasteland, the proposed Project area was sandwiched between two well-known population centers that were each home to several hundreds if not more people in traditional times. The waters of both Mākaha Stream and Keko‘o (or Kīko‘o) Spring at Kamaile were highly valued and carefully managed resources that supported relatively extensive irrigated pondfield cultivation of *kalo* (taro) north and south of the Project area. In addition to the large, well-known *heiau* just north (Kāne‘aki Heiau) and just southeast (Kamaile Heiau), many other religious shrines and temples of varying sizes and character were once located within and near the Project area.

3.2 Place Names

The following discussion dealing with place names and their meanings is organized according to proximity to the proposed Project area, starting with the closest places and names (Figure 5).

In general, Hawaiian place names convey a wide variety of information about the relationships between people, landscapes and other natural and cultural resources. Place names may also express cultural, historical and / or spiritual values and concepts important to Hawaiian world views. It is common for places and landscape features to have multiple names, some of which may only be known to certain *‘ohana* (families) or even certain individuals within *‘ohana*, and many of which have been lost, forgotten and/or kept secret through time. Place names may also convey *kaona* (hidden meanings) and/or *huna* (secret) information that may even have political or subversive undertones. This is especially true in Wai‘anae Moku, as described below, where alternative names for important cultural sites, such as *heiau* (traditional shrines or temples), are quite common.

In traditional times, when cultural information was exclusively preserved and perpetuated orally—rather than in writing—Hawaiians gave names to literally everything in their

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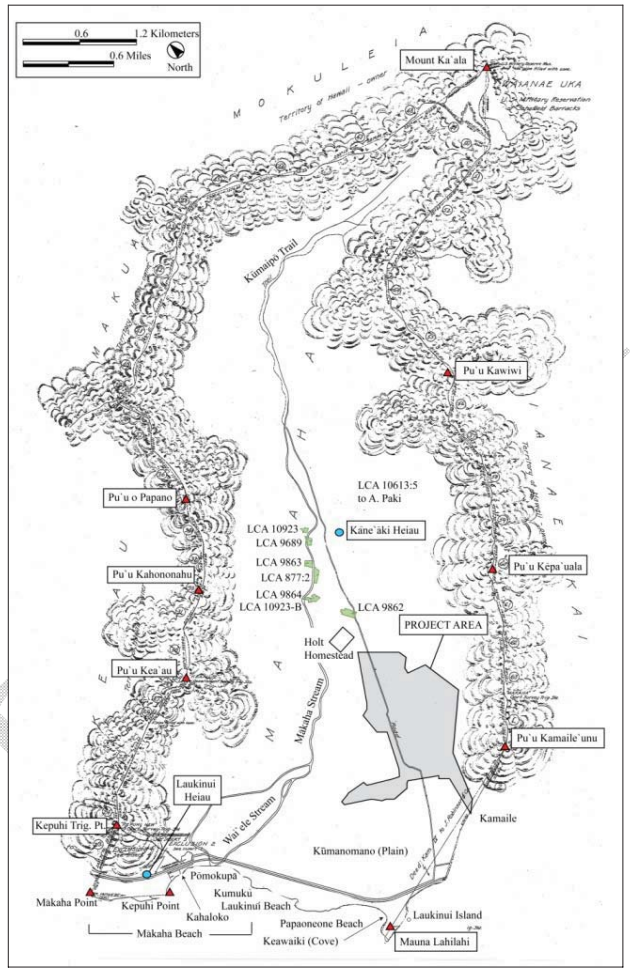

Figure 5. 1932 map of Waianae Sugar Company lands in Mākaha (State Land Survey Divison, Land Court Application 1052), with some place names added

environment, including individual garden plots and *‘auwai* (irrigation ditches), intangible phenomena such as meteorological and atmospheric effects (e.g., the famous Kaiaulu wind of Wai‘anae), *pōhaku* (rocks), *pūnāwai* (fresh-water springs), and many others (cf. Handy and Handy 1972; Pukui et al. 1974; Pukui 1983; Sterling and Summers 1978).

There are different interpretations of **Mākaha**, which Pukui et al. (1974:139) translate as “fierce” in reference to the inhabitants of the land. Alexander (1902, in Sterling and Summers 1978:60) interprets Mākaha as “robbery,” in reference to a well-known story about so-called cannibal robbers who threatened travelers on the coastal trail through Wai‘anae Moku. Mākaha is commonly referred to in writings from the nineteenth and early twentieth century as the “valley of robbery.”

Some older families from Wai‘anae Moku believe these negative interpretations of the meaning of the place name Mākaha, and of the inhabitants of Mākaha as robbers (or cannibal robbers) waiting to ambush travelers along the coastal road, are pure propaganda intended to discredit the old O‘ahu natives for whom Wai‘anae was and remains a stronghold of residency and/or to rationalize their disenfranchisement (Monahan and Silva 2007).

In earlier historic times, there was a second stream channel (now a dry gully) traversing the current Project area along the northern side of the base of Kamaile‘unu Ridge. This stream may have been called **‘Eku**, which Clark (1977) interprets as “to root, as does a pig.” A knowledgeable resident of the area in the early twentieth century, the well-known cultural “informant” Harry G. Poe, Sr., once wrote, “Eku Stream, now called **Ke-aupuni** Stream. At its mouth in the sea is **Kau-puni**. It [Ke-aupuni] runs from Kāne-wai Mountain to the shore of Honus [?]” (Poe n.d. 3). This stream drained into a swampy area on the Kamaile shore in Wai‘anae Ahupua‘a, in the area now known as Mauna Lahilahi Beach Park. Mr. Poe’s use of the name **Kāne-wai** (“water of the god Kāne” or “the god Kāne’s water”) for one of the peaks of the Wai‘anae Mountains is interesting. Also, Ke-aupuni is not defined in any place name source, however, one of its literal definitions would be something like “the government” or “the kingdom” (Pukui and Elbert 1986).

The mountain ridge known as **Kamaile** (literally “the *maile* vine”), which forms part of the southeastern portion of the Project area, separates the valleys and *ahupua‘a* of Mākaha and Wai‘anae. Kamaile is also the name of a large well-known (and still standing) *heiau* along this ridge and an old village at the base of the ridge centered around a famous *pūnāwai* (fresh-water spring). The ridge separating Mākaha from Wai‘anae is also sometimes known as **Kamaileunu** or **Kamaile‘unu** (literally “the striped *maile* vine”), with the highest point of the ridge called **Pu‘u Kamaile**. There is some *kaona* associated with this place name. According to Pukui and Elbert (1986), one of the meanings of the word *unu* is ‘altar’ or ‘*heiau*,’ and some old Wai‘anae families associate this particular ridge, *pu‘u* (peak) and *heiau* with the O‘ahu and Wai‘anae warriors that were sacrificed by the victorious armies of King Kamehameha I in the early nineteenth century (Monahan and Silva 2007). Further inland and higher in elevation along this ridge, there are two other named *pu‘u*: **Pu‘u Kēpa‘uala** (“red gum hill”; Soehren 2009) and **Pu‘u Kawiwi**, also known as “the fortress” because of the famous war stories associated with it. The northern, *mauka* point of Mākaha is at Mount **Ka‘ala**, the highest peak on O‘ahu, which may be interpreted as “laughter” (Thrum 1922:635), “fragrance” (Sterling and Summers 1978:68), or possibly “the path” or “the way” (*ka* meaning “the,” and *ala* meaning “way” or “path”).

Kūmanomano (“stand in greatness,” Kelsey n.d.:2), also known as **Ke Kula o Kūmanomano,** is an old name for the flat plain stretching inland from the Mākaha shoreline area to Kamaile and just southwest of the current Project area. An 1889 visitor to Mākaha noted:

> We rode to the plain of Kumanomano…and it is said of the place, the teeth of the sun is sharp at Kumanomano. Makaha rose above like a rain cloud. We passed in front of a famous hill Malolokai. We saw the talking stone standing there. (Haleiwa Hotele [sic], *Kuokoa*, August 11, 1899, cited in Sterling and Summers 1978:79)

According to Pukui et al. (1974), **Kāne‘aki** (also spelled **Kāne‘akī** in many other sources), the large restored *heiau* just north of the Project area, translates as “hair-switch Kāne” (as in “the whip of Kāne”).

The southern boundary of Mākaha Ahupua‘a is dominated by the promontory called **Mauna Lahilahi** (literally “thin mountain”) (Figure 6). The division between Mākaha and Wai‘anae Ahupua‘a runs along the center of the promontory. Pukui (cited in Sterling and Summers 1978:77) says of the feature: “This hill is very thin [in profile] as though it had been sliced with a knife and so it was called Mauna Lahilahi.” Offshore from Mauna Lahilahi (on the Wai‘anae side) is a small islet today known as Shark Island (Anonymous 1986:6) (Figure 7). According to one resident of the area in the 1950s, an older name for the island is **Laukinui,** which translates as “large united family.” The island was known as the mother of the family, the reefs “following [the] shore line in scallops known as children” (Tutu Ana Kahawai, November 1954, Waianae, cited in Sterling and Summers 1978:77). Pukui (cited in Sterling and Summers 1978:77) indicates the name of the islet was **Lau-kia-nui**, meaning “large concentration.” Others says its name is Oha Po‘e (cf. Monahan and Silva 2007).

At the coast, the division between the *ahupua‘a* of Mākaha and Kea‘au is at **Ka Lae o Mākaha**, or **Mākaha Point**. The area, noted for a rocky, raised reef good for pole fishermen, was also called “Takato” in the historic period, probably named for a resident or fisherman (Clark 1977:94). Another point located immediately south of Mākaha Point, is known as **Kepuhi Point** (or **Ka Lae o Kepuhi**). The word *kepuhi* translates as “to blow,” and Kepuhi Point was probably named for the numerous “blow holes” found along the reef in this area (Clark 1977:93). Pu‘u Kepuhi is known as a “Guard’s Peak” (Poe, to Kekahuna n.d.:1), which may refer to a legend of robbers in Mākaha who watched from the ridge for unwary travelers or to local *kai‘a* (guardians or watchmen) of Wai‘anae who guarded against invaders from afar. The legendary cave known as **Malolokai** (“low tide”) purportedly used by robbers is located along the *makai* end of Kepuhi Ridge, although McAllister (1933:121) placed Malolokai Cave near Mākaha Point. Above the coastal trail that leads from Mākaha to Kea‘au are two *pōhaku*: **Pōhaku o Kanaloa** (“stone of the god Kanaloa”) on the Kea‘au side and **Pōhaku o Kāne** (“stone of the god Kāne”) on the Mākaha side (McAllister 1933:121–122; Site 174). According to Clark (1977:94), the stone on the Mākaha side is also called **Pāpale o Kāne**, the “hat of Kāne.” Regardless of its specific name, this prominent Kāne stone, in particular, is widely-known in Wai‘anae and is still recognized and frequented by many (Figure 8).

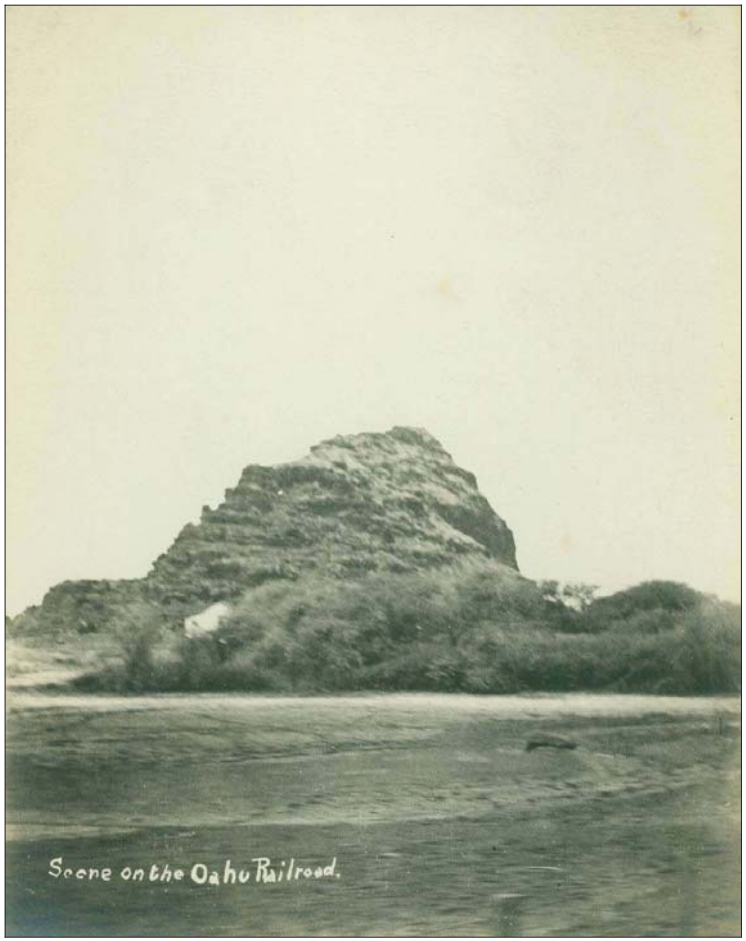

Figure 6. Mauna Lahilahi in 1902, photographed from the OR&L railroad (source: Bernice P. Bishop Museum Archives), facing (approximate) southwest

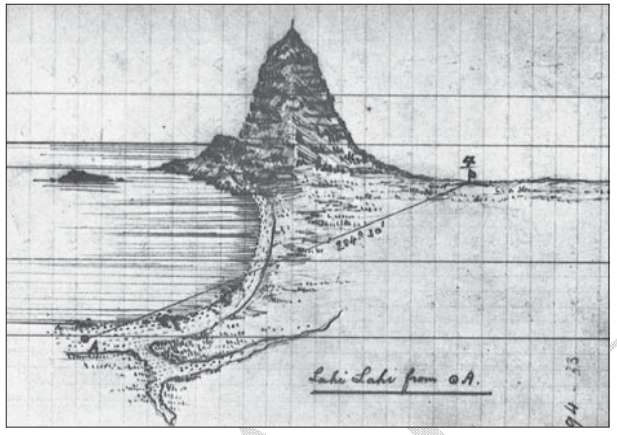

Figure 7. 1884 sketch of Mauna Lahilahi from Kamaile by George Jackson during his survey of the Wai‘anae coast (Jackson notebook)

Figure 8. Pōhaku o Kāne (center of photograph), Mākaha Kai, facing northeast (from Monahan and Silva 2007)

East of Kepuhi Ridge, near the intersection of Lawa‘i‘a Street and Farrington Highway, is a *pōhaku* called **Pōhaku o Kīkēkē** (“clapping” or “knocking” rock). According to Clark (1977:94), if a person stands four or five feet away from the rock and claps his/her hands, it produces an echo of the sound. Many long-time residents of Wai‘anae believe there is a hollow area below the *pōhaku*, perhaps a lava tube, which creates the unusual sound. A long-time resident called the rock **Pōhaku Pa‘ipa‘i** (“clapping stone”), where “a person would hide under this stone and slap it to attract attention” (Poe, to Kekahuna n.d.:2).

McAllister (1933:121) described a large rock (Site 173) “once an object of worship” according to an 1839 visitor. He places it east of Malolokai Cave, suggesting the *pōhaku* associated with the robbers and the “clapping rock” are different stones. Others seem to suggest the two stones are the same. A note in an 1899 Hawaiian language newspaper describes Malolokai as: “A famous hill at which there is a talking stone” (*Kuokoa*, August 11, 1988, p. 4, cited in Sterling and Summers 1978:79).

South of Kepuhi Ridge is a beach once called **Kahaloko** (Poe n.d.:2) or “pond place” (Pukui and Elbert 1986). Clark (1977:92) says it was called **Mākāhā** (“sluice gate”). The inland pond was later filled in during construction of the O‘ahu Railway and Land Company (OR&L) railroad, but its outline and basic morphology are still visible today (Figure 9). There was once a small settlement near the beach, which can be seen as a coconut grove on a drawing by Bingham in 1826. ‘Ī‘ī (1959:98) mentioned the settlement as being adjacent to the coastal trail: “There were many houses at Makaha, where a fine circle of sand provided a landing place for fleets of fishing canoes.” South of the mouth of Wai‘ele Stream, the beach was known as **Pōmokupā,** and the rocky area south of the beach was called **Kumukū**. Clark (1977:204) suggests Kumukū may translate as “school of red goatfish.” Today the entire coastal area from Kahaloko to Kumukū is known as Mākaha Beach, or Mākaha Surfing Beach, famous for surfing contests.

Laukīnui Beach extends south of Kumukū around a point known as Laukīnui, or “large *kī* leaf.” The *ti* (*Cordyline fruticosa*) leaf, *lau kī*, was worn around the neck, especially by *kahuna* (traditional priests or ritual specialists), as a charm against evil spirits. There was once a *heiau* called **Laukīnui** in this area (McAllister’s Site 174). The Holt family, who owned most of Mākaha in historic times, used this coastal area to pasture cows, and thus it was referred to by fisherman as **Pipi**, or “beef” (Clark 1977:91). Continuing south, the next beach was known as **Papaoneone** (“sandy shelf”). Modern names include **Lahilahi Crescent**, **Turtle Beach**, or **Keawaiki Beach**. At the southern end of the beach, adjacent to Mauna Lahilahi, is a small cove known as **Keawaiki** (“the little bay”). Poe (n.d.:6) said that Keawaiki Beach was a net-fishing place (*ku‘una*) where *honu* (green sea turtles), *kala* (surgeonfish, unicornfish), ‘*enenue* (pilotfish), *pualu* (surgeonfish), and *uhu* (parrotfish) were caught.

Along the ridge separating Mākaha from Kea‘au Ahupua‘a, there are three named *pu‘u*: **Pu‘u o Papano** (“dark hill”), **Pu‘u o Kahononahu**, and **Pu‘u Kea‘au**.

The names of several ‘*ili* (subdivisions of *ahupua‘a*) in Mākaha are known from Land Commission documents. Soehren (2009) suggests meanings for several of these based on translations in Pukui and Elbert (1986). The ‘*ili* are **Ahakea**, **Kahihi**, **Kahueiki** (“the small gourd”), **Kapua‘a** (“the pig”), **Kekio**, **Laukīnui** (“large ti leaf”), **Laulauwa‘e** (“laua‘e fern

frond”), **Maka** (which has many possible meanings including “source,” and / or “sight or vision”) and **Waikani** (“sounding water”).

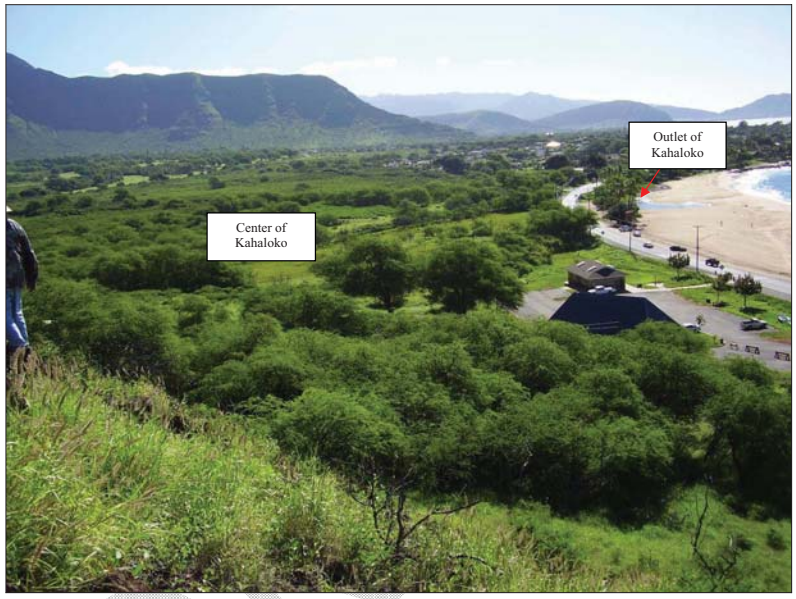

Figure 9. Kahaloko or Kaha Loko viewed from Pōhaku o Kāne at Mākaha Kai, Kamaile‘unu Ridge in background (from Monahan and Silva 2007)

3.3 Mo‘olelo Associated with Specific Place Names

3.3.1 Mākaha

An example of popular writing from the 1930s about the dispersal of people after Kamehameha I conquered the island of O‘ahu includes a description of Mākaha as the “valley of robbery”:

> After the rout of the army of Kalanikupule, the king of Oahu at Nuuanu, April 29, 1795 by the invading army of Kamehameha Nui, the conquered Oahuans were driven from their homes, their lands seized and divided amongst the friends of Kamehameha -- the despoiled people in large numbers fled to Waianae and settled there. This part of Oahu being hot, arid, isolated, with little water, was not coveted by the invaders…romance and sentiment hovers round Mount Kaala (the mount of Fragrance), and three valleys extending from its western base to the Waianae shore, Makaha, the valley of robbery; Po-kai, the valley of the dark sea; Lualualei, the valley of the flexible wreath… (Mouritz 1934:128, in Sterling and Summers 1978:68)

In a more positive and constructive example, Edward Iopa Kealanahele’s legend, “How Makaha got its name” (Kealanahele 1975), conveys many relevant aspects of *mo‘olelo* associated with Mākaha including its varied and abundant ocean resources, its relationship with other places on O‘ahu such as Mānoa, its chief after which the valley was purportedly named, and other phenomena (e.g., the famous double rainbow of Ke-Anuenue).

> Long ago, there lived in this valley a handsome young chief named Makaha. His skill as a fisherman gained island-wide attention, which eventually reached the ears of Ke Anuenue [the rainbow], the goddess of rain, who lived in upper Manoa Valley.
>
> She was so intrigued that she sent her trusted winged friend, Elepaio, to investigate Makaha. Elepaio returned with exciting stories of Makaha’s daring and skills.
>
> The next morning, Ke Anuenue created an awe-inspiring double rainbow which arched from Manoa Valley to this valley, from where she and her retinue could watch Makaha perform his daring feats at the ocean.
>
> The people of the Wai‘anae Valley were petrified by that magnificent rainbow that ended in this unnamed valley where Makaha lived.
>
> Knowing that Ke Anuenue was watching, they prayed that she would bring them the much needed gentle rains and not the harsh storms she could create when displeased.
>
> Makaha, aware of her presence, scaled Mauna Lahilahi and called loudly to his aumakua [his ancestral spirit] Mano ai Kanaka, the most vicious of man-eating

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sharks. As Mano ai Kanaka glided in from the ocean, Makaha dived from the rocky pinnacle, emerged on Mano ai Kanaka’s back and rode with regal grandeur.

As the two disappeared into the depths, the sea became calm. Suddenly Makaha seemed to be everywhere along the rocky coast gracefully tempting death. Then, just as suddenly, Makaha seemed to skim the ocean as Mano ai Kanaka carried him to shore.

Makaha then carried his entire catch to the rainbows end deep in the valley and offered it to Ke Anuenue. Deeply touched, she sent gentle rains to the parched earth of the great Wai‘anae Valley. She was impressed by the selection of seafood that was offered her but was disappointed by the quality of the poi, mai‘a [banana] and uala [sweet potato] which were dry and stringy. She demanded to know why since she was so accustomed to good quality fruits. She was told that it was because of the lack of rainfall in the valley.

Ke Anuenue became enamored with Makaha and from then on her double rainbow would appear in Makaha’s kuleana [land area] and gentle rains would fall on Wai‘anae so the people could enjoy lush bananas and an abundance of taro.

The people built a heiau in honor of Ke Anuenue and Makaha but Ke Anuenue refused the honor and named the entire valley, Makaha, by which it is now known.

According to the famous narrative cycle about the hero Kawelo, who had ancestral roots in both Kaua‘i and the Wai‘anae Moku, he once took his canoe to the Wai‘anae coast to try to capture the supernatural parrotfish called Uhumakaikai. While in Wai‘anae, Kawelo was informed that his family on Kaua‘i were being persecuted by ‘Aikanaka, then the chief of that island. Kawelo landed on the Wai‘anae coast to present on offering at a *heiau* before traveling to Kaua‘i to challenge ‘Aikanaka. In some versions, this *heiau* was Kāne‘ikapualena at Kamaile, located immediately adjacent to the Project area near Kamaile (or Kamaile‘unu) Ridge, in Wai‘anae Ahupua‘a. In other versions, it was at Kāne‘aki Heiau in Mākaha (Westervelt 1963:183).

In Hi‘iaka’s “Address to Cape Kaena,” she mentioned Mākaha as she traveled along the sunny coast. As she stood at the top of the Pōhākea Pass, looking back she sang the following song (Emerson 1915:157):

Kunihi Kaena, Holo i ka Malie;	Kaena’s profile fleets through the calm,
Wela i ka La ke alo o ka pali;	With flanks ablaze in the sunlight-
Auamo mai i ka La o Kilauea;	A furnace-heat like Kilauea;
Ikiiki i ka La na Ke-awa-ula	Ke-awa-ula swelters in heat;
Ola i ka makani Kai-a-ula Kohola‘ lele-	Kohola‘-lele revives in the breeze
He makani ia no lalo.	That breath from the sea, Kai-a-ulu.
Haoa ka Loa i na Makua;	Fierce glows the sun of Makua;
Lili ka La i Ohiki-lolo	How it quivers at Ohiki-lele-
Ha‘a-hula le‘a ke La i ke kula,	‘Tis the Sun-god’s dance o‘er the plain,

Ka Ha‘a ana o ka La i Makaha;	A riot of dance at Makaha.
Oi ka niho o ka La i Ku-manomano;	The sun-tooth is sharp at Kumano;
Ola Ka-maile i ka huna na niho	Life comes again to Maile ridge,
	When the Sun-god ensheaths his fang.
Mo‘a wela ke kula o Walio;	The Plain Walio‘ is sunburned and scorched;
Ola Kua-iwa i ka malama po	Kua-iwa revives with the nightfall;
Ola Waianae i ka makani Kai-a-ulu	Waianae is consoled by the breeze
Ke hoa aku la i ka lau o ka niu	Kai-a-ulu and waves its coco fronds;
Uwe’ o Kane-pu-niu i ka wela o ka La;	Kane-pu-niu’s fearful of sunstroke’(e)
Alaila ku‘u ka luhi, ka malo‘elo‘e,	A truce, now, to toil and fatigue:
Auau aku i ka wai i Lua-lua-lei	We plunge in the Lua-lei water
Aheahe Kona, Aheahe Koolau wahine,	And feel the kind breeze of Kona,
	The cooling breath of the goddess,
Ahe no i ka lau o ka ilima.	As it stirs the leaves of ilima.
Wela, wela i ka La ka pili i ka umauma,	The radiant heat scorches the breast
I Pu‘u-li‘ili‘i, i Kalawalawa, i Pahe-lona,	While I sidle and slip and climb
A ka pi‘i‘na i Wai-ko-ne-ne’-ne;	Up one steep hill then another;
Hoomaha aku i Ka-moa-ula;	Thus gain I at last Moa-ula,
A ka luna i Poha-kea	The summit of Poha-kea.
Ku au, nana i kai o Hilo:	There stand I and gaze oversea
	To Hilo, where lie my dewy-cold
Ke ho‘omoe a‘e la i ke kehau	Forest preserves of lehua
O a‘u hale lehua i kai o Puna,	That reach to the sea in Puna-
O a‘u hale lehua i kai o Ku-ki‘i.	My lehuas that enroot Kuki‘i.

Emerson translated the verse on Mākaha as “A riot of dance at Makaha.” In three other versions of this chant, the verse concerning Mākaha has been translated as “The sun dances over Mākaha,” “The dance of the sun at Mākaha,” and “The sun dances upon Mākaha’s lands” (Ho‘oulumāhiehie 2006:263–265).

3.3.2 Kamaile

As mentioned above (Section 3.2 Place Names), there is a large body of *mo‘olelo* associated with the ridge and *heiau* of Kamaile, which are located immediately adjacent to the current Project area. Kamaile was also once a prominent Hawaiian village and major *lo‘i* complex centered on the famous *pūnāwai* of Keko‘o (or Kīko‘o) that emanated from the base of the ridge (Figure 10 and Figure 11).

Kamaile and environs are mentioned in Kamakau’s (1991:106) *Nā Mo‘olelo a ka Po‘e Kahiko (Tales and Traditions of the People of Old)* in the *mo‘olelo* of Mo‘ikeha:

> Pōka‘ī and Mō‘eke remained on O‘ahu in Wai‘anae—in Wai‘anae of the gentle Kaiaulu wind, the sweet waters of ‘Eku, the thick poi of Pāhoa, the stringy poi of Lehano and Kūāiwa, the rich poi of Kamaile, and the *aku* fish “tidbits” (*aku nahu pū*) of Wai‘anae—in Wai‘anae, land beloved of the sun.

Kaiaulu is the name of the ocean breeze of Wai‘anae. ‘Eku may be the old stream (now a dry gully) running through the current Project area, or it may refer to Kīko‘o (also known as Kamaile or Keko‘o) Spring. Pāhoa is the traditional taro-growing area next to the current location of the

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Wai‘anae McDonalds / City County Building. Lehano and Kūāiwa were traditional taro-growing lands northeast of Kamaile and the spring.

‘Eku is also mentioned by Kamakau (1991:31) in reference to a number of ancient *heiau* in Wai‘anae whose construction was attributed to the *menehune*:

> Kahano was the one who stretched his hands out to the pillars of Kahiki and on his arms came the people called the Menehune. They were brought to be workers for Ka-hihi-kū-o-ka-lani…they were the makers … of the *heiau* Mau‘oki, Kaheiki, Kawa‘ewa‘e, ‘Eku, Kamōali‘i, and Kua‘ōkala.

In 1980, Roger Green had this to say about Kamaile and the spring:

> The most important asset of Kamaile, however, was its spring, Keko‘o. Described by Chamberlain (Ms.:488) as “a beautiful stream of fresh water issuing from the lava, the source of which can not be traced,” it was an unfailing supply until taken over by the plantation as a main source of water for the cane fields in Mākaha and Wai‘anae (McAllister 1933:114; Sterling & Summers 1978:72). The value of such an easily organized water supply just inland of some 55 ha. (138 acres) of rich soils suitable for taro cultivation…yet close to the sea, is indicated by the 62 Land Commission Awards granted to individual owners in this small area, as shown on Monsarrat’s 1878 map…It is the most numerous and compact series of small tenant or kuleana awards to be found anywhere in the Wai‘anae District…With the beach and fishery in front, and the well-watered taro lands just behind, Kamaile was very like a miniature ahupua‘a, lacking only access to products from the inland forest. (Green 1980:8)

In 2002, Ross Cordy, then Branch Chief for Archaeology at the SHPD, wrote about Kamaile and its spring as follows:

> Seeps and springs were also present [in Wai‘anae District]—emerging from the base of the ridges from dikes and from soil layers between old lava flows. By far the largest of these springs in coastal and lower valley areas was the heavily flowing spring at the seaward base of Kamaile‘unu ridge…which taps the wettest parts of the Wai‘anae mountains. This was the spring of Keko‘o in the land of Kamaile. This spring has since been tapped by pumping stations, and the watered land of Kamaile is no longer. (Cordy 2002:8)
>
> Between this spring and the coastal trail, 138 acres of lo‘i kalo [taro] were cultivated. These were in long, narrow mo‘o (sets of fields or lo‘i) running from the ridge toward the shore. In the Māhele, 34 households claimed named mo‘o here…The houses and dry fields of Kamaile were on the back edges of the kalo marsh and along the ocean side of the trail…. (Cordy 2002:53)
>
> Archaeological work at Kamaile…behind the marsh (site 5949) (Elmore & Kennedy 2001) show[s] that subsurface habitation deposits and associated burials are still present where houses once stood in the past. (Cordy 2002:141)

In a recent TCP assessment of the Kamaile environs, Monahan and Silva (2007) documented a wide variety of oral-historical information, some published and some known previously only to

family members, about Kamaile. The following *mo‘olelo* about Kamaile’s famous spring is a small sample of a much more comprehensive treatment.

Kīko‘o is defined by Pukui and Elbert (1986) as a “…chord of an arc; a bent bow [as in a bow-and-arrow]…to shoot, as from a bow…” Old Wai‘anae families know the *pūnāwai* is connected to the seashore by several underground passages. The name **Kīko‘o** is a play on this metaphor of a drawn bow, extending from the spring to the ocean, with the underground passages being the ‘arrows’ (Figure 12). Kiko, furthermore, is any kind of ‘dot’ or ‘point’; in this case, the metaphor is truly a rich one, as the *puka* (‘hole’) into the *papa* (the old buried reef layer) through which the water flows to the sea is the *kiko* (see Figure 12).

Most of the water flowing out of the spring, near the base of the ridge, was captured in 1978 by the Honolulu Board of Water Supply, but a small amount of flow continued until the later 1990s, when the outflow was finally totally sealed. Until this time, there were *‘ōpae ‘ula* (tiny, endemic Hawaiian shrimp) at Kīko‘o Pūnāwai, according to local residents.

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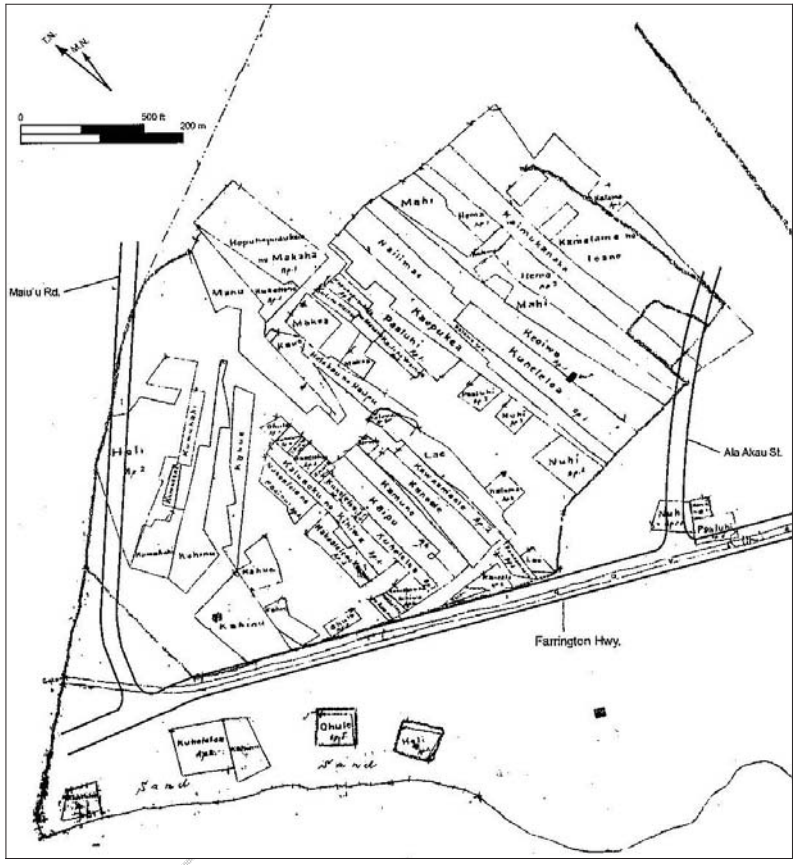

Figure 10. 1878 Kamaile map showing high density of small *kuleana mo'o*, or cultivated fields (source: Cordy 2001)

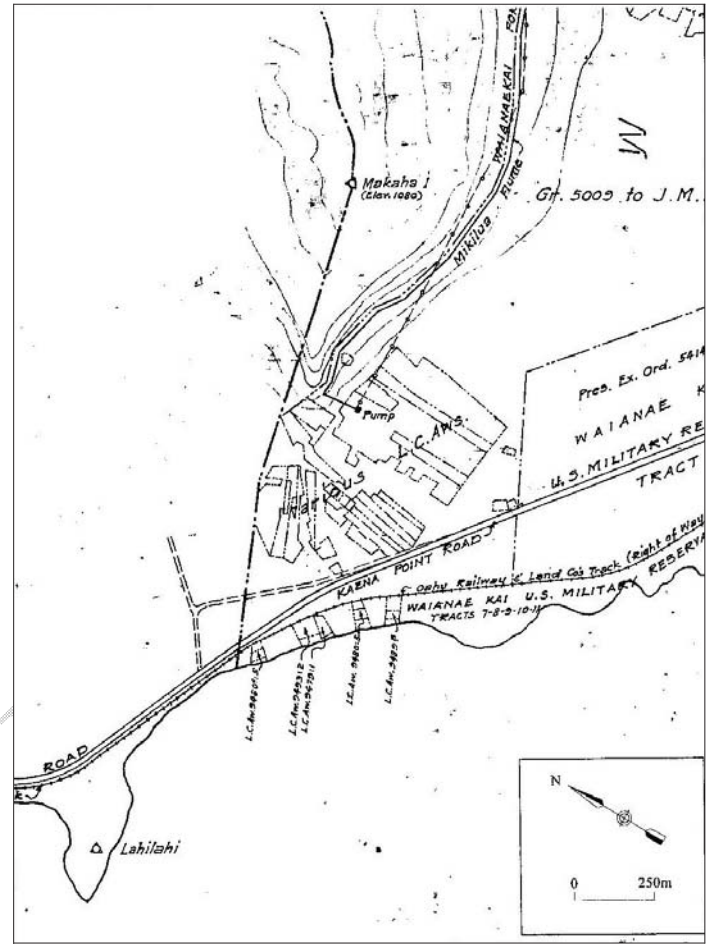

Figure 11. 1939 map showing large number of small parcels of Kamaile (source: Elmore and Kennedy 2001, cited in Whitehouse 1938)

Figure 12. Schematic representation of the ‘bow-and-arrow’ of Kīko‘o (Kamaile) Pūnāwai (from Monahan and Silva 2007

Today, these shrimp are still found in brackish caverns near the coast, and many people in Wai‘anae remember other kinds of animals that used to be at the spring, including several varieties of fish and other shrimp.

The *puka* through which the water used to (until the 1990s) re-enter the *papa* at Kīko‘o was traditionally home to a *mo‘o* (“supernatural water spirit”) that protected the place. It is important to understand that the presence of the *mo‘o* was / is much more than ‘just a legend,’ or ‘just a story’ from the old days. Rather, it (the *mo‘o*) literally kept people from abusing or dirtying or soiling the spring water; thus, it served a vital ecological-environmental role in the community.

3.3.3 Malolokai and the “Fierce” People of Mākaha

As stated above (Section 3.2 Place Names), there is a large body of *mo‘olelo* related to the fierceness of the old residents of Mākaha and neighboring lands, who are variously described in these oral-historical accounts as “robbers” and/or “cannibals.” One of the places closely linked with these legends is a cave known as Malolokai (Figure 13) located near the seashore around the base of the ridge dividing Mākaha and Kea‘au (this is McAllister’s Site 175, as described in Section 5 Archaeological Research and depicted in Figure 23 below).

Harry G. Poe, Sr., born in Mākua Valley in 1882, recounted in his diary that robbers threw their victims into a pit that went underground to the ocean (McGrath et al. 1973:11). He explains, “The reason is, they wants a man’s legs without no hair on to make [an] aku [tuna] fishhook. They believed in those days that the human leg is best, lucky hook for aku” (McGrath et al. 1973:11). Such an account supports the definition given by Mary Kawena Pukui et al. (1974:139) for “Mākaha” as “fierce” and especially the suggestion by Green (1980:5) that the translation refers to the “fierce or savage people” who once inhabited the valley.

Green (1980:5) mentions “…the ‘Ōlohe people, skilled wrestlers and bone-breakers, by various accounts [who] lived in Mākaha, Mākua, and Kea‘au, where they often engaged in robbery of passing travelers.” One legend concerning the fierceness of Mākaha involves robbers and cannibals:

> Long ago there lived here a group of people who are said to have been very fond of human flesh. At a high altitude on each side of the ridge [separating Mākaha from Kea‘au], guards were stationed to watch for people crossing this narrow stretch of land between the mountains and the sea. On the Makaha side, they watched from a prominent stone known as Pohaku o Kane, on the Keaau side, from a stone known as Pohaku o Kaneloa [sic]. The individual who passed here was in constant danger of death, for on each side of the trail men lay in wait for the signal of the watcher. If a group of persons approached, too many to be overcome by these cannibalistic peoples, the guards called out to the men hidden below, “Moanakai” (high tide); but if, as frequently happened, only two or three people were approaching the watchers called “Mololokai” (low tide). The individuals were then attacked and the bodies taken to two small caves on the seaside of the road. Here the flesh is said to have been removed and the bones, skin, and blood left in the holes, which at high tide, were washed clean by the sea.

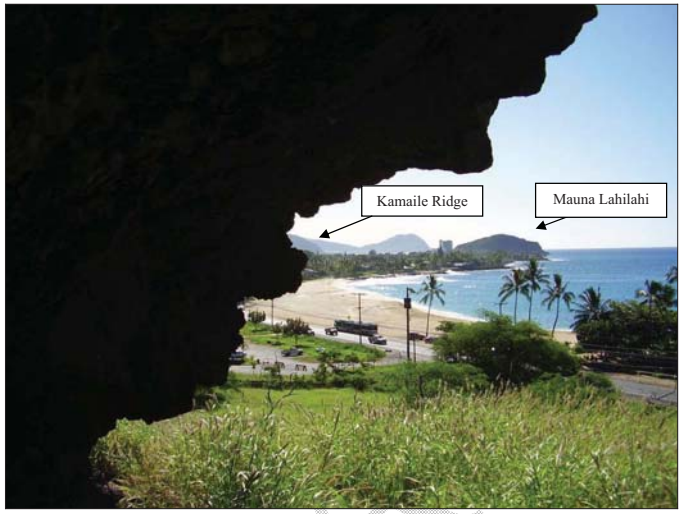

Figure 13. View from Malolokai, Mākaha Kai, facing south (from Monahan and Silva 2007:64)

> For many years these people preyed upon the traveler until at one time men from Kauai, hairless men (Olohe) came to this beach. They were attacked by these cannibals but defeated them, killing the entire colony. Since then the region has been safe for traveling. (McAllister 1933:121–2)

In a different version, the robbers called out, *Mololo kai e, mololo kai!* for only one traveler, and when a large party passed, *Nuimui kai e,* or, *Kaiko‘o kai e, kaiko‘o!* (which translates as “strong, rough seas,” according to Pukui and Elbert 1986:166) (Poe, to Kekahuna n.d.:2). Theodore Kelsey (n.d.:1) says it was the daughter of the robbers who called out the warnings, a short *Mololo-kai e*, if a small party approached, or the phrase “*Kaiko‘o –a-a-a-a-he-a,*” in a long chanting style for a large party.

Lua, the Hawaiian martial art of “hand-to-hand fighting” that includes bone-breaking and other extreme practices (Pukui and Elbert 1986:213), is closely associated with the cave of Malolokai. In Hawaiian tradition, the art of *lua* was reportedly taught only to the *ali‘i* (chiefly classes) and their guards; *lua* involves elaborate secrets and protocols, and could only be passed down through relatives. In the early 1920s, the *kapu* (tabu) was broken, and the Hawaiian martial art of *lua* was taught to other people outside of the bloodline. Lua had an array of weapons used in combat, which were made of different types of hardwood, such as *kauwila* and *kawa‘u*, found throughout the Hawaiian Islands. Marine resources were also used to make weapons, such as the knifelike *leiomano*, which incorporates shark teeth, or the marlin (swordfish) bill. A brief account (*Kuokoa*, July 12, 1923, in Sterling and Summers 1978:80) of the cave known as

Malolokai states: “Malolokai lies below (beyond) the hill of Maunalahilahi close to a cliff. Below, in the level land of Waihokaea are the bones of the travelers who were killed by skilled lua fighters.

3.3.4 Mauna Lahilahi

Traditionally, the entire 10-acre peninsula of Mauna Lahilahi was considered to be a single entity and, according to some old Wai‘anae families, an example of a specific kind of religious place known as a *ka‘ānani‘au*. This appears to be a very ancient concept that may be endemic (unique) to O‘ahu. Pukui and Elbert (1986:108) define *ka‘ānani‘au* as: “Same as *ahupua‘a,* the altar marking the land division. *O‘ahu. Rare.”* Old family information gathered during the TCP study by Monahan and Silva (2007) interprets *ka‘ānani‘au* as (paraphrasing) ‘a place where heaven and earth meet,’ and also, ‘a place where resources are divided.’ Thus, while there seems to be some similarity in function with the *ahupua‘a* concept (e.g., the dividing of resources), there also seems to be deeper connotations dealing with the partition of vertical space (the sacred and the profane).

Oral testimonies of four old Wai‘anae-coast residents born in the early 20th century from a document entitled *Mauna Lahilahi, Waianae, Oral Histories, July 1986, TMK (1) 8-4* (Anonymous 1986) record recollections of traveling to Mauna Lahilahi by train and on foot to fish, and to collect *limu* (seaweed) and other marine (food) resources. All four of these people highlight the enormous spiritual importance of Mauna Lahilahi, which could only be circled by walking in a counter-clockwise (*never* clockwise) direction. One testimony stated:

> When camping we always took our rubbish out with us. Grandma said that Mauna Lahilahi was ‘Mana,’ meaning a place of worship, and to be kept clean. My grandparents used to chant here too when they walked on the trails. They considered *all* of Lahilahi sacred. I did not hear them chant in other places.

Another person “. . . was instructed not to climb up high [on Mauna Lahilahi] as there were three heiaus up there, and I wasn’t supposed to be in the holy places.” Yet another stated: “my father often used the high trail as a lookout point for spotting fish…”

Thus, as late as the early to middle 20th century, the entire landform known as Mauna Lahilahi was still treated as a very holy place, in keeping with its traditional significance.

Curiously, despite the fact that several archaeological sites have been documented here, and despite the *mo‘olelo* about three *heiau* up upon the rock, there are only two references to Mauna Lahilahi in *Sites of Oahu*. The first reference (p. 73) says Mauna Lahilahi “…was the hill on which Hulumaniani the reader of omens and prophet from Kauai stood and saw a rainbow arched on the upland of Kukaniloko, when he was seeking Laiekawai…(from the Hawaiian language newspaper *Nupepa Kuokoa*, dated August 11, 1899). The second reference is from Mary Pukui’s definition of the word ‘lahilahi,’ meaning ‘thin,’ as in the shape of this rocky feature when viewed from the east.

Some old Wai‘anae families have *kaona* names and phrases for Mauna Lahilahi. In English, the *kaona* name is something like the ‘Eyes of Wai‘anae,’ in reference to the fact that one can see nearly the entire Wai‘anae coastline from here; and, one can see the dynamics of the ocean from the peak of Mauna Lahilahi. The old families have a saying, paraphrased roughly as: “You have never seen Wai‘anae until you have been to Mauna Lahilahi.” On a deeper level, Mauna

Lahilahi is called **Maka ‘i‘o**, translated roughly as ‘true vision,’ or ‘true sight.’ This refers to the special qualities of the place, at which one can ‘see’ and commune simultaneously with the heavens and the earth, the east and the west, the sacred and the profane. The old families also say *‘Ike pono maka ‘i‘o pono au o Wai‘anane ka‘ānani‘au o Lahilahi* (paraphrasing, ‘the timeless righteous / harmonious wisdom and vision of the Lahilahi shrine of Wai‘anae’). There are also connotations to the other senses, including hearing and listening—for the vibrations of the drums and of the quaking earth, for example, which can be used to attract great schools of fish.

Mauna Lahilahi is also known as a traditional information-gathering spot to observe the comings and goings of canoes; and, an excellent fish-spotting lookout. Several small shrines (*ko‘a*) are reportedly located near the top of Mauna Lahilahi, according to archaeological surveys and *mo‘olelo*. Mauna Lahilahi is also home to many burials, some documented by archaeologists and some known only in oral-historical accounts.

3.4 Subsistence and Settlement

Traditional subsistence and settlement in Mākaha Ahupua‘a has been systematically studied from an archaeological and ethnohistorical perspective in a classic, long-term project known as the “Makaha Valley Historical Project” funded by the Bishop Museum and reported in five volumes (cf. Green 1969, 1970, 1980; Ladd and Yen 1972; Ladd 1973). The results of this Project, which was the first large-scale, privately-funded archaeological study in the Hawaiian Islands, and one of the first to systematically attempt to reconstruct the pre-Contact settlement pattern for an entire valley, clearly show the valley was intensively modified for agriculture and habitation starting several centuries before the historic era.

Kirch’s (1985:274–275) synopsis of the results of the Makaha Valley Historical Project, directed by archaeologist Roger Green, provides both a general understanding of subsistence and settlement in the valley and a more specific picture of traditional uses of the Project area proper (Figure 14). After noting that the coastal area of Mākaha was likely always relatively sparsely inhabited, Kirch makes a distinction between the upper and lower (inland) portions of the valley; the upper beginning “ … about where Kāne‘aki Heiau is situated [approximately one mile north or *mauka* of the Project area], is much narrower than the lower valley, with steep spur ridges breaking up the landscape” (Kirch 1985:274). The higher rainfall in the upper valley coupled with the permanently flowing Mākaha Stream made wet-taro cultivation feasible along narrow alluvial flats. The lower valley, on the other hand, with significantly less rainfall and a more intermittent stream flow, was used primarily for dryland (non-irrigated) gardening and permanent habitation. Referring specifically to the area just north of the Project area, and including the upper reaches of the Project area, Kirch states:

> The colluvial slopes, especially in the inland part of the lower valley just below K Heiau, were heavily cultivated using a variety of dryfield methods and were a focus of permanent housing and religious sites…. Green further elaborates the distinction between upper and lower valley settlement patterns:
>
> The lower valley … includes all the culturally well-utilized, gently sloping, dry or *kula* lands, up to the point where the valley narrows and becomes well-watered by rainfall.

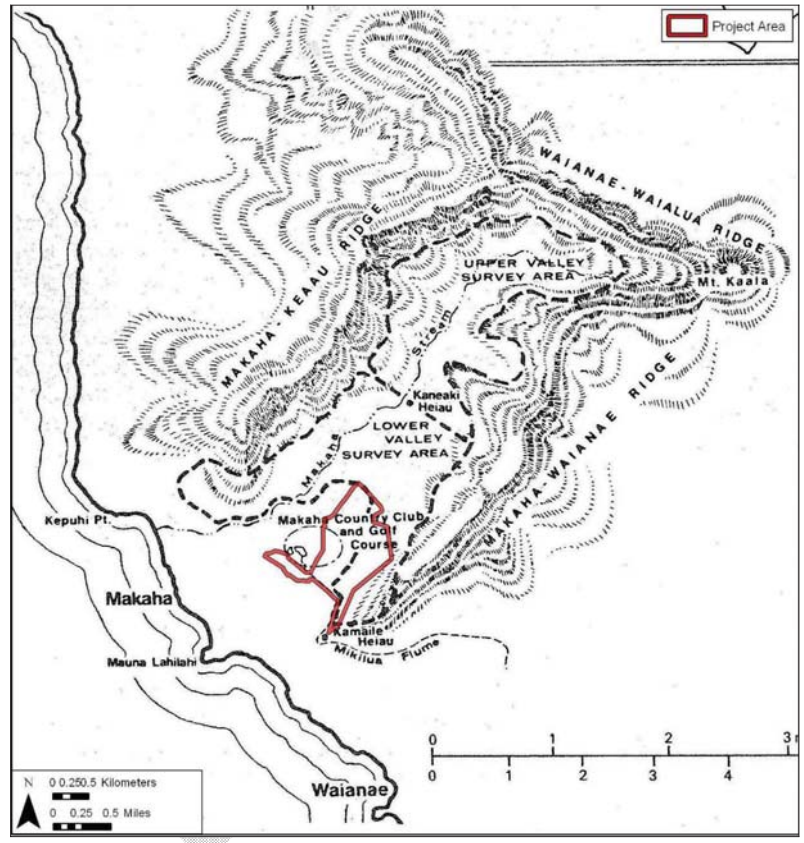

Figure 14. Project area location relative to the Makaha Valley Historical Project showing the physiographic distinction between the upper and lower valleys (Kirch 1985:120)

> Only a small part of these lands was capable of being irrigated from the Mākaha Stream. . [Green 1980:46]
>
> The inland part of the lower valley was the dominant center of permanent habitation, and Green demonstrated that a number of rectangular walled enclosures distributed throughout this region served as major residential sites. Certain larger, and less common, rectangular enclosures were probably special-function sites, such as men's houses … [and] … agricultural temples [such as Kāne‘aki Heiau]…. (Kirch 1985: 274–275)

Handy described abandoned taro *lo‘i* in the upper part of the valley in the 1930s:

> In the past it [Mākaha Valley] supported a small population of fishermen with its taro *lo‘i,* beginning halfway up towards the 4,000-foot elevation of the range at this point. A series of rock-faced terraces still exist, once irrigated by water brought down in ditches from the valley's small stream … (Handy and Handy 1972:468)

In a discussion of the fact that large areas of the greater Wai‘anae Moku were sometimes "areas of dearth" and susceptible to famine, Handy also noted the probable existence in olden times of a permanent settlement in the inland portions of the valley: "It is probable that there was also a village up Makaha Valley, where the taro terraces are still to be seen, having been in use up to fairly recent times" (Handy and Handy 1972:275).

In summary of what is known about traditional subsistence and settlement in and near the Project area, the proposed Project is located quite near a sizeable pre-Contact and early historic village that was probably centered in the general area between the proposed Project and Kāne‘aki Heiau. Another important settlement area was located a short distance to the south, just on the other side of the base of Kamaile Ridge, centered around the famous *pūnāwai* known as Keko‘o or Kīko‘o.

3.5 Heiau

A wide variety of religious shrines and natural landscape features used for spiritual practices has been documented near the current Project area. These include large sacrificial *heiau* dedicated (or re-dedicated) to the war god Kū, agricultural and other fertility shrines dedicated to Lono or Kāne, fishing shrines along the coast such as *ko‘a or kū‘ula*, and personal or family "god stones" such as *pōhaku o Kāne*. Some of these shrines are known only from oral-historical accounts; some have been extensively documented by archaeologists. Many people in Wai‘anae Moku continue to visit these places for religious and spiritual practices.

Two of the largest and most prominent nearby *heiau,* Kāne‘aki and Kamaile, are still largely intact. Kāne‘aki Heiau, which was built and modified in multiple stages of construction over several centuries, has been extensively restored and reconstructed to its final proto-Historic-era form. It is located approximately one mile north of the current Project area in the heart of Mākaha Valley. Kamaile Heiau, located on the ridge to the south directly overlooking the current Project area, has not been restored or rebuilt and consists today of the ruins of a large platform.

Kirch's (1996) *Legacy of the Landscape* provides an excellent summary of the main cultural and historical significance of Kāne‘aki Heiau, and of the reconstruction efforts carried out there.

According to Kirch, this *heiau* was once "part of an extensive complex of habitation sites and agricultural fields" in the "densely occupied" valley (Kirch 1996:38). At the time of European contact, the *heiau* was most likely a *luakini*, or war, temple dedicated to the god Kū, but archaeological work by the Bishop Museum in 1969–70 demonstrated six phases of construction and modification over 275 years prior to the end of the eighteenth century. When it was first built in or around A.D. 1545, it consisted of a "simple stone-faced terrace or platform, now the base of the lower courtyard … [and] … probably functioned as an agricultural temple" (Kirch 1996:38). It is important to stress that many Native Hawaiians identify most strongly with Kāne‘aki's older associations with Kāne and Lono, the primary gods of fertility and agricultural abundance, respectively, rather than with its later (sacrificial) functions.

Kamaile Heiau, located much closer to the current Project area along the dividing line between Mākaha and Wai‘anae Ahupua‘a, also has a long history of construction, remodeling, and re-dedication. Thrum, who visited this site in the early twentieth century, had this to say about Kamaile Heiau:

> A medium sized heiau of platform character and pookanaka [human sacrifice] class, still in fair condition, to be seen from the road on the bluff above the pipe line of the electric pumping station [of Waianae Sugar Company]. (Sterling and Summers 1978:73)

McAllister (1933) created scaled field sketches of this site and provided a fair amount of detailed description of its internal features such as pits and small enclosures (Figure 15). Interestingly, despite the fact that this *heiau* is the center piece of a National Register site, no systematic archaeological, cultural or restorative work has been conducted here since McAllister's investigation over 70 years ago. McAllister (1933) remarked on the high quality of the stone work, which can still be appreciated in some sections (Figure 16); and, the presence of a substantial amount of crushed coral covering the surface of the main platform:

> The heiau is a single terrace, built of large sharp lava rocks. The facings of the terrace are surprisingly even and were carefully fitted. The heiau was formally paved with small bits of coral, giving it the appearance of fine, white gravel. The amount of coral is surprising. (Sterling and Summers 1978:73)

According to Glen Kila (quoted in Hommon 1978:1), human remains have been observed below the surface paving of the *heiau*. Today, there is clear and substantial evidence of prior disturbance of the rocks that comprise the main platform, with numerous irregularly-shaped pits and holes that were not evidently part of the original design and construction.

In addition to these two large and well-known *heiau*, Laukīnui ("large ti leaf") Heiau, was once located at the coast along Laukīnui Beach near the Kea‘au Ahupua‘a side of Mākaha Ahupua‘a. Mitchell (1930:174, cited in Soehren 2009) claimed there was another *heiau*, or possibly a coastal *ko‘a* (fishing shrine), on Kepuhi Point. Mitchell said that the Hawaiian Government Survey established a triangulation station in 1875 on Kepuhi Point "on a stone platform said to be an ancient *heiau*." Another resident remembered that her great-aunt said that there were once three *heiau* on top of Mauna Lahilahi. These may have been *ko‘a*, as fishermen often climbed to the top of Lahilahi to spot schools of fish (Anonymous 1986:2).

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Figure 15. Southern portion of the main platform of Kamaile Heiau, which extends away from the viewer over 100 ft. to the east (from Monahan and Silva 2007)

Figure 16. Front (west) edge of the main platform of Kamaile Heiau, facing Mākaha Valley (north); note vertical rock facing ranging from five to seven feet in height (from Monahan and Silva 2007)

3.6 Trails

John Papa ‘Ī‘ī describes a network of leeward O‘ahu trails (Figure 17), which in early historic times provided access to the Wai‘anae District from Central O‘ahu via the Pōhākea and Kolekole passes through the Wai‘anae Range, and from the coast via Pu‘u Kapolei in the south and Ka‘ena Point in the north. ‘Ī‘ī also describes a trail that traversed Mākaha Valley, called Kūmaipō:

> There was a long cliff trail called Elou from Kalena and Haleauau on the east side of [Mount] Kaala coming down to Waianae. There was also a trail called Kumaipo which went up and then down Makahauka [the upper inland portion of Mākaha Valley].
>
> Below Kumapio trail in the olden days was a stronghold named Kawiwi. At the time of a battle, a boy was posted there as a guard every night. He was often hungry, for the lord of the stronghold did not supply him with food. This caused him to change his allegiance and give the place over to the rebels. This he did by calling out…. The boy kept up the cry until the stronghold was filled with men, and its lords were taken captive by the rebels.
>
> The stronghold of Kawiwi was part of a mountain ridge lying between Waianae and Makaha and overlooking Kamaile. The trail Kumaipo, went down to the farms of Makaha and the homes of that land. A branch trail which led up Mount Kaala and looked down on Waialua and Mokuleia could be used to go down to those level lands. It was customary to have dwelling places along the mountain trails that led downward from here into Kamaile, as well as along the beach trail of Makaha.
>
> There were many houses at Makaha, where a fine circle of sand provided a landing place for fleets of fishing canoes. The trail which passed by this sandy bar was the one from Puu o Kapolei, which had joined the beach trail from Puuloa and from Waimanalo [the place near Kahe Point, not the better-known place in Ko‘olaupoko]. (‘Ī‘ī 1959:97)

Kawiwi was a stronghold as early as the fourteenth century, when O‘ahu was united under one ruler, La‘akona, and his descendants. This family of ‘Ewa chiefs held power until the cruel ruler, Haka, was overthrown by other O‘ahu chiefs. Haka fled to the fort of Waewae on the Kawiwi Ridge, but he was captured by the betrayal of the boy mentioned above (Kamakau 1991). A different line of chiefs, who moved their ruling center to Waikīkī, became the rulers of O‘ahu, including Wai‘anae. Kawiwi was the place of refuge during war for all of O‘ahu (Thrum 1909:152). The *menehune*, the legendary Hawaiian race of little people, built a *heiau* in Mānoa called Mau‘oki, using stones from far off Kawiwi, and “there was so many Menehune that each brought one stone, and Mau‘oki was completed” (Kamakau 1976:144.)

As noted earlier, the coastal trail is referenced in a *mo‘olelo* about cannibals waylaying travelers in Mākaha. This trail has evolved through the horse-and-buggy era to the present Farrington Highway.

It should also be noted that ‘Ī‘ī’s description of “many houses at Mākaha” contradicts other accounts of sparse settlements in pre-Contact Mākaha.

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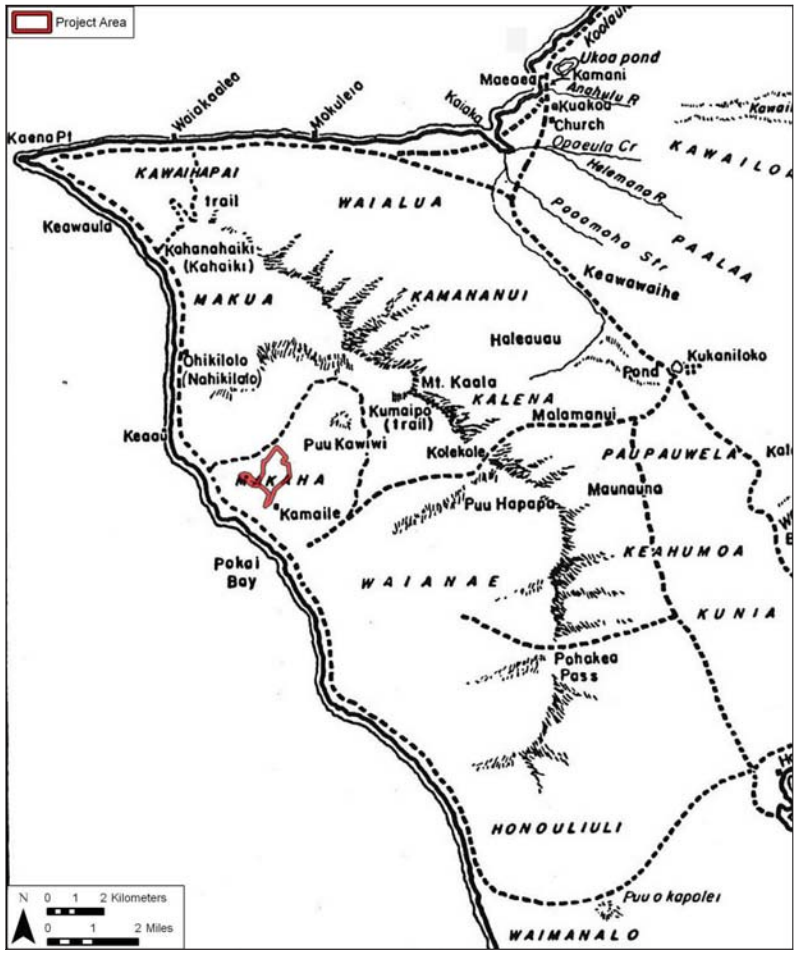

Figure 17. Trails of Leeward O‘ahu, ca. 1810, map by Paul Rockwood (from ‘Ī‘ī 1959:96)

Section 4 Historical Background

4.1 Early Historic Period

4.1.1 Wai‘anae Moku

The origin of the name Wai‘anae is thought to be connected to the richness of the waters off the district’s coast, with *wai* meaning “water” and *‘anae* meaning “large mullet” (Sterling and Summers 1978). Several accounts attest to the abundance of fish from Wai‘anae waters (Wilkes 1845; Pukui et al. 1974). In 1840, Wilkes commented: “the natives are much occupied in catching and drying fish, which is made a profitable business, by taking them to Oahu, where they command a ready sale” (Wilkes 1845:81-82).

Wai‘anae has been portrayed in many historical accounts as a land of dual purpose: a refuge for the dispossessed (including many of the old O‘ahu natives who were driven away from their lands elsewhere by invaders from Maui and Hawai‘i Islands) and a hideout for the rebellious and outlawed. Certain landmarks in Wai‘anae attest to this dichotomy. For example, *kahuna* dedicated Kawiwi, a mountain between Wai’anae and Mākaha Ahupua’a, as a refuge during times of war (McAllister 1933). Pōka‘ī Bay was used as a school administered by exiled *kahuna* who took refuge in Wai‘anae after Kamehameha I gained control of O‘ahu (in Sterling and Summers 1978:68). It was also near Pōka‘ī Bay, at a place named Pu‘u Kāhea, that the eighteenth-century prophet and *kahuna nui* (supreme high priest) of O‘ahu, Ka‘opulupulu, made his last famous prophecy before he was killed in Po‘olua (in Sterling and Summers 1978:71).

In 1793, Captain George Vancouver (1798:217), the first explorer to document in writing his observations about the leeward side of the island, described the Wai‘anae coast as “composed of one barren rocky waste, nearly destitute of verdure, cultivation or inhabitants.” He also, however, described a village located south of Mauna Lahilahi, situated in a grove of coconuts (Vancouver 1798:219). The village is Kamaile, which Green (1980:8) likens to a miniature *ahupua‘a* “with the beach and fishery in front and the well-watered taro lands just behind.” Its fresh-water spring gave life to this land and allowed for the existence of one of the largest populations on the Wai‘anae coast.

The *‘ōku‘u* epidemic of 1804 (thought to be cholera) had a major effect on the native population, not only in Wai‘anae, but throughout Hawai‘i. John Papa ‘Ī‘ī (1959:16) relates that the *‘ōku‘u* “broke out, decimating the armies of Kamehameha [I, on O‘ahu].” Other diseases also took their toll. Although census numbers from historic times are probably underestimates, to some extent, given the vagaries of counting methods used at that time, the combined population of the Wai‘anae and ‘Ewa Districts in 1831–1832 was determined to be 5,883 (Schmitt 1977:12). Twenty years later, the combined census for the two districts was only 2,451.

Levi Chamberlain, a member of the first party of missionaries to the Hawaiian Islands, probably traveled along this coastal trail on a tour of O‘ahu in 1826. Chamberlain traveled clockwise around the island, stopping wherever the population was large enough to support a school for teaching reading, writing, and religious instruction. He examined two schools in Wai‘anae, indicating a large population for that *ahupua‘a*, and next traveled to Mākaha, where he stopped to give a sermon:

> We travelled till about 5 o’ck when we arrived at Makaha the land of Kanepaiti [Kanepaiki] the Chief of Pearl River. Shortly after our arrival the people assembled to hear the word of God…The people to the number of 50 or 60 listened with breathless attention to what was said… (Chamberlain 1956a:8)

In 1828, Chamberlain made a second tour of O‘ahu, this time travelling counterclockwise along the coast. His party reached the settlement of Mākaha at sunset and spent the night.

> Having given out word last night that I would inspect the school in the morning, after attending prayers & eating breakfast, I took a walk along the sea shore to view the rocks & search for curious shells, I thus passed the time away till nine o-clock, and began to be impatient, when the scholars were discovered going down the valley walking in procession. They proceeded to a small enclosure near the beach partly shaded by a few cocoanut trees, under which they sat down; and thither I repaired to attend to the examination… (Chamberlain 1956b:38)

Chamberlain was somewhat disappointed in the number of scholars in the Wai‘anae District. In the most populous *ahupua‘a*, Wai‘anae, he found only 16 scholars. Boki, and later his wife, Liliha, who were in charge of the Wai‘anae District were hostile to the missionaries, and thus this probably explains the low number of students receiving language and religious instruction (Bishop 1916:43).

A visitor to the Wai‘anae District in 1839, described it as:

> …[having] about 1,600 inhabitants…less advanced in improvement than the inhabitants of any other portions of the island…rocky and barren; still, the arable land is not all cultivated…shallow basins in its [white rock] surface are used by the natives as vats for the solar evaporation of sea water…(Hall 1839:100-101)

Starting around 1810 and lasting only two or three decades, the sandalwood trade, introduced by foreign traders traveling between the Northwestern United States and China, greatly impacted Hawaiian culture and traditional lifestyles. In an effort to acquire western goods, ships, guns, and ammunition, the *ali‘i* (chiefs) incurred massive debts to the American merchants (‘Ī‘ī 1959:155). These debts were paid off in shiploads of sandalwood harvested by *maka‘āinana* (commoners) for the *ali‘i.* When Kamehameha I found out how valuable the sandalwood trees were, he ordered people not to let the felled trees crush the young saplings, to ensure their protection for future trade (Kamakau 1992:209-210).

4.1.2 Mākaha Ahupua‘a

Early accounts specific to Mākaha describe a good-sized inland settlement and a smaller coastal settlement. In his summary volume of the Makaha Valley Historical Project, Green (1980:20-21) describes Mākaha’s coastal settlement as “restricted to a hamlet in a small grove of coconut trees on the Kea‘au side of the valley, some other scattered houses, a few coconut trees along the beach, and a brackish water pool that served as a fish pond, at the mouth of the Mākaha Stream.” The fishpond was known in early historic times as Kahaloko or Mākāhā. This small coastal village, within a coconut grove, is shown on an 1884 map of the Wai‘anae coast by the

surveyor George Jackson (Figure 18). Laukīnui Heiau was located near the coastal settlement, and was described by McAllister (1933:121) as “so old as to be accredited to the menehunes.”

As described above (see Section 3.4 Subsistence and Settlement), the primary early historic settlement in Mākaha was situated inland, associated with irrigated taro fields along Mākaha Stream. Associated with the inland settlement was the principal *heiau* of Mākaha, Kāne‘aki. The perennial Mākaha Stream supported wetland agriculture pursuits such as taro in the pre-Contact and early historic periods, and later, with the aid of an extensive system of flumes, artesian wells, and resevoirs, commercial sugarcane. Modest rainfall in the inland areas of Mākaha Valley also supported seasonal dryland cultivation of non-irrigated cultivars such as sweet potatoes.

One well-known chief during the early historic period was Boki. Boki was governor of O‘ahu under Kamehameha I, and was also nephew to Kamehameha’s favorite wife Ka‘ahumanu. Boki had a residence in Wai‘anae Village and appointed the chiefs Aua and Kanepaiki to oversee the Wai‘anae and ‘Ewa Districts, respectively. Control of Wai‘anae was later given to Kanepaiki as well (Bingham 1847:296; Chamberlain 1956b:38).

The first Catholic missionaries arrived in the Hawaiian Islands in 1825. They found a ready patron in Boki, who had been baptized in 1819 by a French Catholic priest on the French ship *Uranie* under Captain Freycinet. The *ali‘i*, who were generally aligned with the Protestant missionaries (who arrived in the islands several years earlier than the Catholics), sought to stop the conversion of Native Hawaiians to Catholicism. They persecuted the converts and priests in Honolulu, and as a result, many of these new Catholics fled to isolated areas of the island. Originally, Boki supported the Protestant missionaries and agreed with the breaking of *kapu*. However, out of growing resentment of the power of Ka‘ahumanu and her missionary advisors, Boki soon after ceased to support the Protestants.

Among other business ventures, Boki also tried his hand at the sandalwood trade. In 1829, he heard of a South Pacific island covered with sandalwood:

> Boki fitted out two ships, the *Kamehameha* and the *Becket*, put on board some five hundred of his followers, and sailed south. Somewhere in the Fiji group the ships separated. Eight months later the *Becket* limped back to Honolulu with only twenty survivors aboard…Boki and two hundred and fifty of his men apparently died at sea when the *Kamehameha* burned in 1830, possibly when gunpowder stored in the hold blew up as a result of careless smoking. (Day 1984:14)

Some historians believe Boki, in his South Pacific adventure, may have also been trying to establish a separate kingdom (Sahlins 1992). That same year, supporters of Boki and his wife Liliha, along with traders and sea captains, attempted to overthrow Ka‘ahumanu. This attempt was known as Pahikaua War and was supported by quite a few people of the Wai‘anae District, but ended when Ulumaheihei talked his daughter, Liliha, into ending the war.

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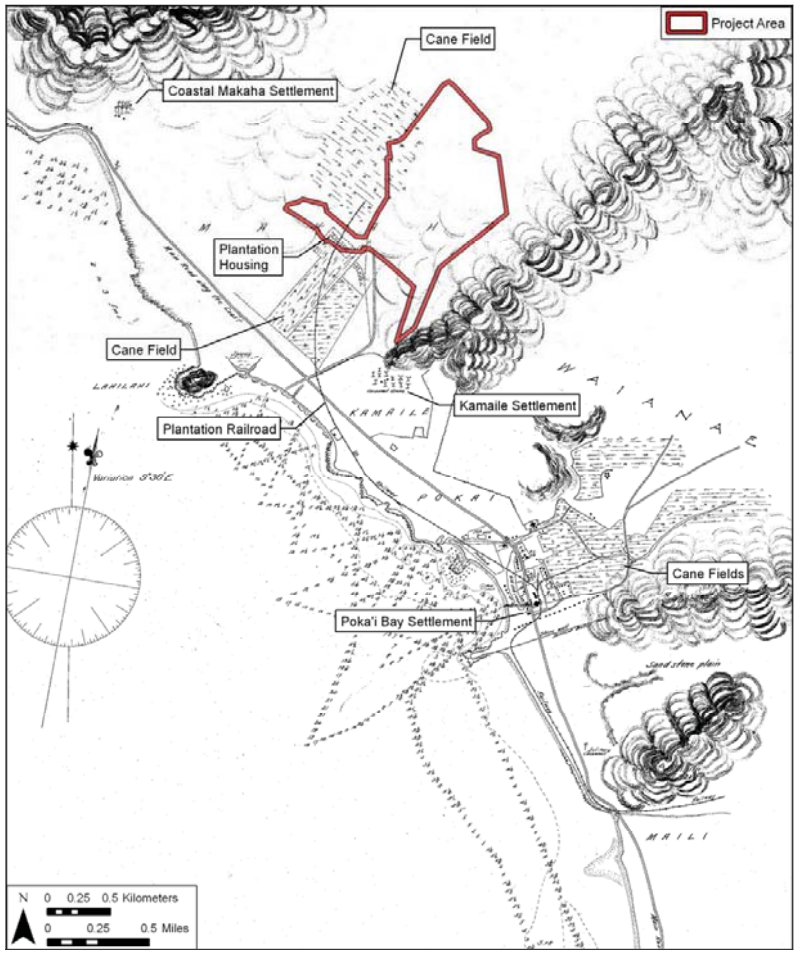

Figure 18. 1884 Hawaiian Government map by George E. G. Jackson Surveyor (Hawai‘i Land Survey Division, Registered Map 1348), showing the location of the Project area

The Wai‘anae District was a favored area for displaced Catholics, since Boki’s widow Liliha was sympathetic to the Catholic converts (Schoofs 1978:3). In 1839, the Wai‘anae Catholics built a chapel in the mid-valley area of Mākaha in the native style, and by the 1840s or 1850s, it was replaced with a stone chapel. In 1881, the chapel was rebuilt and dedicated to St. Philomena. The construction was funded by the Holts, a Catholic family who controlled most of Mākaha Valley, and who lived near the church. The location of the Holt family homestead is shown on a 1932 Land Court Application map (see Figure 5). After about 1896, few records mention the Mākaha Catholic church, and it is not shown on any twentieth century maps. The Mākaha church probably never had a very large congregation, and in the twentieth century worship seems to have shifted to the Sacred Heart Catholic Church in Wai‘anae Ahupua‘a (Schoofs 1978:113-115).

After Boki’s death, Liliha gave the entire *ahupua‘a* of Mākaha to Kuho‘oheihei (Abner) Pākī, father of Bernice Pauahi (Green 1980:14-15). Soon after Pākī was Christianized, and by the time Liliha died in 1839, the majority of people in Mākaha had accepted Christianity. Although several individuals are recorded as having charge over Mākaha at various times, including Aua, Kanepaiki “chief of the Pearl River”, and the present “King,” Pākī claimed the entire *ahupua‘a* of Mākaha.

4.2 Mid-Nineteenth Century and the Māhele

In 1845, the Board of Commissioners to Quiet Land Titles, known informally as the Land Commission, was established “for the investigation and final ascertainment or rejection of all claims of private individuals, whether natives or foreigners, to any landed property” (Chinen 1958:8). This led to the Māhele, the division of lands between the king of Hawai‘i, the *ali‘i*, and the common people, which introduced the concept of private property into the Hawaiian society. Kamehameha III (Kauikeaouli) divided the land into four divisions: certain lands to be reserved for himself and the royal house were known as Crown Lands; lands set aside to generate revenue for the government were known as Government Lands; lands claimed by *ali‘i* and their *konohiki* (supervisors or overseers) were called Konohiki Lands; and habitation and agricultural plots claimed by the common people were called *kuleana* (Chinen 1958:8-15).

In 1848, the crown and the *ali‘i* received their land titles. Kuleana awards for individual parcels within the *ahupua‘a* were subsequently granted beginning in 1850. Mākaha Ahupua‘a had 13 Land Commission claims, of which only eight were awarded (Table 1). Seven of these LCAs were located in a cluster along Mākaha Stream, in the mid-valley area of Mākaha Ahupua‘a (see Figure 5). The location of the LCA cluster corresponds to the aforementioned inland settlement area near which were also located the Holt family homestead and (still there today) Kāne‘āki Heiau. It is important to note these seven *kuleana* parcels each measured only one or two acres (or even less), thus, the *maka‘āinana* of Mākaha were almost completely disenfranchised by the Māhele. The remaining unclaimed lands in Mākaha—consisting of nearly 5,000 acres—were awarded to Abner Pākī (LCA 10613:5). Pākī was apparently able to wield a considerable amount of control over the residents of Mākaha during the Māhele, resulting in the limited number of Land Commission applications. The number of taxpaying adult males in the *ahupua‘a* in 1855 numbered 39, suggesting there were more families living and working the Mākaha lands than was reflected in Māhele awards (Barrère 1970:7).

Land use information for the Mākaha LCAs is sparse. As the LCAs are clustered along Mākaha Stream, multiple *lo‘i* were located within many of the *kuleana* parcels. Kula lands (non-irrigated lands used for dryland crops or pasture) and house lots are also mentioned. Aside from these general land specifications, it is noted that a large quantity of *ma‘o* was growing on *kula* land in the Kamaile area near the boundary between Mākaha and Wai‘anae Ahupua‘a. Ma‘o (*Gossypium tomentosum*), a native species of “cotton,” was used traditionally in making *kapa* (cloth).

The LCA information supports other historical documents indicating Mākaha’s primary settlement was inland, where waters from Mākaha Stream could support *lo‘i* and sufficient rainfall was available for *kula* cultivars. Most of the coastal land was too dry for cultivation, in contrast with the nearby coastal village of Kamaile, which had ample spring water. Although there is evidence for settlement along the shore, this was for the most part limited to scattered, isolated residents focused on procurement of marine resources. The only “cluster” of habitation structures seems to have been concentrated at Mākaha Beach, near the boundary between Kea‘au and Mākaha Ahupua‘a, where there is also reference to a fishpond at the mouth of Mākaha Stream.

4.3 1850 to 1900

By ancient custom, the sea for a mile offshore belonged to the *ahupua‘a* as part of its resources. The ruling chief could prohibit the taking of a certain fish or he could prohibit all fishing at specific times. Chief Pākī filed two such prohibitions on the Mākaha fishery, one in 1852 for the taking of *he‘e* (octopus) and the other in 1854 for the taking of *‘ōpelu* (mackerel) (Barrère 1970:7).

In 1855, Pākī died, and to clear his debts the administrators of his estate sold his Mākaha lands to James Robinson and Co. In 1862, upon the death of Robert Holt, one of the partners in the Mākaha endeavor, the Mākaha lands were acquired by the Holt estate, who “placed the lands in trust for the Holt legatees and their heirs” (Barrère 1970:7). The Holt family dominated the economic, land use, and social scene in Mākaha from this time until the end of the nineteenth century. Owen Jones Holt, son of Robert Holt, leased the family’s Mākaha lands and developed a commercial ranch, known as Makaha Ranch. The successful ranch was in operation for 40 years, with activities including raising pigs, cattle, horses, sheep, chickens, and turkeys; planting rice, coffee, fruit trees, and watermelons; and selling firewood. It is also noted that peacocks were bred at the ranch from birds given to Kamehameha V in 1865 by the Japanese government (Barrère 1970:7). Owen Jones Holt also developed a large residence on Makaha Ranch, known as the “country seat.” The location of the Holt homestead is indicated on a 1932 Land Court Application map (see Figure 5). The homestead is adjacent to the northwestern portion of the current Project area. Associated ranching activities likely occurred within the Project area during this period.

Table 1. Land Commission Claims and Awards in Mākaha Ahupua‘a

Land Claim #	Claimant	‘Ili	Land Use	Awarded*
877:2	Kaana/ Kuaana for Poomano	Kapuaa	--	1 *‘āpana,* 1.6 ac.
8228	Inoaole	Laukinui	Kula, house lot	No
8763	Kanakaa	Hoaole	--	No
9689	Nahina	Kekio	16 *lo‘i*	1 *‘āpana,* 1.0 ac.
9859	Napoe	Aheakai, Mooiki	17 *lo‘i, kula,* house lot	No
9860	Kalua	Luulauwaa (Laulauwaa)	House lot	No
9861	Nahina, see above	Kekio	--	No
9862	Kanehaku	Kekio, Mooiki	5 *lo‘i, kula*	1 *‘āpana,* 2.4 ac.
9863	Kala	Waikani	House lot	1 *‘āpana,* 1.3 ac.
9864	Kapea	Laukinui	19 *lo‘i, kula*	1 *‘āpana,* 1.2 ac.
10613:5	Pākī, Abner	Most of the Ahupua‘a	--	*‘Āpana* 5, 4,933 ac.
10923	Uniu	--	--	1 *‘āpana,* 0.5 ac.
10923-B	Alapai	Kapuaa	7 *lo‘i, kula*	1 *‘āpana,* 0.5 ac.

‘āpana - parcel; ac. - acres

Owen Jones Holt began leasing Mākaha lands to non-family members in 1880. Bowser (1880:491) observed the Mākaha lands *makai* of the Holt house and described it as:

> A stretch of splendid land about a mile in length by three-quarters of a mile wide. The surface, however is in some places stony, but a little trouble would render all of it fit for the plough, and from the character of the soil, there can be no doubt it would repay any pain taken with it.

Owen Jones Holt subsequently began to lease portions of these lands to for sugarcane cultivation. An 1884 map of the Wai‘anae coast (see Figure 18) shows sugarcane fields in areas immediately west and *makai* / southwest of the current Project area. The map also indicates a plantation railroad accessing the cane fields, as well as two clusters of houses for plantation workers, one of which is located within the current Project area.

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4.4 1900 to Present

In the early 1900s, the Holt family began to sell their Mākaha lands. The Waianae Sugar Company, incorporated in 1880, expanded into Mākaha ca. 1908. The plantation utilized large tracts of land in Lualualei, Wai‘anae and Mākaha Ahupua‘a for sugarcane cultivation. By 1923, virtually all the lands of lower Mākaha Valley were used for sugarcane cultivation. Water to irrigate the growing plantation was generally supplied by Mākaha Stream, with reservoirs and ditches constructed to divert, store, and distribute the water to the cane fields. Little water remained for irrigation of taro *lo‘i*, contributing to the demise of traditional agriculture in Mākaha and displacement of the native population. Similar instances of the wholesale displacement of subsistence farmers and Native Hawaiians living off the land—resulting directly from the capture of water by commerical sugarcane operations—have been documented in nearby Kamaile (cf. Monahan and Silva 2007) and elsewhere in the district.

A map of Waianae Sugar Company’s cane fields (Figure 19) shows the extent of plantation development in Mākaha, which is generally shown as *makai* of the current Project area. In addition to the cane fields, a 1919 U.S. War Department map (Figure 20) shows additional plantation infrastructure in the vicinity of the Project area, including a reservoir near the western boundary of the Project area; a ditch running through the eastern and northern portions of the Project area; and the Mikilua Flume near the *makai* boundary of the Project area. The Mikilua Flume originates in Lualualei, transporting water through Wai‘anae and into Mākaha. Also shown on the 1919 map is the Holt homestead, located near the northern tip of the Project area. The 1928 U. S. Geological Survey map (Figure 21) shows additional plantation infrastructure within and in the vicinity of the current Project area, including reservoirs, ditches and flumes. The additional irrigation infrastructure was needed to supply the growing plantation. Also shown on the map are several fence lines and enclosures, indicating that ranching remained prevalent in the mid- and upper valley areas, with the plantation cane fields primarily located *makai* of the current Project area.

Limited water resources played a role in Waianae Sugar Company’s low profitability and eventual demise. In the mid-1930s, Waianae Sugar Company was sold to American Factors, Ltd. (Amfac). Along with the plantation lands, Amfac acquired “all of the Makaha lands that had formerly belonged to Abner Paki and to the Holt estate” (Green 1970:9). In an attempt to increase the amount of water available for irrigating sugarcane fields, Amfac commissioned a geologic study to determine if groundwater in the upper valley areas of Mākaha and Wai‘anae could be utilized. The study indicated that tunneling for water would be successful. However, with the onset of World War II, the planned tunneling was put on hold (Green 1970:13).

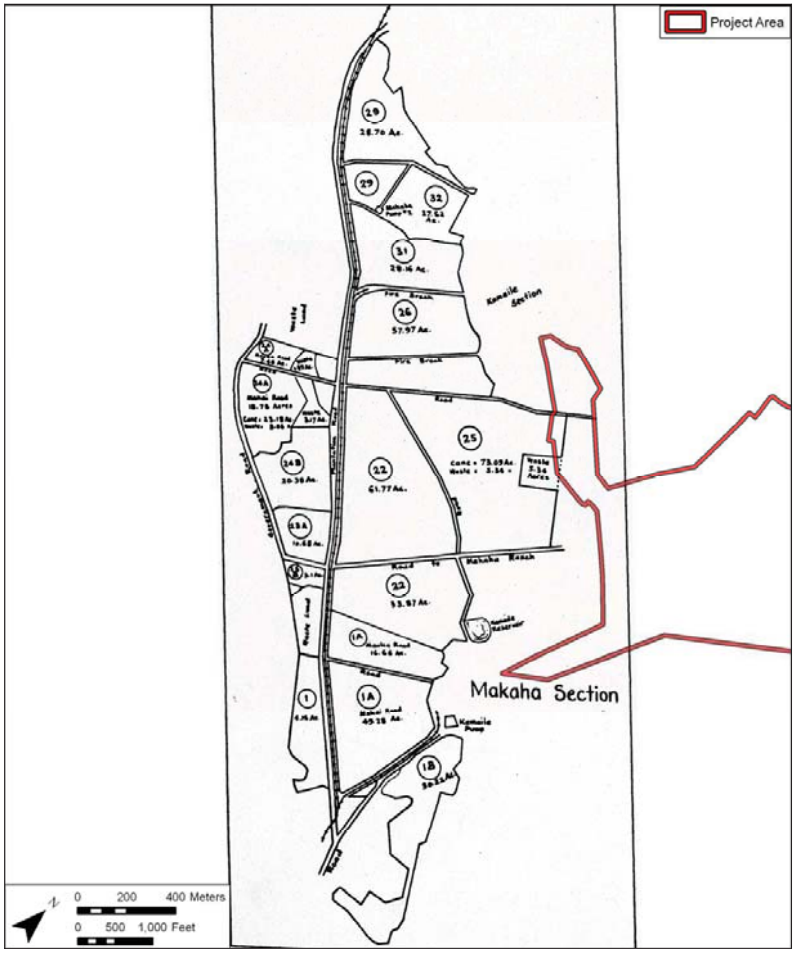

Figure 19. Map of the Waianae Sugar Company cane lands, “Makaha Section” (no date), showing the extent of sugarcane cultivation in the vicinity of the Project area

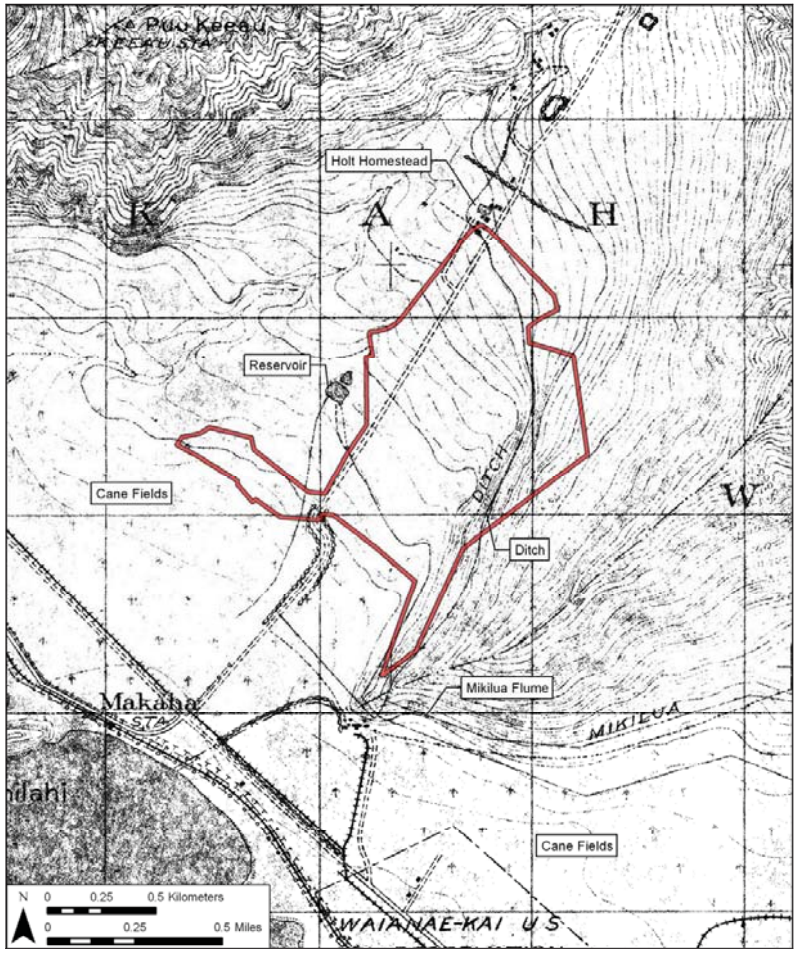

Figure 20. 1919 U.S. War Department Fire Control map, Waianae Quadrangle, showing the location of the Project area and features discussed in the text

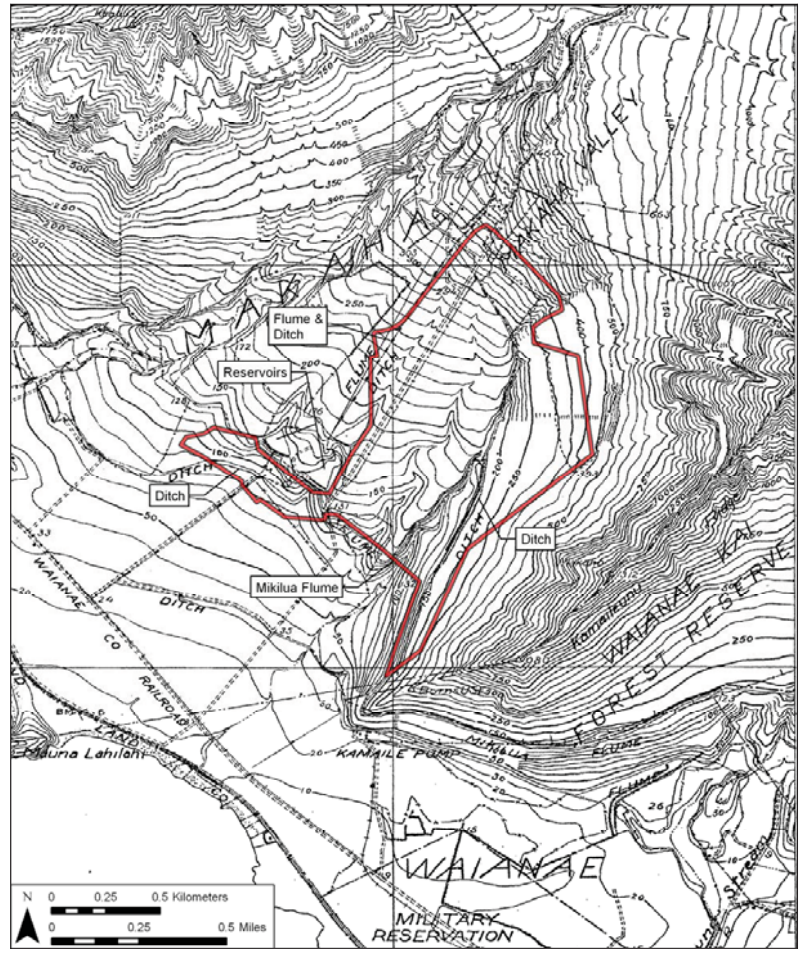

Figure 21. 1928 U.S. Geological Survey topographic map, Kaena Quadrangle, showing the location of the Project area and features discussed in the text

The 1943 U.S. War Department map (Figure 22) shows little additional development in the vicinity of the Project area through the early 1940s. Land use in lower Mākaha Valley and along the coast continued to be dominated by plantation sugarcane cultivation. In 1945, Amfac contracted the firm of James W. Glover, Ltd. to tunnel into a ridge in the back of Mākaha Valley. The completed tunnel, known as the “Glover Tunnel,” was 4,200 feet long with a daily water capacity of 700,000 gallons.

The use of the “Glover Tunnel” water for irrigating sugarcane fields was short lived, however, as Amfac announced in 1946 that its plantation operations were no longer profitable and it planned to liquidate its nearly 10,000 acres of land. News of the impending sale was spread among the investors at the Honolulu Stock Exchange. One of the investors was Chinn Ho:

> The unorthodox Ho had started his Capital Investment Company only the year before with a bankroll of less than $200,000, much of it the life savings of plantation workers. He was known as a friend of the little man, an eager disciple of economic growth, and an upstart among his powerful haole [foreign] competitors. (McGrath et al. 1973:145)

Chinn Ho managed to broker the deal, with the Capital Investment Company purchasing 9,150 acres of land in the Wai‘anae District for $1,250,000 (McGrath et al. 1973:145). The optimistic Ho believed a large increase in population along the Wai‘anae coast would create a demand for land, and therefore a large return on the investment:

> His intention was to attract new residents by offering fee simple land at prices everyone could afford. The first increment would be 340 lots on the beach at Makaha. (McGrath et al. 1973:148)

By 1952, over 1,600 house and farm lots were sold along the Wai‘anae coast. A 1956 U.S. Army Mapping Service map (Figure 23) shows the extensive development of the former cane lands in coastal Mākaha, with a network of roads and many house structures. Some of the former plantation irrigation infrastructure in the vicinity of the Project area, including ditches and reservoirs, remains in place. The Mikilua Flume is indicated to have been abandoned by this time. Portions of the plantation water system were likely converted for use by the growing residential community, as well as small-scale farming operations. The 1956 map also indicates a cluster of structures within the western portion of the current Project area.

In the mid-1960s, Chinn Ho envisioned Mākaka as a tourist destination rivaling Waikīkī:

> He discussed using helicopters and hydrofoils to transport visitors from Waikiki, a kiddies hotel where guests could leave their children to be supervised, a mountain lodge restaurant to be reached only by cable car. (McGrath et al. 1973:59)

Construction of the Makaha Inn, a 200-room luxury hotel, was completed in 1969. Along with the hotel construction, associated resort development also included recreational facilities, two golf courses and both low- and high-rise condominiums. A 1978 aerial photograph (Figure 24) shows the extent of development in the lower valley, in the vicinity of the current Project area, and coastal areas. Approximately half of the Project area consists of a golf course.

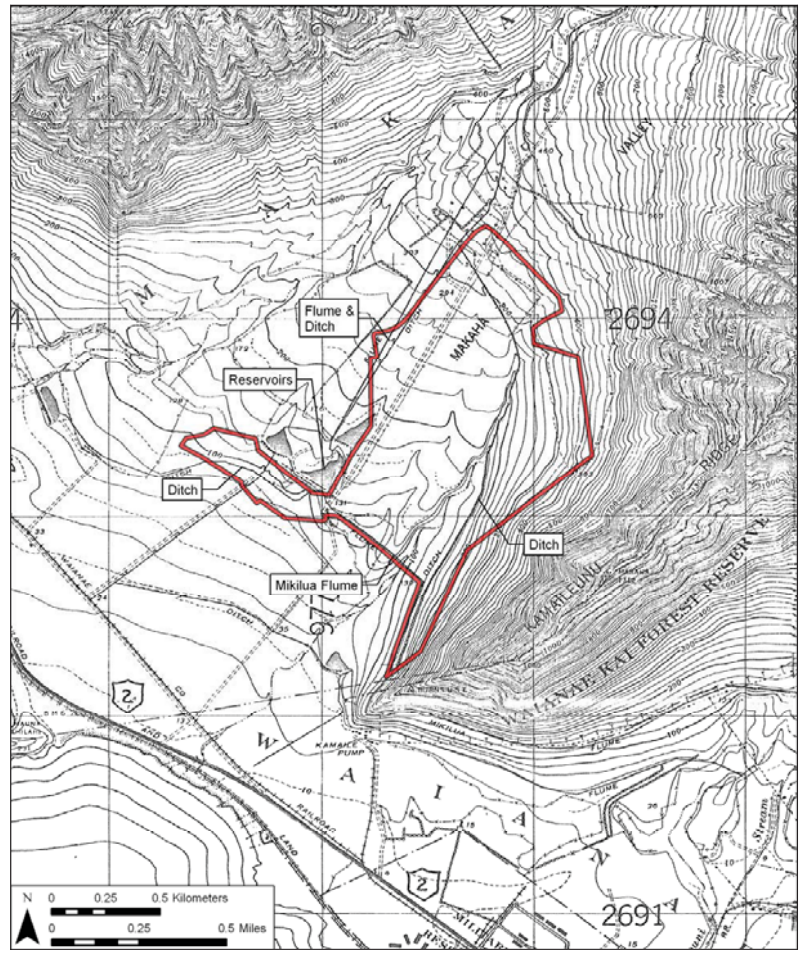

Figure 22. 1943 U.S. War Department topographic map, Waianae Quadrangle, showing the location of the Project area and features discussed in the text

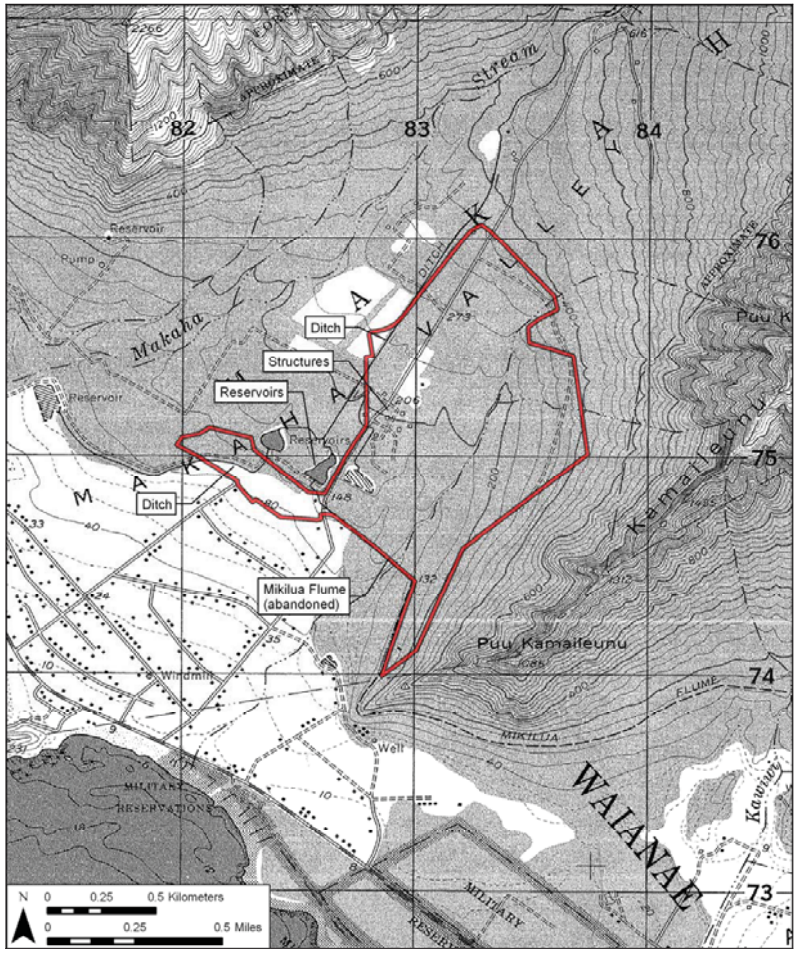

Figure 23. 1956 U.S. Army Mapping Service topographic map, Waianae Quadrangle, showing the location of the Project area and features discussed in the text

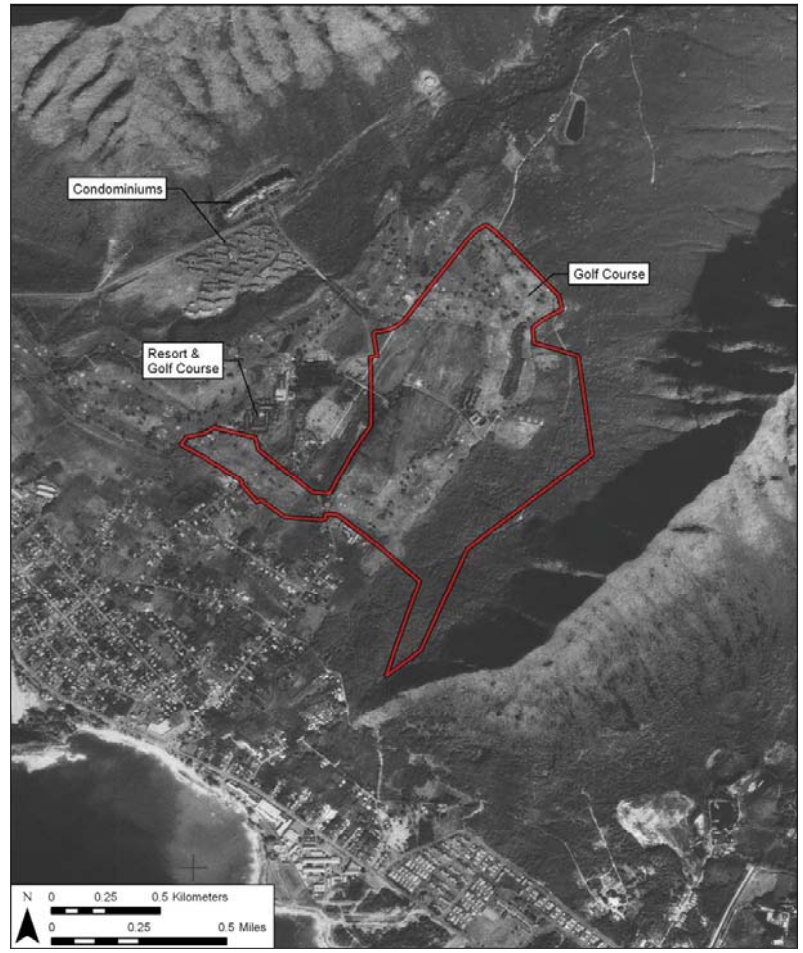

Figure 24. 1978 U.S. Geological Survey Orthophotograph, Waianae Quadrangle, showing the location of the Project area and features discussed in the text

Section 5 Archaeological Research

5.1 Overview

The main objectives of this section are (1) to establish a pre-Contact and early historic-era context for traditional land use and resource management in the Project area by providing an overview of relevant archaeological research in Mākaha Ahupua‘a, and (2) to provide a detailed discussion of archaeological evidence within and immediately adjacent to the Project area (Figure 25 and Table 2). This is not an exhaustive review of all previous archaeological research in Mākaha Ahupua‘a, which is beyond the scope and purpose of this report, and can be found in CSH's companion Archaeological Inventory Survey. The main focus of this section is on reviewing previously-identified archaeological resources that are within or near the current Project area.

This overview demonstrates that the Project area was within and/or immediately adjacent to the primary settlement area of Mākaha Ahupua‘a in traditional times, and that another traditional settlement area was located immediately south of the Project area near the base of Kamaile Ridge. A formal Archaeological Inventory Survey of the KS Learning Community Project area by CSH has recently been completed (Hammatt et al. 2009). Results of this most recent archaeological survey is incorporated into this Draft Report.

Based on all available archaeological evidence, it is likely that historically-significant cultural deposits are located in some portions of the Project area in subsurface contexts. In part, this is due to the fact that commercial sugarcane activities generally did not extend into the Project area, but were confined to lands immediately south of the proposed Project; also, portions of the Project area (e.g., along the base of Kamaile Ridge) have not been extensively developed to date.

5.2 Early Archaeological Research

McAllister's (1933) classic island-wide survey for the Bishop Museum, the first of its kind on O‘ahu, is significant from a historical perspective because it represented an early attempt to record cultural resources in places where no prior scientific work had been conducted; at the same time, however, it is clear that McAllister's findings were skewed towards large, easily-accessible sites, such as prominent *heiau* built by high chiefs, and sites located at or near the coast. His results do not constitute a representative sample of archaeological resources in any given area, but they do provide some understanding of many of the most well-known cultural resources (at the time in the 1930s), including *wahi pana* and associated *mo‘olelo* that were important to Native Hawaiians.

McAllister identified seven sites in Mākaha Ahupua‘a and one on the Wai‘anae-Mākaha border. None of these sites are located within the current Project area. Sites 171 and 172, the closest to the current Project area located less than one-half mile north-northeast of its *mauka* boundary, are a terrace complex and stone platform, respectively, both of traditional design and likely dating from as early as pre-Contact times. Site 171 is particularly significant to the current Project because it provides a glimpse of how extensively the middle Mākaha Valley was once modified and utilized by Native Hawaiians for traditional cultivation practices; and it

compliments other observations (e.g., Handy and Handy 1972; Green 1980) documenting the intensity of traditional use and modification of the valley. McAllister described the terrace complex (on the Honolulu, or southeast, side of Mākaha Stream) designated Site 171 as follows:

> The terraces average from 20 to 50 feet in width and are of varying lengths, some times several hundred feet long. Rock facings from 1 or 2 feet to 6 feet in height separated the terraces. The stones of these facings are evenly piled at a slight slope with the upper side flush with the earth. Water was brought by irrigation ditches now destroyed. It is probable that the plantation flume which is just above the last terrace followed the old Hawaiian ditch. These terraces have been in use up to recent years.

McAllister also decribed Kāne‘aki Heiau:

> Site 170. Kaneaki Heiau
>
> Kaneaki Heiau, about halfway up Makaha Valley, Wai‘anae. One of the best-preserved heiaus on Oahu. Consists of two main inclosed platforms and numerous terraces and adjoining spaces also inclosed. The upper platform has a raised terrace at one end upon which is an altar or possible oracle tower site. Massive walls inclose this platform on three sides; the fourth is open to the other platform, which is 6 feet lower. Three narrow steps connect these two platforms…

A report on the restoration of the Kāne‘aki *Heiau* was written in 1996 by Fields Masonry. It concludes that this *heiau* was considered an agricultural *heiau* when first built but was later modified into a *luakini* (sacrificial) *heiau*.

The peak Kawiwi (Site 167) is on the ridge separating Mākaha and Wai‘anae *ahupua‘a*. The exact location of the Waewae fortress, also used as a place of refuge, is not known; it may have been on the Wai‘anae side, as most references seem to associate the fortress with this *ahupua‘a.*

Sites 173-175 are located in coastal Mākaha, near Kepuhi Point. Site 173 was described as the "probable location" of a large rock reported in 1839 by E. O. Hall as "two or three miles distance" past the settlement at Pukahea (Pu‘u Kāhea) that was once an object of worship. This sacrificial stone was reported by Hall, who was obviously ignorant of even the most rudimentary principles of Hawaiian religion, as "in no peculiar sense striking" and "as undignified as any other hump of inanimate matter along the road." It is unclear whether McAllister actually saw this stone, which Hall describes as "lying at the foot of a frightful precipice several hundred feet in height." McAllister's map appears to locate it in the flats in the central seaward portion of the valley. This may be the same stone others identify as Pōhaku Kīkēkē or Pōhaku Pa‘ipa‘a, the "clapping stone."

Site 174, Laukīnui Heiau, was described as "the important one [*heiau*] in Mākaha Valley," and was said to be so old as to have been built by the *menehune*, a common indication of great antiquity among *maka‘āinana.* McAllister places this site in the vicinity of Kepuhi Point and his description of the *heiau* incorporating a "coral outcrop" and "an amazing amount of coral" fits that locale.

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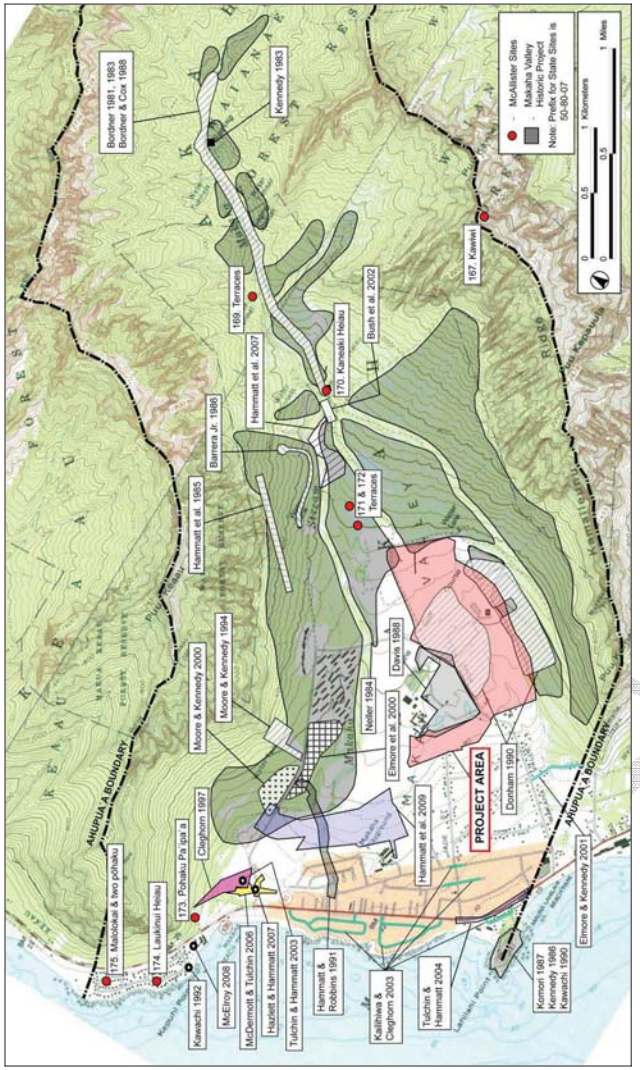

Figure 25. Previous Archaeological Projects in Mākaha; current Project area shaded in red; approximate locations of sites recorded by McAllister (1933) have been added to the map (base map: U.S. Geological Survey 7.5 minute series topographic map, Waianae Quadrangle 1998)

Table 2. Previous Archaeological and Cultural Resource Studies in Mākaha Ahupua'a

Study	Location	Type of Study	Findings
McAllister 1933	Island-wide	Island-wide Survey	Described seven sites in Mākaha Ahupua'a
Green 1969	Large expanse of the central valley	Makaha Valley Historical Project Report 1	Historical documentation and analysis; 600 archaeological features in the upper valley and 1,131 features in the lower valley
Green 1970	Large expanse of the central valley	Makaha Valley Historical Project Report 2	Results of excavations, with 16 radiocarbon dates going back to ca. A.D. 1200; 600 archaeological features in the upper valley and 1,131 features in the lower valley
Ladd and Yen 1972	Large expanse of the central valley	Makaha Valley Historical Project Report 3	Results of excavations at selected sites
Ladd 1973	Large expanse of the central valley	Makaha Valley Historical Project Report 4	Results of excavations at selected sites
Green 1980	Large expanse of the central valley	Makaha Valley Historical Project Report 5 - Summary	Summary of archaeological data and cultural history; 600 archaeological features in the upper valley and 1,131 features in the lower valley
Bordner 1981	Corridor in valley floor, *mauka* of Kāne'aki Heiau	Surface Survey	Noted numerous sites, mostly agricultural
Bordner 1983	Corridor in valley floor, *mauka* of Kāne'aki Heiau	Surface Survey	Noted numerous sites, mostly agricultural
Kennedy 1983	1072-ft. elevation on valley floor, 2 km *mauka* of Kāne'aki Heiau	Well Monitoring Report	Observed no buried features or artifacts
Neller 1984	Central valley (Site Area 997)	Archaeological Reconnaissance Survey	Identified unreported sites, and re-analyzed several previously reported sites
Hammatt et al. 1985	West side of valley (Site Area 776)	Archaeological Reconnaissance Survey	Identified numerous modified natural terraces associated with dryland agriculture

Study	Location	Type of Study	Findings
Barrera 1986	West central side of valley	Archaeological Survey	Identified 4 sites: 4 platforms, a U-shaped habitation enclosure, a terrace, and a wall; 17 test pits excavated
Kennedy 1986	Mauna Lahilahi	Archaeological Investigations	Identified 5 archaeological sites
Anonymous 1986	Mauna Lahilahi	Affidavits of brief oral histories	Noted sacredness of Mauna Lahilahi and the good fishing
Komori 1987	Mauna Lahilahi	Archaeological Survey and Testing	Relocated Kennedy's 5 sites and described 11 more; reports 8 C^{14} dates
Bordner and Cox 1988	Upper valley floor	Mapping Project	Ties in previously identified sites, focus on sites -764 & -77, emphasis on dryland agriculture
Donham 1990	Two areas on SE side of the valley	Archaeological Inventory Survey	Identified a terrace for dry-land agriculture and/or habitation
Kawachi 1990	Mauna Lahilahi	Burial report	Described remains of 2+ individuals, artifacts and sites
Hammatt and Robins 1991	Water Street/ Kili Drive Area	Archaeological Inventory Survey	Identified a linear earthen berm associated with commercial sugarcane cultivation
Kawachi 1992	84-325 Makau St., Kepuhi Point	Burial Report	1 burial? "First in this particular area".
Moore and Kennedy 1994	NW side of valley, 242-ft elevation	Archaeological Investigations	No historic features were located
Cleghorn 1997	North of Kili Drive; *Mauka* of Farrington Hwy.	Archaeological Inventory Survey	Identified a cultural layer, a pond/wetland area, remains of OR&L. Railroad structures, and a bridge foundation
Pagliaro 1999	Kāne‘aki Heiau	Heiau Restoration Report	Background, a restoration plan, account of restoration work
Magnuson 1997	Upper Mākaha Valley	Archaeological Review	Overview and summary of previous studies
Maly 1999	Central valley	Limited Consultation Study	Historical overview and consultation with knowledgeable parties
Elmore et al. 2000	S. south side of Kili Drive (Site area -776)	Archaeological Inventory Survey	Identified 3 features, possibly dry-land agriculture and/or habitation
Moore and Kennedy 2000	North side of Kili Drive (Site area -776)	Archaeological Inventory Survey	Identified2 features, possibly dry-land agriculture

Study	Location	Type of Study	Findings
Bush et al. 2002	Mauna Olu Non-Potable Reservoir (TMK: 8-4-02:13, 8-4-29:43, 134, 135)	Archaeological Monitoring Report	Minimal finds
Kailihiwa and Cleghorn 2003	Lower Mākaha	Archaeological Monitoring Report	Identified 3 sites with 5 features
Tulchin and Hammatt 2003	Kili Drive and Farrington Hwy.	Archaeological Inventory Survey	No cultural resources identified
Tulchin and Hammatt 2004	Farrington Hwy. Jade St. to Kaulawaha Rd., TMK 8-4-01,03,04,11,13, 14; 8-5-02, 14-18	Archaeological Monitoring Report	Minimal finds
McDermott and Tulchin 2006	Mākaha Bridges 3 and 3A, TMK: [1] 8-4-001:012, 8-4-002:045, 47, 8-4-018:014, 122, 123, 8-4-08:018, 019, 020	Archaeological Inventory Survey	Identifies 5 historic properties: 50-80-7-6822 Mākaha Bridge 3; 50-80-7-6823 Mākaha Bridge 3A; 50-80-7-6824 Farrington Highway; 50-80-7-6825 cultural layer with human remains; 50-80-12-6714 OR&L railroad
Hammatt et al. 2007	Inland Mākaha Valley, TMK: [1] 8-4-002:014 por.	Archaeological Inventory Survey	Identified 4 historic properties: 50-80-07-6895 irrigation ditch and plantation infrastructure; 50-80-07-6896 cattle wall; 50-80-07-866 historic habitation complex pre-Contact terrace was recorded: 50-80-07-6897
Hazlett and Hammett 2007	Mākaha Bridge 3, TMK: [1] 8-4-002:047and 8-4-018:014	Archaeological Monitoring Report	No significant finds
Monahan and Silva 2007	250-acre area including Kamaile, Mauna Lahilahi and portions of Wai‘anae Kai	Traditional Cultural Property (TCP) assessment	More than a dozen TCP component features identified

Study	Location	Type of Study	Findings
Hammatt et al. 2009	61-Acre Parcel, TMK: [1] 8-4-002: 043, 044, 048 & 063	Archaeological Literature Review and Field Inspection	Seven historic properties identified: a wall, an alignment 3 mound clusters, a mound and berm complex, % a solitary mound, probably all associated with sugarcane cultivation
Hammatt et al. 2009	306-Acre Parcel, TMK: (1) 8-4-002:005, 007, 056, 057, 070, 76; 8-4-023:014, 015; 8-4-024:001	Archaeological Inventory Survey	This archaeological inventory survey identified five historic properties in the project area, a terrace, a plantation era flume and ditch.concrete foundations, and a stone mound Further investigation concluded the stone mound to be of of modern origin. SIHP #s 50-80-07-875, -3325, -4818, -7749, and -7750 may be affected by the proposed project. Sufficient information regarding the location, function, age, and construction methods of the five historic properties has been generated by the current inventory survey investigation to mitigate any adverse effect caused by proposed development activities. No further work is recommended for SIHP #s 50-80-07-875, -3325, -4818, -7749, and -7750. A draft AIS report was submitted to SHPD, and has subsequently been revised. Final review of the revised Draft AIS from SHPD is pending.

Site 175, known as Mololokai, is located at the base of the ridge between Kea‘au and Mākaha on the seaside of the road. This site was described as two pits about five feet in depth (now filled with dirt and refuse) where early cannibals had come to wash the de-fleshed bodies of their victims at high tide. Two prominent stones, Pōhaku o Kāne on theMākaha side and a Pōhaku o Kanaloa on the Kea‘au side, were reportedly associated with this site (McAllister 1933:121).

5.3 Makaha Valley Historical Project

The Makaha Valley Historical Project (Green 1969, 1970, 1980; Ladd and Yen 1972; Ladd 1973) studied nearly all of Mākaha Valley. The project recorded more than 600 archaeological features in the upper valley and 1,131 features in the lower valley.

Excavations were conducted at 30 features including 10 field shelters, four stone mounds, three platforms, three house enclosures, two storage pits, a clearing, a site thought to be a shrine, a *heiau*, a pondfield terrace system, a habitation feature, two historic house platforms, and a modern curbed foundation. Some of these sites are located around the Holt homestead, north and *mauka* of the Project area, as seen on a reconstructed map of Mākaha about 1855-1884 (Figure 26). Radiocarbon dating indicated settlement as early as the thirteenth century, with settlement focused near the perennial Mākaha Stream. Subsequently, increased population expansion into *kula* lands occurred; by the sixteenth century, the trend had spread to the “upper valley,” largely replacing dryland farming with an irrigated taro system (Green 1980:75).

The lower valley Project area was divided into six Survey Areas (Ladd 1973:29). Survey Areas 4 and 5 overlap with the eastern portion of the current Project area. In the northern section, Area 4 was a triangular area between two jeep roads, the golf course, and the base of the Mākaha-Wai‘anae dividing ridge. Only one feature (designated Bishop Museum site number 50-Oa-C4-102), a poorly-preserved platform, was recorded (Ladd 1973:32; Table 2).

Area 5 was a narrow, 1 by 0.3 km strip, south of Area 4, bounded on the west by a dry streambed (probably ‘Eku Stream) and a old jeep trail on the east. The north boundary also followed a jeep trail, and the southern boundary was adjacent to the Mikilua water flume (Ladd 1973:30). Ladd (1973:30) recorded two features, a mound and a terrace, and noted that the entire survey area had been “previously disturbed.”

Summarizing the finds in the lower valley, Green (1980:23) wrote:

> If there has been any doubt as to the extent of the Hawaiian occupation zone in the lower valley, where it was thought that earlier activities in connection with sugar production, cattle raising, and small farming had perhaps destroyed all prior remains, there is no doubt now. What is not reflected by the figure of 222 recorded sites is the fact that many of the numbered sites are clusters of smaller features adjacent to the well-defined structures. In short, because of the clustering, only those readily identifiable structures that were located have been plotted on the map and have recorded forms. Therefore, the site-record forms are to be regarded chiefly as indicators by which large groupings of sites can be located. Among the recorded sites on file are 106 houses, 25 platforms, 36 terraces, 12 mounds, 3 clearings, 27 walls, portions of what appears to be an irrigation channel, and one rock shelter at the base of the Makaha-Keaau ridge…

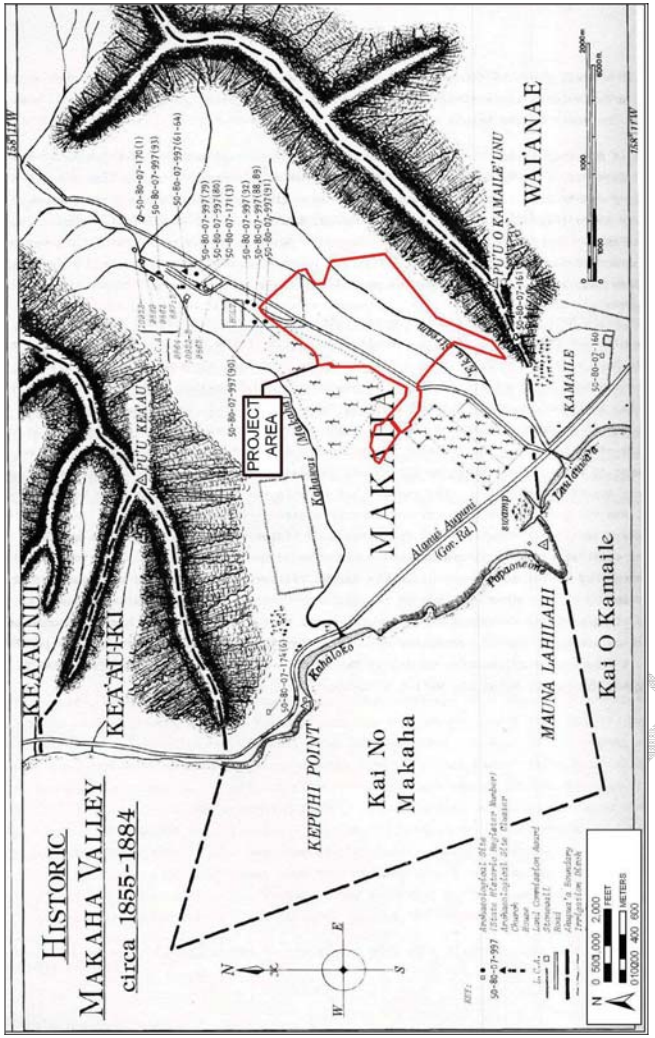

Figure 26. Map of Mākaha Valley in Green (1980:22); topographic features match area for the 1855-1884 period; note number of sites north of the Project area near the Holt family homestead

5.4 Other Relevant Studies

Donham (1990) conducted an archaeological inventory survey of two discrete parcels for a total of approximately 130 acres in the south-central portion of Mākaha Valley (Figure 27). The eastern parcel covered the same survey areas as Ladd's (1973) Survey Areas 4 and 5, and thus overlaps with the current Project area. The feature in Area 4 was relocated, although Donham described it as a terrace, rather than a platform. It was designated site SIHP 50-80-07-875. The two features in Ladd's Area 5 could not be relocated. This area had been heavily disturbed by bulldozing, and Donham concluded that they had been destroyed between 1973 and 1990.

In the western parcel of Donham's survey (which also overlaps the current Project area), she identified a boulder alignment (SIHP 50-80-07-4817) and two mounds (SIHP 50-80-07-4818). Both of these features were probably fairly modern bulldozer piles. Donham also recorded a complex (SIHP 50-80-07-4819), possibly a pre-Contact or early post-Contact house site, which was comprised of 10 terraces, seven modified outcrops, two walls, and one platform.

Davis (1988) conducted a reconnaissance survey of a 35.7-acre parcel, northwest and adjacent to (possibly overlapping) a portion of the current Project area. No pre-Contact or traditional Hawaiian features were noted, but five features associated with sugarcane cultivation were recorded. These consisted of three dams/reservoirs, one irrigated ditch with associated stonework, and one elevated road or railroad bed. Davis also noted the extreme bulldozer alteration of the Project area.

Richard Bordner (1981) carried out a survey of a linear Project area up the middle of the valley floor inland of Kāne'aki Heiau in support of road widening and well placement projects. This corridor ran through several site areas designated during the Makaha Valley Historical Project. Descriptions of sites are by proximity to site mapping points. Bordner (1981:D-22) concludes "the entire Mākaha Valley was utilized for agricultural production in the most intensive way, such that all areas capable of it were undoubtedly utilized for crop production."

Earl Neller (1984) of the SHPD went back into the area designated as Site Area 997 in the Makaha Valley Historical Project "to clear up various deficiencies in the published reports and unpublished site data" and to re-examine various "puzzling inconsistencies." He relocated sites previously reported as destroyed (McAllister Sites 171 and 172), identified unreported sites, and re-analyzed several sites studied during the Makaha Valley Historical Project.

Hammatt et al. (1985) carried out an archaeological reconnaissance survey of a 3,000 foot long corridor on the west side of central Mākaha Valley in the 776 site area, documenting numerous modifications of natural terraces for dryland agriculture. Ten archeological sites (one wall, two habitation sites, and seven agricultural sites) were recorded.

Barrera (1986) carried out an archaeological survey of a mid-valley well site on the west central side of the valley. The Project area appears to have included a corridor approximately 600 m long and 30 m wide and a proposed reservoir site 90 m in diameter. He identified four sites, including four stone platforms (Site -1465), a U-shape habitation enclosure (Site -1466), a terrace (Site -1467) and a wall (Site -1468).

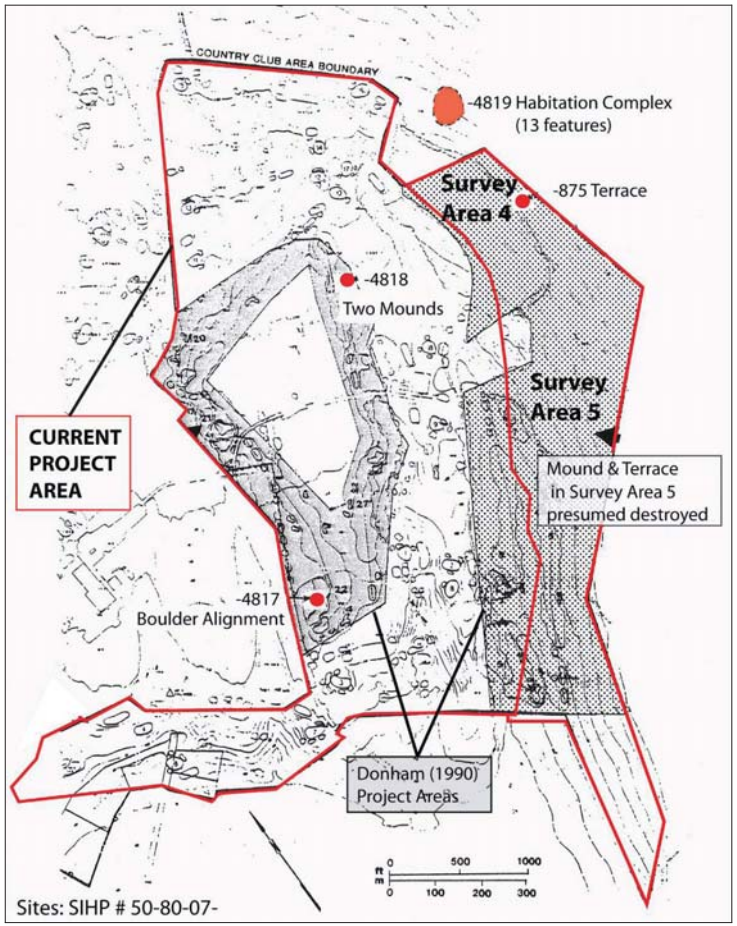

Figure 27. Archaeological sites previously identified within or near the current Project area (outlined in red); the current Project area includes portions of the Mākaha Valley Archaeological Project Lower Valley Survey Areas 4 and 5 (Ladd 1973) and the two parcels of the Donham 1990 Project area (shaded in gray)

Bordner and Cox (1988) carried out a mapping Project on the upper valley floor inland of Kāne‘aki Heiau. While much of the focus of this study was more accurately locating sites previously identified during the Makaha Valley Historical Project, their findings suggest that the relative importance of dryland, non-irrigated agriculture had previously been underestimated.

Moore and Kennedy (1994) carried out archaeological investigations on the northwest side of the valley for a proposed reservoir at 242-ft elevation. The access corridor and reservoir site covered approximately eleven acres. No historic features were located.

Fields Masonry documented the stabilization and restoration of Kāne‘aki Heiau carried out in 1996 (1999 documentation by Emily Pagliaro). Prior restoration efforts had been carried out in 1970.

Magnuson (1997) carried out a preliminary archaeological review of upper Mākaha Valley for a proposed water line replacement project. This was primarily an archaeological literature review with an overview of sites.

Maly (1999) carried out a *“*Limited Consultation Study with Members of the Hawaiian Community in Wai‘anae” in support of the Mauna ‘Olu Water System. Several interviewees deferred to Mr. Landis Ornellas (a co-founder of the organization *Hui Mālama o K Heiau*) as a cultural expert for mid-valley Mākaha. Concerns for continuing community consultation were expressed.

Elmore et al. (2000) carried out an archaeological inventory survey of an approximately 19.6-acre parcel located on the south side of Kili Drive and just west of the condominiums in a portion of the previously identified site area 50-80-07-776. A total of eight features were identified. Five of these were determined to be modern disturbances while the other three were thought to be possible traditional Hawaiian dry-land agricultural and/or habitation features.

Moore and Kennedy (2000) carried out an archaeological inventory survey of an approximately 20-acre parcel located on the north side of Kili Drive in a portion of the previously identified site area 50-80-07-776. The survey was located across Kili Drive. A total of twelve features were identified. Ten of these were determined to be modern disturbances while the other two were thought to be possible traditional Hawaiian dry-land agricultural features.

No cultural material was found during monitoring of the excavations of new water lines at the Mauna Olu Non-Potable Reservoir (Bush et al. 2002). This Project area was only 200 feet south of Kanē‘āki Heiau. Because of this proximity, a surface terrace in the Project area was tested. Only fill material was found in the excavation.

Four historic properties, an irrigation ditch and other features associated with the Wai‘anae Sugar Co., a cattle wall, an historic habitation complex, and a possible pre-Contact agricultural terrace were recorded during the field inspection of a 61-acre parcel in the area near the junction of the lower and upper Mākaha valleys (Hammatt et al. 2007).

CSH conducted an archaeological inventory survey of the KS Learning Community project site in 2009 (Hammatt et al. 2009). This archaeological inventory survey identified five historic properties in the project area. SIHP #s 50-80-07-875, -3325, -4818, -7749, and -7750 may be affected by the proposed project.

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Each of the five historic properties identified in the project area was documented with detailed written descriptions, photographs, and accurately located with GPS survey equipment. Scale drawings were made of SIHP # 50-80-07-875, -4818, and -7749, and limited subsurface testing was conducted at SIHP # 50-80-07-875 and -4818.

Sufficient information regarding the location, function, age, and construction methods of the five historic properties has been generated by the current inventory survey investigation to mitigate any adverse effect caused by proposed development activities. No further work is recommended for SIHP #s 50-80-07-875, -3325, -4818, -7749, and -7750.

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Section 6 Community Consultation

Throughout the research process, CSH researchers made an effort to contact and consult with Hawaiian cultural organizations, government agencies, and individuals who might have knowledge of and/or concerns about cultural resources and practices specifically related to the Project area. The community consultation effort was made by letter, email, telephone and in person. Although the wording of the outreach letter refers to the “Ka Pua - Mākaha Learning Complex and the DHHL Homestead Development Project,” the name has since changed to the “Learning Community and DHHL Residential Community Project.” In the majority of cases, letters along with a map of the Project area were mailed with the following text (see Appendix A):

> At the request of PBR Hawaii & Associates, Inc., Cultural Surveys Hawai‘i (CSH) is conducting a Cultural Impact Assessment (CIA) for the proposed Ka Pua - Mākaha Learning Complex and Department of Hawaiian Home Lands (DHHL) Mākaha Homestead Development Project.
>
> The Ka Pua - Mākaha Learning Complex and the DHHL Homestead Development Project will be constructed in the Mākaha Ahupua‘a, Wai‘anae District, O‘ahu Island (TMK: [1] 8-4-002:005, 007, 056, 057, 070; 8-4-023:014, 015; 8-4-024:001). The approximately 306-acre Project area is located in the eastern portion of Mākaha Valley, approximately 1.3 km (0.8 mi.) *mauka* (inland) of Farrington Highway (see map enclosed).
>
> The Project area consists of lands at the base of the valley, including the Makaha Valley Country Club, and lands along the lower slopes of the Kamaile‘unu Ridge. The Project area is privately owned by Ko Olina Makaha East, LLC / Honolulu Limited.
>
> The proposed Ka Pua Project includes development of an approximately 67-acre Kamehameha Schools learning complex and an approximately 112-acre DHHL Mākaha Homestead residential community.
>
> The Kamehameha Schools learning complex is currently envisioned as including a preschool, educational learning lab, multimedia center, learning halls, short-term residence halls, multi-function sports fields, community gathering area, and *lo‘i* (irrigated agricultural field).
>
> The DHHL Mākaha Homestead development is currently envisioned as including up to 600 homes and a community center.
>
> The current conceptual plan also includes large expanses of open space that is not proposed for development. Minimally, land disturbing activities associated with the proposed Project would include the following: grubbing and grading; excavations for building foundations and subsurface utilities; and excavations for associated infrastructure improvements.
>
> The Project’s area of potential effect (APE) is defined as the entire 306-acre Project area, within the larger context of Mākaha Ahupua‘a. The APE further

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includes the Mākaha Ahupua‘a and the island of O‘ahu, as these relate to Hawaiian beliefs (e.g. *mo‘olelo*, or legends, oral histories and *wahi pana*, or storied places), resources and practices.

The purpose of this cultural study is to assess potential impacts to cultural practices as a result of this proposed development in Mākaha. We are seeking your *kōkua* (assistance) and guidance regarding the following aspects of our study:

- **General history and present and past land use of the project area.**
- **Knowledge of cultural sites which may be impacted by future development of the project area - for example, historic sites, archaeological sites, and burials.**
- **Knowledge of traditional gathering practices in the project area, both past and ongoing.**
- **Cultural associations of the project area, such as legends and traditional uses.**
- **Referrals of *kūpuna* or elders and *kama‘āina* who might be willing to share their cultural knowledge of the project area and the surrounding *ahupua‘a* lands.**
- **Any other cultural concerns the community might have related to Hawaiian cultural practices within or in the vicinity of the project area.**

While the initial letter indicated that short-term residence halls and *lo‘i* would be included in the KS Learning Community, by the time CSH conducted the interviews these had been removed. The Project acreage has also increased from 303 acres to 306 acres, and maps reflecting that change were provided to participants. During the interview process each person was informed of these changes. At times, however, participants did comment on the short term residence halls and the *lo‘i*, because these items were included in the initial community contact letter.

Several attempts (one to nine) were made by mail, email and telephone to contact individuals, organizations, and agencies apposite to the subject CIA. The summary of the community consultation is presented in Section 6.1.

6.1 Community Consultation Table

Table 3. Summary of Community Consultation Efforts

Name	Affiliation	Notes
Abaro, Brenda	Mākaha Elementary Faculty	8 February 2010 CSH briefed Ms. Abaro about KS Learning Community project and CIA consultation process. 10 February 2010 CSH interviewed Ms. Abaro.
Ailā, William	Wai‘anae Harbor Master	20 November 2009 CSH sent initial letter 8 February 2010 CSH phoned Mr. Ailā.
Aipa, Linda	Hawaiian Homestead recipient	12 March 2010 Ms. Aipa attended group interview at Leeward Community College, Wai‘anae. Ms. Aipa consented to have her responses included in the interview summary.
Aldeguer, Walterbea	Clerk, Leeward Community College, Wai‘anae	12 March 2010 Ms. Aldeguer helped coordinate and participated in a group interview, so that CSH could discuss Project with Kūpuna from Mākaha area. 18 March 2010 Ms. Aldeguer made changes to and approved the interview.
Amaral, Annelle	‘Ahahui Siwila Hawai‘i O Kapolei Hawaiian Civic Club	20 November 2009 CSH sent initial letter.
Burgess, Puanani	Longtime resident of Wai‘anae District, Native Hawaiian facilitator and consultant in community development	20 November 2009 CSH sent initial letter. 23 November 2009 CSH phoned Ms. Burgess who suggested Maile Shimabukuro and others for a group meeting. (This meeting with Maile Shimabukuro and others, although planned, did not occur, due to time scheduling conflicts.) 11 December 2009 CSH phoned Ms. Burgess. 15 January 2010 CSH interviewed Ms. Burgess. During the interview Ms. Burgess suggested that CSH contact Hokalai Nui, Ho‘oipo de Cambra, Eric Enos, William Ailā, Flo Pell, Hayden F. Burgess (Pōkā Laenui), and her three children. For mo‘olelo and place names, she referred Puakea Nogelmeier and Michael Los Calzo. (CSH interviewed Eric Enos and sent an intitial contact letter to William Ailā. Pōkā Laenui was very busy at this time and unable to participate in an interview. Due to time constraints, the other

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Name	Affiliation	Notes
		names listed were not contacted. 18 February 2010 CSH met with Ms. Burgess to discuss interview summary, and to follow-up on a few questions. She also approved the interview summary. 10 March 2010 CSH met with with Ms. Burgess for final corrections: interview summary approved.
Cachola, Fred	Retired instructor at Wai‘anae High School	20 November 2009 CSH sent initial letter. 30 November 2010 Mr. Cachola phoned CSH to inform us that he is out of town. He spoke of royalty who lived in Mākaha. Mr. Cachola also directed CSH to Beck Ka‘aikuahiwi and Jimmy Pililau. Mr. Cachola also mentioned Ladd archaeology study [Bishop Museum work] as source of information. Due to time constraints, Beck Ka‘aikuahiwi and Jimmy Pililau were not contacted. 5 January 2010 CSH phoned Mr. Cachola who agreed to an interview. 13 January 2010 CSH phoned Mr. Cachola to confirm interview date. 18 January 2010 CSH interviewed Mr. Cachola. 22 March 2010 CSH called Mr. Cachola; however, due to his busy schedule, he was unable to make corrections to his interview
Card, Keala	Hawaiian Homestead recipient in Wai‘anae Kai	12 March 2010 Ms. Card attended the group interview at Leeward Community College, Wai‘anae and gave her consent to have her remarks included in the interview summary.
Cayan, Phyllis “Coochie”	History and Culture Branch Chief, SHPD	20 November 2009 CSH sent initial letter.
Cocquio, Luigi “Gigi”	Hoa ‘Aina O Makaha (Makaha Farm)	20 January 2010 CSH interviewed Mr. Cocquio. 8 February 2010 CSH conducted a follow-up meeting.
Cruz-Losano, Momi	Kumu Hula, Halau Hula Namakahonuakapiliwale	20 November 2009 CSH sent initial letter. 23 November 2009 CSH phoned Ms. Cruz-Losano and left a message. 3 December 2009 CSH phoned again but the message machine was full.

Name	Affiliation	Notes
DeTroye, Butch	Cultural Learning Center Manager for Ka‘ala Farms	4 March 2010 CSH interviewed Mr. Butch DeTroye at Ka‘ala Farms.
Dodge M.D., Fred	Mālama Mākua member	8 February 2010 CSH briefed Dr. Dodge about the project and CIA consultation process.
Dodge, Vince	Mākaha *kama‘āina*	8 February 2010 CSH briefed Mr. Dodge about KS Learning Community project. Mr. Dodge recommended that KS and DHHL conduct a walk-through of the Project area with Mākaha and Wai‘anae *kama‘āina.*
Enos, Eric	Founder and Executive Director of The Cultural Learning Center at Ka‘ala	4 March 2010 CSH interviewed Mr. Enos at Ka‘ala Farms. 18 March 2010 CSH again met with Mr. Enos, and he approved interview, with minor corrections.
Gay, Lucy	Instructor at Leeward Community College, Wai‘anae	12 March 2010 Ms. Gay attended a group interview at Leeward Community College, Wai‘anae. 18 March 2010 Ms. Gay reviewed the interview with others who participated in the group interview, made changes and approved interview.
Gomes, Gail	Editor of *Westside Stories*, a leeward O‘ahu newspaper	20 November 2009 CSH sent initial letter.
Greenwood, Alice	Kupuna and Wai‘anae District resident for most of her life	12 March 2010 Ms. Greenwood attended a group interview at Leeward Community College, Wai‘anae and gave her consent to have her remarks included in the interview summary.
Hopfe, Harris	*Kupuna* who has lived most of his life in Wai‘anae District	12 March 2010 Mr. Hopfe attended a group interview at Leeward Community College, Wai‘anae and gave his consent to have his remarks included in the interview summary.
Kaho‘onei, Sharlene	Nānākuli resident her entire life, since 1959	12 March 2010 Ms. Kaho‘onei attended a group interview at Leeward Community College, Wai‘anae and gave her consent to have her remarks included in the interview summary.
Kalawa, Florence Waikahekhae	Mā‘ili resident for 22 years	12 March 2010 Ms. Kalawa attended a group interview at Leeward Community College, Wai‘anae and gave her consent to have her remarks included in the interview summary.
Kanahele, Kamaki	*Kahuna lā‘au lapa au* (healer)	20 November 2009 CSH sent initial letter 23 November 2009 CSH phoned, but number

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Name	Affiliation	Notes
		was out of service.
Kane, Shad	Makakilo/Kapolei Neighborhood Chairperson	20 November 2009 CSH sent initial letter.
Kauihou, Ka‘iulani	Hawaiian Language Curriculum Developer for Ka‘ala Farms, Inc. and Ma‘ili Elementary School Longtime Resident of Mākaha	20 January 2010 CSH interviewed Ms. Kauihou.
Keli‘i, Arviella	Nānākuli resident for 70 years	12 March 2010 Ms. Keli‘i attended a group interview at Leeward Community College, Wai‘anae and gave her consent to have her remarks included in the interview summary.
Kila, Glen	Principal, Kamaile Elementary School	20 November 2009 CSH sent initial letter
Kim, Ku‘uipo Ka‘aekuahiwi-Holokahi	Mākaha resident for 50 years	12 March 2010 Ms. Kim attended a group interview at Leeward Community College, Wai‘anae and gave her consent to have her remarks included in the interview summary.
Lindsey, Doreen K.	Pelekikena Emeritus Nanaikapono Hawaiian Civic Club	20 November 2009 CSH sent initial letter. 23 November 2009 CSH learned that Doreen Lindsey had passed away in 2009.
Magallenes, Elton	Wai‘anae resident	20 November 2009 CSH sent initial letter.
McQuivey, Jace	O‘ahu Island Burial Council	20 November 2009 CSH sent initial letter.
Nāmu‘o, Clyde	OHA Administrator	20 November 2009 CSH sent initial letter. CHS received response letter dated 12 March 2010.
Nunes, Keoni	*Kalaikakau* (tattoo) expert	20 November 2009 CSH sent initial letter. 3 December 2009 CSH phoned Mr. Nunes who explained that he will return for an interview the week of December 14–18. 13 January 2010 CSH phoned: left message 14 January 2010 CSH phoned: left message.
Nu‘uanu, Theodore I.	Nānākuli resident for 52 years	12 March 2010 Mr. Nu‘uanu attended a group interview at Leeward Community College, Wai‘anae and gave his consent to have his remarks included in the interview summary.
Ornellas, Landis	Co-Founder Hui Mālama o Kāne‘aki	4 March 2010 CSH interviewed Uncle Landis at the Mākaha East Golf Course Club House. 18 March 2010 CSH met with Mr. Ornellas: he to made changes and approved his

Name	Affiliation	Notes
		interview.
Patterson, Dr. Kahu Kaleo	Wai‘anae District resident	20 November 2009 CSH sent initial letter. 23 November 2009 CSH phoned Dr. Patterson who suggested Eric Enos, Buffalo Keaulana, Mel Poole, Jason Patterson (his brother), Nettie Armitage, and the Caretaker of Kāne‘aki Heiau. (CSH interviewed Eric Enos and scheduled a meeting with Baffalo Keolana, but the meeting with Keolana did not occur, due to time constraints. CSH also spoke with Jason Patterson.)
Philpotts, Douglas “McD”	Hawai‘i Forest Industry Association	20 November 2009 CSH sent initial letter.
Pomaika‘i, Amanda	Nānākuli resident for 27 years	12 March 2010 Ms. Pomaika‘i attended a group interview at Leeward Community College, Wai‘anae and gave her consent to have her remarks included in the interview summary.
Rapoza, James W.	Mākaha *kama‘āina*	12 March 2010 CSH interviewed Mr. Rapoza at Mākaha Beach.
Salmon, Pake	Mākaha *kama‘āina*	8 February 2010 CSH briefed Ms. Salmon about KS Learning Community project and CIA consultation process.
Silva, Mary L.	Wai‘anae resident for 60 years	12 March 2010 Ms. Silva attended a group interview at Leeward Community College, Wai‘anae and gave her consent to have her remarks included in the interview summary.
Suckoll, Rene	Mākaha Elementary Faculty	8 February 2010 CSH briefed Ms. Suckoll about KS Learning Community project and CIA consultation process. 10 February 2010 CSH interviewed Ms. Suckoll.
Tanahy, Dalani	Executive Administrator at Ka‘ala Farms Cultural Learning Center, and renowned *kapa* practitioner and *kumu*	20 January 2010 CSH interviewed Ms. Tanahy.

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6.2 Written Responses

6.2.1 Office of Hawaiian Affairs (OHA) Response Letter

In OHA's response letter dated March 12, 2010 (see Appendix B), OHA requested that "a comprehensive review of cultural and archaeological studies related to the project area be conducted in order to determine whether and archaeological inventory survey is warranted." OHA also recommended consultation with the following *kūpuna* and cultural practioners: Glen Kila, Hanalei Hopfe, William Ailā, Alika Silva, the Badayos *‘ohana,* Eric Enos, Mel Pu‘u, Walt Keala and the Keaulana *‘ohana* (see Section 6.1 for information on who was contacted). In addition, OHA "applauds the work of all parties involved in this collaborative effort" and looks "forward to seeing the proposals of this development fully implemented as they will certainly provide much needed services and housing opportunities to the Mākaha community." OHA is "looking forward to the opportunity to review the completed assessment."

6.2.2 State Historic Preservation Division (SHPD) Response Letter

In SHPD's response letter dated December 17, 2009 (see Appendix E), the second and third paragraphs are as follows:

> This project has been presented to several Hawaiian organizations and folks are aware of this innovative project that will enhance partnerships in the Hawaiian community to address housing, education, cultural practices and socio-economics. Please also contact the Neighborhood Boards for Waianae and for Nanakuli (see County website for contact list). There are various community leaders and individuals who may be helpful to your CIA regarding that land area.
>
> SHPD recommends you search for core families (three generations) of the area who can recall the land use and access of the area to get a glimse of any cultural practices (i.e., gathering, access to sacred sites, burials, endangered species) that may be impacted by this project.

SHPD further recommended that CSH contact Eric Enos, William Ailā and the Association of Hawaiian Civic Clubs (President Momi Khan). Due to time constrainsts Momi Khan was not contacted.

Section 7 Summaries of Community Interviews

7.1 Overview

Kama‘āina and *kūpuna* with knowledge of the proposed Project and study area participated in interviews for this CIA. Interviews for this study were conducted in January and March, 2010, and are ongoing. CSH attempted to contact 42 individuals for this CIA (see Table 3). Of these potential participants, 28 *kūpuna* and *kama‘āina* participated in formal interviews for more in-depth contributions to the CIA. At the present time, 27 of these interviews have been reviewed and approved by the participants for inclusion in this CIA Draft Report; approval for the last interview is pending. CSH initiated the interviews with questions from the following five broad categories: Resource Gathering and Hunting, Ritual and Ceremonial Practices, Freshwater and Marine Resources, Burials, Trails and Cultural and Historic Properties. Participants' biographical backgrounds (in brief), comments and concerns about the proposed development and Project area and environs are presented below.

7.2 Acknowledgements

The authors and researchers of this report deeply appreciate everyone who took time to speak and share their *mana‘o* (thoughts, ideas, beliefs, opinions, theories) with CSH whether in interviews or brief consultations. We request that if these interviews are used in future documents, the words of contributors are reproduced accurately and not in any way altered, and that if large excerpts from interviews are used, report preparers obtain the express written consent of the interviewee/s.

7.3 Mrs. Puanani Burgess

CSH met and interviewed Mrs. Puanani Burgess on January 15, 2010, in Honolulu. Born in 1947 at St. Francis Hospital in Kalihi to Christopher Yoshyuki Sonoda and Mauna ‘Ala Bunker Sonoda, Mrs. Burgess grew up in Kalihi and has lived in Waia‘anae for 42 years. She has three children: Pua‘Ena, Pōhā (Pōhā-‘o-kalani-kūlanakila-nānā-ike-kumulipo), and Mauna Ala with her husband, Pōkā Laenui (a.k.a. Hayden F. Burgess). Affiliated with several organizations, Mrs. Burgess is an active community facilitator and consultant. She is also a board member of "The Positive Futures Network," which publishes *Yes* magazine. She also helped established the Wai‘anae Coast Community Alternative Development Corporation, the ‘Opelu Project, Ka‘ala Farm, Inc., Hoa ‘Āina o Mākaha, Pū‘ā Foundation, Wai‘anae Time Out Nursery, Wai‘anae Coast Time-Out Nurseries, Legal Services for Children, and Hale Na‘au Pono.

Mrs. Burgess shared her *mana‘o* on the proposed Project and the need for community-based development that integrates Hawaiian principles such as the value of the *‘ohana,* the necessity of sharing and of doing work that promotes one's self-worth. To her, these principles promote the sustainability of Hawai‘i's food resources.

The interview began with Mrs. Burgess seeking clarification on the proposed learning center's intended audience, which Project proponents' estimate will eventually serve 1,200 students by

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the year 2050. She noted that the transportation infrastructure must be in place for people to get to the center, and questioned the choice of the site:

> It just is curious to me why. I can understand why building something like this in Wai‘anae or in our region would be good, because the amount of Native Hawaiian children and families and people there, that makes sense. But why? What do they want to do there? Who will be involved? Because there are no details about, and I'm not talking about built-in-stone kind of details, but what is the thinking of the kind of learning going there?… I am more interested in what might be taught and to whom issues, and those two things should really shape if anything gets built.

After CSH explained that there will likely be a multi-media aspect to the learning center, Mrs. Burgess replied,

> I wonder how the teaching is going to be tied to economics, [if] what people learn there will help them not just survive but to prosper. If the things they learn like how to do a *lo‘i* or raise fish, whatever they learn there, how is that going to be practical?
>
> I guess if I have to think about how—I think what is going to be done or developed in Mākaha by Kamehameha Schools is supposed to benefit whom? Who is it supposed to benefit and benefit them how? And I am not so sure that building buildings is what is really required. I'd like to figure out a place where we understand things about weather, and how weather both changed and is changing. What we do about it. A place where people really get back to what is living green and in balance and in sync with nature, and not conquering it with our buildings. I understand that multimedia is important…. But I'm not sure that's what is really going to promote survival and prosperity for the 90 percent (of the community). Multimedia will serve a handful of people. What about people who should be fishing or should be farming? We cannot build all technical people and think that's the only important thing for people to learn.

Mrs. Burgess pondered about the possibility of opening a different kind of school, where the topics are practical to daily life:

> How come we don't have an agricultural school, keep things out in the open. A weather school, an environment school, an archaeology school. Why does it have to be in a hall? Why can't it be a big *fale* [traditional oval-shaped houses with open sides] like they do in Sāmoa, where people come and go? It's an open space where they cannot keep electronics out because that is not the proper place, so maybe you don't really need it.

Although Mrs. Burgess confirmed that interviewing people one-on-one was an important part of the process of hearing what the community wants, that is just the start for her:

> There needs to develop a community process where people can come together without competing with their ideas and figure out a way to learn to dream together. I think I like their approach in asking people what they think before they

> actually make the plans and then just ask us then about what we think about what we are already going to do and can't be changed; I mean we can't change it. I like that approach.

She would prefer to find out more about the parameters of the proposed Project, in order to help shape what is to come:

> But I also know that you do not dedicate this much resource to acquiring this much land without having some idea in your own house about what should be there. I think I don't appreciate them pretending that they don't have a set of ideas that they would like to see come up. So if honesty is required, they need to ‘fess up and say exactly what it is that they are dreaming about themselves happening and see if there is any correspondence within the community for what they are dreaming about. But don't pretend that they don't have something in mind. I think that is an unbelievable thing to have us believe. And so it's like talking into a black hole; you are giving it all that way, and you are getting nothing back this way. And I think that's really the typical bureaucratic way of treating people now.

For Mrs. Burgess, the proposed Project should allow people to dream and to be able to bring their ideas to fruition. She gave the example of a friend who is able to help others with his inventions:

> You know, I am interested in a place where people can invent things. Where you are encouraged to invent, to try to produce something that makes sense. I have a friend with the name of Paul Polak. He's an inventor of all kinds of agricultural stuff for the 90 percent [of the community]. So he invents technologies that can be used by the 90 percent of people in Taiwan, in Thailand, in Africa, to grow crops. And his little inventions cost $3. He is working on a computer system in which the hardware costs $3 and the software costs $12. So a village can own a computer that can link them up to market and the world, for under $20.

When CSH asked Mrs. Burgess about her thoughts on Mākaha Valley and its significance, she stated the following:

> That it's still green. That it has water and the thing that I would really like to ask Kamehameha School is where they are going to get water. Where are they going to get water for homes? For the constant usage when water is so hard to get. And putting it into these kinds of developments, as opposed to agriculture, I wonder about the wisdom of it. And to use the agriculture as a teaching place. That makes sense to me.

She warned against merely constructing a set of buildings with no real goal:

> I'm not a fan of putting up buildings. Not concrete with air conditioning and all of that stuff. It just modernizes us in a way that we can't take back. We can't take back, and we can't learn the very fundamental things that really help people survive. That's the culture. So I do understand us from being modern people and [that] modernity and tradition have to be supported. But Paul Pollack again; he

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> supports modernity by inventing. Things that haven't been there before. And putting them into use to support the tradition of agriculture in people's lives and their villages. I don't see why we can't do that. Hawaiians were inventive people and we are not celebrating or helping that inventiveness live.

Mrs. Burgess described *laua‘e* (*Phymatosorus grossus*), the ti leaf (*Cordyline terminalis*), and *kukui* (*Aleurites moluccana*) as plants that are still collected in Mākaha Valley. These plants are collected by cultural practitioners who go to the back of the existing *heiau*, where waterways can also be seen. One of Mrs. Burgess's past projects grew *laua‘e*, the ti leaf, and *kukui* , chosen for their cultural uses. In the backyards of communities such as Mākaha, Wai‘anae, Nānākuli, and Mā‘ili, Mrs. Burgess related how plants were chosen due to their traditional value in that area.

Confirming the existence of a *heiau* in the valley, Mrs. Burgess noted that there are people who care for the *heiau*, and that there are several *hula halau* (hula schools) that continue to gather plants near there. She also acknowledged the trails that are visible near there, and discussed the ongoing cultural practices of surfing by the shore and fishing by throwing nets.

In Lualualei Valley, Mrs. Burgess described the continuing presence of several farmers, or "truck farmers" as she called them. She is also committed to the agricultural movement to grow one's food by raising her own taro and fish in her backyard. "We have a fish tank and we grow tilapia, and we use the effluent from that to water our *lo‘i* and then the vegetables. And that's work that I did when I was head of the Alternative Development Corporation," she stated.

Her work with the development corporation emphasized fish farming based on traditional Hawaiian principles from *‘Ōlelo No‘eau* and Native Hawaiians like Uncle Walter Pauolo from Miloli‘i.

> They were based on the practice of "I'll feed the fish, you feed me." So that's what we taught farmers how to do, is to take care of the fish, take care of the land, take care of the resources, and in turn they will take care of you … And it also came from the Hawaiian thinking that work is medicine. We try to build [a] human service project based on teaching people how to work again, as a collective.

Elaborating on the Hawaiian way of raising fish and eventually sharing the catch with the community, Mrs. Burgess noted,

> You know the Uncles who taught us, Uncle Walter Pauolo, and Uncle Eddie Ka‘anā‘anā, so they taught us the Miloli‘i way of fishing. And it wasn't the Miloli‘i way of fishing, it was a Miloli‘i way of caring for fish. So they would go out and feed and *pa‘i* [slap, clap] the fish, the *ko‘a* [fishing grounds], and when the fish were ready, then they go out and harvest. But it started with a fishing family taking care of the fish. That's what we did with our aquaculture. The family took care of the fish and then the fish took care of you. And what we did was use modern technology which Hawaiians would have figured out if the natural process of invention and maturity wasn't interrupted. So we used modern equipment, like the technology we learned from Rodale (Institute) in building those fish tanks made out of plywood, but we applied Hawaiian principles to how

> we took care of the fish, how we shared the fish. So when it was harvest time for the fish, we took, and we shared with our neighbors.

Nothing was wasted in the process of raising the fish, as even the water containing fish waste was used to water plants. According to Mrs. Burgess,

> Instead of wasting the water, Hawaiian values use it all, use it well. Instead of *poho*, [where] you just throw away your water after you finish with the fish, you put the water back into the land which can grow the taro. Then we introduce another layer; we put the water in the tank into hydroponically growing vegetables and then we put it into the pond for the taro.

Expanding on the traditional values that guided her work with the development corporation, Mrs. Burgess stated,

> The principles, there were three basic ones. Like the *‘ohana* is the basic unit of economics, learning, and social interaction. That in sharing, everyone can have enough. That you do this work not just for yourself, not just for your family, but for the larger family. And then the third is "Work is medicine."
>
> We were seeing so many men who were not engaged in work that was dignified to them. There were people who joined our project, families who joined our project, the men were working, but when you asked them what they do, they wouldn't tell you. But after they joined this project, they would say, I grow fish for my community. And the dignity that's associated with work. Those three principles. My family is the basic unit of economic, social and spiritual wholeness. In sharing, everyone can have enough….
>
> It's sort of universal Hawaiian values of taking care of the land. And sharing. *‘Ōlelo No‘eau* is in sharing so everyone can have enough. We practiced Hawaiian economics of *kōkua*, so in *kōkua* there is reciprocity. I give to you, you may not give back to me but you're going to give someone else down the line. But you're going to give. And someone will give to me when I need. So we practice Hawaiian economics, and the Hawaiian approach to economics. You share first and then you are shared with. So we built that into a methodology for this modern fisheries project [where] we use the water multiple times. We work only with families. Individually, we taught the whole family how to do it.

When asked why the *‘ohana* was the preferred audience for teaching how to raise fish, Mrs. Burgess related the following:

> Because that's the fundamental unit in Hawaiian culture, is the *‘ohana*. Not the individual. And so what we wanted to do was—we really understood that in most things that are very complex—if there is only one person doing it, the chances of failure are so great. But if you had a group of people doing it, you share the risk and you share the talent. So in doing the backyard aquaculture, the reason it was so appealing to families was because that it was simple. It's a plywood tank filled

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> with fish and people saw it and thought, “I could do this.” But eventually, what you have to know and how to take care of them. They are not like dogs you can leave and you don’t feed them. They’re gonna stay in that tank of water so the principles we taught have to be one that we designated in people’s *na‘au*.

Utilizing oral traditions from *kūpuna* such as Uncle Walter Pauolo from Miloli‘i and Eddie Ka‘anā‘anā as well as *‘ōlelo no‘eau* enabled people to fully understand Hawaiian principles:

> Everything was about work. If you work, you would feed, you would be fed. Part of the reason we work with families is we wanted to be sure that the children understood that “I work, I eat.” Not after you graduate from college or high school, but right there, “I work, and I eat.” And so those four principles are what really drove the design of the project. And the years of working with Uncle Walter and Uncle Eddie really taught us how families can work together, because that’s how they were taught within the context of their family. And that’s how they fished and how they shared it, and how they ensured prosperity by making sure other people around them weren’t starving.

Mrs. Burgess emphasizes that this learning needs to take place on the land, in order to ensure Hawaii’s sustainability:

> So that we can be assured that no matter what happens … that Hawai‘i won’t be vulnerable, Hawaiian families won’t be vulnerable, when there are downturns in economics. With my family, even with the downturns, we have fish, we have *poi* [pounded taro]. We grow fish and taro in our land. In a small portion of our yard. Other families can do that. So this place can become a nursery that can put the fingerlings into families’ backyards. It can be starter kit for a *lo‘i*.

When CSH showed Mrs. Burgess a map of the proposed Project, Mrs. Burgess envisioned a place for a nursery:

> Well, I don’t know where the best place where you have the best soil there, but it would have to be someplace like that and someplace where for certain plants, it needs shelter. So it cannot be right in the middle where the wind blows constantly.

Mrs. Burgess explained what is essential to both the home and the learning center:

> The homes should be a learning center, and the learning center should be a place where people feel safe and welcome. Whether they are learning things that can be applied back in their home, in their family, in their counties, in their workplace.

Mrs. Burgess illustrated her point by narrating the story of a boy’s gift, which she hopes will act as a blueprint for the proposed Project:

> Let me tell you that story. This is what I am hoping will be the approach for this center. I do this process that I call “guts on the table.” In it, I ask people to tell three stories. First, to tell the stories of all of their names. And when you tell that story, you tell the story of the people you come from, what they thought about

> you when they named you. The birth and the blessing you carry with your name. The second story that I ask them to tell is the story of what is their community; however, they defined what community is. For some people, community is my family, or my church. For others, it is where they live. It is a physical place. A geography. And there’s tension between people who see their world in terms of human social groups and [those who] see themselves as part of a community that is grounded in a place and the spirituality of that place. And for me, I do a lot of work in mediation and building teams. So it’s important to be able to see where the tensions are without asking people to tell were the tensions are. So the third story I ask people to tell is to tell the story about their gift.
>
> So I did this process with 11th and 12th graders in Wai‘anae High School, and we sat around in a circle, 12 kids, and when we came to this young man’s turn, he told the story of his names and his community well. But when it came time to tell the story of his gift, he said, “What, miss? What kind of gift you think I get? This is freakin’ Special Ed. class. I hard time read, and I cannot do that math stuff. And you make me shamed for asking that kind of question, “What’s your gift?” “If I had a gift, you think I’d be here?”
>
> So he just shut up and shut down. And I felt shame, ‘cause I made him shamed, so I shut up. After the circle was *pau*, I just loaded up my stuff and practically ran out of that room. I felt shame, and I felt like, “What can I do? Nothing I can do now.” But two weeks later, I saw him in Tamura store, where everybody goes eventually. So I see him down the aisle, and taking my cart down there, and I see this boy, and I think “What?” So I am trying to back out of that row, so he doesn’t see me and he won’t yell at me again, but then he turns around, and he sees me, throws his arms open like this and says, “Auntie, I’ve been thinking about you. Two weeks I’ve been thinking. What my gift? That auntie told me I got a gift, and I better find it. I’ve been thinking.”
>
> So I said, “Brother, what is your gift?” He said, “I can’t do that math stuff or read too good, but auntie, when I go to the ocean, I can call the fish you know, and the fish come every time. So with that I can put food on my family table. And sometimes, what I see in the water, the shark he come, and he look at me, and I look at him, and I tell him, ‘Uncle, I ain’t go take plenty fish. I only take one or two, just for my family. All the rest I leave for you.’ And so the shark, he goes his way, you know auntie, I go my way.”
>
> I look at this boy, and I knew, “genius.” But the school and the system cannot see him. They don’t see his genius. If we could have a learning center in which the gift of that person was center, and we could teach around that, wrap the curriculum around that and elevate it, what a blessing our community would be, if everybody worked within their gift.

When asked what kind of recommendations she has for the proposed Project, Mrs. Burgess states the following:

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> You know, I think they should go out and tell people tell stories of what they—take people onto the land—and say we want to gather and hear the stories before we begin designing. And have one of those people who draw as we talk, draw as the people are telling their stories, and out of those drawings and those stories, then build what will naturally uplift that community. Don't start buildings, but start with the stories, and see where the strong, healthy stories are. And develop the development for that healthy strong part of the community and the culture. Gotta focus on the strength and the gift. And that's what I am hoping will come out of this community discussion stuff. And if it starts that way, then we are not going to bicker about small, stupid stuff.

Mrs. Burgess further described how the process of listening to the community could be done, where groups of people who want to come can be brought to the site of the Project area.

> Invite a core two or three people and say, "Bring the people you like to dream with. No more than 15. And let's come and hear them dream. And draw it down. And ask two or three other key people to put together another group, and people they want to dream with, so you have some cohesion, you not gonna fight among these people. And you gonna see what cohesion and what dreams can be about with a group of people who really respect and like each other. And then look at all those bubbles and bring them all together in a bigger space.

Mrs. Burgess referred several individuals to CSH, including Hokalai Nui, Ho‘oipo de Cambra, Eric Enos, William Ailā, Flo Pell, Hayden F. Burgess (Pōkā Laenui), and her three children who are all from Wai‘anae. For *mo‘olelo* and place names, she referred Puakea Nogelmeier and Michael Los Calzo.

7.4 Mr. Gigi Coquio

CSH met with Gigi Cocquio at Hoa ‘Āina O Mākaha, also known as Mākaha Farm, on January 20, 2010 (Figure 28). Uncle Gigi, as he is affectionately known by thousands of students young and old, has developed Hoa ‘Āina O Mākaha from a five-acre parcel of *haole koa* in 1979 to a large multi-program educational garden center today. As Executive Director of Hoa ‘Āina O Mākaha—a 501c(3) educational organization that focuses on "Creating Peaceful Communities in Harmony with Nature, Through the Eyes, Hands, and Hearts of the Children"—he oversees all of the programs and staff at Hoa ‘Āina O Mākaha. Uncle Gigi has lived in Mākaha since he moved to Hawai‘i from the Philippines in 1978. Within a few years, he founded the non-profit, Hoa ‘Āina O Mākaha. Presently, he resides at Hoa ‘Āina O Mākaha with his wife Judy and son Pomaika‘i.

Uncle Gigi has been supporting the advancement of the Mākaha community for decades, and over the years he has acquired much knowledge of the area as well as constructive ideas on how to empower the local community and sustain and perpetuate the Hawaiian culture. Uncle Gigi is widely appreciated as a rare gem who has unselfishly given so much of himself to build a self-sustaining and strong community in Mākaha. CSH believes collaboration with Uncle Gigi is essential to maximizing the long-term success of the KS Learning Community project.

Hoa ‘Āina O Mākaha works with many schools and educational groups in Hawai‘i, but they have established and maintained a particularly strong relationship with their next door neighbors at Mākaha Elementary since l987. Together, Mākaha Elementary and Hoa ‘Āina O Mākaha have established the Na Keiki O Ka ‘Āina program where each day of the week a different grade level from Mākaha Elementary conducts their science class at the farm. Currently, all of the 600 students at Mākaha Elementary participate in this program. As part of their hands-on science class, the students garden, care for the land and animals at the farm, and learn about Hawaiian culture. Additionally, the students plant their own plots of corn, beans, lettuce, onions, *won bok* (Chinese cabbage), *pak choi* (bak choi), peanuts, taro, and a variety of herbs that they can harvest and take home to eat with their families.

Figure 28. A beautiful ānuenue (rainbow) adorns Makaha Farm in Mākaha Valley (CSH 2010)

Other programs that Hoa ‘Āina O Mākaha operates and administers from their facilities include:

1. **Ke Ala (The Learning Center)**: This Learning Center is a classroom without walls where the students are encouraged to actively participate in the leaning process by using all of their senses. Students that visit the Learning Center have the opportunity to plant, harvest, learn how bees make honey, and learn about alternative energies. Presently, the Ke Ala Learning Center has hosted 80 visiting schools and served over 4,000 students and adults.
2. **Mālama Mākaha Credit Work Program:** This program is designed to assist Mākaha Elementary 4th, 5th, and 6th graders by supplementing their school fundraising activities toward their school field trip fees. Last year there were 21 workdays with 83 students and 175 adults participating with a total of 2,586 hours of participation. With participation of adults and youth in the program, parents have been able to spend quality time with their children, thereby strengthening *‘ohana* relationships.
3. **Hale Ho‘omaluhia (The Peace Center):** The Peace Center was constructed in 1995, commemorating the 50th anniversary of the bombing of Hiroshima and Nagasaki. It functions as a conference-retreat center that provides a place where people from different countries and diverse cultures can begin to bridge their differences and celebrate their uniqueness.
4. **Hale Mahi‘ai:** The farm program is an educational resource for students to experiment with hands-on activities that reinforce the application of their classroom lesson plans. At Hale Mahi‘ai, productive use of land to increase individual and community self-reliance is promoted.

When CSH visited Uncle Gigi at Hoa ‘Āina O Mākaha, he explained this was the first time someone had come to speak to him about the KS Learning Community Mākaha project. He is frustrated that KS representatives have not undertaken extensive community outreach efforts. He was not informed about any of the community meetings that KS held, and he questioned why he was not notified in advance about these meetings. Uncle Gigi feels strongly that KS should go door-to-door in Mākaha to talk to the residents about their plans and to listen to the residents’ concerns.

Uncle Gigi expressed that over the years he has witnessed numerous landowners and developers come into *Wai‘anae Moku* without conducting proper community outreach efforts. Due to these past experiences, he remains suspicious about some of the landowners’ intentions. He does not want to see landowners and developers “sell” a particular idea to the community and then see plans change in the future.

Furthermore, Uncle Gigi feels this Project is happening too quickly and that KS should slow down and make sure they do an adequate job in consulting with the community. Uncle Gigi encourages KS to genuinely spend time with members of the Mākaha community in order to truly understand their lifestyle and what their hopes and visions are for the future of their community: “Spend as much time as it takes to really get a good feel for the community. Work with us, see who we are; see how we feel.”

When asked if he had any recommendations or suggestion on how the KS Learning Community Project Mākaha project should be carried out, developed and managed, Uncle Gigi said that he would get everyone together to discuss the future of KS Learning Community. He recommends getting dedicated individuals and groups together to discuss their vision of the future of Mākaha. “It has to be the community’s idea … no one can do it on their own.” Uncle Gigi would like to see a community participatory approach to the planning of this KS Learning Community. “Kamehameha Schools should come to Mākaha to listen to the people without having an agenda and then shape their plans around what the community wants.” Uncle Gigi truly believes this Project could be the impetus for getting the community together to help build a collective vision for Mākaha and even the entire Wai‘anae Moku.

Uncle Gigi’s vision for Mākaha includes taking out the golf course and developing a living village where residents and others could practice ‘Ōlelo Hawai‘i (Hawaiian language), Hawaiian culture, and *mālama ‘āina* (take care of the land). As part of his vision, residents would have to commit to perpetuating the Hawaiian culture and language through speaking ‘Ōlelo Hawai‘i on a regular basis. He also advocates getting the water flowing back in the streams and growing *kalo* again.

Uncle Gigi believes the buildings and houses in the village should reflect the life and culture of the people. He recommends there be meeting places, similar to *marae* (a traditional Maori tribal meeting place), where visitors can come to learn and share about their cultures. Committed residents could live together in the village as a community of *keiki* (children) and *kūpuna*, learning from one another in a holistic environment. The village could also function as a *pu‘uhonua* (place of refuge), open to all Hawaiians who want to live and practice Hawaiian culture, attitudes, and values. Different *hālau* (hula schools) could function as different learning centers focusing on themes such as organic farming, traditional building practices, aquaponics, aquaculture, animal farming, *mālama ‘āina*, and ‘Ōlelo Hawai‘i.

In closing, Uncle Gigi suggested that the Project proponents, “Come out to Mākaha, not just to talk, but to work. Make the effort to really show you care about our *‘āina* and our community. Come to Hoa ‘Āina O Mākaha and work with me in the gardens … in the dirt, and spend sincere time with us because it takes time to get to know the people, community, and *‘āina* of Mākaha.”

7.5 Mr. Eric Enos and Mr. Butch DeTroye

CSH met with Uncle Eric Enos and Uncle Butch DeTroye at Ka‘ala Farms on March 4, 2010. Because of their status in the community, many people refer to them as Uncle Eric and Uncle Butch. Uncle Eric is the Executive Director, and Uncle Butch is the Cultural Learning Center Manager for Ka‘ala Farms (see Figure 29 and Figure 30). Ka‘ala Farms is located in Wai‘anae Valley and is a community development organization that focuses on educational and community outreach through their cultural learning center; school partnerships with both public and private schools throughout the State; land use and resource management programs; economic opportunities, and ‘*ohana* programs.

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Figure 29. The Hale Pili at Ka‘ala Farms (CSH 2010)

While this was the first time CSH met with Uncle Eric and Uncle Butch regarding the KS Learning Community Project, Uncle Eric did participate in an earlier meeting with representatives from KS, the DHHL, and their planning firm PBR that was organized by Julie Cachola. According to Uncle Eric, this was more of an informational meeting, where select community members were invited to hear about KS and DHHL's plans for This KS Learning Community. Therefore, Uncle Eric said that he did not express many of his concerns, ideas, and suggestions at this meeting, but rather he used it as an opportunity to listen to what was being proposed.

Having lived in and worked with the Wai‘anae community for decades, both Uncle Eric and Uncle Butch have a deep connection to the ‘*āina* and its natural and cultural resources. At Ka‘ala Farms they have utilized place-based and hands-on learning techniques that have been successful in teaching Hawaii's *keiki* about Hawaii's culture and environment. While Uncle Eric and Uncle Butch humbly note that they do not claim to be the voice of the community, their voices are ones of wisdom, experience, and dedication because of their long-term commitment to the well-being of the ‘*āina* and *kānaka* (people) of Wai‘anae.

Learning Center:

When asked generally what he feels about the proposed learning center, Uncle Eric explained that KS going into Hawaiian Communities is not a new idea. In the past, KS has done outreach programs and discussions surrounding a possible learning center in Wai‘anae has been going on for the past couple of years. However, he also noted that he hasn't been involved in discussing

other important issues such as if this new learning center will be truly community shared; what will the curriculum be; and is it going to be western? Consequently, Uncle Eric is concerned that these questions have not been brought up and discussed with the community. The learning center is not only an end product: a lot needs to be done in the community prior to the completion of the KA Learning Community.

Uncle Eric suggested that KS should recruit people within the community to work at the learning center and that the *kumu* (teachers) should be individuals from the Wai‘anae Moku because they are intimately connected to the land and this KS Learning Community.

Uncle Eric emphasized that the learning center needs to be integrated with what already exists in Wai‘anae. For instance, KS can use this new development plan to pull together a network of community groups and individuals who have been successful in carrying out place-based education initiatives in Wai‘anae, and further support those programs through additional resources.

Uncle Eric also expressed his concern regarding the high number of youth in Wai‘anae who are enlisting in the military, since these youths have nowhere else to go and no other way to pay for an education. "The schools out in Wai‘anae are so overwhelmed that they can no longer provide adequate counseling, mentoring, and encouragement to continue education in college." This then lead Uncle Eric to ask, "So, how is the learning center going to address these challenges?"

Department of Hawaiian Homeland Houses:

With regard to the potential 600 houses that the DHHL plans to build, Uncle Butch questioned who will actually get those homes. "I have a feeling it's not going to be locals, so that means that Mākaha is going to get 600 new families which will have a huge impact on the community," He said. Uncle Butch also questioned how Jeff Stone (who currently owns the land where the Project will be) will benefit from this development and from "gifting" land to KS and DHHL . He said that because of the long, wary history between Jeff Stone and the people of Wai‘anae, many residents do not trust him.

***Wai* and *Lo‘i*:**

Uncle Eric and Uncle Butch are no strangers when it comes to dealing with water struggles and water rights. They have contended with the Board of Water Supply, and they have also worked as a community partner with the Board of Water Supply (for example on the Wai‘anae Watershed Partnership) to open up the streams in Wai‘anae Valley so the water can nourish the *kalo* that they grow in the ancient *lo‘i* at Ka‘ala. These water struggles are also occurring at Mākaha Valley where the community *hui* (group), Mohala I Ka Wai are working with the Board of Water Supply to return the water to streams so they can open up the ancient *lo‘i* that are located along the Mākaha Stream. According to Uncle Eric, this Stream is a significant site where traditional cultural practices occurred and still occur today. Additionally, Uncle Eric and Mohala I Ka Wai assert that what is known today as "Glover's Tunnel" is not "Glover's

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Tunnel," but is actually *Kāne i ka wai ola*, a traditional cultural place where Native Hawaiians have the right to freely partake in traditional cultural practices.

Figure 30. The ancient *lo‘i* that are still being used today at Ka‘ala Farm (CSH 2010)

In terms of this KS Learning Community development and how it will affect Wai‘anae's water resources, Uncle Eric and Uncle Butch have heard both KS and the Board of Water Supply claim that water will not be an issue. However, it is hard for them to believe that the Board of Water Supply has enough water for this large development, when they claim there is not even enough water to release into the streams for the *lo‘i*: "We know that water will be a major issue for the future."

In terms of building *lo‘i* on the KS Learning Community property, Uncle Eric stated, "Why build a fake *lo‘i* when there are ancient *lo‘i* in the back of Mākaha Valley that Mohala I Ka Wai are currently trying to restore and reuse?" Again, he reiterates that the KS Learning Community Project needs to work with and support the existing programs in Wai‘anae. Uncle Butch suggest that as part of the learning center, KS should push to reopen the streams in Mākaha, and start restoring the *lo‘i* in the back of the valley.

Kāne‘aki Heiau:

Uncle Eric was very involved in the restoration of Kāne‘aki Heiau in the late 1990s. The physical and spiritual restoration of this *wahi pana* was a collective effort of a group of cultural practitioners who worked together to guide the restoration process in a *pono* (righteous) way. Some of these individuals included Aunty Frenchy DeSoto, Walterbea Aldeguer, Landis Ornellas, and Dalani Tanahy. Aunty Pua Kanahele also played an instrumental role in the

spiritual restoration of the *wahi kupuna* (ancestral places?) by teaching Uncle Eric and the rest of their *hui* certain protocols relating to the rededication of the *heiau*.

Recommendations and Suggestions:

In terms community outreach, Uncle Eric is thinking about organizing a cultural tour of Mākaha so KS and DHHL can see the land through the community's eyes. Then after this occurs, he feels it will the appropriate time to have a collective discussion about this KS Learning Community with substance. Additionally, he feels it is extremely important to meet with KS and DHHL when others such as William Ailā, Gigi Cocquio, Dalani Tanahy, and Landis Ornellas are present so they can share their *mana‘o* and discuss the future of Mākaha as a *hui*. Uncle Eric is adamant that this has to be a collective effort, not something that is decided by one individual, organization, or institution.

Overall, Uncle Eric and Uncle Butch are primarily concerned about the well-being of the *‘āina* and their community; more specifically, with food production, shelter and health. According to Uncle Eric, "It is essential that we make sure the *‘āina* is productive again, feed our people with the resources from the land and sea, and maintain a healthy body, mind and spirit." With these issues at the forefront, Uncle Eric questions how we (*kākou*) can work together with KS and DHHL, as well as Alu Like, Queen Lili‘uokalani Childrens Trust, etc. He wants to know how the KS Learning Community Project in Mākaha will help with these efforts.

7.6 Ms. Ka‘iulani Kauihou

CSH met with Ms. Ka‘iulani Kauihou on January 20, 2010, at her residence in Mākaha Valley. Ms. Kauihou is a 1998 graduate of Kamehameha Schools. While there, she became fascinated with the beauty of her Hawaiian culture and language. This fascination paved the course for her college years at the University of Hawai‘i at Mānoa. She attained a Bachelor of Science degree in Hawaiian Language followed shortly thereafter by a Master's of Education in Teaching.

In addition to her formal education, Ms. Kauihou was also fortunate to be taught about her culture by way of her parents' interest in various Hawaiian activities. Her parents, Kimo and Dalani, are both experts in water activities, and Ms. Kauihou participated with them in canoe paddling and surfing events. Both parents were also students of *lua*, Hawaiian martial arts, and have been trained in Hawaiian weapon making. Ms. Kauihou learned *kapa* from her mother, who is one of only a handful of professional *kapa* makers.

For five years, Ms. Kauihou taught at Ke Kula Kaiapuni ‘o Nānākuli, a Hawaiian Language immersion school, in an effort to revive the Hawaiian Language. Currently, she works as a Hawaiian Language Curriculum Developer for Ka‘ala Farms, Inc., and Ma‘ili Elementary School. Ms. Kauihou also spends part of her time teaching GED classes in Lualualei to many part-Hawaiian students who, for various reasons, have left Nānākuli and Wai‘anae High Schools and who seek to move forward with their lives in an alternative way.

Ms. Kauihou's belief is that teaching is one of the greatest responsibilities a person can have. She hopes to ignite and support programs that promote education in our communities. She would

like to have a hand in creating programs that help parents teach their children values at home, help schools teach students how to learn, not what to learn, and teach communities how to take responsibility of their natural resources, and to sustain the people living there, among others.

When asked how long she has lived in Mākaha, and what it was it like when she moved there, Ms. Kauihou shared:

> I was born at Kahuku Hospital and lived in ‘Ewa until I was six years old. I have lived in Mākaha at my current residence since 1987, when I was seven years old. When I moved to Mākaha 23 years ago, I witnessed this neighborhood being built around me.
>
> For instance, where my house is today, this whole area was back filled with dirt to build this subdivision. If you dig down about two feet deep under the dirt, you hit coral. When we moved to Mākaha there were a few housing subdivisions, the Mākaha golf course, the Mākaha Resort, Mauna‘olu—which was always gated—the Mākaha towers, the Mākaha Plantation, Mākaha Elementary, Mākaha Farms, Coronets which turned into Mākaha Marketplace, where [the convenience store] 7-11 is today. The condos on Mākaha Beach and Lahilahi Beach were also all there when I moved to the neighborhood.
>
> In regards to development, nothing much has changed around here. There haven’t been any new subdivisions and developments in the last 20 years. However, there were a number of projects that were proposed in this area but they fell through. Right on the side of my house by the river, between my house and Kili Drive, there was a piece of property that developers wanted to make into a subdivision and care home and mini market place. But for some reason or another it fell through, but I don’t know what happened.

Regarding water resources in Mākaha, Ms. Kauihou noted:

> There’s basically one main stream up in the valley that comes down, but it’s currently blocked by the Board of Water Supply. There’s no running water, there’s only stream beds for when it overflows. So it splits into Mākaha East stream and Mākaha West stream. The stream next to my house is referred to as Mākaha Stream. Board of Water Supply diverts the water to all different areas, so it’s hard to tell if these were the original streams because it might have been the streams that Board of Water made by diverting it into their paths.
>
> For instance, down by Mākaha beach there’s a marsh [known to some as Kaha Loko or Kahaloko, see, and sometimes the water comes down that way, and when it rains heavily it goes there. There’s a stream in back of our house, which is an overflow path for when it rains heavily. There’s a drainpipe and the water flows down there and brings down a bunch of ‘*opala* [garbage] from the mountain. So a few years ago when Mākaha Beach had all the debris on it, it was from heavy rains, and it comes down right under that bridge by my house. What happened that time was that this whole area flooded, so all of Mākaha Resorts pools flooded

> and then the water went down into the stream close to our house, and then it went under the bridge out to Mākaha Beach. There was around two million golf balls found on the beach after that storm! We picked up a whole rubbish bag full of golf balls and we didn’t make a dent in the amount left of the beach!

Ms. Kauihou and her *kāne* (man) have a beautiful garden in the front of her *hale* (house). Some of the plants and trees they are currently growing are dryland *kalo*, basil, papaya, tomato, gourds, *liliko‘i* (passion fruit), spinach, avocadoes, cantaloupe, and bananas (Figures 31-34).

> The native plants, such as *‘uala* [sweet potato] and *kalo* [taro] have been growing really well in my garden. Trees, such as the papaya and guava trees, also grow well here. Overall, most of the plants and trees grow good because it’s so sunny in Mākaha and it’s the right conditions. However, the non-native species have been attacked by bugs so I haven’t been able to grow them organically.

Figure 31. Ka‘iulani Kauihou tending to her dryland *kalo* (CSH 2010)

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Figure 32. Ka‘iulani Kauihou’s *kāne*, Kalei, planting papaya trees (CSH 2010)

Figure 33. *Ipu* gourd growing on Ka‘iulani Kauihou’s fence (CSH 2010)

Not too many people grow their own food out here because there isn’t a lot of available land to have gardens. Because this is low income housing, the parcels of land aren’t very big, and even with the little amount of land that people do have, it doesn’t get full sun, so you can’t grow a lot of plants. Also, with the different seasons, you only get certain times when the sun shines on your little property, so it’s hard to grow things.

Also, most people don’t own the houses they live in out here, so it’s harder to start up gardens because you need to get consent from the landowners. Other than that, most of the Hawaiians are living at Mākaha Plantation or the Towers, and those are apartments, so they can’t grow anything there except for something small on your balcony.

When asked what types of native plants and resources are found in Mākaha, Ms. Kauihou shared:

> Starting from the ocean, there’s a lot of fishermen out here, and people live off of the marine resources. Especially with the numerous homeless people out here, a big portion of their diet is the marine resources, such as *opihi* [limpets], *limu*, *loli* [sea cucumber], and *wana* [sea urchins].

Ms. Kauihou also mentioned she would like to start a *limu* restoration project in Mākaha because she has witnessed that over the years the fish population has been decreasing. Ms. Kauihou doesn’t believe the decrease is from people overfishing, because people do not usually catch fish like *hīnālea*. Rather, she believes the declining fish population is because the invasive *limu* species have taken over. Ms. Kauihou suggested that the Mākaha community could take similar actions as the “uncles” in ‘Ewa to try and restore the native *limu* so the fish populations increase.

In terms of gathering plant resources in Mākaha, Ms. Kauihou stated:

> The *hula hālau* don’t really come into Mākaha Valley to gather because they probably don’t know where the *palapalai* [ferns used for *hula*] is, that’s more Wai‘anae Valley. However, Mākaha Valley does have the *kahuli*, the native tree snail, but nobody gathers it because they are an endangered species.
>
> Mākaha Valley has its cultural gems, but as far as gathering, there’s not that much that occurs in the valley because people don’t really live like that anymore. Culturally, there aren’t any big *hālau* in this valley, that’s more Wai‘anae Valley, where more gathering occurs like at Ka‘ala Farms.

Looking northwest from Ms. Kauihou’s house is Kea‘au Ridge. There is a distinct switchback trail going up the side of the ridge, which Ms. Kauihou noted is a hunters’ trail. She stated there are a lot of hunters that access that trail to hunt pigs and goats.

> There are trails in Mākaha to access the mountain, waterfalls during the wet season. But the biggest access to the mountains is by hunters, and they go into the mountains to hunt goats and pigs.

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Figure 34. Kea‘au Ridge with the switch back trail (CSH 2010)

7.7 Group Interview at Leeward Community College

The *kūpuna* and *kama‘āina* who attended a group meeting at Leeward Community College, Wai‘anae (LCCW) on March 12, 2010 are listed below. CSH met with this group at the end of their computer skills class, and spoke to them about the KS Learning Community Project to gather their *mana‘o*. The summary of these interviews was then presented to the class for their approval on 18 March 2010.

While sixteen people attended the group interview, not everyone spoke. The names indicated on the Community Consultation Table in Section 6.1 above are those people who signed the release form and whose comments were included in the interview summary.

1. **Linda Aipa** was born in Honolulu on August 6, 1944. She grew up in Pālolo, but has been living in Mā‘ili for 22 years.

2. **Walterbea Aldeguer** is a clerk at LCCW, a lifelong resident of Ma`ili in the *ahupua‘a* of Lualualei.

3. **Keala Card** was born in Honolulu in 1959. She grew up in Pearl City and has lived in Wai‘anae Kai, on the Hawaiian Homestead lands for five years.

4. **Lucy Gay** is the Director of the Leeward Community College Wai‘anae Educational Opportunities Program.

5. **Alice Greenwood** was born in 1946. She has lived in Wai‘anae for most of her life. Her father is James Akoni Kaholo and her mother is Rebecca Ululani Kaiama.

6. **Harris Hopfe, Senior** was born in Kona but grew up in Wai‘anae, and continues to live there today.

7. **Sharlene Kaho‘onei** was born in Honolulu in 1959, and has lived in Nānākuli her entire life.

8. **Florence Waikahekhae Kalawa** was born in Kona on February 18, 1942. She has lived in Mā‘ili for 22 years.

9. **Ka‘iulani Kauihou**, who participated in a previous interview for this Project, also attended this session

10. **Arviella Keli‘i** was born in Kalihi on January 10, 1940. She has lived in Nānākuli for 70 years.

11. **Ku‘uipo Ka‘aekuahiwi-Holokahi Kim** was born in Honolulu in 1952. She lived there until she was seven years old when her grandparents purchased land in Mākaha and moved their four children and their families to their newly purchased farm. She has lived in Mākaha for 50 years.

12. **Theodore I. Nu‘uanu** was born in Mānoa Valley on February 24, 1947. He has lived in Nānākuli for 52 years.

13. **Paul K. Nu‘uanu** was born on January 17, 1955. He was born and raised in Nānākuli, and continues to reside there.

14. **Lillian Mae Pomaika‘i** was born in Kula, Maui on May 4, 1950. She has lived in Wai‘anae for 49 years.

15. **Amanda Pomaika‘i** was born in Honolulu on January 6, 1983. She has lived in Nānākuli all of her life.

16. **Mary L. Silva** was born in Mā‘ili on October 16, 1950. She has lived in Wai‘anae for 60 years.

<u>Kamehameha Schools Learning Community:</u>

- One participant posed the question, “What does a learning center mean?” They wanted to know more specifics of how a learning center differs from a campus.
- The Learning Center should service a large area, not just the homes and families that are directly surrounding it.

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- Walterbea Aldeguer shared that she sees the potential for KS to sponsor extracurricular activities for students during DOE furlough and professional development days. KS could provide resources to, and work in conjunction with community based programs like Ka‘ala Farms, Inc. or Hoa ‘Aina o Makaha, to help provide the “hands on” cultural component to sustainable living.
- Given the huge drug and alcohol problem in Wai‘anae, participants wanted to know how the learning center will provide outreach and education for these issues? They asked how KS will positively impact the effects of drugs and alcohol on their communities
- One participant explained that *lo‘i* once existed where the KS learning complex would be built.

DHHL Housing:

- Will there be any rules/restrictions for the DHHL like the rules/restrictions that are enforced at the Kapolei homesteads?
- Are there going to be planting restrictions for the DHHL homes? We should be able to plant trees and plants that are culturally significant and provide us with food: planting indigenous and endemic plants “is part of our culture.”
- Will the *kama‘āina* of Wai‘anae and Mākaha have preference for the new DHHL homes? They need to house people from this area first.
- Housing in Wai‘anae needs to be more accessible to local residents.

Water:

- There are springs in Wai‘anae that used to go out to the ocean.
- There are concerns that with an increase in development, the Board of Water Supply will tap into the springs to provide water for the KS Learning Community housing.
- There’s a misconception that Wai‘anae was desolate and scarce, but in the past there was a lot of water in this area. There were and are springs, streams, etc., but the Board of Water Supply just diverts Mākaha’s water to other places.
- There are *lo‘i* terraces in Mākaha but it’s hard to maintain *lo‘i* without water running in the streams.

Infrastructure:

- How will the infrastructure keep up with the development?
- There was a concern throughout the group about another large community coming into Wai‘anae without proper infrastructure. A few of the participants noted that this would feed into the already frustrating traffic problems.
- Currently there is only one 7-11, one grocery store, and one gas station in Mākaha, so there are not enough amenities to keep up with the new development.

Community make up:

- Mākaha Towers has a lot of retirees and non-Hawaiians, and Maunaolu is made up of more wealthy individuals. How will the addition of DHHL homes enable the community of Mākaha to live together harmoniously? “How [do] we all live together in harmony when you have all diverse people, and still be able to keep harmony where we live? We certainly don’t want to be fierce in this situation—but do the right thing. We all want to live together.”

KS Community Outreach Efforts:

- Out of the 17 people that participated in the group interview, only one person, Aunty Alice Greenwood had heard about the KS Learning Community project. This concerned many of them, that they had not been informed by KS or DHHL about this substantial development plan.
- One person, who learned of the Project at this meeting, was in “awe” of the efforts to build the KS Learning Community complex.
- Aunty Lucy Gay shared, “KS hasn’t used the informal ways to reach the masses to information out there.”
- KS needs to come out here and ask the people of Mākaha what we think and what we need out here, rather than just telling us what they’re going to do.

Recommendations from those Present:

- KS needs to communicate more with the residents of Wai‘anae regarding this Project. Aunty Lucy stated, “Get off the hill and come out here!”
- KS needs to do more community outreach through non-traditional means.
- Aunty Arviella Keli‘i suggested, “Someone well-known at Kamehameha Schools should come out here, into the community, to inform us on what their plans are. And it shouldn’t be through [neighborhood board] meetings because people don’t go to meetings. People argue and fight at meetings, and nothing ever gets done, so it should be through other means.”
- Aunty Keala Card recommended that KS should hold a *lū‘au* (feast) or some other type of informal gathering where there is food and music, and people feel comfortable and get to know each other.
- Aunty Lucy explained that Kamehameha has a network of alumni and that many of them live on the west side. She recommended that KS utilize that network or people to get into the community. “Kamehameha Schools can’t be so separated from us; they need to come out here and get to know us.”

7.8 Mr. Landis Ornellas

CSH interviewed Mr. Ornellas on March 4, 2010. Well-known in Wai‘anae as a community leader, Mr. Ornellas has been the *kahu* (caretaker) for Kāne‘aki Heiau in Mākaha Valley for the last 27 years. He is also a member of Hui Mālama o Kāne‘aki, a community group that cares for the *heiau* and educates the public on its significance. In a wide-ranging discussion, Mr. Ornellas

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shares his thoughts on the proposed development and raises issues that he would like to be addressed by Project proponents.

To begin with, the Project comes with what he calls “cultural responsibilities,” especially “responsibility to our *kūpuna* and also to the *mo‘opuna* (grandchildren). Although Mr. Ornellas sees aspects of the Project in a favorable light, he remains cautious on how areas will be affected, among other things.

> Favorably, we have 600 homes possible which is a conceptual idea. Homes for our people is very welcome, that’s a good part. But…are we considering everybody around us? Are we taking into consideration all the entities…also on the coastline? Will this organization be duplicating any services? Will they be contributing to the areas surrounding this project? Kāne‘aki Heaiu?

Although he recognizes the benefits of the Project, Mr. Ornellas shares his opinion that it may well be suited to be located somewhere else:

> We need to determine whether it is suited here and how would it impact the coastline. Would we put this development here and then not have enough people? Just because we have 31% [of the population as] Hawaiians, what are these 31% Hawaiians exposed to? Or do we have to have other Hawaiians come to support this? But I sure would like to see that this 31% Hawaiian people, or Hawaiian descendants, *kūpuna*, to be able to benefit from this, and the concept that was given, and if that concept would really teach the schools here how to teach our children, I think this would be good.
>
> … And I share with you my personal *mana‘o*, this project belongs in an area where people from everywhere are exposed to it. I really think this project should have been somewhere in Kapolei or Ko‘olina. A lot of the Hawaiians are moving to Kapolei. We have a vast amount of locals with the cultural background that live in Kapolei.

Mr. Ornellas stresses the importance of Project proponents to fully understand the area where the proposed development is being planned to take place. He notes that although the conceptual ideas were presented to him as well as others via a computer simulation program, it still did not work for him. For Mr. Ornellas, Project proponents need to understand Mākaha and what it has to offer and then build on that.

Relishing the opportunity to share his thoughts, Mr. Ornellas discusses ways in which the Project could be implemented:

> So my thoughts are, they’ve given us this land…as a gift. What do we do with this gift? Why is it way back here in the corner, why can’t it be somewhere so everybody can use it? So now everybody has to come down through the funnel, into Mākaha…Because 31% Hawaiians won’t support this, I don’t think.

When asked if he had heard about the proposed development in the past, Mr. Ornellas responds:

> As the concept exists, as it was presented, I knew it before it was locked in. But the thing is, it doesn’t matter. A guy [Jeff Stone] had an idea. He made a

> presentation not only to this organization but to others. But if I was looking from the point of investment interest, this would be a very good idea and I respect him [Stone] for it. And I commend him [Stone] for it. Because I am looking at tax credits, I am looking at some irons in the fire, I am looking at requirements on the law for his development. But the thing I don’t like is when you take it out of context.

Emphasizing his concern over 30-40 employees that may (or will) be affected by the proposed development, Mr. Ornellas discusses what he would like to happen to the employees of the East Golf Course.

> I have had these employees [working for my private company] forever. They are very loyal. I need them to be treated with respect. You [Jeff Stone] have that opportunity; you got hotels being proposed for that development. You [Jeff Stone] have the great possibilities of saying to Disneyland, “You know what? I got very good employees that work for me, would you be sensitive to them when they come and apply?” This is all I need, I need you [Jeff Stone] to open a door for them…That was my main concern, I was worried about my employees…It’s real, stuff happens, but if you are capable of assisting them in any way, that is my main concern.

As for information regarding any archaeological resources that may be affected by the Project, Mr. Ornellas notes that the area proposed for development was cleared in the 1960s.

> Because people weren’t sensitive to areas that weren’t visible, we have actually bulldozed a great deal of sites in this area. It happened before me but somebody marked this place that said this was one *heiau*…. There are many significant in value that have been disturbed. I know of none of the area that has not been already disturbed at a depth of one foot, whatever it is, has a mechanical system or facilities with irrigation water or potable water, that may have gone in some areas up to 50s; so a lot of it has gone, but I don’t remember a lot of areas that have sensitive areas.

7.9 Mr. James W. Rapoza

CSH interviewed Mr. Rapoza on March 4, 2010 at Mākaha Beach, in Wai‘anae, O‘ahu. Born in Kahuku, Mr. Rapoza moved to Wai‘anae in 1959 as a third grader and has been a resident of Wai‘anae ever since. Active in the community and local politics, Mr. Rapoza began the discussion by asserting his disappointment about the way the proposed Project has split the community into two groups. He wonders who could afford to buy the homes that are proposed to be built. He also raises questions regarding how the Project will benefit the greater Wai‘anae community and its members, especially the children.

When asked what he thinks about the proposed Project, Mr. Rapoza states the following:

> Before we go any further, he [Jeff Stone] made us two separate communities, one upper and lower; he talked to those guys first. Because they were the rich ones, yeah? You know what their concern is up there? The view, that it’s going to be disturbed. They are not worried about us guys at the bottom here. So why should

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> we worry about them? Kamehameha [Schools], all he is doing is throwing *palu* [bait] out there, and we, as Hawaiians, are biting. What do you think? Who is he giving the homestead to? Who is going to build the 500 units? Him? At $600,000? Tell me what kind of Hawaiian can afford to go in there? Let's look at the big picture here.

Mr. Rapoza expresses his concern about the environmental effects of the Project:

> Where are they going to put the *kākā* [human waste]? We only got one *kākā* plant in here. Now you are going to build a complex up there, where are they going to put the s---t? We only got one sewer plant in Wai‘anae… The survey says people down here don't like it. Bottom line. To begin with, he split the community, upper and lower. There's no upper or lower. There's only one community here. We are all together…. This thing will take 20 years in the making. The only reason Kamehameha is grabbing at it is because Kamehameha has no holding on the leeward side. They have nothing. Kamehameha has no schools, nothing.

When asked about the proposed KS Learning Community, Mr. Rapoza replies: "Benefit who? What community? And what way? Higher learning? What is this learning center for? It's not for our community. It's for higher learning. A higher learning of who? They say we are illiterate down here, we need guidance. They need to show us what to do."

Noting that KS is a non-profit organization, which would make it easier to get permits, Mr. Rapoza discusses the lack of infrastructure in Wai‘anae and the issues that may face the proposed Project. He explains, "The roads are bad. The infrastructure is really bad in Wai‘anae." He maintains that the current road system would be bad for the people who are not from Wai‘anae, but residents will be less affected: "There is no problem with me being stuck in Wai‘anae. I don't really care because I'm not stuck. People like you are stuck thinking that it is, yeah. But you look at all the community living here, they are not stuck. We live here. Where we gonna be? We're going to live with whatevah."

Mr. Rapoza also raises the issue of the terrain in the valley, and the way it slopes down, encouraging flooding:

> You do any construction in Mākaha Valley—the whole lower part of Mākaha Valley is lowland. That's why there is no building here. Literally, you have to fill up the land. Only a little bit rain, highwater, the whole thing is flooded. Anything you do up … all *kākā* fall downhill. It's going to flow to people at the bottom. Before you do that, you got to lift them up. You know what I mean? All your resorts will go down.

Asserting the state has neglected Wai‘anae through the years, Mr. Rapoza expresses the following:

> The state of Hawai‘i has been putting everything on this side of the island. Everything that they could get rid of. All their *‘ōpala* [trash] has always been here. We, the people of Wai‘anae, have lived through all that, and thrived. Not only that, we've flourished. When they want to learn culture, heritage, where do they come? They come here for culture and heritage. The very places they made a rubbish dump, dumping grounds.

Mentioning his disappointment with the current mayor of Honolulu, Mufi Hannemann, Mr. Rapoza explains that he would like someone who delivers on promises. Wai‘anae has certain issues that must be addressed, and he is not convinced Wai‘anae will benefit from the proposed Project:

> Even this learning center. It's called a "higher learning." That's what it is. In reality, it's a higher learning. A higher learning in what degree? A professor's degree? You see any professors over here? You see any of us with a higher degree? This is the poverty area. You don't need a higher degree of education. A higher degree of education is going to come from people from outside. And they are going to come down here and infest our community.

Mr. Rapoza points out that construction in Wai‘anae uses up water from the area, and the natural resources should be conserved. If the proposed 600 residential homes were to be built, it would likely impact the livelihood of the people, and the area. He also questions the length of time for the Project to be finished:

> How long internal construction you people are planning on having? How many phases, different phases of the project are we going to do? We are talking about 10-15 years of it? Is the community ready for that? Is the community going to support something like that? I wouldn't go to your house and do that. It's not the time, and it's sure not the place right now. We have a lot more pressing issues on the leeward side that needs to be cared for, besides building it, it would take 20 years.

Bringing up the presence of historical and cultural sites in the area, Mr. Rapoza notes that construction and its accompanying large equipment can endanger these important resources.

> All that dust, the destruction of our central land, everything, let alone, what if there are historical sites up there. Hello! Mākaha. This is the land of the rich and famous. The *ali‘i* nui(s) [high chiefs] came to the cliffs because it was the farthest place south, this is the boonies, go west young man. You want a place, they all went west.

Ultimately, if the proposed Project is to be successful, Mr. Rapoza would like to see certain issues—like the need for solid infrastructure and good educational opportunities—be addressed:

> Infrastructure is real weak, they really need to look hard, and they need to get good information…. There's problems with continuous flood. We know this place, we know its high-low land…. I live here. What better survey you need? All those things are great and fine but it is not the time, nor the place. We're congested as it is. If they want to do something for the community, for Wai‘anae, education is the key. Education is the key.... You want to help something in Wai‘anae? Free education, but that's the only the beginning. You have to start them off, but you have to guide them to the point of finish. You cannot do a half-ass job. That's what's wrong with Kamehameha. They want to come in here and start projects, at the beginning, but what about the middle and the end? You come here for the kids, what about the mother and the father? What about the whole

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> *‘ohana*? You guys only think about your vision, what you think, but what about the bigger world?

According to Mr. Rapoza, Wai‘anae is a special place where people come to learn about Hawai‘i. He also shares his thoughts on the causes of environmental degradation, and the harmful effects of a capitalist system, where profit is the motive, not sharing with others and being careful with surrounding resources:

> They're gonna come learn from us. That's what they're gonna do, come learn from us…. This is how Hawai‘i should be, you know what I mean. You need to look back, Hawai‘i. I tell you something. The reason why we are in this situation is because we as human beings are pigs in our consumption of natural resources. Overdevelopment is what is causing the fish to deplete because we have water run-off into the ocean. Clean the land. The ecosystem has been broken. Why? Because we kick it too much as human beings. And you wonder why. Then you start blaming the fisherman. He has nothing to do with the depleting the fish. Other guys have been doing it before him, and before him, and before him.
>
> We as human beings are not looking. That's why they need to look at Hawaiians. Because Hawaiians are smart. They knew that they live on an island in the middle of the ocean. They need to be in tune with their environment. In tune to what they needed. They never heard the word "profit;" They didn't make a profit. They didn't pick for self to make profit. I pick because I need it. I needed something, my family gave me. Today in the society we live in, we have the word profit. White man came in, and said, "Now, you can get money, you can sell and make more money." We can't get what we need because we have to sell to the *haole*... That's what we need to do. We need to rebuild our ecosystem. We need to get more green, more friendly.

Mr. Rapoza understands the appeal of Wai‘anae to others, and he would like the Project proponents to carefully look at what the community needs:

> I know everybody needs work, and because of all that, you are going to get all these people coming out and trying to push their project. So maybe they really need to look at the population [needs]…. Being that this is the last virgin area, more people [are] coming to the *‘āina*. Golf course is no longer feasible for the size of land....We are not against education. It's that we need to be smart and develop in a way that is feasible to our community, not big business.

7.10 Ms. Pake Salmon

CSH interviewed Ms. Pake Salmon on February 10, 2010 at Mākaha Beach. Ms. Salmon grew up in Nānākuli, but has been raised just as much in Mākaha because her family would frequent Mākaha Beach to surf and enjoy other ocean activities. Currently, Ms. Salmon lives in Mākaha and owns and operates Mākaha Angels Productions. She has run Mākaha Angels for six years. The goal of her business is "to capture and produce entertaining and educational media that reflects Hawaii's healthy lifestyles, diverse communities, and Hawaiian culture in a real and natural way!"

Ms. Salmon has been surfing in Hawai‘i's oceans since she was a *keiki*. Growing up in the *moku* of Wai‘anae, she learned to paddle canoe, body board, body surf, and fish at a very young age. She was taught in the Hawaiian ways and values, and the ocean is in her blood. Through the Hawaiian art form of surfing, she gained strength and insight from the sea. Using the ocean as her art canvas, she combined her passion of filmmaking with raising ocean awareness.

Ms. Salmon grew up on the Leeward Coast and spent much of her life on the beach in Mākaha. She remembers Mākaha as a very close community where everyone knew each other, and she admits that it is not like that anymore. She has also witnessed the encroachment of tourism, and she rarely surfs her home break at Mākaha anymore because of the crowds. While Ms. Salmon acknowledges that the lifestyle she grew up with is gone, she remains adamant that she does not want her ‘*ohana* and her community to lose their sense of place.

Ms. Salmon is very excited and supportive of KS's plans in Mākaha, but she recommends that the School's representatives spend time with some of the community groups in Mākaha to genuinely see what they do. While Ms. Salmon has not been notified about the KS community meetings, she asks that she be informed about future KS Learning Community informational gatherings and discussions, so she can voice her opinion.

In terms of water resources, Ms. Salmon noted that there is very little water in Mākaha and that there is no water in the streams anymore. She poses the question, "Will there be enough water to sustain Kamehameha School's development?" Ms. Salmon shared that there are *lo‘i* in the back of Mākaha Valley and that the community *hui*, Mohala I Ka Wai, is currently doing a great job in restoring and utilizing the ancient *lo‘i* in the valley. Ms. Salmon also expressed her worries about the chemicals that have been used in maintaining the golf course for years, and how they will impact the food that is grown on those lands.

Ms. Salmon believes it is wonderful that the KS Learning Community will provide educational resources for *keiki*, but she also notes that adults in Mākaha need help and resources too. There are very few jobs in Mākaha, and Ms. Salmon recommends that KS should strive to provide jobs for Mākaha residents at the KS Learning Community and elsewhere.

Overall, Ms. Salmon remains optimistic about the potential of this KS Learning Community, but she also realizes that it is an immense change for her community and that bringing in more people will also impact local infrastructure. She hopes that with these new and exciting changes, the *kama‘āina* of Mākaha will not get left out.

7.11 Mrs. Rene Suckoll and Mrs. Brenda Abaro

CSH spoke with Mrs. Rene Suckoll and Mrs. Brenda Abaro on February 10, 2010 at Mākaha Elementary School. Both Mrs. Suckoll and Mrs. Abaro are faculty members at Mākaha Elementary, and when CSH met with them, they stated that none of the employees at the Elementary School had been contacted by KS in regards to the KS Learning Community project.

Currently there are around 600 students at Mākaha Elementary School, and before Kamaile Elementary was built, there used to be anywhere between 800 to 1,000 students attending Mākaha Elementary. While Mākaha Elementary is used to a large student body, Mrs. Suckoll and Mrs. Abaro are concerned about the potential increases in the number of students from the

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new DHHL homes. Mākaha Elementary does not have the capacity to properly cater to hundreds more students that will be living in the KS Learning Community DHHL homes. Alternatively, they suggested that KS should build a K-12 campus instead of a learning center.

Another significant concern Mrs. Suckoll and Mrs. Abaro expressed is that both of their husbands are employees at the Maunaolu East Golf Course and will soon be losing their jobs when the golf course closes to make way for the KS Learning Community development. Mrs. Suckoll noted that news of her husband's layoff came as a surprise when she read about the KS Learning Community project in an article in the *Star Bulletin* in August 2009. Jeff Stone, her husband's employer, did not notify his employees about their layoffs until after the KS Learning Community development plans were made public.

While Mrs. Suckoll and Mrs. Abaro and their husbands are upset about the lack of communication from Mr. Stone, they hope that Mr. Stone will work with KS to help find jobs for the current Maunaolu East Golf Course employees who will be laid off. Since jobs are scarce in Mākaha, Mrs. Suckoll and Mrs. Abaro are concerned that their husbands will not find other jobs so close to home. Both ladies are eager to participate in community meetings for the KS Learning Community project, and hope that KS's representatives will come to Mākaha Elementary to further discuss their plans.

7.12 Mrs. Dalani Tanahy and Ms. Ka‘iulani Kauihou

CSH met with Ms. Dalani Tanahy (DT) and her daughter Ka‘iulani Kauihou (KK) at their residence in Mākaha on January 20, 2010 (Figure 35). Dalani is currently the Executive Administrator at Ka‘ala Farms Cultural Learning Center in Wai‘anae Valley. In her work at Ka‘ala Farms she develops and manages educational programs that integrate the natural landscape and cultural traditions of Wai‘anae. Dalani is also an esteemed Native Hawaiian artist and *kapa* maker. She has been making *kapa* since 1995 and teaching the art and skill of *kapa* making since 1997.

Figure 35. Dalani teaching students how to pound *wauke* (paper mulberry, *Broussonetia papyrifera*) to make *kapa* at Hoa ‘Āina O Makaha, or Mākaha Farm (CSH 2010)

We began our interview talking about access to the *mauka* portions of Mākaha Valley. Dalani has been lucky enough to access remote and privately-owned portions of the valley, but typically, access to a lot of the natural and cultural resources in Mākaha is very restricted:

> DT: Access to everything out here in Mākaha is really limited. That's why Ka‘ala Farms [in Wai‘anae] is really crucial because we provide the only access to any of the valleys on this side. Lualualei is military owned, Nānākuli is owned by the Lyman's and their ranch—even though Ka‘ala Farms has access there because we have native forest restoration—and there are sites back in the valley, which for years, the *kūpuna* back in the valley have said that there is nothing back there and nobody lived there. And then Ross Cordy came in and found choke [lots of] stuff back there. That's what Eric [Enos] has been doing for the past thirty years, making sure we have access. Not for us, but for the community. Mākaha has Maunaolu but they gated that off. Mākua is the military. ‘Ōhikilolo I think is still owned by the Japanese company who wants to put a golf course there. So out here there's really no access. You can't really hike out here. There's plenty of hunting, but you get plenty young hunters who come out and they don't learn good hunting protocols, they just want to go out and kill things. I've walked up Kili Drive and that place has been full of dead pigs. They take out their jaws and then throw the pig in a bag and throw it on the side of the road.
>
> In most of my time out here, I've never been able to be in the back of a lot of these valleys. But Landis [Ornellas] took me to the back of Mākaha Valley which goes in and then it curves around to the back of Mount Ka‘ala. I've been able to hike to the top of Ka‘ala, go back inside of Nānākuli and that's where we found

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an ancient *pāhoa* [short dagger] underneath a giant boulder and now it's at Nānāikapono at the museum.

I just love this place … it's just a part of my bones. And the ocean, we paddle and surf out here. We know this whole coastline. We've been out to Ka‘ena Point and all around there, so I have a good physical sense of this place. And then a lot of my work has been in the community at Ka‘ala. And it is only now that KS [is] saying, "We're going to be at the place where there's the most Hawaiians." Really, you only notice that now? You mean the six buses that go into KS wasn't a clue before! But now that you have a piece of land in Mākaha, which isn't even where most of the Hawaiians are on the west side, because there are all of the *haoles* that live up the back.

You know, Chin Ho used to own all of Mākaha, and his original plan for Mākaha was to make it an entire resort area. He was the one who found the water in the back because people kept saying that there was no water back there, but there was. There is *lo‘i* back there, and they grew coffee and all kinds of things. Way back in the back of the valley when the Holts were living there—that's who Chin Ho bought the land from—they had a house and there was orchards, so there was water. But Chin Ho was the one that developed the water, put in the lines, and built the system to feed his dream of this place. Then Board of Water Supply came in and said he had to sell the water to them. So he had to give it up to them.

There was supposed to be four towers and they were supposed to ring the whole valley, and there was supposed to be an arena.… He [Chin Ho] had a whole plan. But it didn't work out, and so they divided the land up. So when you look at the tax map keys, the original acre lots are still the same today. They didn't really subdivide the land up well because they are usually zoned R6 for six acres so you can put six houses on it. So that's why you have all these stupid lanes with six houses there. Also, if you look at the tax map keys, and look at the original owners, they are all Chinese. So all his *Pākē* [Chinese] friends came in and got a good deal by coming in and buying five to six thousand dollar lots on the beach back in 1965 and then turn around and sell it for a million and a half. They were smart people these *Pākēs*. So when you look at it now, when I drive through, I think, where is the caring about how the neighborhood and houses look. But people don't own their houses, and a lot of the landlords rent their houses out to Section 108, and a lot of time these are people who don't care.

When we moved into this neighborhood, it was all people who owned their houses, and they were young families with little kids, and all of the families were like that. The neighborhood was really nice, and my children grew up here, and my kids stayed, and now there are grandkids here too! And my whole neighborhood is like this where people's kids have stayed, and nobody's moved out.

When asked if she is supportive of DHHL's plans of building houses in Mākaha so her kids can stay in this *ahupua‘a* and not have to move out, Dalani and Ka‘iulani explained:

DT: Well if DHHL changes their blood quantum and my mother gets her property. She's 77 and she just got on the list. So it's not likely that my kids will get the houses here in Mākaha unless they change the blood quantum because there's still over 8,000 people on that list who claim to be half Hawaiian.

KK: You know people have a bad mentality about the west side so a lot of people will deny land out here. So maybe we might have a better chance of getting a DHHL home out here.

DT: Well it's just like Kaupuni, 300 people originally replied back about living there and there's 15 lots, and I think after the financial qualifications it's down to 70. It's low income, but people have their thing about Wai‘anae and plenty of people have turned down houses there. You know they homestead in Wai‘anae Valley, I would never live there.

KK: Princess Kahanu is the same thing, except they have associations so there's rules. But, it's homestead so it's still hard to enforce those rules about community beautification because people are working a couple of jobs to support themselves, and their children, and their nieces and nephews. They don't have time to take care of their yard.

Having homestead in each *ahupua‘a* would be good so that the Hawaiians who are living in that *ahupua‘a* can stay there because they have roots there. Instead of uprooting Hawaiians to live on DHHL lands, and those people are not a community, and there's already a community here and then they have to try and find their place.

DT: Well that's how all DHHL is.

KK: Well that's what we're saying, that DHHL uproots Hawaiians from where they are from. Like all of Kapolei, nobody's from Kapolei, and now there's so many Hawaiians there who have no connection to that area.

When asked if they have any recommendations on how DHHL should manage their lands in Mākaha, Kai‘ulani and Dalani shared the following:

KK: When I was looking at this map I noticed that the DHHL land is totally surrounding the KS lands, and it kind of gives a feeling of separation between the DHHL community that they're building and the existing community. Also, how it's surrounding the KS project, it's almost like it's their project and I think that's a problem out here when people want to get involved in different programs or organizations but they feel like it belongs to this certain *ahupua‘a* so they don't want to go. And that's kind of the feeling I get by looking at how the map layout is set up.

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DT: And yet, what a nice bridge it is between the ghetto that is down here and the upscale community that is up in the mountains.

KK: Yeah but how do you know that DHHL isn't just going to add to the ghetto and not be a bridge?

DT: Kaupuni is a precedent on how DHHL wants to build houses in the future. Everyone has to have solar and photovoltaic. The whole point of Kaupuni is to see if DHHL should take their homes in this new direction.

KK: Also, the thing with Kaupuni is that they are trying to find 15 people who are going to agree to commit to maintaining and taking care of that land. And I want to know if they worked out a plan to divide up the benefits of the aquaponics and the *lo‘i*.

DT: We're writing that piece at Ka‘ala Farms, not DHHL. The other part of it is we cannot build all of this community center for them. They can put a building there and call it whatever, but the center has to be devised by the families because they have to buy into it and they have to plot it out themselves. We cannot just build this whole system and plop them in there and expect them to all work together. That's why there is a screening process. And even in the Kaupuni forms, it says that this is not for everyone, because it's not only the house you have to worry about, it's a big commitment. When DHHL first planned it, all it was houses with solar panels … that was their whole push for being green. But then Eric [Enos] got involved and started scheming and they introduced this whole other part about adding the garden and aquaponics. So they have to tell people that this is going to be different and they have to agree to roll with something that has never been done before, that's possibly setting a precedent for how DHHL is going to work in the future.

Section 8 Cultural Landscape of the Project Area

8.1 Overview

Discussions of specific aspects of traditional Hawaiian culture as they may relate to the Project area are presented below. This section examines cultural resources and practices identified within or in proximity to the subject Project area in the broader context of the encompassing Mākaha Ahupua‘a landscape and the Wai‘anae Moku. Here, excerpts from Sections 3–7 are integrated and summarized, anticipating the overall recommendations in Section 9.

8.2 Wahi Pana: Heiau and Trails

As noted in Section 3.5 above, a wide variety of religious shrines and natural landscape features used for spiritual practices has been documented near the current Project area. These include large sacrificial *heiau* dedicated (or re-dedicated) to the war god Kū, agricultural and other fertility shrines dedicated to Lono or Kāne, fishing shrines along the coast such as *ko‘a or kū‘ula*, and personal or family "god stones" such as *pōhaku o Kāne*. Some of these shrines are known only from oral-historical accounts; some have been extensively documented by archaeologists. Many people in Wai‘anae Moku continue to visit these places for religious and spiritual practices.

Of the *wahi pana* in the area, with well-known *heiau* just north (Kāne‘aki Heiau) and just southeast (Kamaile Heiau), many other religious shrines and temples of varying sizes and character were once located within and near the Project area. These *heiau* and trails could have the most direct impact on the Project. Uncle Eric Enos, who was involved in the restoration of Kāne‘aki Heiau, believes that the physical and spiritual restoration of this *wahi pana* was a collective effort of a group of cultural practitioners who worked together to guide the restoration process in a *pono* way. The restoration of Kāne‘aki Heiau included other participants in this study: Walterbea Aldeguer, Landis Ornellas and Dalani Tanahy. Landis Ornellas has also been the *kahu* for Kāne‘aki Heiau for the last 27 years. He is also a member of Hui Mālama o Kāne‘aki, a community group that cares for the *heiau* and educates the public on its significance.

Besides the *heiau* in the area, there is also an intricate lattice of trails, linking the *heiau* and the people of Leeward O‘ahu. John Papa ‘Ī‘ī's map (ca. 1810) of Leeward O‘ahu depicts Kumapio and other trails near the Project site (‘Ī‘ī 1959:96) (see Figure 17). Uncle Fred Cachola, in his interview, also spoke of an intricate network of trails and communication systems along the Leeward Coast. In addition, Ka‘iulani Kauihou described trails in Mākaha to access the mountains and waterfalls during the wet season.

The prevalence of *wahi pana*, particularly *heiau* and trails near the Project area, link the KS Learning Community project with the traditions and culture of the Leeward Coast. Thus, it would be difficult to detach this Project from the *ahupua‘a* system that once existed in the area and from the traditional practices that continue along the Leeward Coast, especially with two prominent *heiau* so close to the Project site.

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8.3 Water Resources

Many of the participants noted the scarcity of water in Mākaha Ahupua‘a. Puanani Burgess and Pake Salmon asked, “Where are they going to get water for homes?” Mrs. Burgess specified that the difficulty is “constant usage when water is so hard to get. And putting it into these kinds of developments, as opposed to agriculture, I wonder about the wisdom of it.”

Uncle Eric Enos and Uncle Butch DeTroye have heard KS and the Board of Water Supply claim that water will not be an issue. However, like Puanani Burgess, Uncle Eric and Uncle Butch do not believe that the Board of Water Supply has enough water for this large development, but not for the *lo‘i*. According to Uncle Eric and Uncle Butch, “We know that water will be a major issue for the future.”

During the interview with the kūpuna group at LCCW, some participants acknowledged that, “in the past there was a lot of water in this area,” but they also noted that “the Board of Water Supply just diverts our water to other places.” Ka‘iulani Kauihou, during her interview, spoke of the Board of Water Supply diverting water in Mākaha: “There’s basically one main stream up in the valley that comes down, but it’s currently blocked by the Board of Water Supply.” The group at LCCW is concerned that, “with an increase in development, the Board of Water Supply will tap into the springs to provide water for the Ka Pua [KS Learning Community] housing.” The LCCW *kūpuna* group further explains that, “There are *lo‘i* terraces in Mākaha but it’s hard to maintain *lo‘i* if there’s no water running in the streams.”

Water struggles have been a concern in Wai‘anae Moku generally, and Mākaha Valley specifically, for a long time. And many of these struggles have concerned agriculture use in the Mākaha Valley, resulting in the diversion of water away from *lo‘i* in Mākaha Valley. The LCA information from the mid-1800s supports other historical documents indicating Mākaha’s primary settlement was inland, where waters from Mākaha Stream could support *lo‘i* and sufficient rainfall was available for *kula* cultivars (see Figure 5). By 1923, with the lands of lower Mākaha Valley used for sugarcane cultivation, little water remained for irrigation of *lo‘i*, contributing to the demise of traditional agriculture in Mākaha and displacement of the native population. Similar displacement of subsistence farmers and Native Hawaiians living off the land—resulting directly from the capture of water by commercial sugarcane operations—have been documented in nearby Kamaile (Monahan and Silva 2007) and elsewhere in the district.

Today, Uncle Eric Enos and Uncle Butch DeTroye continue to contend with the Board of Water Supply on issues related to *lo‘i* in the area. They also partner with the Board of Water Supply on community projects, such as the Wai‘anae Watershed Partnership. Regarding the streams in Mākaha Valley, Uncle Eric and Uncle Butch are trying to allow more water into the streams so the water can nourish the *kalo* that they grow in the ancient *lo‘i* at Ka‘ala. These water struggles are also occurring at Mākaha Valley where the community *hui*, Mohala i Ka Wai are pushing the Board of Water to let the water run back into the streams so they can open up the ancient *lo‘i* that are located along the stream bed of Mākaha Stream. According to Uncle Eric, this stream is a significant site where traditional cultural practices occurred and still occur today. Uncle Gigi similarly advocates, “getting the water flowing back in the streams and growing *kalo* again.”

Puanani Burgess describes water usage as a traditional cultural and economic process. This process has been incorporated into her many projects and her home life. In her back yard she raises fish and uses the runoff to grow *kalo*, *laua‘e* and other plants. She explains, “We practice Hawaiian economics, and the Hawaiian approach to economics. You share first and then you are shared with. So we built that into a methodology for this modern fisheries project [where] we use the water multiple times. We work only with families. Individually, we taught the whole family how to do it.” Nothing was wasted in the process of raising the fish, as even the water containing fish waste was used to water plants. According to Mrs. Burgess,

> Instead of wasting the water, Hawaiian values use it all, use it well. Instead of *poho*, [where] you just throw away your water after you finish with the fish, you put the water back into the land which can grow the taro. Then we introduce another layer; we put the water in the tank into hydroponically growing vegetables and then we put it into the pond for the taro.

With this traditional view in mind, as water flows down the Mākaha Valley, the runoff from one usage may also serve another purpose at each part of the process.

With the terrain of the valley, when it floods, the streams bring debris to the shore. Mr. Rapoza explains that, “You do any construction in Mākaha Valley—the whole lower part of Mākaha Valley is lowland. That’s why there is no building here. Literally, you have to fill up the land. Only a little bit rain, highwater, the whole thing is flooded.” Kai‘ulani Kauihou described the debris that settles in the marshes and the shoreline areas. Ms. Kauihou spoke of the “two million golf balls found on the beach after that storm!” These community participants offer evidence that the Ka Pua project, with the DHHL homes built where the Mākaha Golf Course is now, will impact shoreline activities and resources.

The DHHL Residential Community and KS Learning Community Project resides within an intricate network of complexes (i.e., *heiau* and trails) on the Leeward Coast (see Sections 3.5 and 3.6), this Project will also be integrated into an elaborate water resource management system. Because of the size and impact of this Project, the water resources of Mākaha Valley could drastically change if this Project proceeds without a keen understanding of this water system. Some community participants believe that knowledge of the traditional use and reuse of water in Mākaha Valley would minimize that impact. Understanding the cultural knowledge of this water system requires time spent in Mākaha Valley with people knowledgeable about the water resources, agricultural use, and cultural practices of and the Leeward Coast.

8.4 Gathering of Plants and Fish

Ms. Kauihou explains that,

> The *hula hālau* don’t really come into Mākaha Valley to gather because they probably don’t know where the *palapalai* [ferns used for *hula*] is, that’s more Wai‘anae Valley. However, Mākaha Valley does have the *kahuli*, the native tree snail, but nobody gathers it because they are an endangered species.

Puanani Burgess describes *laua‘e*, *ti* leaf, and *kukui* as being gathered by some *hula hālau* and others in Mākaha Valley. However, the largest concern regarding native plants was whether the

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DHHL homes would allow tenants to grow native plants. The *kūpuna* at LCCW assert that, “We should be able to plant trees and plants that are culturally significant and provide us with food: planting indigenous and endemic plants ‘is part of our culture.”

In the ocean and near the shore, fish and *limu* are still gathered. Ms. Kauihou tells of the ocean resources at Mākaha Beach: “There’s a lot of fishermen out here, and people live off of the marine resources. Especially with the numerous homeless people out here, a big portion of their diet is the marine resources, such as *opihi*, *limu*, *loli*, and *wana*.” Puanani Burgess also discussed the ongoing cultural practices of fishing by throw net and surfing down by the shore. Traditionally, Mākaha Point is noted for its rocky, raised reef, good for pole fishermen. The area is also called “Takato” in the historic period, probably named for a resident or fisherman (Clark 1977:94).

However, Ms. Kauihou believes that over the years, the fish population has been decreasing and that the declining fish population is because the invasive *limu* species have taken over. Kauihou suggested that the Mākaha community could take similar actions as the “uncles” in ‘Ewa to try and restore the native *limu* so the fish populations increase. James Rapoza similarly sees depletion in the fish populations and attributes that to over-development and run-off.

For the participants in this CIA regarding the DHHL Residential Community development, the gathering of plants and fish is closely related to water distribution. Mrs. Dalani Tanahy explains that,

> They can put a building there and call it whatever, but the center has to be devised by the families because they have to buy into it and they have to plot it out themselves. We cannot just build this whole system and plop them in there and expect them to all work together. That’s why there is a screening process. And even in the Kaupuni forms, it says that this is not for everyone, because it’s not only the house you have to worry about, it’s a big commitment. When DHHL first planned it, all it was houses with solar panels … that was their whole push for being green. But then Eric [Enos] got involved and started scheming and they introduced this whole other part about adding the garden and aquaponics. So they have to tell people that this is going to be different and they have to agree to roll with something that has never been done before, that’s possibly setting a precedent for how DHHL is going to work in the future.

Puanani Burgess, drawing from her work on community development, and using Hawaiian principles from *‘Ōlelo No‘eau* and Native Hawaiians like Uncle Walter Pauolo, describes a process whereby people would *mālama* the community, the fish and the land. According to Auntie Pua, some of the community development projects that she participated in,

> … were based on the practice of “I’ll feed the fish, you feed me.” So that’s what we taught farmers how to do, is to take care of the fish, take care of the land, take care of the resources, and in turn they will take care of you … And it also came from the Hawaiian thinking that work is medicine. We try to build [a] human service project based on teaching people how to work again, as a collective.

Overall, Uncle Eric Enos and Uncle Butch DeTroye are primarily concerned about the well-being of the *‘āina* and their community. More specifically, with food production, shelter and health. According to Uncle Eric, “It is essential that we make sure the *‘āina* is productive again, feed our people with the resources from the land and sea, and maintain a healthy body, mind and spirit.”

Gathering of fish or plants is not only a matter of taking from the environment: it is giving to the fish or the *‘āina*, so that the ocean and the land reciprocate. Within this philosophical, cultural context, the concerns of gathering are concerns of community. Participants wanted to know what was allowable for growing within the DHHL homes. Participants also spoke of the changing environment, how population growth and development have impacted the area. Participants were also hopeful that this project could nourish the community, and in so doing, the Mākaha Ahupua‘a would thrive. As with the traditional Hawaiian land management system, where the *konohiki* cared for the gathering practices throughout the *ahupua‘a*, participants viewed this Project as a means for ensuring proper management of the resources in the area.

8.5 Cultural Education

One of the main themes from the interviews is that cultural education is a process that begins long before any buildings are erected. Participants explained that cultural education, regarding the Wai‘anae Moku and Mākaha Ahupua‘a, requires a paradigm shift, from seeing the project as a KS and DHHL project placed in Mākaha Ahupua‘a to seeing this Project as cultural education from the people of Mākaha Ahupua‘a and Wai‘anae Moku for KS and DHHL, as well as the students and residents of KS Learning Community. With this cultural shift in mind, the learning process begins now, by participating with the Mākaha community.

During her interview, Puanani Burgess acknowledged that individual interviews are helpful. At the same time, she stressed the need for community-based development that integrates Hawaiian principles such as the value of the *‘ohana,* the necessity of sharing and of doing work that promotes one’s self-worth. Puanani Burgess expressed notion of cultural learning most clearly:

> I think they should go out and tell people tell stories of what they—take people onto the land—and say we want to gather and hear the stories before we begin designing. And have one of those people who draw as we talk, draw as the people are telling their stories, and out of those drawings and those stories, then build what will naturally uplift that community. Don’t start buildings, but start with the stories, and see where the strong, healthy stories are. And develop the development for that healthy strong part of the community and the culture.

Uncle Gigi similarly asked that KS, “Come out to Mākaha, not just to talk, but to work. Make the effort to really show you care about our *‘āina* and our community. Come to Hoa ‘Āina O Mākaha and work with me in the gardens … in the dirt, and spend sincere time with us because it takes time to get to know the people, community, and *‘āina* of Mākaha.”

Uncle Eric intends to organize a cultural tour of Mākaha so KS and DHHL can see the land through the community’s eyes. He feels it is extremely important to meet with KS and DHHL when others such as William Ailā, Gigi Cocquio, Dalani Tanahy, and Landis Ornellas are

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present, so they can share their *mana‘o* and discuss the future of Mākaha as a *hui*. Uncle Eric is adamant that this has to be a collective effort, not something that is decided by one individual, organization, or institution.

During the group interview at Leeward Community College Wai‘anae, many had questions about the nature of the KS Learning Community project and what would be taught there. At the same time, many expressed the notion that KS was teaching the Mākaha community that the KS Learning Community project mattered more than the people and culture of Mākaha. Without substantial participation from KS and DHHL with the Mākaha community, the participants interpreted this as a lack of cultural engagement. Aunty Arviella Keli‘i recommended that, “Someone well-known at KS should come out here, into the community, to inform us on what their plans are. And it shouldn’t be through [neighborhood board] meetings because people don’t go to meetings. People argue and fight at meetings, and nothing ever gets done, so it should be through other means.” Auntie Lucy Gay similarly said that KS needs to “Get off the hill and come out here!”

Drawing attention to the idea of cultural displacement through the Project, Landis Ornellas stresses the importance of Project proponents to fully understand the area where the proposed development is being planned. For Mr. Ornellas, Project proponents need to understand what is in Mākaha and what it has to offer and then build on that.

Drawing attention to the State of Hawaii’s neglect of the Wai‘anae Moku through the years, James Rapoza contends that this neglect has strengthened the culture of the area:

> The state of Hawai‘i has been putting everything on this side of the island. Everything that they could get rid of. All their *‘ōpala* (trash) has always been here. We the people of Wai‘anae have lived through all that, and thrived. Not only that, we’ve flourished. When they want to learn culture, heritage, where do they come? They come here for culture and heritage. The very places they made a rubbish dump, dumping grounds.

Mr. Raposa was similarly skeptical of KS and DHHL’s commitment to the Mākaha community and Wai‘anae Moku.

> If they want to do something for the community, for Wai‘anae, education is the key. Education is the key.... You want to help something in Wai‘anae? Free education, but that’s the only the beginning. You have to start them off, but you have to guide them to the point of finish. You cannot do a half-ass job. That’s what’s wrong with Kamehameha. They want to come in here and start projects, at the beginning, but what about the middle and the end? You come here for the kids, what about the mother and the father? What about the whole *‘ohana*? You guys only think about your vision, what you think, but what about the bigger world?

While Pake Salmon is very excited and supportive of KS’s plans in Mākaha, she recommends that the Schools’ representatives spend time with some of the community groups in Mākaha to genuinely see what they do. Similarly, Rene Suckoll and Brenda Abaro are eager to participate in community meetings for the Ka Pua project, and hope that KS’s representatives will come to

Mākaha Elementary to further discuss their plans. Dalani Tanahy and Ka‘iulani Kauihou, who are also supportive of the KS Learning Community project, warned about trying to create a community without having participation from the people of Mākaha Ahupua‘a:

> We cannot build all of this community center for them [KS and DHHL]. They can put a building there and call it whatever, but the center has to be devised by the families because they have to buy into it and they have to plot it out themselves. We cannot just build this whole system and plop them in there and expect them to all work together.

Another important aspect of cultural education, discussed in the interviews and closely linked with the need to spend time in Mākaha Ahupua‘a, is deciding what would be taught at the KS Learning Community. Moreover, by determining what would be taught this would decide what would be built and the style of the Learning Community.

During her interview, Auntie Puanani Burgess pondered the idea of opening a different kind of school, where the topics are practical to daily life:

> How come we don’t have an agricultural school, keep things out in the open. A weather school, an environment school, an archaeology school. Why does it have to be in a hall? Why can’t it be a big *fale* [traditional oval-shaped houses with open sides] like they do in Samoa, where people come and go? It’s an open space where they cannot keep electronics out because that is not the proper place, so maybe you don’t really need it.

Auntie Puanani Burgess wonders whether what KS intends to teach “is going to be tied to economics, [if] what people learn there will help them not just survive but to prosper. If the things they learn like how to do a *lo‘i* or raise fish, whatever they learn there, how is that going to be practical?” She understands that a multi-media center is important but she also questions whether a multi-media center will positively Wai‘anae Moku:

> I understand that multimedia is important…. But I’m not sure that’s what is really going to promote survival and prosperity for the 90 percent. Multimedia will serve a handful of people. What about people who should be fishing or should be farming? We cannot build all technical people and think that’s the only important thing for people to learn.

Uncle Gigi similarly sees the KS Learning Community project as creating a cultural learning environment. Uncle Gigi believes the buildings and houses in the DHHL village should reflect the life and culture of the people. He recommends there be meeting places, similar to *marae*, where visitors can come to learn and share about their cultures. Committed residents could live together in the village as a community of *keiki* (children) and *kūpuna*, learning from one another in a holistic environment. The village could also function as a *pu‘uhonua* (place of refuge), open to all Hawaiians who want to live and practice Hawaiian culture, attitudes, and values. Different *hālau* (hula schools) could function as different learning centers focusing on themes such as organic farming, traditional building practices, aquaponics, aquaculture, animal farming, *mālama ‘āina*, and ‘Ōlelo Hawai‘i.

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Uncle Eric emphasizes that the KS Learning Community needs to be integrated with what already exists in Wai‘anae. For instance, KS can use this new development plan to pull together a network of community groups and individuals who have been successful in carrying out place based education initiatives in Wai‘anae, and further support those programs through additional resources.

Mr. Rapoza explains the cultural learning of students at the KS Learning Community, from the perspective of someone who comes from the Wai‘anae Moku: “They’re gonna come learn from us. That’s what they’re gonna do, come learn from us.” The cultural learning for the KS Learning Community project, begins and ends in Mākaha.

8.6 Summary of Site Specific Impacts

(The wording for this section has been provided by the client.)

Approximately half of the project area consists of one of the two aforementioned golf courses (Makaha East Golf Course), the remainder is not occupied by any residents and is overgrown. The portion along the lower slopes of Kamaile‘unu Ridge is both steep and overgrown, and shows signs of being used for agriculture.

While there are significant cultural resources off-site (Mauna Lahilahi, Kamaile Heiau, Kāne‘aki Heiau), the proposed project is not sited such that it restricts access to these sites or cultural religious practices. There are several individuals, including Eric Enos, Walterbea Aldeguer, Landis Ornellas and Dalani Tanahy that were involved in the restoration of Kāne‘aki Heiau. Landis Ornellas has also served as *kahu* for the Kāne‘aki Heiau for the last 27 years. He is also a member of Hui Mālama o Kāne‘aki, a community group that cares for the heiau.

It is reported that *lauae*, *ti* leaf and *kukui* in Mākaha Valley is being gathered by some *hula halau*, but it is unlikely that it is being gathered on the project site.

Construction of the proposed project is unlikely to negatively impact any Hawaiian cultural practices that may be occurring on the project site, such as gathering of materials for *lei* making. There are only two native species, *‘ilima* and *‘uhaloa*, that occur in their natural environment, within the project site. Both species are common throughout the region

Once in operation, the proposed project is anticipated to have a positive impact on cultural use of the project site. Recognizing that learning does not need to occur under a roof, a majority of the proposed KS Learning Community (roughly 50 acres) is being planned to allow for outdoor learning opportunities. Indigenous and educational gardens are expected to be incorporated within the KS Learning Community so students and the community can learn about, cultivate and gather endemic, Polynesian-introduced and other plants of cultural and economic value to Hawai‘i. CSH believes the cultural practices of Mākaha Valley will be impacted by the construction and implementation of these teaching programs.

Subsequent to the completion of the interviews, CSH learned that ultimate plans for the KS Learning Community will be developed after a two-year effort of meeting with many residents and educators who live and work along the Wai‘anae Coast. Over a span of six months (September 2009 to April 2010), KS has briefed more than 35 groups/organizations on the Mākaha KS Learning Community informing/updating more than 900 people. KS acknowledges

it has much to learn, not only about the educational needs of Wai‘anae Coast residents, but also about how best to preserve and enhance the cultural resources of Mākaha Valley.

DHHL plans to further to refine the sustainable design concepts from its recent Kaupuni subdivision project in Wai‘anae Valley, to its DHHL Residential Community on the project site. This may include aquaponics gardening that was developed for the DHHL Kaupuni project, that included input from Wai‘anae Coast residents such as Eric Enos, to make new DHHL homes not only energy efficient, but provide a level of food security as well.

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Section 9 Summary and Recommendations

At the request of PBR Hawaii & Associates, Inc. (PBR), CSH, Inc. (CSH) conducted a Cultural Impact Assessment (CIA) for the KS Learning Community and DHHL Mākaha Residential Community Project. The proposed Project consists of development of a Kamehameha Schools (KS) Learning Community and a Department of Hawaiian Home Lands (DHHL) residential community in Mākaha Ahupua‘a, Wai‘anae District, on the island of O‘ahu (TMK: (1) 8-4-002:005, 007, 056, 057, 070, 76; 8-4-023:014, 015; 8-4-024:001) (see Figure 1).

The approximately 306-acre Project area is located in the lower, eastern portion of Mākaha Valley, approximately 1.3 km (0.8 mi.) *mauka* (inland) of the Farrington Highway, as depicted on the U.S. Geological Survey 7.5-Minute Series topographic map, Wai‘anae Quadrangle (1998). The Project area consists of lands at the base of the valley, including the Mākaha Country Club and Golf Course, and lands along the lower slopes of the Kamaile‘unu Ridge. The Project area is privately owned by Ko Olina Makaha East, LLC / Honolulu Limited.

The proposed KS Learning Community Project includes development of an approximately 67-acre KS Learning Community and an approximately 112-acre DHHL Mākaha Homestead residential community. The KS Learning Community is currently envisioned as including a preschool, educational learning lab, multimedia center, learning halls, multi-function sports fields and a community gathering area,. The DHHL Mākaha Residential Community is currently envisioned as including up to 600 homes and a community center.

The current conceptual plan also includes large expanses of open space that are not proposed for development. Minimally, land disturbing activities associated with the proposed Project would include the following: grubbing and grading; excavations for building foundations and subsurface utilities; and excavations for associated infrastructure improvements.

The Project’s area of potential effects (APE) is defined as the entire 306-acre project area, within the larger context of Mākaha Ahupua‘a. The APE also includes the Project area’s relationship with the rest of the *moku* (district) of Wai‘anae, the island of O‘ahu, and other islands, as these relate to Hawaiian beliefs (e.g., *mo‘olelo*, or oral-historical accounts, and *wahi pana*, or legendary places), resources and practices

9.1 Results of Background Research

Background research reveals the following salient information:

1. A wide variety of religious shrines and natural landscape features used for spiritual practices has been documented near the current Project area, including large sacrificial *heiau* dedicated (or re-dedicated) to the war god Kū, agricultural and other fertility shrines dedicated to Lono or Kāne, fishing shrines along the coast such as *ko‘a* or *kū‘ula*, and personal or family “god stones” such as *pōhaku o Kāne*. Two of the largest and most prominent nearby *heiau,* Kāne‘aki and Kamaile, are still largely intact.
2. The proposed Project is located about a mile from a sizeable pre-Contact and early historic village between. A mile to the north of the proposed Project is Kāne‘aki Heiau. Another important settlement area was located a short distance to the south, just on the other side of the base of Kamaile Ridge, centered around the famous *pūnāwai* (fresh water spring) known as Keko‘o or Kīko‘o.
3. *Kahuna* dedicated Kawiwi, a mountain between Wai‘anae and Mākaha Ahupua‘a, as a refuge during times of war (McAllister 1933). Thus, the Wai‘anae Moku was where O‘ahu *kahuna* took refuge after Kamehameha I conquered the island. Pōka‘ī Bay was used as a school administered by exiled *kahuna* who took refuge in Wai‘anae after Kamehameha I gained control of O‘ahu (in Sterling and Summers 1978:68).
4. Land Commission Awards in Mākaha Ahupua‘a support other historical documents indicating Mākaha’s primary settlement was inland, where waters from Mākaha Stream could support *lo‘i* and sufficient rainfall was available for *kula* cultivars.
5. Sugarcane cultivation dominated Mākaha Valley by 1923, and little water remained for irrigation of taro *lo‘i*, contributing to the demise of traditional agriculture in Mākaha and displacement of the native population. By the mid-1930s, sugar cultivation in Mākaha Valley diminished, due in part to limited water resources.
6. The Makaha Valley Historical Project (Green 1969, 1970, 1980; Ladd and Yen 1972; Ladd 1973) recorded more than 600 archaeological features in the upper valley and 1,131 features in the lower valley.

Donham (1990) conducted an archaeological inventory survey of two discrete parcels for a total of approximately 130 acres in the south-central portion of Mākaha Valley, including portions of the Project area (see Figure 27). In the eastern portion of Donham’s survey, a platform was designated site SIHP 50-80-07-875. Donham also recorded a complex (SIHP 50-80-07-4819), possibly a pre-Contact or early post-Contact house site, which was comprised of 10 terraces, seven modified outcrops, two walls, and one platform.

9.2 Results of Community Consultation

Kama‘āina and *kūpuna* with knowledge of the proposed Project and study area participated in interviews for this CIA. Interviews for this study were conducted in January and March, 2010, and are ongoing. CSH attempted to contact 42 individuals for this CIA (see Table 3). Twenty-eight *kūpuna* (elders) and/or *kama‘āina* (native born) participated in a total of 11 interviews for more in-depth contributions to the CIA. Ten of these interviews were formal interviews. One of these interviews, which included a total of 16 individuals—only some of whom contributed their *mana‘o*—was not a *formal* interview but more accurately an *ad hoc* opportunity to speak with multiple elders simultaneously about the project (see Section 7.7 above). At the present time, 10 of the 11 interviews have been reviewed and approved by the participants for inclusion in this CIA Draft Report; approval for the last interview (with Mr. Fred Cachola) is pending.

Participants expressed a broad range of comments, and none are against the Project. Individually, four community participants spoke of their excitement about the Project. Others also expressed their desire that this Project succeed. However, the primary concern of the community participants is to encourage KS and DHHL to incorporate Native Hawaiian culture in the development of the project and educational programs. Specifically, these participants want KS and DHHL to consult with community leaders and residents of the Waianae Coast, as well as work with existing educational providers.

Community consultation yielded the following recommendations from Community participants:

1. **Spend Time in Mākaha, Working, Observing and Listening.** Participants explained that cultural education, regarding the Wai‘anae Moku and Mākaha Ahupua‘a, requires a paradigm shift, from seeing the project as a KS and DHHL project placed in Mākaha Ahupua‘a to seeing this Project as cultural education from the people of Mākaha Ahupua‘a and Wai‘anae Moku for KS and DHHL, as well as the students and residents of KS Learning Community. With this cultural shift in mind, the learning process begins now, by participating with the Mākaha community. Participants warned about trying to create a community without having participation from the people of Mākaha Ahupua‘a.

   The main recommendation from all of the participants is that, before breaking ground, KS and the DHHL should spend time in Mākaha Ahupua‘a observing and learning about the valley, and the history and culture of people who live there. There is a common sentiment among participants that they are not being involved in the project and plans adequately. They perceive that KS has already planned the project even though the community itself has not been consulted or informed of it. Aunty Lucy expressed it as, “Get off the hill and come out here!” Uncle Eric Enos believes that KS should participate in a cultural tour of Mākaha before proceeding with any discussion about this KS Learning Community. Puanani Burgess advised, “Don’t start buildings, but start with the stories, and see where the strong, healthy stories are.” Similarly, Uncle Gigi recommends: “Kamehameha Schools should come to Mākaha to listen to the people without having an agenda and then shape their plans around what the community wants.

2. **Inspire the Community to become involved in the planning process through Non-Traditional Outreach.** Out of the 17 people that participated in the group interview, only one person, Aunty Alice Greenwood, had heard about the KS Learning Community project. This concerned many of them, that they had not been informed by KS or DHHL about this substantial development plan. Aunty Arviella Keli’s suggestion is more specific about how to do this. She recommends, “Someone well-known at Kamehameha Schools should come out here, into the community, to inform us on what their plans are. And it shouldn’t be through [neighborhood board] meetings because people don’t go to meetings. People argue and fight at meetings, and nothing ever gets done, so it should be through other means.” The group interviewed at Leeward Community College in Wai‘anae expressed the notion that “KS needs to do more community outreach through non-traditional means.” Aunty Keala Card recommended that KS should hold a *lū’au* (feast), or some other type of informal gathering, where there is food and music, and people feel comfortable and get to know each other. Aunty Lucy suggested that KS utilize its network of alumni to get into the community. “Kamehameha Schools can’t be so separated from us; they need to come out here and get to know us.”

3. **Collaborate with a Committee of Dedicated People from Mākaha Area.** Only after working, observing and listening, the community recommends that KS and DHHL should engage the community in discussions about planning the project. Uncle Gigi recommends getting dedicated individuals and groups together to discuss their vision of the future of Mākaha. Eric Enos advises KS and DHHL to consult: William Ailā, Gigi Cocquio,

Dalani Tanahy, and Landis Ornellas so they can share their *mana‘o* (thoughts, beliefs, opinions) and discuss the future of Mākaha as a *hui* (club, association, organization). Uncle Eric is adamant that this has to be a collective effort, not something that is decided by one individual, organization, or institution.

4. **Integrate and Collaborate with Existing Programs that already have experience and community support.** Uncle Eric emphasizes that the learning center needs to be integrated with what already exists in Wai‘anae Moku. For instance, KS can use this new development plan to pull together a network of community groups and individuals who have been successful in carrying out place based education initiatives in Wai‘anae, and further support those programs through additional resources.

   In addition to recommendations about *how* to go about the process of planning the Project, participants also had specific suggestions for Project activities.

5. **Hire Residents of Wai‘anae Moku.** Ms. Salmon notes that there are very few jobs in Mākaha, and she recommends that KS should strive to provide jobs for Mākaha residents at the KS Learning Community. The layoffs from the Maunaolu East Golf Course resulting from the proposed Project concern current employees and their families. Specifically, Mrs. Suckoll and Mrs. Abaro (both faculty at Mākaha Elementary whose husbands currently are employed at the Golf Course but are expecting to lose their jobs) recommend that Mr. Stone work with KS to help find jobs for those affected.

6. **Educate the Whole ‘Ohana (family).** Mr. Rapoza advises strengthening the physical and educational “infrastructure” in Wai‘anae Moku by expanding the Project focus from “only children” to also include the whole *‘ohana* and the whole *ahupua‘a*.

7. **Consider the relationship of the Homes, Learning Community, and larger community.** Mrs. Burgess explains that, “The homes should be a learning center, and the learning center should be a place where people feel safe and welcome. Whether they are learning things that can be applied back in their home, in their family, in their counties, in their workplace.” Integrate the KS Learning Community project with the Mākaha Community. Ka‘iulani Kauihou described the KS Learning Community project as being disconnected from the Mākaha Community:

   > When I was looking at this map I noticed that the DHHL land is totally surrounding the KS lands, and it kind of gives a feeling of separation between the DHHL community that they’re building and the existing community. Also, how it’s surrounding the KS project, it’s almost like it’s their project and I think that’s a problem out here when people want to get involved in different programs or organizations but they feel like it belongs to this certain *ahupua‘a* so they don’t want to go. And that’s kind of the feeling I get by looking at how the map layout is set up.

   And yet Dalani Tanahy described the KS Learning Community project as “a nice bridge … between the ghetto that is down here and the upscale community that is up in the mountains.”

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9.3 Overall Recommendations from CSH

Based on the information gathered from the community consultation efforts as well as the archaeological and archival research documented in this report, CSH proposes the following recommendations. The recommendations presented below are suggested to minimize the impact of the proposed Project on Hawaiian historical, natural and cultural resources and practices in and adjacent to Mākaha. A good faith effort to address these recommendations may help mitigate the potentially adverse effects the proposed Project may have on Hawaiian cultural practices, beliefs and resources in and near the Project area.

1. Demonstrate to the Mākaha Community that KS and DHHL understand the cultural significance of Mākaha Ahupua‘a and Waianae Moku. In the interviews, the community expressed in many ways that they feel their mana‘o and culture are not valued for the KS Learning Community project. Participants asked KS to spent time in Mākaha; work the land of Mākaha; send important people to Mākaha; hold *lū‘au* in Mākaha; visit the sites in Mākaha; and learn about the culture of Mākaha. People know when they are being valued, and the Mākaha community does not seem to have experienced this with regard to the KS Learning Community project.
2. Utilize recognized community members, such as those contacted for this study, to create a committee, which will coordinate the cultural development of the KS Learning Community project. Uncle Gigi recommends getting dedicated individuals and groups together to discuss their vision of the future of Mākaha. For the KS Learning Community project to work, KS and DHHL must base the cultural development of this project on the people and culture of Mākaha Ahupua‘a and Waia‘nae Moku. This Project must be an integral part of the Mākaha community, not a separate community within the Mākaha Ahupua‘a.
3. Learn about cultural sites in Mākaha and integrate knowledge of these sites with the instruction at the learning center. One participant is concerned that construction and its accompanying large equipment can endanger cultural resources. If the sites are part of the learning experience, then they will be protected. Moreover, especially with early settlements and trails near the Project area, personnel involved in development activities in the Project area should be informed of the possibility of inadvertent cultural finds, including human remains. Should cultural or burial sites be identified during ground disturbance, all work should immediately cease, and the appropriate agencies notified pursuant to applicable law.

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Appendix A Sample Letter with Map

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

P.O. Box 1114 # # Kailua, Hawai'i 96734 # # #Ph: (808) 262-9972 Fax: (808) 262-4950
Job code: Makaha 8 kvogeler@culturalsurveys.com # # # # # www.culturalsurveys.com

November 20, 2009

Aloha Sample,

At the request of PBR Hawaii & Associates, Inc., Cultural Surveys Hawai'i (CSH) is conducting a Cultural Impact Assessment (CIA) for the proposed Ka Pua - Mākaha Learning Complex and Department of Hawaiian Home Lands (DHHL) Mākaha Homestead Development Project.

The Ka Pua - Mākaha Learning Complex and the DHHL Homestead Development Project will be constructed in the Mākaha Ahupua'a, Wai'anae District, O'ahu Island (TMK: [1] 8-4-002:005, 007, 056, 057; 8-4-023:014, 015; 8-4-024:001). The approximately 303-acre project area is located in the eastern portion of Mākaha Valley, approximately 1.3 km (0.8 mi.) mauka (inland) of Farrington Highway (see map enclosed).

The project area consists of lands at the base of the valley, including the Makaha Valley Country Club, and lands along the lower slopes of the Kamaile'unu Ridge. The project area is privately owned by Ko Olina Makaha East, LLC / Honolulu Limited.

The proposed Ka Pua Project includes development of an approximately 67-acre Kamehameha Schools learning complex and an approximately 112-acre DHHL Mākaha Homestead residential community.

The Kamehameha Schools learning complex is currently envisioned as including a preschool, educational learning lab, multimedia center, learning halls, short-term residence halls, multi-function sports fields, community gathering area, and lo'i (irrigated agricultural field).

The DHHL Mākaha Homestead development is currently envisioned as including up to 600 homes and a community center.

The current conceptual plan also includes large expanses of open space that is not proposed for development. Minimally, land disturbing activities associated with the proposed project would include the following: grubbing and grading; excavations for building foundations and subsurface utilities; and excavations for associated infrastructure improvements.

The project's area of potential effect (APE) is defined as the entire 303-acre project area, within the larger context of Mākaha Ahupua'a. The APE further includes the Mākaha Ahupua'a and the island of O'ahu, as these relate to Hawaiian beliefs (e.g. *mo'olelo*, or legends, oral histories and *wahi pana*, or storied places), resources and practices.

Douglas "McD" Philpots, **11/20/2009**

Page 2

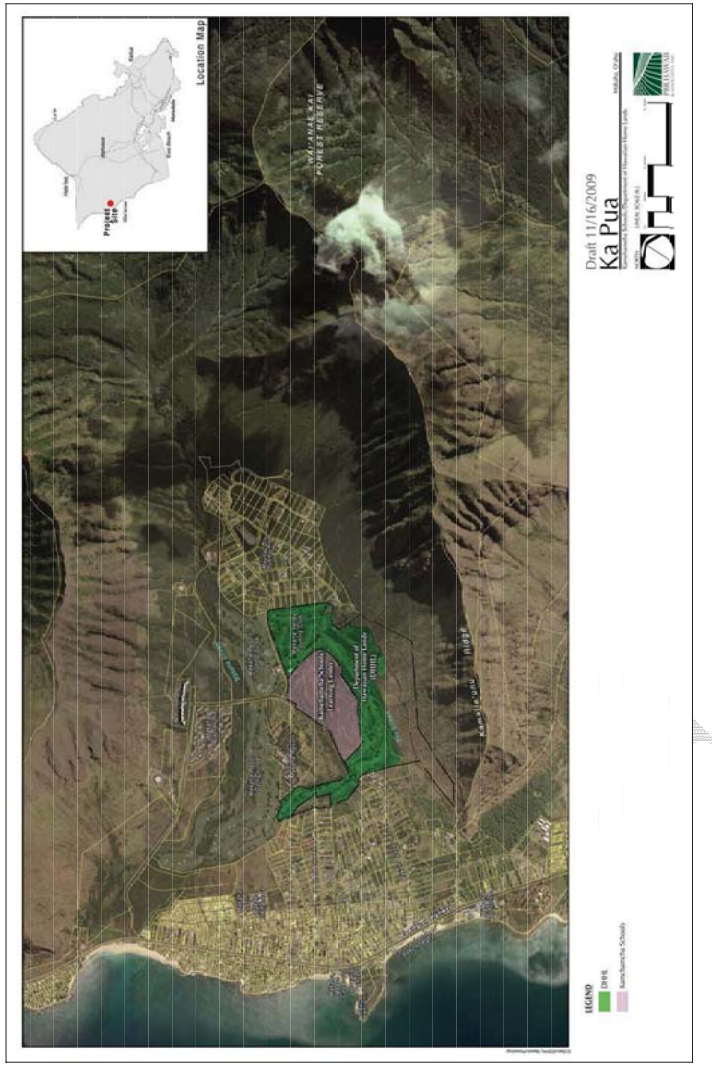
The purpose of this cultural study is to assess potential impacts to cultural practices as a result of this proposed development in Mākaha. We are seeking your *kōkua* (assistance) and guidance regarding the following aspects of our study:

- **General history and present and past land use of the project area.**
- **Knowledge of cultural sites which may be impacted by future development of the project area - for example, historic sites, archaeological sites, and burials.**
- **Knowledge of traditional gathering practices in the project area, both past and ongoing.**
- **Cultural associations of the project area, such as legends and traditional uses.**
- **Referrals of *kāpuna* or elders and *kama'āina* who might be willing to share their cultural knowledge of the project area and the surrounding *ahupua'a* lands.**
- **Any other cultural concerns the community might have related to Hawaiian cultural practices within or in the vicinity of the project area.**

Please contact me, Kūhiō Vogeler, at (808) 262-9972, or send me an e-mail at kvogeler@culturalsurveys.com if you have any information you would like to share.

Mahalo Nui Loa,

Kūhiō Vogeler, Ph.D.
Cultural Researcher
Cultural Surveys Hawai'i



Appendix B Interview Questions

INTERVIEW QUESTIONS FOR MĀKAHA 8 CIA

Part I: Contact information

1. Name: _____
2. Where were you born: _____
3. Where did you grow up:_____
4. When were you born:_____
5. Parents? Mother_____ Father _____
6. Occupation/Affiliation: _____
7. Area of residence: _____
8. How long have you lived here: _____
9. Personal and/or family connection to *ahupua'a*:_____
10. *Referrals:*_____

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Part II: Historical information

11. Is there anything you would like to say about the general history of the area, or past and present land use?

12. How about personal and/or family history in the area?

13. Past land use? Past agricultural (ranching; rice, sugar cultivation), fisheries or other uses of the area (e.g., *lo‘i, kula, ko‘a*)?

Part III: Cultural and historic sites

14. Are there any cultural, archeological, historic, and/or burial sites in or around the proposed project area (e.g., *heiau, hale, kū‘ula, ilina*)?

Part IV: Gathering/hunting/fishing/etc. practices

15. Are you, is or is anyone you know, involved in any cultural practices in the project area – for example plant gathering, fishing, hunting, surfing, etc.?

16. If you are, how did you learn the activity/ies and how long have you engaged in _____?

17. Can you tell me about any cultural practices from the past?

18. Knowledge of past or present cultural protocols observed?

Part V: Legends, stories and place, and sense of place

19. Is there anything you would like to say about legends, or stories about the project area?

20. Are there any names, traditions, or practices associated with the area and features of the landscape? Origin stories…?

21. Trails ancient or contemporary in the area? Who used/uses them?

22. *Mauka-makai* relationships?

Part VI: What else?

23. Do you have any, or do you know of any concerns the community might have related to Hawaiian or other cultural practices within or in the vicinity of the project area?

24. Do you have any recommendations regarding site management or protection, and development in the proposed project area?

25. Did CSH miss anything? Is there anything else you would like to add?

26. Is there anyone else we should talk to about this cultural study?

27. IF SO, may I say that you referred CSH to him/her?

DRAFT

Appendix C Authorization and Release

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

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

Job code: Makaha 8 kvogeler@culturalsurveys.com www.culturalsurveys.com

AUTHORIZATION AND RELEASE FORM

Cultural Surveys Hawai'i (CSH) appreciates the generosity of the *kūpuna* and *kama'āina* who are sharing their knowledge of cultural and historic places, experiences of past and present cultural practices. At the request of PBR Hawaii & Associates, Inc., Cultural Surveys Hawai'i (CSH) is conducting a Cultural Impact Assessment (CIA) for the proposed Ka Pua - Mākaha Learning Complex and Department of Hawaiian Home Lands (DHHL) Mākaha Homestead Development Project.

We understand our responsibility in respecting the wishes and concerns of the interviewees participating in our study. Here are the procedures we promise to follow:

1. The interview will not be tape-recorded without your knowledge and explicit permission.
2. You will have the opportunity to review the written transcript or notes of our interview with you. At that time you may make any additions, deletions or corrections you wish.
3. You will be given a copy of the interview transcript or notes for your records.
4. You will be given a copy of this release form for your records.

For your protection, we need your written confirmation that:

1. You consent to the use of the complete transcript and/or interview quotes for reports on cultural sites and practices, historic documentation, and/or academic purposes.
2. You agree that the interview shall be made available to the public.

I, _____, agree to the procedures outlined above and, by my
(Please print your name here)
signature, give my consent and release for this interview and/or photograph to be used as specified.

_____
(Signature)

_____
(Date)

Appendix D OHA Response Letter

PHONE (808) 594-1888 FAX (808) 594-1865

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

HRD09/4748

March 12, 2010

Kūhiō Vogeler, Cultural Researcher
Cultural Surveys Hawai'i
P.O. Box 1114
Kailua, Hawai'i 96734

RE: Cultural Impact Assessment Consultation
Ka Pua- Mākaha Learning Complex and
Department of Hawaiian Home Lands Mākaha Homestead Development Project
Mākaha, Wai'anae, Island of O'ahu

Aloha e Mr. Vogeler,

The Office of Hawaiian Affairs (OHA) is in receipt of your November 20, 2009 letter initiating consultation ahead of a cultural impact assessment (assessment) for the proposed Ka Pua- Mākaha Learning Complex and Department of Hawaiian Home Lands (DHHL) Mākaha Homestead Development Project. The project is approximately 303-acres in size and includes the development of an approximately 67-acre Kamehameha Schools learning complex and 112-acre DHHL residential community with up to 600 homes and a community center.

The current and past land uses of the project area are unclear to us at this time and we request that a comprehensive review of cultural and archaeological studies related to the project area be conducted in order to determine whether an archaeological inventory survey is warranted.

OHA recommends consultation with the following individuals who may be willing to share their thoughts with you: Glen Kila, Hanalei Hopfe, William Aila, Alika Silva, Badayos 'ohana , Eric Enos, Mel Pu'u, Walt Keale and the Keaulana 'ohana. Please remember that this list is not all encompassing and we are sure additional individuals and/or organizations will be identified as you move forward with your consultation process.

Kūhiō Vogeler, Cultural Researcher
Cultural Surveys Hawai'i
March 12, 2010
Page 2 of 2

OHA applauds the work of all parties involved in this collaborative effort. We look forward to seeing the proposals of this development fully implemented as they will certainly provide much need services and housing opportunities to the Mākaha community. Thank you for initiating consultation at this early stage and we look forward to the opportunity to review the completed assessment. Should you have any questions, please contact Keola Lindsey, Lead Advocate-Culture at 594-1904 or keolal@oha.org.

'O wau iho nō me ka 'oia'i'o,

Clyde W. Nāmu'o
Chief Executive Officer

Appendix E SHPD Response Letter

LINDA LINGLE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
STATE HISTORIC PRESERVATION DIVISION
601 KAMOKILA BOULEVARD, ROOM 555
KAPOLEI, HAWAII 96707

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

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

December 17, 2009

LOG NO: 2009.4615
DOC. NO: 0912PC005

MEMORANDUM

TO: Kuhio Vogeler, Ph.D., Cultural Researcher
Cultural Surveys Hawai'i, P.O. Box 1114, Kailua, Hawai'i 96734

FROM: Phyllis Coochie Cayan, History and Culture Branch Chief

Subject: MAKAHA 8: A Cultural Impact Assessment (CIA) for the proposed Ka Pua-Makaha Learning Complex and Department of Hawaiian Home Lands(DHHL) Makaha Homestead Development Project, Makaha Ahupuaa, Waianae District, O'ahu Island.
TMK: [1] 8-4-002:005,007,056, 057; 8-4-023:014, 015; 8-4-024:001.

This memo is in response to your request to help assess potential impacts to cultural practices as a result of the proposed Ka Pua Makaha Learning Complex and Department of Hawaiian Home Lands (DHHL) Makaha Homestead Development Project.

This project has been presented to several Hawaiian organizations so folks are aware of this innovative project that will enhance partnerships in the Hawaiian community to address housing, education, cultural practices and socio-economics. Please also contact the Neighborhood Boards for Waianae and for Nanakuli (see County website for contact list). There are various community leaders and individuals who may be helpful to your CIA regarding that land area.

SHPD recommends you search for core families (three generations) of the area who can recall the land use and access of that area to get a glimpse of any cultural practices (i.e., gathering, access to sacred sites, burials, endangered species) that may be impacted by this project.

Others who may be helpful:

1. Eric Enos, Ka'ala Farms, Executive Director Phone: 696-4954 kaalafarm@gmail.com
   Ka'ala Farms is a partner for this project's learning center.
2. William Aila, Hawaiian community leader Phone: 697-7095
3. Association of Hawaiian Civic Clubs President Momi Kahn aloha@aohcc.org
   They can direct you to the Hawaiian Civic clubs on the Waianae Coast. Also a presentation was done at the AOHCC annual convention in November, 2009.

Any questions, please call me at 808-692-8015 or via email Phyllis.L.Cayan@hawaii.gov .

Appendix E

Traffic Impact Analysis Report

Traffic Impact Report

Ka Pua at Makaha

Prepared for:
PBR Hawaii

Prepared by:
Wilson Okamoto Corporation

March 2010

TRAFFIC IMPACT REPORT

FOR

KA PUA AT MAKAHA

Prepared for:

PBR Hawaii & Associates, Inc.
1001 Bishop Street, ASB Tower, Suite 650
Honolulu, Hawaii 96813

Prepared by:

Wilson Okamoto Corporation
1907 S. Beretania Street, Suite 400
Honolulu, Hawaii 96826
WOC Ref #8000-01

March 2010

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FIGURE 8	Year 2018 Peak Hours of Traffic With Project

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I. INTRODUCTION

A. Purpose of Study

The purpose of this study is to identify and assess the traffic impacts resulting from the Ka Pua at Makaha development on the island of Oahu. The proposed project entails the development of a Kamehameha Schools Learning Complex and Department of Hawaiian Homelands (DHHL) residential subdivision in Makaha.

B. Scope of Study

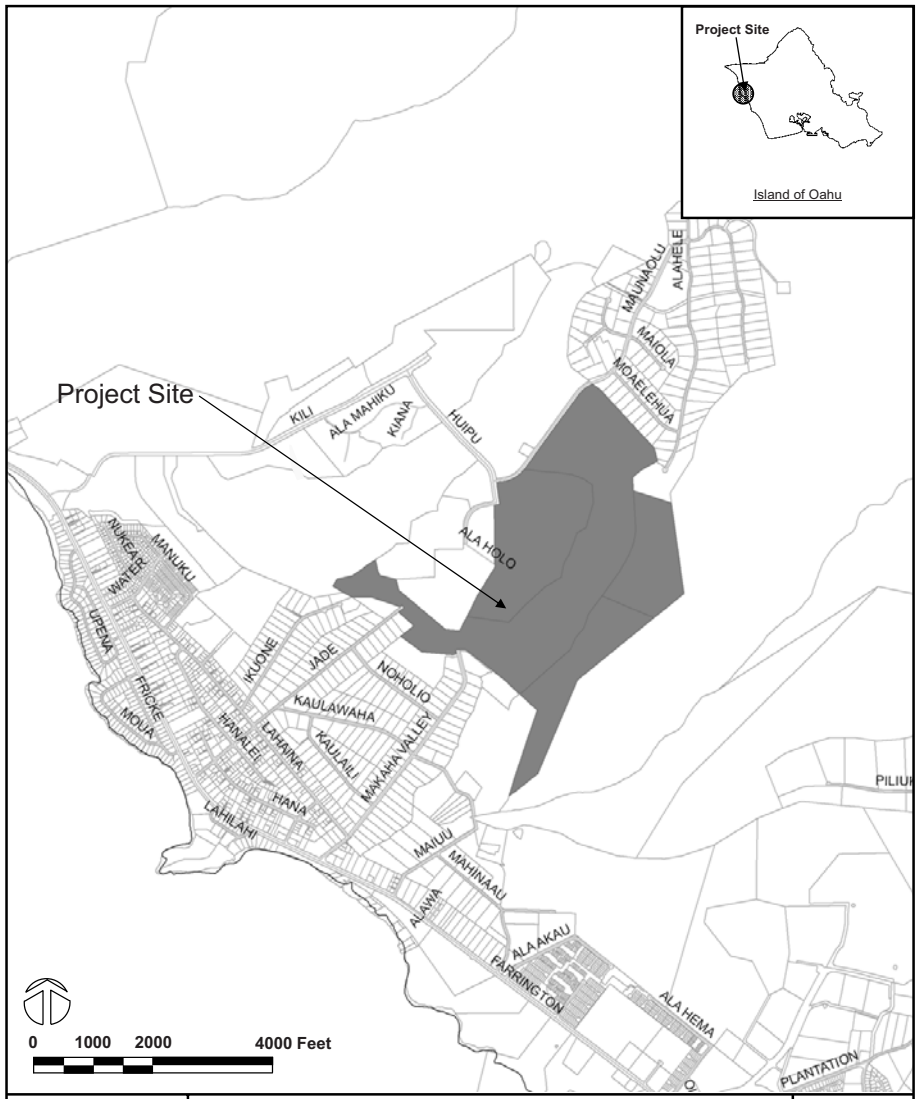
This report presents the findings and conclusions of the traffic study, the scope of which includes:

1. Description of the proposed project.
2. Evaluation of existing roadway and traffic operations in the vicinity.
3. Analysis of future roadway and traffic conditions without the proposed project.
4. Analysis and development of trip generation characteristics for the proposed project.
5. Superimposing site-generated traffic over future traffic conditions.
6. The identification and analysis of traffic impacts resulting from the proposed project.
7. Recommendations of improvements, if appropriate, that would mitigate the traffic impacts resulting from the proposed project.

II. PROJECT DESCRIPTION

A. Location

The proposed development will be located adjacent to Makaha Valley Road east of Farrington Highway in Makaha on the island of Oahu (see Figure 1). The site is bounded by the Mauna'olu subdivision to the east and the Makaha Resort to the west, and is further identified as Tax Map Keys: 8-4-002:005, 7, 56, and 57, 8-4-023:014 and 15, 8-4-024:001, 8-4-002:076, and 8-4-002:070 (portion). Primary access to the development will be provided via Makaha Valley Road with secondary access provided via Kili Drive.



WILSON OKAMOTO CORPORATION
ENGINEERS - PLANNERS

KA PUA AT MAKAHA

LOCATION MAP AND VICINITY MAP

FIGURE 1

B. Project Characteristics

The Ka Pua at Makaha development will be located in Makaha on a site that currently houses the Makaha Valley Country Club. The proposed development is comprised of two major components, the Kamehameha Schools Learning Complex and a DHHL residential subdivision. The Kamehameha Schools Learning Complex will be developed over 15 years with the first phase expected to be completed by the Year 2018 and the remainder of the project expected to be completed by the Year 2026. The complex will include the following:

<u>Phase 1 (by Year 2018)</u>

- Preschool (~160 students)
- P-20 learning facility (~120 students)
- Piko or gathering space
- Lo'i and indigenous gardens
- Sports fields
- Community center referred to as "Kauhale Services" (~3,000 sf)

<u>Phase 2 (by Year 2026)</u>

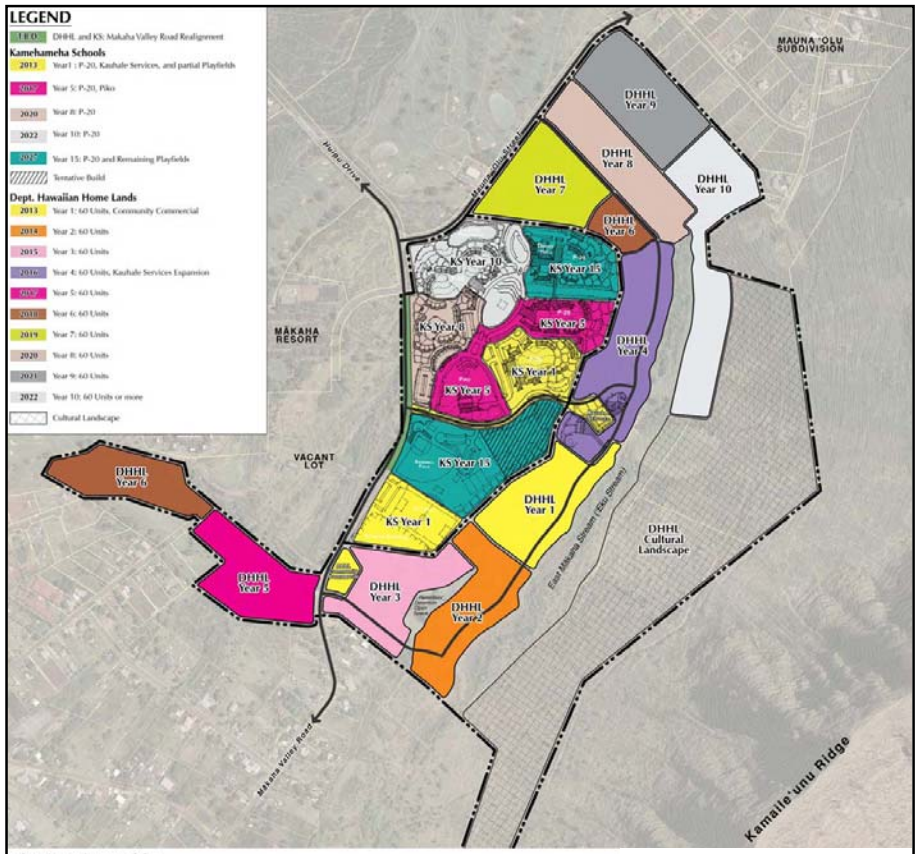
- P-20 learning facility expansion (additional ~984 students)
- Additional sports fields

The DHHL residential subdivision will be developed concurrently with the Kamehameha Schools Learning Complex over 10 years. The subdivision is expected to include 600 single-family homes constructed at a rate of approximately 60 homes per year, as well as, some neighborhood commercial space to serve the surrounding residents. Primary access for the Ka Pua at Makaha development will be provided via Makaha Valley Road with secondary access provided via Kili Drive. Figure 2 shows the project site plan.

III. EXISTING TRAFFIC CONDITIONS

A. General

The project site is located adjacent to Makaha Valley Road east of Farrington Highway. Farrington Highway serves as the main access roadway along the western coastline of the island of Oahu. In the vicinity of the project site, Farrington Highway



Phasing Time Table

2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Kamehameha Schools														
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
Dept. Hawaiian Homelands														
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15

WILSON OKAMOTO CORPORATION ENGINEERS - PLANNERS	KA PUA AT MAKAHA	FIGURE
	PROJECT SITE PLAN	2

is a primarily four-lane, two-way roadway generally oriented in the north-south direction that transitions to a two-lane roadway north of Makaha Valley Road.

B. Area Roadway System

West of the project site, Farrington Highway intersects Makaha Valley Road. At this signalized T-intersection, the northbound approach of the highway has one through lane and an exclusive right-turn lane while the southbound approach has an exclusive left-turn lane and two through lanes. Makaha Valley Road is a primarily two-lane, two-way roadway generally oriented in the east-west direction. At the intersection with Farrington Highway, the Makaha Valley Road approach has an exclusive left-turn lane and a shared left-turn and right-turn lane.

North of Makaha Valley Road, Farrington Highway intersects Kili Drive. At this unsignalized T-intersection, the northbound approach of the highway has a shared through and right-turn lane while the southbound approach has a shared left-turn and through lane. Kili Drive is a two-lane, two-way roadway generally oriented in the east-west direction. At the intersection with Farrington Highway, the Kili Drive approach has one stop-controlled lane that serves left-turn and right-turn traffic movements.

C. Traffic Volumes and Conditions

1. General

a. Field Investigation

Field investigations were conducted on October 14-15, 2009 and consisted of manual turning movement count surveys along Farrington Highway in the project vicinity. The manual turning movement count surveys were conducted between the morning peak hours of 5:30 AM and 8:30 AM, and the afternoon peak hours of 3:00 PM and 6:00 PM at the following intersections:

- Farrington Highway and Makaha Valley Road
- Farrington Highway and Kili Drive

Appendix A includes the existing traffic count data.

b. Capacity Analysis Methodology

The highway capacity analysis performed in this study is based upon procedures presented in the "Highway Capacity Manual", Transportation Research Board, 2000, the "Highway Capacity Software", developed by the Federal Highway Administration, and the "Synchro" software developed by Trafficware. The analysis is based on the concept of Level of Service (LOS).

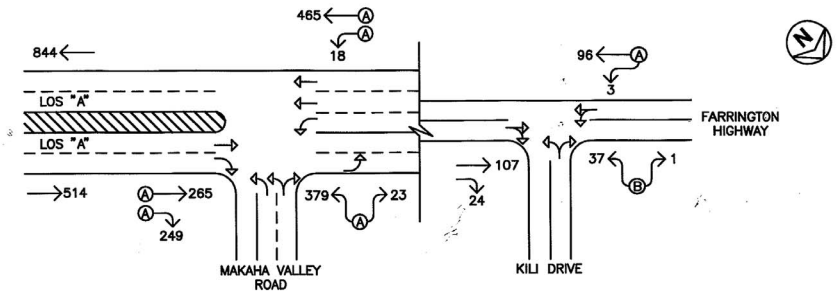
LOS is a quantitative and qualitative assessment of traffic operations. Levels of Service are defined by LOS "A" through "F"; LOS "A" representing ideal or free-flow traffic operating conditions and LOS "F" unacceptable or potentially congested traffic operating conditions.

"Volume-to-Capacity" (v/c) ratio is another measure indicating the relative traffic demand to the road carrying capacity. A v/c ratio of one (1.00) indicates that the roadway is operating at or near capacity. A v/c ratio of greater than 1.00 indicates that the traffic demand exceeds the road's carrying capacity. The LOS definitions are included in Appendix B.

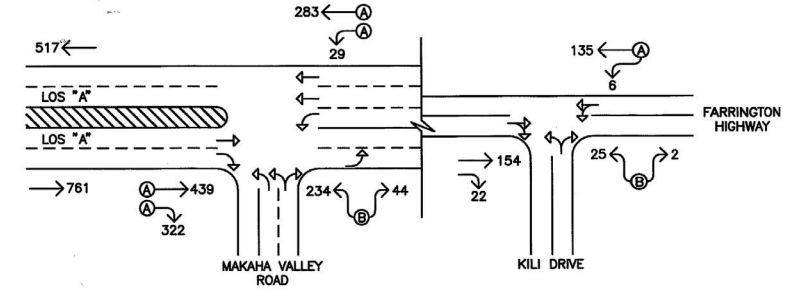
2. Existing Peak Hour Traffic

a. General

Figures 3 shows the existing AM and PM peak hour traffic volumes and operating traffic conditions. The AM peak hour of traffic generally occurs between 7:00 AM and 8:00 AM in the vicinity of the proposed project. In the afternoon, the PM peak hour of traffic generally occurs between the hours of 4:00 PM and 5:00 PM. Although the peak hours of traffic generally occur around the same time periods at each of the study intersections, the absolute commuter peak hour time periods for each intersection may differ slightly as shown in Table 1.



AM PEAK PERIOD



PM PEAK PERIOD

LEGEND

90 TRAFFIC MOVEMENT VOLUME (VPH)

LANE USAGE

Ⓐ LANE GROUP LEVEL OF SERVICE

Date of Count: October 14–15, 2009

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KA PUA AT MAKAHA

EXISTING PEAK HOURS OF TRAFFIC

FIGURE 3

Table 1: Peak Hours of Traffic

Intersection	AM Peak	PM Peak
Farrington Hwy/ Makaha Valley Rd	7:00 – 8:00 AM	4:00 – 5:00 PM
Farrington Hwy/ Kili Drive	7:15 – 8:15 AM	3:30 – 4:30 PM

The analysis is based on the above absolute commuter peak hour time periods for each intersection to identify the traffic impacts resulting from the proposed project. LOS calculations are included in Appendix C.

b. Farrington Highway and Makaha Valley Road

South of Makaha Valley Road, Farrington Highway operates at LOS "A" in the northbound and southbound directions during both peak periods. At the intersection with Makaha Valley Road, Farrington Highway carries 514 vehicles northbound and 483 vehicles southbound during the AM peak hour of traffic. During the PM peak hour, the overall traffic volume is higher with 761 vehicles traveling northbound and 312 vehicles traveling southbound. The traffic movements on the northbound and southbound approaches of the highway operate at LOS "A" during both peak periods.

The Makaha Valley Road approach of the intersection carries 402 vehicles and 278 vehicles westbound during the AM and PM peak hours of traffic, respectively. This approach operates at LOS "A" and LOS "B" during the AM and PM peak periods, respectively.

c. Farrington Highway and Kili Drive

At the intersection with Kili Drive, Farrington Highway carries 131 vehicles northbound and 99 vehicles southbound during the AM peak hour of traffic. During the PM peak hour, traffic volumes are higher with 176 vehicles traveling northbound and 141 vehicles traveling southbound. The critical traffic movement on the highway

approaches of the intersection is the southbound left-turn and through traffic movement which operates at LOS "A" during both peak periods.

The Kili Drive approach of the intersection carries 38 vehicles and 27 vehicles westbound during the AM and PM peak hours of traffic, respectively. This approach operates at LOS "B" during both peak periods.

IV. PROJECTED TRAFFIC CONDITIONS

A. Site-Generated Traffic

1. Trip Generation Methodology

The trip generation methodology used in this study is based upon generally accepted techniques developed by the Institute of Transportation Engineers (ITE) and published in "Trip Generation, 8th Edition," 2008. The ITE trip generation rates are developed empirically by correlating the vehicle trip generation data with various land use characteristics such as the number of vehicle trips generated per student or dwelling unit. For the purpose of this report, the Kamehameha Schools P-20 learning facility is conservatively assumed to be similar to a K-12 private school. Kamehameha Schools plans to utilize buses to transport at least 50% of their P-20 learning facility students to and from the school and approximately 25% of their preschool students are expected to come from the adjacent DHHL residential subdivision. As such, the trips generated by the school uses of the development were adjusted to accommodate their plans. In addition, the trips associated with the Kauhale Services component of the Kamehameha Schools project are assumed to occur during off-peak periods, and those associated with the neighborhood commercial component of the DHHL project are all expected to be internal to the proposed development. Table 2 summarizes the adjusted project site trip generation characteristics applied to the AM and PM peak hours of traffic to measure the impact resulting from the proposed Ka Pua at Makaha development.

Table 2: Peak Hour Trip Generation

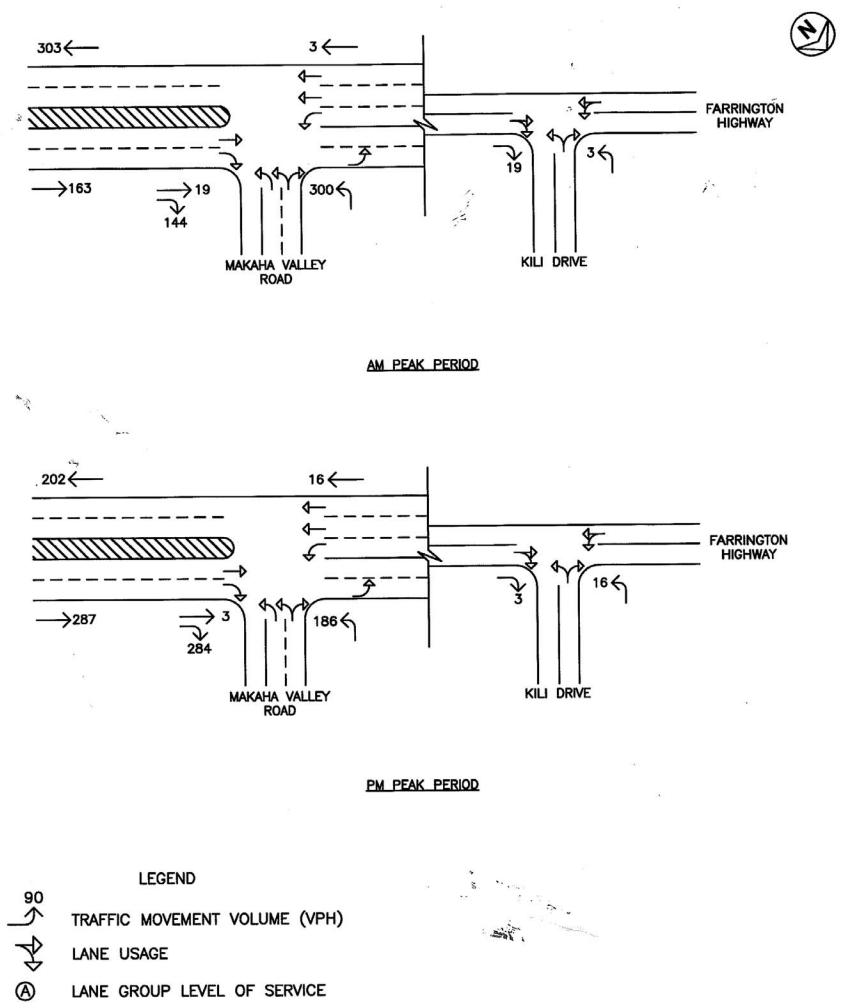
YEAR 2018		
SINGLE-FAMILY DETACHED HOUSING		
INDEPENDENT VARIABLE:		Dwelling Units = 420
		PROJECTED TRIP ENDS
AM PEAK	ENTER	79
	EXIT	236
	TOTAL	315
PM PEAK	ENTER	267
	EXIT	157
	TOTAL	424
DAY CARE CENTER (Preschool)		
INDEPENDENT VARIABLE:		Enrollment = 160
		PROJECTED TRIP ENDS
AM PEAK	ENTER	51
	EXIT	45
	TOTAL	96
PM PEAK	ENTER	46
	EXIT	52
	TOTAL	98
P-20 LEARNING FACILITY (PRIVATE SCHOOL K-12)		
INDEPENDENT VARIABLE:		Enrollment = 120
		PROJECTED TRIP ENDS
AM PEAK	ENTER	33
	EXIT	22
	TOTAL	55
PM PEAK	ENTER	12
	EXIT	15
	TOTAL	27
YEAR 2018 TOTALS		
		PROJECTED TRIP ENDS
AM PEAK	ENTER	163
	EXIT	303
	TOTAL	466
PM PEAK	ENTER	325
	EXIT	224
	TOTAL	549

Table 2: Peak Hour Trip Generation (Cont'd)

YEAR 2026		
SINGLE-FAMILY DETACHED HOUSING		
INDEPENDENT VARIABLE:		Dwelling Units = 180
		PROJECTED TRIP ENDS
AM PEAK	ENTER	34
	EXIT	101
	TOTAL	135
PM PEAK	ENTER	115
	EXIT	67
	TOTAL	182
P-20 LEARNING FACILITY (PRIVATE SCHOOL K-12)		
INDEPENDENT VARIABLE:		Enrollment increase = 984
		PROJECTED TRIP ENDS
AM PEAK	ENTER	254
	EXIT	167
	TOTAL	421
PM PEAK	ENTER	83
	EXIT	112
	TOTAL	195
YEAR 2026 TOTALS		
		PROJECTED TRIP ENDS
AM PEAK	ENTER	288
	EXIT	268
	TOTAL	556
PM PEAK	ENTER	198
	EXIT	179
	TOTAL	377

2. Trip Distribution

Figures 4 and 5 show the distribution of site-generated vehicular trips at the study intersections during the Year 2018 and Year 2026 AM and PM peak hours of traffic. Primary access to the proposed development will be provided via Makaha Valley Road with secondary access provided via Kili Drive. All residential-related trips are assumed to utilize the primary access along Makaha Valley Road to travel to and from areas to the south via



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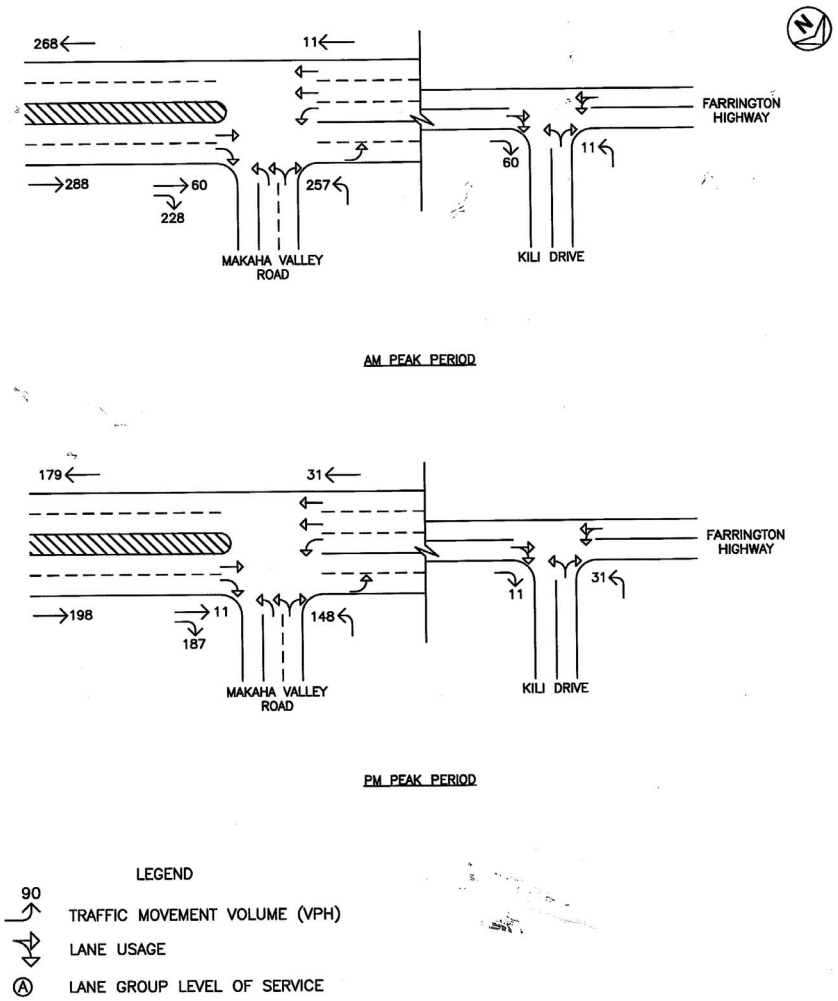
KA PUA AT MAKAHA

YEAR 2018 DISTRIBUTION OF SITE-GENERATED VEHICLES

FIGURE 4



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KA PUA AT MAKAHA

YEAR 2026 DISTRIBUTION OF SITE-GENERATED VEHICLES (FROM YEAR 2018)

FIGURE 5

Farrington Highway. Trips associated with the Kamehameha Schools project were divided to three categories: bus, staff, and students. Kamehameha Schools plans to utilized buses to transport at least 50% of their P-20 learning facility students to and from the school. For the purpose of this analysis, all buses are assumed to be 80% occupied (~40 students per bus). To alleviate traffic demands along Makaha Valley Road, these buses will be directed to utilize the secondary access along Kili Drive to travel to and from areas to the south via Farrington Highway. Of the remaining trips generated by the P-20 learning facility and preschool, approximately 20% are identified as staff-related trips that enter the school during the AM peak period and exit during the PM peak period. Similar to the routing of the buses, these trips will be directed to utilize the secondary access along Kili Drive to travel to and from areas to the south via Farrington Highway. The remaining trips generated by the school are assumed to be comprised of students who will be driven to and from school. These trips are assigned to utilize Makaha Valley Road to travel to and from areas to the south via Farrington Highway.

B. Through Traffic Forecasting Methodology

Typically, travel forecasts are developed based upon historical traffic count data obtained from the State Department of Transportation (SDOT), Highway Division survey stations. However, there was insufficient SDOT data in the project vicinity to derive an appropriate growth rate with a reasonable level of accuracy or certainty in the traffic forecast. As such, the travel forecast developed for this study conservatively assumes the existing traffic volumes along Farrington Highway will increase at a rate of 0.5% per year. Using 2009 as the Base Year, a growth factor of 1.045 and 1.085 was applied to the existing traffic demands along Farrington Highway and Makaha Valley Road to achieve the projected Year 2018 and Year 2026 traffic demands, respectively.

C. Other Considerations

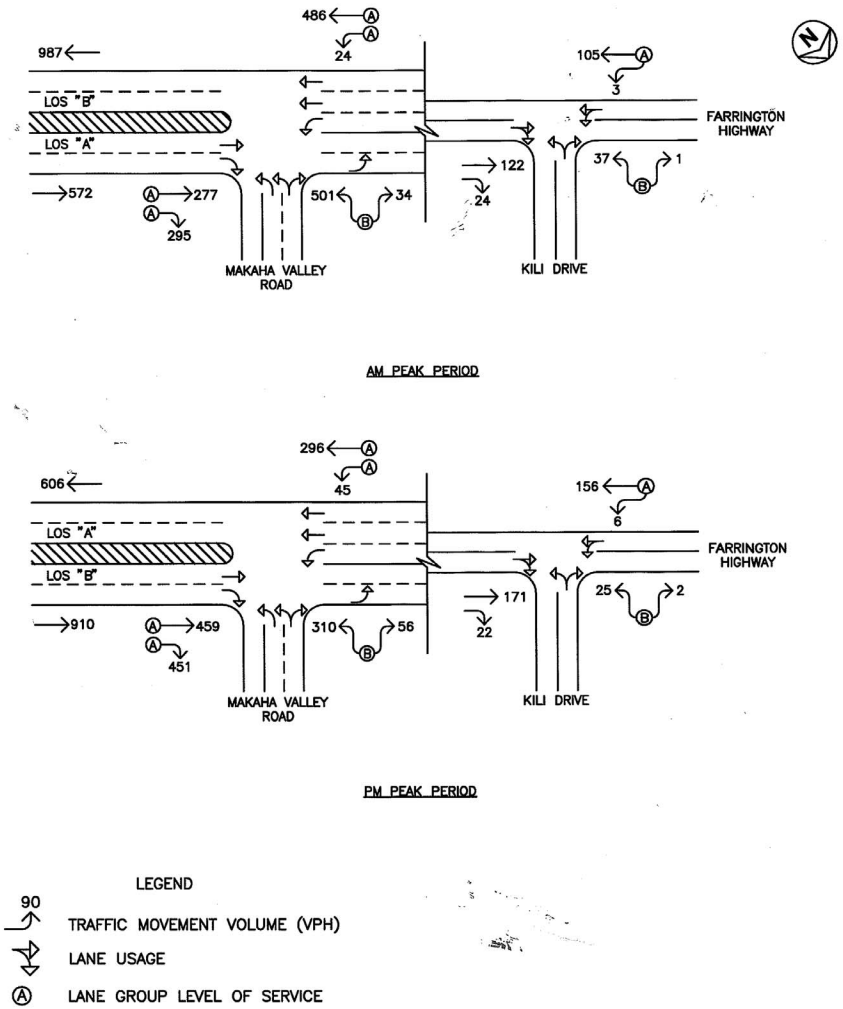
A new residential subdivision is proposed in Makaha adjacent to the proposed Ka Pua at Makaha development. The proposed subdivision will include approximately 202 single-family homes with access provided off Makaha Valley Road. As detailed in the "Traffic Impact Report for Lot 1025-C Makaha Valley" prepared by Phillip Rowell and Associates dated July 2008, the proposed project is expected to generate a total of 155 trips and 205 trips during the AM and PM peak periods, respectively. The proposed project is anticipated to be completed by the Year 2015 and, as such, the trips associated with the subdivision were incorporated into the Year 2018 without project conditions.

D. Year 2018 Total Traffic Volumes

1. Without Ka Pua at Makaha Project

The projected Year 2018 AM and PM peak hour traffic volumes and operating conditions in the project vicinity without the Ka Pua at Makaha development are shown on Figure 6, and summarized in Table 3. The existing levels of service are provided for comparison purposes. LOS calculations are included in Appendix D.

Traffic operations under Year 2018 without project conditions are expected to deteriorate slightly from existing conditions due to ambient growth in traffic and the development of other projects in the vicinity. South of Makaha Valley Road, the northbound direction of traffic along Farrington Highway is expected to continue operating at LOS "A" during the AM peak period while the southbound direction of traffic is expected to operate at a slightly lower LOS "B." During the PM peak period, the northbound direction of traffic is expected to operate at a slightly lower LOS "B" while the southbound direction is expected to continue operating at LOS "A." At the intersection with Makaha Valley Road, the traffic movements on both approaches of the highway are expected to continue operating at LOS "A" during both peak periods while the Makaha Valley Road approach of the



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KA PUA AT MAKAHA

YEAR 2018 PEAK HOURS OF TRAFFIC WITHOUT PROJECT

FIGURE 6

intersection is expected to operate at LOS "B" during both peak periods. At the intersection with Kili Drive, the critical traffic movement on the highway approaches is expected to continue operating at LOS "A" during both peak periods while the Kili Drive approach is expected to continue operating at LOS "B" during both peak periods.

Table 3: Existing and Projected (Without Project) LOS Traffic Operating Conditions

Intersection/ Roadway Segment	Critical Traffic Movement		AM		PM	
			Exist	Year 2018 w/out Proj	Exist	Year 2018 w/out Proj
Farrington Hwy south of Makaha Valley Rd	Northbound		A	A	A	B
	Southbound		A	B	A	A
Farrington Hwy/ Makaha Valley Rd	Westbound	LT-RT	A	B	B	B
	Northbound	TH	A	A	A	A
		RT	A	A	A	A
	Southbound	LT	A	A	A	A
		TH	A	A	A	A
Farrington Hwy/ Kili Dr	Westbound	LT-RT	B	B	B	B
	Southbound	LT-TH	A	A	A	A

2. With Ka Pua at Makaha Project

The Year 2018 cumulative AM and PM peak hour traffic conditions with the development of Ka Pua at Makaha are shown on Figure 7 and summarized in Table 4. The cumulative volumes consist of site-generated traffic superimposed over Year 2018 projected traffic demands. The projected Year 2018 (Without Project) operating conditions are provided for comparison purposes. LOS calculations are included in Appendix E.

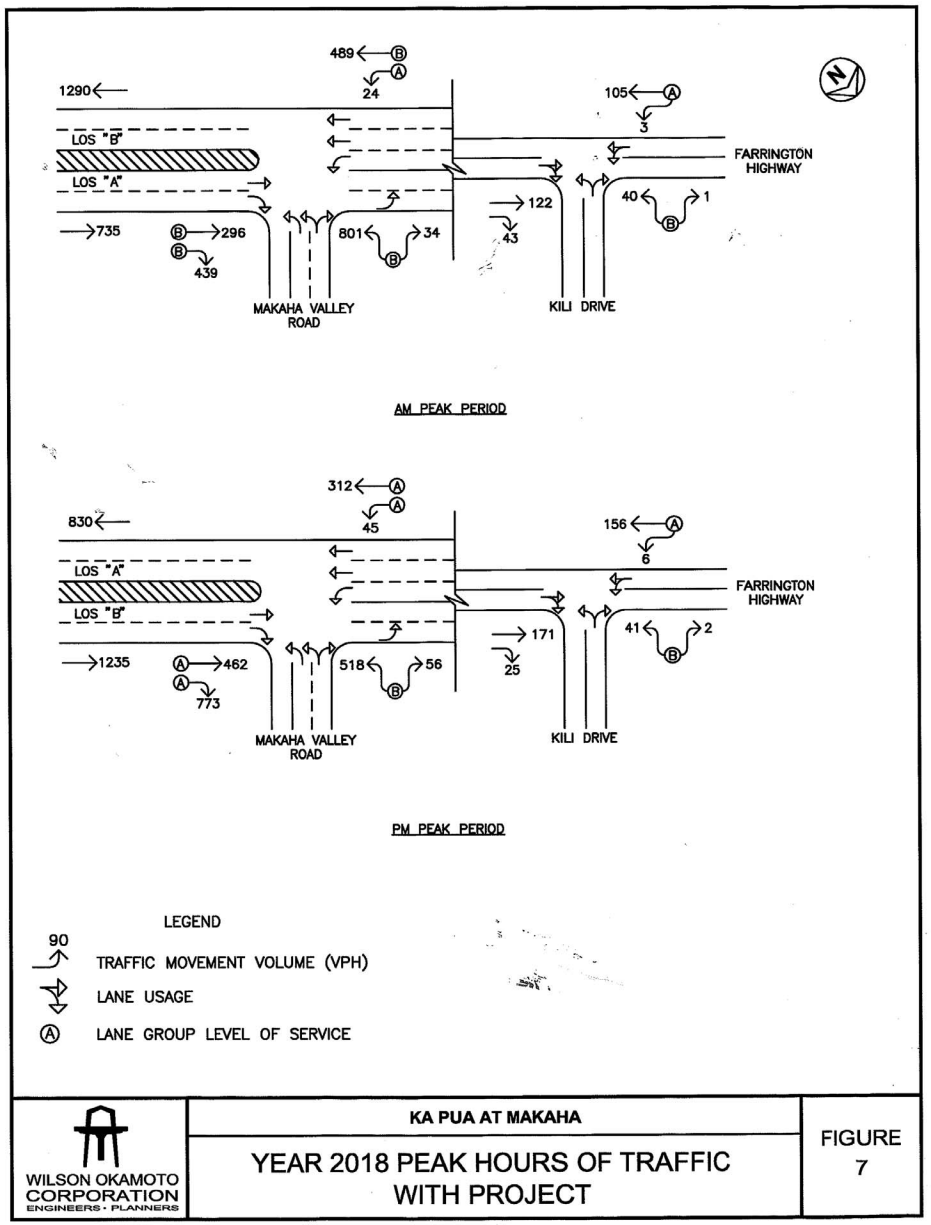


Table 4: Projected (Without and With Project) LOS Traffic Operating Conditions

Intersection	Critical Traffic Movement		AM		PM	
			Year 2018 w/out Proj	Year 2018 w/ Proj	Year 2018 w/out Proj	Year 2018 w/ Proj
Farrington Hwy south of Makaha Valley Rd	Northbound		A	A	B	B
	Southbound		B	B	A	A
Farrington Hwy/ Makaha Valley Rd	Westbound	LT-RT	B	B	B	B
	Northbound	TH	A	B	A	A
		RT	A	B	A	A
	Southbound	LT	A	A	A	A
		TH	A	B	A	A
Farrington Hwy/ Kili Dr	Westbound	LT-RT	B	B	B	B
	Southbound	LT-TH	A	A	A	A

Traffic operations in the project vicinity are expected, in general, to remain similar to Year 2018 without project conditions despite the addition of site-generated vehicles to the surrounding roadway network. South of Makaha Valley Road, the northbound direction of traffic along Farrington Highway is expected to continue operating at LOS "A" and LOS "B" during the AM and PM peak periods, respectively, while the southbound direction of traffic is expected to continue operating at LOS "B" and LOS "A" during the AM and PM peak periods, respectively. At the intersection of Farrington Highway with Makaha Valley Road, the traffic movements on the northbound approach, the southbound through traffic movement, and westbound approach are expected to operate at a slightly lower LOS "B" during the AM peak period. The remaining critical traffic movements at this intersection, as well as, the intersection with Kili Drive are expected to operate at levels of service similar to Year 2018 without project conditions.

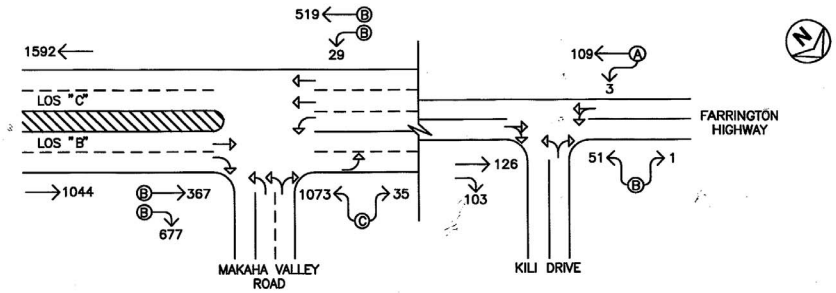
E. Year 2026 Total Traffic Volumes

The projected Year 2026 AM and PM peak hour traffic volumes and operating conditions in the project vicinity with the Ka Pua at Makaha development are shown on Figure 8, and summarized in Table 5. The projected Year 2018 (With Project) operating conditions are provided for comparison purposes. LOS calculations are included in Appendix F.

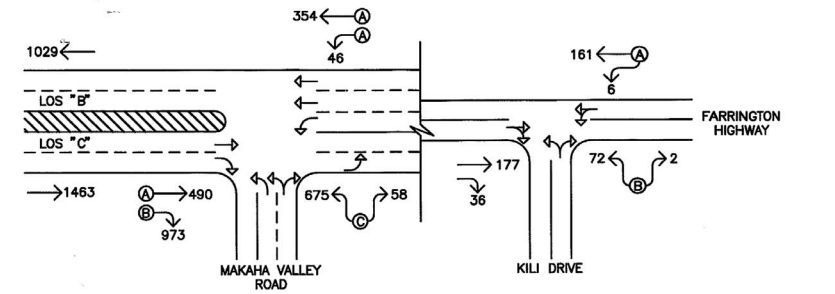
Table 5: Projected Year 2018 (With Project) and Year 2026 (With Project) LOS Traffic Operating Conditions

Intersection	Critical Traffic Movement		AM		PM	
			Year 2018 w/ Proj	Year 2026 w/ Proj	Year 2018 w/ Proj	Year 2026 w/ Proj
Farrington Hwy south of Makaha Valley Rd	Northbound		A	B	B	C
	Southbound		B	C	A	B
Farrington Hwy/ Makaha Valley Rd	Westbound	LT-RT	B	C	B	C
	Northbound	TH	B	B	A	A
		RT	B	B	A	B
	Southbound	LT	A	B	A	A
		TH	B	B	A	A
Farrington Hwy/ Kili Dr	Westbound	LT-RT	B	B	B	B
	Southbound	LT-TH	A	A	A	A

Traffic operations in the project vicinity are expected to deteriorate slightly from Year 2018 with project conditions due to ambient growth in traffic along the highway and the addition of site-generated vehicles to the surrounding roadway network. South of Makaha Valley Road, the northbound direction of traffic along Farrington Highway is expected to operate at LOS "B" and LOS "C" during the AM and PM peak periods, respectively, while the southbound direction of traffic is expected to operate at LOS "C" and LOS "B" during the AM and PM peak periods, respectively. At the intersection of Farrington Highway with Makaha Valley Road, the northbound through traffic movement is expected to operate at LOS "B" and LOS



AM PEAK PERIOD



PM PEAK PERIOD

LEGEND

90 TRAFFIC MOVEMENT VOLUME (VPH)

LANE USAGE

A LANE GROUP LEVEL OF SERVICE

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KA PUA AT MAKAHA

YEAR 2026 PEAK HOURS OF TRAFFIC WITH PROJECT

FIGURE 8

"A" during the AM and PM peak periods, respectively, while the northbound right-turn traffic movement is expected to operate at LOS "B" during both peak periods. On the southbound approach of the highway, the left-turn and through traffic movements are expected to operate at LOS "B" and LOS "A" during the AM and PM peak periods, respectively. At the intersection with Kili Drive, the critical traffic movement on the highway approaches is expected to operate at LOS "A" during both peak periods while the Kili Drive approach is expected to operate at LOS "B" during both peak periods.

V. RECOMMENDATIONS

Based on the analysis of the traffic data, the following are the recommendations of this study:

1. Maintain sufficient sight distance for motorists to safely enter and exit all project driveways/roadways.

2. Provide adequate on-site loading and off-loading service areas and prohibit off-site loading operations.

3. Provide adequate turn-around area for service, delivery, and refuse collection vehicles to maneuver on the project site to avoid vehicle-reversing maneuvers onto public roadways.

4. Provide sufficient turning radii at all project driveways/roadways to avoid or minimize vehicle encroachments to oncoming traffic lanes.

5. Establish a bus program for the P-20 learning facility students at the Kamehameha Schools Learning Complex to accommodate a minimum of 50% of the student enrollment.

6. Require buses and staff to enter and exit the project area via Kili Drive to alleviate traffic demands along Makaha Valley Road.

7. Encourage a minimum of 50% of staff, through subsidies or other incentives, to carpool or utilize public transit.

8. Establish a partnership with the Department of Hawaiian Home Lands (DHHL) to encourage residents within the adjacent DHHL residential subdivision to enroll their children at the Kamehameha Schools preschool. Kamehameha Schools estimates that at least 25% of the student enrollment at the preschool will come from this subdivision.

9. Consider implementing localized circulator transit services with the establishment of regional hubs (pick-up and drop-off points) appropriately distributed in the region based on demand.

10. Modify the traffic signal timing at the intersection of Farrington Highway with Makaha Valley Road to accommodate increases in traffic demands.

11. Rehabilitate the intersection of Farrington Highway with Makaha Valley Road to ensure that the existing infrastructure can safety accommodate the increases in traffic demands. These improvements could include rehabilitation of the existing pavement, replacement of existing striping and markers, and replacement of damaged traffic signal equipment. Submit improvement plans to the State Department of Transportation for review and approval.

12. Rehabilitate the intersection of Farrington Highway with Kili Drive to ensure that the existing infrastructure can safety accommodate the increases in traffic demands. These improvements could include rehabilitation of the existing pavement, as well as, replacement of existing striping and markers. Submit improvement plans to the State Department of Transportation for review and approval.

13. Update the Traffic Impact Analysis Report (TIAR) every three years to validate traffic projections and associated recommended mitigating measures.

14. Prepare a Transportation Management Plan (TMP) for the Kamehameha Schools Learning Center to minimize the facilities impact on traffic operations in the vicinity.

VI. CONCLUSION

The Ka Pua at Makaha development will be comprised of two major components, the Kamehameha Schools Learning Complex and a Department of Hawaiian Home Lands (DHHL) residential subdivision. The Kamehameha Schools Learning Complex is expected to include a preschool, P-20 learning facility, and a community center while the DHHL subdivision is expected to include ~600 single-family homes. Traffic volumes in the vicinity are expected to increase significantly by the Year 2026 due to the completion of the Ka Pua at Makaha development, as well as, other projects in the Makaha area. However, with the implementation of the aforementioned recommendations, traffic operations in the vicinity of the project site are expected to continue operating at acceptable levels of service. The implementation of transportation demand management strategies, as well as, rehabilitation of the existing roadway infrastructure is expected to alleviate potentially adverse traffic operating conditions. In addition, a Transportation Management Plan will be prepared for the

Kamehameha Schools Learning Complex to further mitigate the schools impact on the surrounding roadway network and periodic updates to the traffic study will be prepared to validate the appropriateness of the recommended mitigating measures.

APPENDIX A

EXISTING TRAFFIC COUNT DATA

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counter:D4-5677, D4-5673
Counted By:DY, JY
Weather:Clear

File Name : FarrMak AM
Site Code : 00000001
Start Date : 10/14/2009
Page No : 1

Groups Printed- Unshifted

	Farrington Hwy Southbound				Makaha Valley Rd Westbound				Farrington Hwy Northbound				Eastbound	
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	App. Total	Int. Total
05:30 AM	6	81	0	87	41	0	2	43	0	15	15	30	0	160
05:45 AM	5	63	0	68	38	0	4	42	0	23	20	43	0	153
Total	11	144	0	155	79	0	6	85	0	38	35	73	0	313
06:00 AM	3	63	0	66	40	0	3	43	0	26	17	43	0	152
06:15 AM	3	77	0	80	46	0	3	49	0	34	25	59	0	188
06:30 AM	7	76	0	83	50	0	8	58	0	39	29	68	0	209
06:45 AM	7	100	0	107	72	0	6	78	0	33	45	78	0	263
Total	20	316	0	336	208	0	20	228	0	132	116	248	0	812
07:00 AM	6	115	0	121	104	0	3	107	0	46	47	93	0	321
07:15 AM	5	125	0	130	107	0	7	114	0	61	74	135	0	379
07:30 AM	4	135	0	139	89	0	4	93	0	71	55	126	0	358
07:45 AM	3	90	0	93	79	0	9	88	0	87	73	160	0	341
Total	18	465	0	483	379	0	23	402	0	265	249	514	0	1399
08:00 AM	5	76	0	81	69	0	3	72	0	62	53	115	0	268
08:15 AM	2	60	0	62	83	0	0	83	0	59	48	107	0	252
Grand Total	56	1061	0	1117	818	0	52	870	0	556	501	1057	0	3044
Apprch %	5	95	0		94	0	6		0	52.6	47.4			
Total %	1.8	34.9	0	36.7	26.9	0	1.7	28.6	0	18.3	16.5	34.7	0	

	Farrington Hwy Southbound				Makaha Valley Rd Westbound				Farrington Hwy Northbound				Eastbound	
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	App. Total	Int. Total
Peak Hour Analysis From 05:30 AM to 08:15 AM - Peak 1 of 1														
Peak Hour for Entire Intersection Begins at 07:00 AM														
07:00 AM	**6**	115	0	121	104	0	3	107	0	46	47	93	0	321
07:15 AM	5	125	0	130	**107**	0	7	**114**	0	61	**74**	135	0	**379**
07:30 AM	4	**135**	0	**139**	89	0	4	93	0	71	55	126	0	358
07:45 AM	3	90	0	93	79	0	**9**	88	0	**87**	73	**160**	0	341
Total Volume	18	465	0	483	379	0	23	402	0	265	249	514	0	1399
% App. Total	3.7	96.3	0		94.3	0	5.7		0	51.6	48.4			
PHF	.750	.861	.000	.869	.886	.000	.639	.882	.000	.761	.841	.803	.000	.923

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counter:D4-5677, D4-5673
Counted By:DY, JY
Weather:Clear

File Name : FarrMak PM
Site Code : 00000001
Start Date : 10/14/2009
Page No : 1

Groups Printed- Unshifted

	Farrington Hwy Southbound				Makaha Valley Rd Westbound				Farrington Hwy Northbound				Eastbound	
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	App. Total	Int. Total
03:00 PM	6	93	0	99	65	0	5	70	0	83	76	159	0	328
03:15 PM	10	84	0	94	51	0	8	59	0	99	73	172	0	325
03:30 PM	9	83	0	92	71	0	10	81	0	97	63	160	0	333
03:45 PM	8	61	0	69	53	0	7	60	0	109	89	198	0	327
Total	33	321	0	354	240	0	30	270	0	388	301	689	0	1313
04:00 PM	9	81	0	90	57	0	15	72	0	117	63	180	0	342
04:15 PM	8	64	0	72	57	0	11	68	0	120	85	205	0	345
04:30 PM	6	49	0	55	60	0	13	73	0	101	91	192	0	320
04:45 PM	6	89	0	95	60	0	5	65	0	101	83	184	0	344
Total	29	283	0	312	234	0	44	278	0	439	322	761	0	1351
05:00 PM	5	58	0	63	62	0	9	71	0	108	75	183	0	317
05:15 PM	7	57	0	64	46	0	7	53	0	103	82	185	0	302
05:30 PM	11	80	0	91	54	0	7	61	0	105	53	158	0	310
05:45 PM	6	45	0	51	29	0	1	30	0	91	63	154	0	235
Total	29	240	0	269	191	0	24	215	0	407	273	680	0	1164
Grand Total	91	844	0	935	665	0	98	763	0	1234	896	2130	0	3828
Apprch %	9.7	90.3	0		87.2	0	12.8		0	57.9	42.1			
Total %	2.4	22	0	24.4	17.4	0	2.6	19.9	0	32.2	23.4	55.6	0	

	Farrington Hwy Southbound				Makaha Valley Rd Westbound				Farrington Hwy Northbound				Eastbound	
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1														
Peak Hour for Entire Intersection Begins at 04:00 PM														
04:00 PM	**9**	81	0	90	57	0	**15**	72	0	117	63	180	0	342
04:15 PM	8	64	0	72	57	0	11	68	0	**120**	85	**205**	0	**345**
04:30 PM	6	49	0	55	**60**	0	13	**73**	0	101	**91**	192	0	320
04:45 PM	6	**89**	0	**95**	60	0	5	65	0	101	83	184	0	344
Total Volume	29	283	0	312	234	0	44	278	0	439	322	761	0	1351
% App. Total	9.3	90.7	0		84.2	0	15.8		0	57.7	42.3			
PHF	.806	.795	.000	.821	.975	.000	.733	.952	.000	.915	.885	.928	.000	.979

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counter:D4-5677, D4-5673
Counted By:DY, JY
Weather:Clear

File Name : FarrKili AM
Site Code : 00000002
Start Date : 10/15/2009
Page No : 1

Groups Printed- Unshifted

	Farrington Hwy Southbound				Kili Drive Westbound				Farrington Hwy Northbound				Eastbound	
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	App. Total	Int. Total
05:30 AM	1	15	0	16	6	0	1	7	0	15	1	16	0	39
05:45 AM	0	14	0	14	4	0	0	4	0	12	0	12	0	30
Total	1	29	0	30	10	0	1	11	0	27	1	28	0	69
06:00 AM	0	12	0	12	4	0	1	5	0	16	1	17	0	34
06:15 AM	0	10	0	10	3	0	1	4	0	13	0	13	0	27
06:30 AM	0	12	0	12	4	0	1	5	0	25	3	28	0	45
06:45 AM	3	17	0	20	5	0	1	6	0	14	5	19	0	45
Total	3	51	0	54	16	0	4	20	0	68	9	77	0	151
07:00 AM	1	24	0	25	6	0	0	6	0	22	4	26	0	57
07:15 AM	0	27	0	27	12	0	0	12	0	16	1	17	0	56
07:30 AM	2	21	0	23	12	0	0	12	0	23	6	29	0	64
07:45 AM	1	28	0	29	11	0	1	12	0	28	10	38	0	79
Total	4	100	0	104	41	0	1	42	0	89	21	110	0	256
08:00 AM	0	20	0	20	2	0	0	2	0	40	7	47	0	69
08:15 AM	0	29	0	29	4	0	1	5	0	15	3	18	0	52
Grand Total	8	229	0	237	73	0	7	80	0	239	41	280	0	597
Apprch %	3.4	96.6	0		91.2	0	8.8		0	85.4	14.6			
Total %	1.3	38.4	0	39.7	12.2	0	1.2	13.4	0	40	6.9	46.9	0	

	Farrington Hwy Southbound				Kili Drive Westbound				Farrington Hwy Northbound				Eastbound	
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	App. Total	Int. Total
Peak Hour Analysis From 05:30 AM to 08:15 AM - Peak 1 of 1														
Peak Hour for Entire Intersection Begins at 07:15 AM														
07:15 AM	0	27	0	27	**12**	0	0	**12**	0	16	1	17	0	56
07:30 AM	**2**	21	0	23	12	0	0	12	0	23	6	29	0	64
07:45 AM	1	**28**	0	**29**	11	0	**1**	12	0	28	**10**	38	0	**79**
08:00 AM	0	20	0	20	2	0	0	2	0	**40**	7	**47**	0	69
Total Volume	3	96	0	99	37	0	1	38	0	107	24	131	0	268
% App. Total	3	97	0		97.4	0	2.6		0	81.7	18.3			
PHF	.375	.857	.000	.853	.771	.000	.250	.792	.000	.669	.600	.697	.000	.848

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counter:D4-5677, D4-5673
Counted By:DY, JY
Weather:Clear

File Name : FarrKili PM
Site Code : 00000002
Start Date : 10/15/2009
Page No : 1

Groups Printed- Unshifted

	Farrington Hwy Southbound				Kili Drive Westbound				Farrington Hwy Northbound				Eastbound	
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	App. Total	Int. Total
03:00 PM	2	39	0	41	4	0	1	5	0	18	2	20	0	66
03:15 PM	3	23	0	26	6	0	1	7	0	26	7	33	0	66
03:30 PM	1	45	0	46	8	0	1	9	0	36	3	39	0	94
03:45 PM	1	31	0	32	3	0	0	3	0	41	6	47	0	82
Total	7	138	0	145	21	0	3	24	0	121	18	139	0	308
04:00 PM	2	35	0	37	8	0	0	8	0	42	9	51	0	96
04:15 PM	2	24	0	26	6	0	1	7	0	35	4	39	0	72
04:30 PM	0	24	0	24	3	0	1	4	0	32	3	35	0	63
04:45 PM	2	32	0	34	1	0	0	1	0	34	0	34	0	69
Total	6	115	0	121	18	0	2	20	0	143	16	159	0	300
05:00 PM	1	31	0	32	2	0	2	4	0	32	3	35	0	71
05:15 PM	0	39	0	39	8	0	0	8	0	37	6	43	0	90
05:30 PM	1	36	0	37	5	0	1	6	0	42	10	52	0	95
05:45 PM	2	25	0	27	2	0	1	3	0	26	4	30	0	60
Total	4	131	0	135	17	0	4	21	0	137	23	160	0	316
Grand Total	17	384	0	401	56	0	9	65	0	401	57	458	0	924
Apprch %	4.2	95.8	0		86.2	0	13.8		0	87.6	12.4			
Total %	1.8	41.6	0	43.4	6.1	0	1	7	0	43.4	6.2	49.6	0	

	Farrington Hwy Southbound				Kili Drive Westbound				Farrington Hwy Northbound				Eastbound	
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1														
Peak Hour for Entire Intersection Begins at 03:30 PM														
03:30 PM	1	**45**	0	**46**	**8**	0	**1**	**9**	0	36	3	39	0	94
03:45 PM	1	31	0	32	3	0	0	3	0	41	6	47	0	82
04:00 PM	**2**	35	0	37	8	0	0	8	0	**42**	**9**	**51**	0	**96**
04:15 PM	2	24	0	26	6	0	1	7	0	35	4	39	0	72
Total Volume	6	135	0	141	25	0	2	27	0	154	22	176	0	344
% App. Total	4.3	95.7	0		92.6	0	7.4		0	87.5	12.5			
PHF	.750	.750	.000	.766	.781	.000	.500	.750	.000	.917	.611	.863	.000	.896

APPENDIX B

LEVEL OF SERVICE DEFINITIONS

LEVEL OF SERVICE DEFINITIONS

LEVEL-OF-SERVICE CRITERIA FOR SIGNALIZED INTERSECTIONS

Level of Service (LOS) for signalized intersections is defined in terms of delay, which is a measure of driver discomfort, frustration, fuel consumption, and increased travel time. Specifically, level-of-service (LOS) criteria are stated in terms of the average control delay per vehicle, typically a 15-min analysis period. The criteria are given in the following table.

Table 1: Level-of-Service Criteria for Signalized Intersections

Level of Service	Control Delay per Vehicle (sec/veh)
A	≤10.0
B	>10.0 and ≤20.0
C	>20.0 and ≤35.0
D	>35.0 and ≤55.0
E	>55.0 and ≤80.0
F	>80.0

Delay is a complex measure and depends on a number of variables, including the quality of progression, the cycle length, the green ratio, and the v/c ratio for the lane group.

Level of Service A describes operations with low control delay, up to 10 sec per vehicle. This level of service occurs when progression is extremely favorable and most vehicles arrive during the green phase. Many vehicles do not stop at all. Short cycle lengths may tend to contribute to low delay values.

Level of Service B describes operations with control delay greater than 10 and up to 20 sec per vehicle. This level generally occurs with good progression, short cycle lengths, or both. More vehicles stop than with LOS A, causing higher levels of delay.

Level of Service C describes operations with control delay greater than 20 and up to 35 sec per vehicle. These higher delays may result from only fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level. Cycle failure occurs when a given green phase does not serve queued vehicles and overflows occur. The number of vehicles stopping is significant at this level, though many still pass through the intersection without stopping.

Level of Service D describes operations with control delay greater than 35 and up to 55 sec per vehicle. At level of service D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high v/c ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.

"Highway Capacity Manual," Transportation Research Board, 2000.

Level of Service E describes operation with control delay greater than 55 and up to 80 sec per vehicle. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent.

Level of Service F describes operations with control delay in excess of 80 sec per vehicle. This level, considered to be unacceptable to most drivers, often occurs with oversaturation, that is, when arrival flow rates exceed the capacity lane groups. It may also occur at high v/c ratios with many individual cycle failures. Poor progression and long cycle lengths may also contribute significantly to high delay levels.

"Highway Capacity Manual," Transportation Research Board, 2000.

LEVEL OF SERVICE DEFINITIONS

LEVEL-OF-SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS

Level of Service (LOS) criteria are given in Table 1. As used here, control delay is defined as the total elapsed time from the time a vehicle stops at the end of the queue to the time required for the vehicle to travel from the last-in-queue position to the first-in-queue position, including deceleration of vehicles from free-flow speed to the speed of vehicles in the queue.

The average total delay for any particular minor movement is a function of the service rate or capacity of the approach and the degree of saturation. If the degree of saturation is greater than about 0.9, average control delay is significantly affected by the length of the analysis period.

Table 1: Level-of-Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay (Sec/Veh)
A	≤10.0
B	>10.0 and ≤15.0
C	>15.0 and ≤25.0
D	>25.0 and ≤35.0
E	>35.0 and ≤50.0
F	>50.0

"Highway Capacity Manual," Transportation Research Board, 2000.

LEVEL OF SERVICE DEFINITIONS

LEVEL-OF-SERVICE CRITERIA FOR MULTILANE HIGHWAY

A multilane highway is characterized by three performance measures:

- Density, in terms of passenger cars per mile per lane
- Speed, in terms of mean passenger car speed; and
- Volume to capacity ratio

Each of these measures indicates how well the highway accommodates traffic flow.

Density is the assigned primary performance measure for estimating the level-of-service. The three measures of speed, density, and flow or volume are interrelated. If the values of two of these measures are known, the remaining measure can be computed.

Level of Service A describes completely free-flow conditions. The operation of vehicles is virtually unaffected by the presence of other vehicles, and operations are constrained only by the geometric features of the highway and by driver preferences. Maneuverability within the traffic stream is good. Minor disruptions to flow are easily absorbed without a change in travel speed.

Level of Service B also indicates free flow, although the presence of other vehicles becomes noticeable. Average travel speeds are the same as in LOS A, but drivers have slightly less freedom to maneuver. Minor disruptions are still easily absorbed, although local deterioration in LOS will be more obvious.

In **Level of Service C**, the influence of traffic density on operations become marked. The ability to maneuver within the traffic stream is now clearly affected by other vehicles. On multilane highways with a free-flow speed above 50 mi/h, the travel speeds reduce somewhat. Minor disruptions can cause serious local deterioration in service, and queues will form behind any significant traffic disruption.

At **Level of Service D**, the ability to maneuver is severely restricted due to traffic congestion. Travel speed is reduced by increasing volume. Only minor disruptions can be absorbed without extensive queues forming and the service deteriorating.

Level of Service E represents operations at or near capacity, an unstable level. The densities vary depending on the free-flow speed. Vehicles are operating with the minimum spacing for maintaining uniform flow. Disruptions cannot be dissipated readily, often causing queues to form and service to deteriorate to LOS F. For the majority of multilane highways with free-flow speeds between 45 and 60 mi/h, passenger-car mean speeds at capacity range from 42 to 55 mi/h but are highly variable and unpredictable.

"Highway Capacity Manual," Transportation Research Board, 2000.

Level of Service F represents forced or breakdown flow. It occurs either when vehicles arrive at a rate greater than the rate at which they are discharged or when the forecast demand exceeds the computed capacity of a planned facility. Although operations at these points--and on sections immediately downstream--appear to be at capacity, queues form behind these breakdowns. Operations within queues are highly unstable, with vehicles experiencing brief periods of movement followed by stoppages. Travel speeds within queues are generally less than 30 mi/h. Note that the term LOS F may be used to characterize both the point of the breakdown and the operating condition within the queue.

"Highway Capacity Manual," Transportation Research Board, 2000.

APPENDIX C

CAPACITY ANALYSIS CALCULATIONS
EXISTING PEAK HOUR TRAFFIC ANALYSIS

HCM Signalized Intersection Capacity Analysis
3: Makaha Valley Rd & Farrington Hwy

1/21/2010

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	379	23	265	249	18	465
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	5.0
Lane Util. Factor	0.97		1.00	1.00	1.00	0.95
Frt	0.99		1.00	0.85	1.00	1.00
Flt Protected	0.95		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3422		1863	1425	1770	3539
Flt Permitted	0.95		1.00	1.00	0.56	1.00
Satd. Flow (perm)	3422		1863	1425	1045	3539
Peak-hour factor, PHF	0.88	0.88	0.80	0.80	0.87	0.87
Adj. Flow (vph)	431	26	331	311	21	534
RTOR Reduction (vph)	8	0	0	188	0	0
Lane Group Flow (vph)	449	0	331	123	21	534
Parking (#/hr)				0		
Turn Type				Perm	Perm	
Protected Phases	8		2			6
Permitted Phases				2	6	
Actuated Green, G (s)	9.9		13.1	13.1	13.1	13.1
Effective Green, g (s)	9.9		13.1	13.1	13.1	13.1
Actuated g/C Ratio	0.30		0.40	0.40	0.40	0.40
Clearance Time (s)	5.0		5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1027		740	566	415	1405
v/s Ratio Prot	c0.13		c0.18			0.15
v/s Ratio Perm				0.09	0.02	
v/c Ratio	0.44		0.45	0.22	0.05	0.38
Uniform Delay, d1	9.3		7.3	6.6	6.1	7.1
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3		0.4	0.2	0.1	0.2
Delay (s)	9.6		7.7	6.8	6.2	7.2
Level of Service	A		A	A	A	A
Approach Delay (s)	9.6		7.3			7.2
Approach LOS	A		A			A

Intersection Summary			
HCM Average Control Delay	7.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	33.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	34.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Makaha Valley Rd & Farrington Hwy

1/21/2010

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	294	44	439	322	29	283
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	5.0
Lane Util. Factor	0.97		1.00	1.00	1.00	0.95
Frt	0.98		1.00	0.85	1.00	1.00
Flt Protected	0.96		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3386		1863	1425	1770	3539
Flt Permitted	0.96		1.00	1.00	0.45	1.00
Satd. Flow (perm)	3386		1863	1425	843	3539
Peak-hour factor, PHF	0.95	0.95	0.93	0.93	0.82	0.82
Adj. Flow (vph)	246	46	472	346	35	345
RTOR Reduction (vph)	29	0	0	171	0	0
Lane Group Flow (vph)	263	0	472	175	35	345
Parking (#/hr)				0		
Turn Type				Perm	Perm	
Protected Phases	8		2			6
Permitted Phases				2	6	
Actuated Green, G (s)	8.4		18.9	18.9	18.9	18.9
Effective Green, g (s)	8.4		18.9	18.9	18.9	18.9
Actuated g/C Ratio	0.23		0.51	0.51	0.51	0.51
Clearance Time (s)	5.0		5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	763		944	722	427	1793
v/s Ratio Prot	c0.08		c0.25			0.10
v/s Ratio Perm				0.12	0.04	
v/c Ratio	0.34		0.50	0.24	0.08	0.19
Uniform Delay, d1	12.1		6.1	5.2	4.7	5.0
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3		0.4	0.2	0.1	0.1
Delay (s)	12.4		6.5	5.4	4.8	5.1
Level of Service	B		A	A	A	A
Approach Delay (s)	12.4		6.0			5.1
Approach LOS	B		A			A

Intersection Summary			
HCM Average Control Delay	7.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	37.3	Sum of lost time (s)	10.0
Intersection Capacity Utilization	40.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
7: Kili Dr & Farrington Hwy

1/21/2010

	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	37	1	167	24	3	96
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.79	0.79	0.70	0.70	0.85	0.85
Hourly flow rate (vph)	47	1	153	34	4	113
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	290	170			187	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	290	170			187	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	100			100	
cM capacity (veh/h)	699	874			1387	

	WB 1	NB 1	SB 1
Volume Total	48	187	116
Volume Left	47	0	4
Volume Right	1	34	0
cSH	703	1700	1387
Volume to Capacity	0.07	0.11	0.00
Queue Length 95th (ft)	5	0	0
Control Delay (s)	10.5	0.0	0.3
Lane LOS	B		A
Approach Delay (s)	10.5	0.0	0.3
Approach LOS	B		

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	17.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
7: Kili Dr & Farrington Hwy

1/21/2010

	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	25	2	154	22	6	165
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.75	0.75	0.86	0.86	0.77	0.77
Hourly flow rate (vph)	33	3	179	26	8	175
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	383	192			205	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	383	192			205	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	95	100			99	
cM capacity (veh/h)	616	850			1367	

	WB 1	NB 1	SB 1
Volume Total	36	205	183
Volume Left	33	0	8
Volume Right	3	26	0
cSH	629	1700	1367
Volume to Capacity	0.06	0.12	0.01
Queue Length 95th (ft)	5	0	0
Control Delay (s)	11.1	0.0	0.4
Lane LOS	B		A
Approach Delay (s)	11.1	0.0	0.4
Approach LOS	B		

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	22.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCS+: Multilane Highways Release 5.4

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst:	CL
Agency/Co:	
Date:	1/21/2010
Analysis Period:	AM Peak
Highway:	Farrington Highway
From/To:	South of Makaha Valley Rd
Jurisdiction:	
Analysis Year:	Existing
Project ID:	

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	10		10	
Median type	Divided		Divided	
Free-flow speed:	Base		Base	
FFS or BFFS	50.0	mph	50.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	2.5	mph	2.5	mph
Free-flow speed	47.5	mph	47.5	mph

VOLUME

Direction	1		2	
Volume, V	514	vph	844	vph
Peak-hour factor, PHF	0.85		0.85	
Peak 15-minute volume, v15	151		248	
Trucks and buses	2	%	2	%
Recreational vehicles	0	%	0	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	0.990		0.990	
Flow rate, vp	305	pcphpl	501	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	305	pcphpl	501	pcphpl
Free-flow speed, FFS	47.5	mph	47.5	mph
Avg. passenger-car travel speed, S	47.5	mph	47.5	mph
Level of service, LOS	A		A	
Density, D	6.4	pc/mi/ln	10.5	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

HCS+: Multilane Highways Release 5.4

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst:	CL
Agency/Co:	
Date:	1/21/2010
Analysis Period:	PM Peak
Highway:	Farrington Highway
From/To:	South of Makaha Valley Rd
Jurisdiction:	
Analysis Year:	Existing
Project ID:	

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	10		10	
Median type	Divided		Divided	
Free-flow speed:	Base		Base	
FFS or BFFS	50.0	mph	50.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	2.5	mph	2.5	mph
Free-flow speed	47.5	mph	47.5	mph

VOLUME

Direction	1		2	
Volume, V	517	vph	761	vph
Peak-hour factor, PHF	0.85		0.85	
Peak 15-minute volume, v15	152		224	
Trucks and buses	2	%	2	%
Recreational vehicles	0	%	0	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	0.990		0.990	
Flow rate, vp	307	pcphpl	452	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	307	pcphpl	452	pcphpl
Free-flow speed, FFS	47.5	mph	47.5	mph
Avg. passenger-car travel speed, S	47.5	mph	47.5	mph
Level of service, LOS	A		A	
Density, D	6.5	pc/mi/ln	9.5	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

APPENDIX D

CAPACITY ANALYSIS CALCULATIONS
PROJECTED YEAR 2018 PEAK HOUR TRAFFIC
ANALYSIS WITHOUT PROJECT

HCM Signalized Intersection Capacity Analysis
3: Makaha Valley Rd & Farrington Hwy

1/29/2010

Movement	WBL	WBR	NBT	SBT	SBL	SBR
Lane Configurations						
Volume (vph)	501	34	277	295	24	486
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	5.0
Lane Util. Factor	0.97		1.00	1.00	1.00	0.95
Frt	0.99		1.00	0.85	1.00	1.00
Flt Protected	0.96		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3419		1863	1425	1770	3539
Flt Permitted	0.96		1.00	1.00	0.54	1.00
Satd. Flow (perm)	3419		1863	1425	1013	3539
Peak-hour factor, PHF	0.88	0.88	0.80	0.80	0.87	0.87
Adj. Flow (vph)	569	39	346	369	28	559
RTOR Reduction (vph)	9	0	0	225	0	0
Lane Group Flow (vph)	599	0	346	144	28	559
Parking (#/hr)				0		
Turn Type				Perm	Perm	
Protected Phases	8		2			6
Permitted Phases				2	6	
Actuated Green, G (s)	12.0		14.1	14.1	14.1	14.1
Effective Green, g (s)	12.0		14.1	14.1	14.1	14.1
Actuated g/C Ratio	0.33		0.39	0.39	0.39	0.39
Clearance Time (s)	5.0		5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1137		728	557	396	1382
v/s Ratio Prot	c0.18		c0.19			0.16
v/s Ratio Perm				0.10	0.03	
v/c Ratio	0.53		0.48	0.26	0.07	0.40
Uniform Delay, d1	9.8		8.2	7.5	6.9	8.0
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4		0.5	0.2	0.1	0.2
Delay (s)	10.2		8.7	7.7	7.0	8.2
Level of Service	B		A	A	A	A
Approach Delay (s)	10.2		8.2			8.1
Approach LOS	B		A			A

Intersection Summary			
HCM Average Control Delay	8.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	36.1	Sum of lost time (s)	10.0
Intersection Capacity Utilization	43.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Makaha Valley Rd & Farrington Hwy

1/29/2010

Lane Configurations						
Volume (vph)	310	56	459	451	45	296
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	5.0
Lane Util. Factor	0.97		1.00	1.00	1.00	0.95
Frt	0.98		1.00	0.85	1.00	1.00
Flt Protected	0.96		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3387		1863	1425	1770	3539
Flt Permitted	0.96		1.00	1.00	0.42	1.00
Satd. Flow (perm)	3387		1863	1425	785	3539
Peak-hour factor, PHF	0.95	0.95	0.93	0.93	0.82	0.82
Adj. Flow (vph)	326	59	494	485	55	361
RTOR Reduction (vph)	27	0	0	244	0	0
Lane Group Flow (vph)	358	0	494	241	55	361
Parking (#/hr)				0		
Turn Type				Perm	Perm	
Protected Phases	8		2			6
Permitted Phases				2	6	
Actuated Green, G (s)	9.8		19.6	19.6	19.6	19.6
Effective Green, g (s)	9.8		19.6	19.6	19.6	19.6
Actuated g/C Ratio	0.25		0.50	0.50	0.50	0.50
Clearance Time (s)	5.0		5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	842		927	709	391	1761
v/s Ratio Prot	c0.11		c0.27			0.10
v/s Ratio Perm				0.17	0.07	
v/c Ratio	0.43		0.53	0.34	0.14	0.20
Uniform Delay, d1	12.4		6.8	6.0	5.3	5.5
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3		0.6	0.3	0.2	0.1
Delay (s)	12.8		7.4	6.3	5.5	5.6
Level of Service	B		A	A	A	A
Approach Delay (s)	12.8		6.8			5.6
Approach LOS	B		A			A

HCM Average Control Delay	7.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	39.4	Sum of lost time (s)	10.0
Intersection Capacity Utilization	50.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
7: Kili Dr & Farrington Hwy

1/29/2010

Movement						
Lane Configurations						
Volume (veh/h)	37	1	122	24	3	105
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.79	0.79	0.70	0.70	0.85	0.85
Hourly flow rate (vph)	47	1	174	34	4	124
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	322	191			209	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	322	191			209	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	100			100	
cM capacity (veh/h)	670	850			1362	

Direction, Lane #						
Volume Total	48	209	127			
Volume Left	47	0	4			
Volume Right	1	34	0			
cSH	674	1700	1362			
Volume to Capacity	0.07	0.12	0.00			
Queue Length 95th (ft)	6	0	0			
Control Delay (s)	10.8	0.0	0.2			
Lane LOS	B		A			
Approach Delay (s)	10.8	0.0	0.2			
Approach LOS	B					

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	17.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
7: Kili Dr & Farrington Hwy

1/29/2010

Lane Configurations						
Volume (veh/h)	25	2	171	22	6	156
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.75	0.75	0.86	0.86	0.77	0.77
Hourly flow rate (vph)	33	3	199	26	8	203
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	430	212			224	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	430	212			224	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	94	100			99	
cM capacity (veh/h)	579	829			1344	

Volume Total	36	224	210
Volume Left	33	0	8
Volume Right	3	26	0
cSH	592	1700	1344
Volume to Capacity	0.06	0.13	0.01
Queue Length 95th (ft)	5	0	0
Control Delay (s)	11.5	0.0	0.3
Lane LOS	B		A
Approach Delay (s)	11.5	0.0	0.3
Approach LOS	B		

Average Delay		1.0	
Intersection Capacity Utilization		23.1%	ICU Level of Service A
Analysis Period (min)		15	

HCS+: Multilane Highways Release 5.4

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst: CL
Agency/Co:
Date: 1/21/2010
Analysis Period: AM Peak
Highway: Farrington Highway
From/To: South of Makaha Valley Rd
Jurisdiction:
Analysis Year: Year 2018 w/out project
Project ID:

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	10		10	
Median type	Divided		Divided	
Free-flow speed:	Base		Base	
FFS or BFFS	50.0	mph	50.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	2.5	mph	2.5	mph
Free-flow speed	47.5	mph	47.5	mph

VOLUME

Direction	1		2	
Volume, V	987	vph	572	vph
Peak-hour factor, PHF	0.85		0.85	
Peak 15-minute volume, v15	290		168	
Trucks and buses	2	%	2	%
Recreational vehicles	0	%	0	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	

Heavy vehicle adjustment, fHV	0.990		0.990	
Flow rate, vp	586	pcphpl	339	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	586	pcphpl	339	pcphpl
Free-flow speed, FFS	47.5	mph	47.5	mph
Avg. passenger-car travel speed, S	47.5	mph	47.5	mph
Level of service, LOS	B		A	
Density, D	12.3	pc/mi/ln	7.1	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

HCS+: Multilane Highways Release 5.4

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst: CL
Agency/Co:
Date: 1/21/2010
Analysis Period: PM Peak
Highway: Farrington Highway
From/To: South of Makaha Valley Rd
Jurisdiction:
Analysis Year: Year 2018 w/out project
Project ID:

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	10		10	
Median type	Divided		Divided	
Free-flow speed:	Base		Base	
FFS or BFFS	50.0	mph	50.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	2.5	mph	2.5	mph
Free-flow speed	47.5	mph	47.5	mph

VOLUME

Direction	1		2	
Volume, V	606	vph	910	vph
Peak-hour factor, PHF	0.85		0.85	
Peak 15-minute volume, v15	178		268	
Trucks and buses	2	%	2	%
Recreational vehicles	0	%	0	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	

Heavy vehicle adjustment, fHV	0.990		0.990	
Flow rate, vp	360	pcphpl	540	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	360	pcphpl	540	pcphpl
Free-flow speed, FFS	47.5	mph	47.5	mph
Avg. passenger-car travel speed, S	47.5	mph	47.5	mph
Level of service, LOS	A		B	
Density, D	7.6	pc/mi/ln	11.4	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

APPENDIX E

CAPACITY ANALYSIS CALCULATIONS
PROJECTED YEAR 2018 PEAK HOUR TRAFFIC
ANALYSIS WITH PROJECT

HCM Signalized Intersection Capacity Analysis
3: Makaha Valley Rd & Farrington Hwy

1/29/2010

Lane Configurations						
Volume (vph)	801	34	296	439	24	489
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	5.0
Lane Util. Factor	0.97		1.00	1.00	1.00	0.95
Frt	0.99		1.00	0.85	1.00	1.00
Flt Protected	0.95		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3427		1863	1425	1770	3539
Flt Permitted	0.95		1.00	1.00	0.47	1.00
Satd. Flow (perm)	3427		1863	1425	882	3539
Peak-hour factor, PHF	0.88	0.88	0.80	0.80	0.87	0.87
Adj. Flow (vph)	910	39	370	549	28	562
RTOR Reduction (vph)	5	0	0	337	0	0
Lane Group Flow (vph)	944	0	370	212	28	562
Parking (#/hr)				0		
Turn Type				Perm	Perm	
Protected Phases	8		2			6
Permitted Phases				2	6	
Actuated Green, G (s)	17.8		17.5	17.5	17.5	17.5
Effective Green, g (s)	17.8		17.5	17.5	17.5	17.5
Actuated g/C Ratio	0.39		0.39	0.39	0.39	0.39
Clearance Time (s)	5.0		5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1347		720	550	341	1367
v/s Ratio Prot	c0.28		c0.20			0.16
v/s Ratio Perm				0.15	0.03	
v/c Ratio	0.70		0.51	0.39	0.08	0.41
Uniform Delay, d1	11.5		10.6	10.0	8.8	10.1
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.7		0.6	0.5	0.1	0.2
Delay (s)	13.2		11.3	10.5	8.9	10.3
Level of Service	B		B	B	A	B
Approach Delay (s)	13.2		10.8			10.3
Approach LOS	B		B			B

HCM Average Control Delay	11.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	45.3	Sum of lost time (s)	10.0
Intersection Capacity Utilization	52.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Makaha Valley Rd & Farrington Hwy

1/29/2010

Lane Configurations						
Volume (vph)	518	56	462	773	45	312
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	5.0
Lane Util. Factor	0.97		1.00	1.00	1.00	0.95
Frt	0.99		1.00	0.85	1.00	1.00
Flt Protected	0.96		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3407		1863	1425	1770	3539
Flt Permitted	0.96		1.00	1.00	0.41	1.00
Satd. Flow (perm)	3407		1863	1425	755	3539
Peak-hour factor, PHF	0.95	0.95	0.93	0.93	0.82	0.82
Adj. Flow (vph)	545	59	497	831	55	380
RTOR Reduction (vph)	14	0	0	409	0	0
Lane Group Flow (vph)	590	0	497	422	55	380
Parking (#/hr)				0		
Turn Type				Perm	Perm	
Protected Phases	8		2			6
Permitted Phases				2	6	
Actuated Green, G (s)	12.9		23.6	23.6	23.6	23.6
Effective Green, g (s)	12.9		23.6	23.6	23.6	23.6
Actuated g/C Ratio	0.28		0.51	0.51	0.51	0.51
Clearance Time (s)	5.0		5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	945		946	723	383	1796
v/s Ratio Prot	c0.17		0.27			0.11
v/s Ratio Perm				c0.30	0.07	
v/c Ratio	0.62		0.53	0.58	0.14	0.21
Uniform Delay, d1	14.7		7.7	8.0	6.1	6.3
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.3		0.5	1.2	0.2	0.1
Delay (s)	16.0		8.2	9.2	6.3	6.4
Level of Service	B		A	A	A	A
Approach Delay (s)	16.0		8.8			6.4
Approach LOS	B		A			A

HCM Average Control Delay	10.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	46.5	Sum of lost time (s)	10.0
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
7: Kili Dr & Farrington Hwy

1/29/2010

Movement						
Lane Configurations						
Volume (veh/h)	40	1	122	43	3	105
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.79	0.79	0.70	0.70	0.85	0.85
Hourly flow rate (vph)	51	1	174	61	4	124
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	336	205			236	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	336	205			236	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	92	100			100	
cM capacity (veh/h)	658	836			1331	

Volume Total	52	236	127
Volume Left	51	0	4
Volume Right	1	61	0
cSH	661	1700	1331
Volume to Capacity	0.08	0.14	0.00
Queue Length 95th (ft)	6	0	0
Control Delay (s)	10.9	0.0	0.2
Lane LOS	B		A
Approach Delay (s)	10.9	0.0	0.2
Approach LOS	B		

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	19.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
7: Kili Dr & Farrington Hwy

1/29/2010

Movement						
Lane Configurations						
Volume (veh/h)	41	2	171	25	6	156
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.75	0.75	0.86	0.86	0.77	0.77
Hourly flow rate (vph)	55	3	199	29	8	203
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	432	213			228	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	432	213			228	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	91	100			99	
cM capacity (veh/h)	578	827			1340	

Volume Total	57	228	210
Volume Left	55	0	8
Volume Right	3	29	0
cSH	586	1700	1340
Volume to Capacity	0.10	0.13	0.01
Queue Length 95th (ft)	8	0	0
Control Delay (s)	11.8	0.0	0.3
Lane LOS	B		A
Approach Delay (s)	11.8	0.0	0.3
Approach LOS	B		

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	23.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCS+: Multilane Highways Release 5.4

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst: CL
Agency/Co:
Date: 1/21/2010
Analysis Period: AM Peak
Highway: Farrington Highway
From/To: South of Makaha Valley Rd
Jurisdiction:
Analysis Year: Year 2018 w/ project
Project ID:

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	10		10	
Median type	Divided		Divided	
Free-flow speed:	Base		Base	
FFS or BFFS	50.0	mph	50.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	2.5	mph	2.5	mph
Free-flow speed	47.5	mph	47.5	mph

VOLUME

Direction	1		2	
Volume, V	1290	vph	735	vph
Peak-hour factor, PHF	0.85		0.85	
Peak 15-minute volume, v15	379		216	
Trucks and buses	2	%	2	%
Recreational vehicles	0	%	0	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	0.990		0.990	
Flow rate, vp	766	pcphpl	436	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	766	pcphpl	436	pcphpl
Free-flow speed, FFS	47.5	mph	47.5	mph
Avg. passenger-car travel speed, S	47.5	mph	47.5	mph
Level of service, LOS	B		A	
Density, D	16.1	pc/mi/ln	9.2	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

HCS+: Multilane Highways Release 5.4

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst: CL
Agency/Co:
Date: 1/21/2010
Analysis Period: PM Peak
Highway: Farrington Highway
From/To: South of Makaha Valley Rd
Jurisdiction:
Analysis Year: Year 2018 w/ project
Project ID:

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	10		10	
Median type	Divided		Divided	
Free-flow speed:	Base		Base	
FFS or BFFS	50.0	mph	50.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	2.5	mph	2.5	mph
Free-flow speed	47.5	mph	47.5	mph

VOLUME

Direction	1		2	
Volume, V	830	vph	1235	vph
Peak-hour factor, PHF	0.85		0.85	
Peak 15-minute volume, v15	244		363	
Trucks and buses	2	%	2	%
Recreational vehicles	0	%	0	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	0.990		0.990	
Flow rate, vp	493	pcphpl	733	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	493	pcphpl	733	pcphpl
Free-flow speed, FFS	47.5	mph	47.5	mph
Avg. passenger-car travel speed, S	47.5	mph	47.5	mph
Level of service, LOS	A		B	
Density, D	10.4	pc/mi/ln	15.4	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

APPENDIX F

CAPACITY ANALYSIS CALCULATIONS
PROJECTED YEAR 2026 PEAK HOUR TRAFFIC
ANALYSIS WITH PROJECT

HCM Signalized Intersection Capacity Analysis
3: Makaha Valley Rd & Farrington Hwy

1/29/2010

Lane Configurations						
Volume (vph)	1073	35	367	677	29	519
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	5.0
Lane Util. Factor	0.97		1.00	1.00	1.00	0.95
Frt	1.00		1.00	0.85	1.00	1.00
Flt Protected	0.95		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3430		1863	1425	1770	3539
Flt Permitted	0.95		1.00	1.00	0.36	1.00
Satd. Flow (perm)	3430		1863	1425	674	3539
Peak-hour factor, PHF	0.88	0.88	0.80	0.80	0.87	0.87
Adj. Flow (vph)	1219	40	459	846	33	597
RTOR Reduction (vph)	4	0	0	502	0	0
Lane Group Flow (vph)	1255	0	459	344	33	597
Parking (#/hr)				0		
Turn Type				Perm	Perm	
Protected Phases	8		2			6
Permitted Phases				2	6	
Actuated Green, G (s)	22.5		22.3	22.3	22.3	22.3
Effective Green, g (s)	22.5		22.3	22.3	22.3	22.3
Actuated g/C Ratio	0.41		0.41	0.41	0.41	0.41
Clearance Time (s)	5.0		5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1408		758	580	274	1440
v/s Ratio Prot	c0.37		c0.25			0.17
v/s Ratio Perm				0.24	0.05	
v/c Ratio	0.89		0.61	0.59	0.12	0.41
Uniform Delay, d1	15.0		12.8	12.7	10.1	11.6
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	7.5		1.4	1.6	0.2	0.2
Delay (s)	22.5		14.2	14.3	10.3	11.8
Level of Service	C		B	B	B	B
Approach Delay (s)	22.5		14.3			11.7
Approach LOS	C		B			B

HCM Average Control Delay	17.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	54.8	Sum of lost time (s)	10.0
Intersection Capacity Utilization	64.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Makaha Valley Rd & Farrington Hwy

1/29/2010

Lane Configurations						
Volume (vph)	675	58	490	973	46	354
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	5.0
Lane Util. Factor	0.97		1.00	1.00	1.00	0.95
Frt	0.99		1.00	0.85	1.00	1.00
Flt Protected	0.96		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3414		1863	1425	1770	3539
Flt Permitted	0.96		1.00	1.00	0.38	1.00
Satd. Flow (perm)	3414		1863	1425	702	3539
Peak-hour factor, PHF	0.95	0.95	0.93	0.93	0.82	0.82
Adj. Flow (vph)	711	61	527	1046	56	432
RTOR Reduction (vph)	11	0	0	501	0	0
Lane Group Flow (vph)	761	0	527	545	56	432
Parking (#/hr)				0		
Turn Type				Perm	Perm	
Protected Phases	8		2			6
Permitted Phases				2	6	
Actuated Green, G (s)	14.8		27.0	27.0	27.0	27.0
Effective Green, g (s)	14.8		27.0	27.0	27.0	27.0
Actuated g/C Ratio	0.29		0.52	0.52	0.52	0.52
Clearance Time (s)	5.0		5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	975		971	743	366	1845
v/s Ratio Prot	c0.22		0.28			0.12
v/s Ratio Perm				c0.38	0.08	
v/c Ratio	0.78		0.54	0.73	0.15	0.23
Uniform Delay, d1	17.0		8.3	9.6	6.5	6.8
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	4.1		0.6	3.8	0.2	0.1
Delay (s)	21.1		8.9	13.4	6.6	6.8
Level of Service	C		A	B	A	A
Approach Delay (s)	21.1		11.9			6.8
Approach LOS	C		B			A

HCM Average Control Delay	13.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	51.8	Sum of lost time (s)	10.0
Intersection Capacity Utilization	71.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
7: Kili Dr & Farrington Hwy

1/29/2010

Lane Configurations						
Volume (veh/h)	51	1	126	103	3	109
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.79	0.79	0.70	0.70	0.85	0.85
Hourly flow rate (vph)	65	1	180	147	4	128
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	389	254			327	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	389	254			327	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	89	100			100	
cM capacity (veh/h)	613	785			1232	

Volume Total	66	327	132
Volume Left	65	0	4
Volume Right	1	147	0
cSH	616	1700	1232
Volume to Capacity	0.11	0.19	0.00
Queue Length 95th (ft)	9	0	0
Control Delay (s)	11.5	0.0	0.2
Lane LOS	B		A
Approach Delay (s)	11.5	0.0	0.2
Approach LOS	B		

Average Delay	1.5		
Intersection Capacity Utilization	22.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
7: Kili Dr & Farrington Hwy

1/29/2010

Lane Configurations						
Volume (veh/h)	72	2	177	36	6	161
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.75	0.75	0.86	0.86	0.77	0.77
Hourly flow rate (vph)	96	3	206	42	8	209
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	451	227			248	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	451	227			248	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	83	100			99	
cM capacity (veh/h)	562	813			1318	

Volume Total	99	248	217
Volume Left	96	0	8
Volume Right	3	42	0
cSH	567	1700	1318
Volume to Capacity	0.17	0.15	0.01
Queue Length 95th (ft)	16	0	0
Control Delay (s)	12.7	0.0	0.3
Lane LOS	B		A
Approach Delay (s)	12.7	0.0	0.3
Approach LOS	B		

Average Delay		2.3	
Intersection Capacity Utilization		24.1%	ICU Level of Service A
Analysis Period (min)		15	

HCS+: Multilane Highways Release 5.4

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst: CL
Agency/Co:
Date: 1/21/2010
Analysis Period: AM Peak
Highway: Farrington Highway
From/To: South of Makaha Valley Rd
Jurisdiction:
Analysis Year: Year 2026 w/ project
Project ID:

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	10		10	
Median type	Divided		Divided	
Free-flow speed:	Base		Base	
FFS or BFFS	50.0	mph	50.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	2.5	mph	2.5	mph
Free-flow speed	47.5	mph	47.5	mph

VOLUME

Direction	1		2	
Volume, V	1592	vph	1044	vph
Peak-hour factor, PHF	0.85		0.85	
Peak 15-minute volume, v15	468		307	
Trucks and buses	2	%	2	%
Recreational vehicles	0	%	0	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	

Heavy vehicle adjustment, fHV	0.990		0.990	
Flow rate, vp	945	pcphpl	620	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	945	pcphpl	620	pcphpl
Free-flow speed, FFS	47.5	mph	47.5	mph
Avg. passenger-car travel speed, S	47.5	mph	47.5	mph
Level of service, LOS	C		B	
Density, D	19.9	pc/mi/ln	13.1	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

Phone: Fax:
E-mail:

OPERATIONAL ANALYSIS

Analyst: CL
Agency/Co:
Date: 1/21/2010
Analysis Period: PM Peak
Highway: Farrington Highway
From/To: South of Makaha Valley Rd
Jurisdiction:
Analysis Year: Year 2026 w/ project
Project ID:

FREE-FLOW SPEED

Direction	1		2	
Lane width	12.0	ft	12.0	ft
Lateral clearance:				
Right edge	6.0	ft	6.0	ft
Left edge	6.0	ft	6.0	ft
Total lateral clearance	12.0	ft	12.0	ft
Access points per mile	10		10	
Median type	Divided		Divided	
Free-flow speed:	Base		Base	
FFS or BFFS	50.0	mph	50.0	mph
Lane width adjustment, FLW	0.0	mph	0.0	mph
Lateral clearance adjustment, FLC	0.0	mph	0.0	mph
Median type adjustment, FM	0.0	mph	0.0	mph
Access points adjustment, FA	2.5	mph	2.5	mph
Free-flow speed	47.5	mph	47.5	mph

VOLUME

Direction	1		2	
Volume, V	1029	vph	1463	vph
Peak-hour factor, PHF	0.85		0.85	
Peak 15-minute volume, v15	303		430	
Trucks and buses	2	%	2	%
Recreational vehicles	0	%	0	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	mi	0.00	mi
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	

Heavy vehicle adjustment, fHV	0.990		0.990	
Flow rate, vp	611	pcphpl	869	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	611	pcphpl	869	pcphpl
Free-flow speed, FFS	47.5	mph	47.5	mph
Avg. passenger-car travel speed, S	47.5	mph	47.5	mph
Level of service, LOS	B		C	
Density, D	12.9	pc/mi/ln	18.3	pc/mi/ln

Overall results are not computed when free-flow speed is less than 45 mph.

Appendix F

Pre-Consultation Letters and Responses

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

February 11, 2010

MUFI HANNEMANN, Mayor

RANDALL Y. S. CHUNG, Chairman
SAMUEL T. HATA
WILLIAM K. MAHOE
THERESIA C. McMURDO
ADAM C. WONG

JEOFFREY S. CUDIAMAT, Ex-Officio
BRENNON T. MORIOKA, Ex-Officio

WAYNE M. HASHIRO, P.E.
Manager and Chief Engineer

DEAN A. NAKANO
Deputy Manager and Chief Engineer

Ms. Malia M. Cox
Environmental Planner
PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Ms. Cox:

Subject: Your Letter Dated January 21, 2010 on the Pre-Consultation for Draft Environmental Assessment for the Proposed Na Pua Development, TMK: 8-4-2: 5&7, 8-4-2: 56 & 57, 8-4-2:14&5, 8-4-23:1, Makaha Valley

Thank you for the opportunity to comment on the proposed Na Pua Development in Makaha.

The existing water system is presently not adequate to accommodate the proposed development. The Lualualei Line Booster Station is operating at maximum capacity. We are currently in the design phase of the Lualualei Line Booster Station upgrade. As an option, the developer may construct the necessary Line Booster upgrade in lieu of waiting for the Board of Water Supply to install the improvements.

We also have the following comments to the proposed developments:

Makaha 242' System

The existing water system cannot provide adequate fire protection to the proposed on-site development in accordance with our Water System Standards. Our Water System Standards require a fire hydrant to be located within 175 linear feet (l.f.) and provide a fire flow of 1,000 gallons per minute (gpm) to single family development. The developer will be required to install the necessary on-site water system improvements and upgrade approximately 3000 l.f. of 8-inch main along Jade Street to 12-inch main, to provide the necessary fire flows to the development. Construction drawings should be submitted for our review and approval.

The service limit for this system is the 142-foot elevation.

The developer will be required to pay our Water System Facilities Charges for resource development, transmission, and daily storage.

Makaha 525' System

The developer will be required to install the necessary water system improvements including a reservoir to provide the necessary domestic water service and fire protection to the development. Construction drawings should be submitted for our review and approval.

Tax Map Key 8-4-002:007 was allocated storage and pipeline capacities from the developer of the existing Makaha 525' reservoir. Please provide any documents you may have indicating of any such storage and pipeline capacities to the lot, as well as documents which indicate that these capacities were properly transferred to your client.

A water master plan for the entire development including the proposed on-site and off-site water system improvements, lot layouts, access, estimated water demands and the proposed reservoir should be submitted for our approval. This should be accompanied with supporting calculations showing that the proposed water facilities are adequate to provide domestic water service and fire protection within the water systems.

All proposed water system improvements should be designed to Board of Water Supply (BWS) standards. All new distribution line intended for dedication to BWS should be placed in a well-maintained roadway conforming to city standards.

The developer should investigate the feasibility of using non-potable water for irrigation of the campus development. If non-potable water is either unavailable or infeasible, a report of the investigation including proposed irrigation demands should be submitted to us before we will consider the use of potable water. Please contact Michael Matsuo of our Water Resource Division at 748-5951, to coordinate the non-potable requirements.

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 your building permit application. The final decision on the availability of water will be confirmed when the building permit application is submitted for approval. When water is made available, the applicant will be required to pay the applicable Water System Facilities Charges.

If you have any questions, please contact Robert Chun at 748-5443.

Very truly yours,

PAUL S. KIKUCHI
Chief Financial Officer
Customer Care Division

PBR HAWAII
& ASSOCIATES, INC.

PRINCIPALS
THOMAS S. WITTEN, ASLA
President
R. STAN DUNCAN, ASLA
Executive Vice-President
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Associate
KIMI MIKAMI YUEN, LEED® AP
Associate
SCOTT ALIKA ABRIGO, LEED® AP
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KAPOLEI OFFICE
1001 Kamokila Boulevard
Kapolei Building, Suite 313
Kapolei, Hawai'i 96707-2005
Tel: (808) 521-5631
Fax: (808) 535-3163

April 26, 2010

Mr. Paul S. Kikuchi
City and County of Honolulu
Board of Water Supply
630 South Beretania Street
Honolulu, Hawai'i 96843

Attn: Mr. Robert Chun

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED DEPARTMENT OF HAWAIIAN HOME LANDS RESIDENTIAL COMMUNITY AND KAMEHAMEHA SCHOOLS LEARNING COMMUNITY [FORMERLY COMPLEX], MĀKAHA, ISLAND OF O'AHU, DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Kikuchi;

Thank you for your letter dated February 11, 2010. We offer the following responses to your comments.

We acknowledge your assessment that the existing water system is not presently adequate, but that the city is currently in the design phase to improve the system. We further acknowledge that as an option, the project proponent may construct necessary Line Booster upgrades in lieu of waiting for city installed improvements.

With regard to the 242' System, we understand that the existing system is not adequate to provide necessary fire flow protection to the proposed site below the 142-foot elevation. We further understand that resource development, transmission, and daily storage fees will apply.

With regard to the 525' System, we acknowledge that improvements needed to meet the demands of a portion of the proposed project may include installation of a reservoir, unless it is determined that there is excess capacity within the current reservoir that while currently allocated to various undeveloped parcels within Valley, have seen no development in many years. We also understand that storage, and pipeline capacity has been allocated to Tax Map Key 8-4-002:007 and any documentation should be provided to BWS.

We acknowledge that a water master plan should be submitted to BWS for your review and approval, and all improvements should be designed to BWS standards. We further acknowledge your request for an assessment of the feasibility of the use

of non-potable water for campus irrigation. This has been relayed to the project proponents and their engineering team.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you need any additional information or have any questions regarding this project, please do not hesitate to contact Malia Cox at (808) 521-5631.

Sincerely,

Grant Murakami, AICP, LEED AP
Principal

cc: Mr. Walter Thoemmes, Kamehameha Schools
Mr. Kamuela Cobb-Adams, Department of Hawaiian Home Lands
Mr. Randall Fujiki, The Resort Group

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 11TH FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8480 • Fax: (808) 768-4567
Web site: www.honolulu.gov

MUFI HANNEMANN
MAYOR

CRAIG I. NISHIMURA, P.E.
DIRECTOR

COLLINS D. LAM, P.E.
DEPUTY DIRECTOR

February 9, 2010

Ms. Malia M. Cox
PBR Hawaii & Associates, INC.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813

Dear Ms. Cox:

Subject: Pre- Consultation for the Proposed Department of Hawaiian Home Lands Residential Community and Kamehameha Schools Learning Complex, Makaha, Island of O'ahu
Draft Environmental Assessment

Thank you for inviting us to review the above Draft Environmental Assessment. The Department of Design and Construction has the following comments:

1. We would like to see the time table for the relief line and construction plans should be submitted for our review. If there are any questions, please contact Jay Hamai, Wastewater Division at 768-8750.

2. The off-site sewer line modification will need to be coordinated with our ongoing Bayview Street Relief Drain project. If there are any questions, please contact Gary Kam, Civil Division at 768-8819.

Very truly yours,

Craig I. Nishimura, P.E.
Director

CN:pg(350259)

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& ASSOCIATES, INC.

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Kapolei, Hawai'i 96707-2005
Tel: (808) 521-5631
Fax: (808) 535-3163

April 26, 2010

Mr. Craig Nishimura, Director
City and County of Honolulu
Department of Design & Construction (DDC)
650 South King Street
Honolulu, Hawai'i 96813

Attention: Jay Hamai, Wastewater Division
Gary Kam, Civil Division

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED DEPARTMENT OF HAWAIIAN HOME LANDS RESIDENTIAL COMMUNITY AND KAMEHAMEHA SCHOOLS LEARNING COMMUNITY [FORMERLY COMPLEX], MĀKAHA, ISLAND OF O'AHU, DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Nishmura;

Thank you for the letter dated July February 9, 2010 (DDC reference number CN.pg (350259)).

We understand that construction plans and relief line timetable should be submitted to the Wastewater Division, at the appropriate stage during the design process.

We further acknowledge your request for project coordination with DDC's Civil Division regarding the ongoing Bayview Street Relief Drain project.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you have any questions regarding this project, please do not hesitate to contact Malia Cox at (808) 521-5631.

Sincerely,

Grant Murakami, AICP, LEED AP
Principal

cc: Mr. Walter Thoemmes, Kamehameha Schools
Mr. Kamuela Cobb-Adams, Department of Hawaiian Home Lands
Mr. Randall Fujiki, The Resort Group

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DEPARTMENT OF FACILITY MAINTENANCE
CITY AND COUNTY OF HONOLULU
1000 Uluohia Street, Suite 215, Kapolei, Hawaii 96707
Phone: (808) 768-3343 • Fax: (808) 768-3381
Website: www.honolulu.gov

MUFI HANNEMANN
MAYOR

JEOFFREY S. CUDIAMAT, P.E.
DIRECTOR AND CHIEF ENGINEER

GEORGE "KEOKI" MIYAMOTO
DEPUTY DIRECTOR

IN REPLY REFER TO:
DRM 10-158

February 26, 2010

Ms. Malia M. Cox
PBR Hawaii & Associates
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Ms. Cox:

Subject: Pre-Consultation for the Proposed Department of Hawaiian Home Lands (DHHL) Residential Community and Kamehameha Schools (KS) Learning Complex, Makaha, Island of Oahu
Draft Environmental Assessment (DEA)

Thank you for the opportunity to review and comment on the DEA pre-consultation for the subject proposed combined residential community and educational complex project.

We have no existing or planned projects that will impact on the proposed DHHL and KS project.

By State statute the City and County of Honolulu will be tasked to maintain only the roadways and associated infrastructure within DHHL residential subdivisions that are constructed to City and County Standards. However, City maintenance responsibility would not include similar improvements within the KS educational complex. Therefore, the DEA should include language regarding maintenance responsibilities for the roadway and associated infrastructure improvements.

Should you have any questions, please call Charles Pignataro of the Division of Road Maintenance, at 768-3697.

Sincerely,

Jeoffrey S. Cudiamat, P.E.
Director and Chief Engineer

PBR HAWAII
& ASSOCIATES, INC.

April 26, 2010

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Fax: (808) 535-3163

Mr. Jeoffrey S. Cudiamat, P.E. Acting Director & Chief Engineer
City and County of Honolulu
Department of Facility Maintenance (DFM)
1000 Uluohia Street, Suite 215
Kapolei, Hawai'i 96707

Attn: Mr. Charles Pignataro

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED DEPARTMENT OF HAWAIIAN HOME LANDS RESIDENTIAL COMMUNITY AND KAMEHAMEHA SCHOOLS LEARNING COMMUNITY [FORMERLY COMPLEX], MĀKAHA, ISLAND OF O'AHU, DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Cudiamat:

Thank you for the response dated February 26, 2010. We acknowledge that DFM has no existing or planned projects that will impact the proposed project.

We understand that by State statute, the City and County of Honolulu will only be tasked to maintain roadways and associated infrastructure constructed to City and County of Honolulu Subdivision Standards within the DHHL residential subdivision. We further understand that such maintenance would not extend to the Kamehameha Schools Learning Community. This will be clarified within the Draft Environmental Assessment.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you need any additional information or have any questions regarding this project, please do not hesitate to contact Malia Cox at (808) 521-5631.

Sincerely,

Grant Murakami, AICP, LEED AP
Principal

cc: Mr. Walter Thoemmes, Kamehameha Schools
Mr. Kamuela Cobb-Adams, Department of Hawaiian Home Lands
Mr. Randall Fujiki, The Resort Group

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LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
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

February 19, 2010

PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Attention: Ms. Malia M. Cox, Environmental Planner

Ladies and Gentlemen:

Subject: Pre-Consultation for Proposed Department of Hawaiian Home Lands Residential Community and Kamehameha Schools Learning Complex

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 comment.

Other than the comments from Division of Forestry & Wildlife, Land Division-Oahu District, Engineering Division, Commission on Water Resource Management, the Department of Land and Natural Resources has no other comments to offer on the subject matter. Should you have any questions, please feel free to call our office at 587-0433. Thank you.

Sincerely,

Charlene E. Unoki
for Morris M. Atta
Administrator

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
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

January 25, 2010

MEMORANDUM

TO: **DLNR Agencies:**
x Div. of Aquatic Resources
Div. of Boating & Ocean Recreation
x Engineering Division
x 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: for Morris M. Atta Charlene
SUBJECT: Pre-Consultation for Proposed DHHL Residential Community and Kamehameha Schools Learning Complex
LOCATION: Island of Oahu
APPLICANT: PBR Hawaii & Associates

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by February 17, 2010.

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 my office at 587-0433. Thank you.

Attachments

( ) We have no objections.
(X) We have no comments.
( ) Comments are attached.

Signed: _____
Date: 1/26/10 BC

PBR HAWAII
& ASSOCIATES, INC.

April 26, 2010

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Fax: (808) 535-3163

Mr. Morris Atta
State of Hawai'i
Department of Land and Natural Resources
Land Division
1151 Punchbowl Street, Room 220
Honolulu, Hawai'i 96813

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED DEPARTMENT OF HAWAIIAN HOME LANDS RESIDENTIAL COMMUNITY AND KAMEHAMEHA SCHOOLS LEARNING COMMUNITY [FORMERLY COMPLEX], MĀKAHA, ISLAND OF O'AHU, DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Atta;

Thank you for the letter dated January 26, 2010. We acknowledge your review of the project and that the Land Division-O'ahu District has no comments to the project.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you need any additional information or have any questions regarding this project, please do not hesitate to contact Malia Cox at (808) 521-5631.

Sincerely,

Grant Murakami, AICP, LEED AP
Principal

cc: Mr. Walter Thoemmes, Kamehameha Schools
Mr. Kamuela Cobb-Adams, Department of Hawaiian Home Lands
Mr. Randall Fujiki, The Resort Group

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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

January 25, 2010

MEMORANDUM

TO: **DLNR Agencies:**
x Div. of Aquatic Resources
_Div. of Boating & Ocean Recreation
x Engineering Division
x 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: for Morris M. Atta Charlene
SUBJECT: Pre-Consultation for Proposed DHHL Residential Community and Kamehameha Schools Learning Complex
LOCATION: Island of Oahu
APPLICANT: PBR Hawaii & Associates

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by February 17, 2010.

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 my office at 587-0433. Thank you.

Attachments

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed: [signature]
Date: 2/11/10

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/Morris Atta
REF: Pre-Consult.ForProposedDHHLResidenCommunity&KamSchoolsLearningComplex Oahu.002

COMMENTS

( ) We confirm that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Flood Zone ___.

(X) Please take note that the project site according to the Flood Insurance Rate Map (FIRM), is located in Zones X and D. The National Flood Insurance Program (NFIP) does not regulate developments within Zone X.

( ) Please note that the correct Flood Zone Designation for the project site according to the Flood Insurance Rate Map (FIRM) is ___.

( ) Please note that the project must comply with the rules and regulations of the National Flood Insurance Program (NFIP) presented in Title 44 of the Code of Federal Regulations (44CFR), whenever development within a Special Flood Hazard Area is undertaken. If there are any questions, please contact the State NFIP Coordinator, Ms. Carol Tyau-Beam, of the Department of Land and Natural Resources, Engineering Division at (808) 587-0267.

Please be advised that 44CFR indicates the minimum standards set forth by the NFIP. Your Community's local flood ordinance may prove to be more restrictive and thus take precedence over the minimum NFIP standards. If there are questions regarding the local flood ordinances, please contact the applicable County NFIP Coordinators below:

( ) Mr. Robert Sumimoto at (808) 523-4254 or Mr. Mario Siu Li at (808) 523-4247 of the City and County of Honolulu, Department of Planning and Permitting.
( ) Mr. Frank DeMarco at (808) 961-8042 of the County of Hawaii, Department of Public Works.
( ) Mr. Francis Cerizo at (808) 270-7771 of the County of Maui, Department of Planning.
( ) Mr. Mario Antonio at (808) 241-6620 of the County of Kauai, Department of Public Works.

(X) The applicant should include project water demands and infrastructure required to meet water demands. Please note that the implementation of any State-sponsored projects requiring water service from the Honolulu Board of Water Supply system must first obtain water allocation credits from the Engineering Division before it can receive a building permit and/or water meter.

( ) The applicant should provide the water demands and calculations to the Engineering Division so it can be included in the State Water Projects Plan Update.

( ) Additional Comments: _____

( ) Other: _____

Should you have any questions, please call Mr. Dennis Imada of the Planning Branch at 587-0257.

Signed: [signature]
CARTY S. CHANG, ACTING CHIEF ENGINEER

Date: 2/11/10

PBR HAWAII
& ASSOCIATES, INC.

April 26, 2010

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Tel: (808) 521-5631
Fax: (808) 535-3163

Mr. Carty S. Chang, Acting Chief Engineer
State of Hawai'i
Department of Land and Natural Resources
Engineering Division
P.O. Box 621
Honolulu, Hawai'i 96809

Attn: Mr. Dennis Imada

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED DEPARTMENT OF HAWAIIAN HOME LANDS RESIDENTIAL COMMUNITY AND KAMEHAMEHA SCHOOLS LEARNING COMMUNITY [FORMERLY COMPLEX], MĀKAHA, ISLAND OF O'AHU, DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Chang,

Thank you for your letter dated February 11, 2010. We offer the following response to your comments.

We acknowledge your assessment that the project is located in Zones X and D and that the National Flood Insurance Program does not regulate developments within Zone X.

We understand that project water demands and required infrastructure should be included in the Draft EA. In addition, we understand that State-sponsored projects must have necessary water allocation credits prior to receiving building permits or a water meter.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you have any questions regarding this project, please do not hesitate to contact Malia Cox at (808) 521-5631.

Sincerely,

Grant Murakami, AICP, LEED AP
Principal

cc: Mr. Walter Thoemmes, Kamehameha Schools
Mr. Kamuela Cobb-Adams, Department of Hawaiian Home Lands
Mr. Randall Fujiki, The Resort Group

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LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
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BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

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January 25, 2010

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STATE OF HAWAII

MEMORANDUM

TO: **DLNR Agencies:**
x Div. of Aquatic Resources
_ Div. of Boating & Ocean Recreation
x Engineering Division
x 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: for Morris M. Atta Charlene
SUBJECT: Pre-Consultation for Proposed DHHL Residential Community and Kamehameha Schools Learning Complex
LOCATION: Island of Oahu
APPLICANT: PBR Hawaii & Associates

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by February 17, 2010.

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 my office at 587-0433. Thank you.

Attachments

(✓) We have no objections.
( ) We have no comments.
( ) Comments are attached.

Signed: R. Chong
Date: 1/26/10

FILE ID: MP. 2486.3
DOC ID: 6050 ✓
6052 ✓

PBR HAWAII
& ASSOCIATES, INC.

April 26, 2010

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Fax: (808) 535-3163

Mr. Ken C. Kawahara, P.E., Deputy Director
State of Hawai'i
Department of Land and Natural Resources
Commission on Water Resource Management (CWRM)
1151 Punchbowl Street, Room 227
Honolulu, Hawai'i 96813

Attn: R.K. Chong

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED DEPARTMENT OF HAWAIIAN HOME LANDS RESIDENTIAL COMMUNITY AND KAMEHAMEHA SCHOOLS LEARNING COMMUNITY [FORMERLY COMPLEX], MĀKAHA, ISLAND OF O'AHU, DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Kawahara;

Thank you for the response dated January 26, 2010. We acknowledge your review of the project and that the CWRM has no objections at this time.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you need any additional information or have any questions regarding this project, please do not hesitate to contact Malia Cox at (808) 521-5631.

Sincerely,

Grant Murakami, AICP, LEED AP
Principal

cc: Mr. Walter Thoemmes, Kamehameha Schools
Mr. Kamuela Cobb-Adams, Department of Hawaiian Home Lands
Mr. Randall Fujiki, The Resort Group

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→ Fire Program –

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
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

January 25, 2010

MEMORANDUM

TO: **DLNR Agencies:**
x Div. of Aquatic Resources
~~Div. of Boating & Ocean~~ Recreation
x Engineering Division
x 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: for Morris M. Atta Charlene
SUBJECT: Pre-Consultation for Proposed DHHL Residential Community and Kamehameha Schools Learning Complex
LOCATION: Island of Oahu
APPLICANT: PBR Hawaii & Associates

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by February 17, 2010.

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 my office at 587-0433. Thank you.

Attachments

( ) We have no objections.
(X) We have no comments.
( ) Comments are attached.

Signed: Paul Conry
Date: 1/27/10

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2010 JAN 28 P 3:31
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

PBR HAWAII
& ASSOCIATES, INC.

April 26, 2010

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Mr. Paul Conry
State of Hawai'i
Department of Land and Natural Resources
Division of Forestry and Wildlife
P.O. Box 621
Honolulu, Hawai'i 96809

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED DEPARTMENT OF HAWAIIAN HOME LANDS RESIDENTIAL COMMUNITY AND KAMEHAMEHA SCHOOLS LEARNING COMMUNITY [FORMERLY COMPLEX], MĀKAHA, ISLAND OF O'AHU, DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Conry;

Thank you for your letter dated January 27, 2010. We acknowledge your review of the project and that the Division of Forestry and Wildlife has no comments at this time.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you need any additional information or have any questions regarding this project, please do not hesitate to contact Malia Cox at (808) 521-5631.

Sincerely,

Grant Murakami, AICP, LEED AP
Principal

cc: Mr. Walter Thoemmes, Kamehameha Schools
Mr. Kamuela Cobb-Adams, Department of Hawaiian Home Lands
Mr. Randall Fujiki, The Resort Group

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DEPUTY DIRECTOR - WATER

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BUREAU OF CONVEYANCES
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CONSERVATION AND COASTAL LANDS
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KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

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

February 7, 2010

Malia Cox
PBR Hawaii
1001 Bishop Street, Suite 650
Honolulu Hawai`i 96813

LOG NO: 2010.0330
DOC NO: 1002NM07
Archaeology

Dear Ms. Cox

SUBJECT: Pre-Consultation on DEA Review –
Mākaha Cultural Learning Center Project, Phase 1
Mākaha Ahupua'a, Wai`anae District, Island of O'ahu
TMK: (1) 8-4-002:014 portion

Thank you for the opportunity to consult with you on this project.

Proposed development associated with the Mākaha Cultural Learning Center includes; restoration of riparian biology and habitat within and along Mākaha Stream, restoration of traditional Hawaiian agricultural practices including taro lo`i, construction of associated support infrastructure including a main building, field shelters, and a trail and roadway network.

The archaeological survey identified four historic properties within the 13 acre parcel. One site SIHP 50-80-07-866 had been previously identified (Green 1969), and three sites, SIHP 50-80-07-6895, 6896, and 6897 were identified during the fieldwork portion of this inventory survey.

Site 6895 (Irrigation Ditch and associated retaining walls) has been assessed as eligible for the State Register of Historic Places under Criteria D. Site 6896 (historic ranching era stone wall) has been assessed as eligible for the State Register of Historic Places under Criteria D. Site 6897 (traditional Hawaiian, pre-contact, agricultural terrace) has been assessed as eligible for the State Register of Historic Places under Criteria D. And Site 866 (Habitation Complex) has been assessed as eligible for the State Register of Historic Places under Criteria A, B and D. We concur with these recommendations.

All four sites are recommended for preservation, in the form of avoidance and protection. We concur with the passive preservation recommendations as well and we concur with the need for a cultural resource preservation plan for the project and the four identified historic properties. Additionally we recommend that a program of archaeological monitoring be conducted in association with grubbing and grading activities, excavation related to building construction, and the installation of underground utilities.

Aloha,

Nancy A. McMahon

Nancy McMahon, Archaeology and Historic Preservation Manager
State Historic Preservation Division

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
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DEPARTMENT OF LAND AND NATURAL RESOURCES

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

January 21, 2010

David Shideler
Cultural Surveys Hawai`i, Inc.
P.O. Box 1114
Kailua Hawai`i 96734

LOG NO: 2009.4675
DOC NO: 1001NM31
Archaeology

Dear Mr. Shideler:

SUBJECT: National Historic Preservation Act - Historic Preservation Review –
Archaeological Inventory Survey for the Ka Pua – Makaha Learning Complex and DHHL Makaha Homestead Development Project
Makaha Ahupua'a, Waianae District, Island of O'ahu
TMK: (1) 9-2 002:006, 9-2-003:079

Thank you for the opportunity to review the aforementioned archaeological inventory survey report (Tulchin, OHare, Shideler and Hammatt 209), which we received on December 11, 2009. The report details the archaeological inventory survey of 303 acres in Makaha Waianae proposed for the development of a learning Complex and Homestead Development. Five new historic properties, State Inventory of Historic Properties (SIHP) #'s 50-80-07-875 [post contact agricultural terrace], 50-80-07-3325 [plantation era flume Mikilua Flume], 50-80-07-7749 [two concrete slab foundations], and 50-80-07-7750 [plantation era ditch], were identified during the survey as well as one site 50-80-07-4818 [a stone mound] that was determined at the time of the survey to not be significant. All of the other sites and features are eligible for the National and State Registers of Historic Properties under criterion 'D' (information relevant to history and/or prehistory). We concur with this determination.

Based on this survey five historic sites were to be impacted by the development. After completion of the this AIS, the five sites have been documented with descriptions, photographs and limited subsurface testing conducted at site 875 and 4818. We agree this has been done. No further archaeological work has been recommended,

This is an acceptable archaeological inventory survey report as satisfying the requirements of Hawai`i Administrative Rules (HAR) Chapter 13-276-5.

Please contact me at (808) 692-8015 if you have any questions or concerns regarding this letter.

Aloha,

Nancy A. McMahon

Nancy McMahon, Archaeology and Historic Preservation Manager
State Historic Preservation Division

PBR HAWAII
& ASSOCIATES, INC.

March 24, 2010

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Ms. Pua Aiu, Administrator
State Historic Preservation Division
601 Kamokila Blvd., #555
Kapolei, Hawai‘i 96707

Attn: Nancy McMahon

SUBJECT: FOLLOW-UP REQUEST FOR SECTION 106 REVIEW AND PRE-CONSULTATION FOR THE PROPOSED DEPARTMENT OF HAWAIIAN HOME LANDS RESIDENTIAL COMMUNITY AND KAMEHAMEHA SCHOOLS LEARNING COMPLEX, MĀKAHA, ISLAND OF O‘AHU (TMK-VARIOUS)
DRAFT ENVIRONMENTAL ASSESSMENT

Dear Ms. Aiu:

We are submitting this follow-up request for clarification and concurrence with our determination of the proposed 297 acre **Department of Hawaiian Home Lands Residential Community and Kamehameha Schools Learning Complex in Mākaha** (subject project) (identified as TMKs (1)8-4-002:005, 007, 056, and 057) and associated off-site infrastructure improvements (identified as TMKs (1)8-4-002:061 (portion), 014 (portion), 070 (portion) and actions within right of ways on Bayview Street, Wai‘anae Valley Road (portion), Pōka‘ī Bay Street, and Farrington Highway (portion)) regarding significant impacts on historic or archaeological site as required by the National Historic Preservation Act (36 CFR 800). This follow-up request is being submitted as we believe that the response we received to the subject project in a letter dated February 7, 2010, Log No 2010.0330, Doc No: 1002NM07 in which SHPD responded to PBR HAWAII on the subject matter, Pre-Consultation on DEA Review-Mākaha Cultural Learning Center Project, Phase I, Mākaha Ahupua‘a, Wai‘anae District, Island of O‘ahu TMK: (1)8-4-002:014 portion was not for the same project, and we respectfully request clarification regarding this matter. As is documented below, we have conducted a review of the project and also respectfully request Section 106 concurrence with our findings.

The following is a summary of actions by SHPD and the project proponent's consultants with regard to the proposed project.

1. On Dec 9, 2009, Cultural Surveys Hawaii (CSH) hand delivered an Intensive AIS of the proposed project site.

2. On January 20, 2010, PBR hand delivered a packet requesting a Section 106 Review and Pre-Consultation for the Proposed Department of Hawaiian Home Lands Residential Community and Kamehameha Schools Learning Complex, Mākaha, Island of O‘ahu Draft Environmental Assessment.

3. In a letter dated January 21, Log No 2009.4675, Doc No: 1001NM31, SHPD responded to CSH, confirming receipt and review of the report. SHPD found the AIS was acceptable and satisfied the requirements of HAR Chapter 13-276-5. We believe this response was for the subject project.

4. In a letter dated February 7, 2010, Log No 2010.0330, Doc No:1002NM07, SHPD responded to PBR HAWAII on the subject matter, Pre-Consultation on DEA Review-Mākaha Cultural Learning Center Project, Phase I, Mākaha Ahupua‘a, Wai‘anae District, Island of O‘ahu TMK: (1)8-4-002:014 portion. After review of this letter, PBR noted inaccuracies in the project location, project name, project acreage, Tax Map parcel numbers, and information contained in the letter, which led us to believe that the proposed letter was referring to a different project.

5. On March 9, 2010, to request clarification on this matter, PBR sent two follow up emails to staff of SHPD requesting clarification. PBR requested that the review conducted by SHPD include all aspects of the project, not just those covered in the AIS. The proposed project will include actions on the 297 acre site covered by the AIS as well as actions along 4,700 linear feet of an existing utility right of way along the coast and approximately 1 acre of BWS land at the 525-foot elevation in Mākaha Valley, and the 1,900 linear foot realignment of Mākaha Valley Road. In addition, PBR stated that after a more thorough review of Doc No: 1002NM07 (SHPD letter dated 1/21/10), the SHPD letter did not appear to reference the proposed **Department of Hawaiian Home Lands Residential Community and Kamehameha Schools Learning Complex, Mākaha, Island of O‘ahu, Draft EA**, but rather a separate project involving a learning center and the restoration of a riparian habitat, also in Mākaha Valley. PBR requested the correct consultation letter be provided.

6. We received a response from staff of SHPD on March 9, 2010, but it still appears that the project referenced in the response is not the same project as the **Department of Hawaiian Home Lands Residential Community and Kamehameha Schools Learning Complex, Mākaha, Island of O‘ahu.** We are still requesting concurrence with the Section 106 determination which was provided in the packet dated January 20, 2010, previously submitted to SHPD.

To help all parties understand the differences between the two projects, a graphic has been prepared showing the location of each project. While they are both in Mākaha Valley, the project we are requesting a review is a 297 acre project that will include up to 600 residential units, a learning complex, modifications to a portion of the existing sewer line and the installation of a potable water reservoir. The other project is a 13 acre learning center conducting a riparian and cultural restoration. We are requesting clarification regarding our project and Section 106 concurrence with our findings.

If you need any additional information or have any questions, please do not hesitate to contact me at (808) 521-5631.

Sincerely,

Malia M. Cox
Environmental Planner

Enclosures: Packet submitted to SHPD by PBR HAWAII on January 20, 2010
SHPD Letter, Log No 2009.4675, Doc No: 1001NM31 (AIS review of proposed project)
SHPD Letter, Log No 2010.0330, Doc No: 1002NM07 (DEA review of other project in Mākaha Valley)
Project Location Comparison graphic

cc: Mr. Walter Thoemmes, Kamehameha Schools
Mr. Kamuela Cobb-Adams, Department of Hawaiian Home Lands

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DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

February 24, 2010

Regulatory Branch

File No. POH-2010-00037

Ms. Malia M. Cox
PBR Hawaii & Assoociates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawai'i 96813

Dear Ms. Cox:

We have received a copy of the letter you sent to U.S. Fish and Wildlife Service dated January 27, 2010 that requested comments for the proposed project to develop 297 acres for a residential community and learning complex at Mākaha, Island of Oahu, Hawai'i. We would like to take this opportunity to also outline Corps Regulatory authorities and permit requirements that may potentially apply to this work. Please note that the project description provided did not include information regarding potential waterbodies on-site that could be impacted so our comments are only general in nature.

Section 10 of the Rivers and Harbors Act (Section 10) of 1899 requires that a Department of the Army (DA) permit be obtained from the U.S. Army Corps of Engineers (Corps) prior to undertaking any construction, dredging, and other activities occurring in, over, or under navigable waters of the U.S. Navigable waters of the United States are those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. The line of jurisdiction is the Mean High Water mark for tidal waters and the Ordinary High Water mark for non-tidal waters.

Section 404 of the Clean Water Act (Section 404) of 1972 (33 U.S.C. 1344) requires that a DA permit be obtained for the discharge (placement) of dredge and/or fill material into waters of the U.S., including wetlands. Waters of the U.S. can include navigable waters, streams, rivers, lakes, wetlands, and drainage features/ditches/gulches. The line of jurisdiction is the Mean Higher High Water mark for tidal waters and the Ordinary High Water mark for non-tidal waters. Wetland boundaries must be delineated using the *Corps of Engineers 1987 Wetland Delineation Manual* and the *Draft Hawaii and Pacific Islands Regional Supplement*.

You may submit a pre-application/jurisdictional determination request if you propose to conduct work in a waterbody. The Corps can then determine what authority, if any, may apply to the waterbody. We also recommend that you include a description of the work proposal so we may determine what regulations, if any, may apply to the work. If the work is determined to be regulated, you will need to submit an application to the Corps and receive authorization prior to

project construction. You may also bypass the pre-application stage and submit an application directly. Additional information regarding the application process is available so please contact us for details.

Should you have any questions regarding this letter or the Regulatory Program, please contact Ms. Amy Klein at (808) 438-7023 or via email at Amy.S.Klein@usace.army.mil.

Sincerely,

George P. Young, P.E.
Chief, Regulatory Branch

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF:

February 3, 2010

Regulatory Branch

File No. : POH-2010-00017

Malia Cox
Environmental Planner
PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, HI 96813

Dear Ms. Cox:

This responds to your pre-consultation request for written comments for a draft Environmental Assessment (dEA) which will address activities and impacts of the proposed Department of Hawaiian Home Lands Residential Community and Kamehameha Schools Learning Complex Project located on 297 acres in parcels identified as TMKs: 184002005, 184002056, 184002057 and 184002007, Waianae, Oahu. The dEA will also address an off-site area for a proposed sewer line improvement

The proposed dEA will be reviewed pursuant to Section 10 of the Rivers and Harbors Act of 1899 (Section 10) and Section 404 of the Clean Water Act (Section 404). Section 10 requires that a Department of Army (DA) permit be obtained for certain structures or work in or affecting navigable waters of the United States (U.S.), prior to conducting the work (33 U.S.C. 403). Navigable waters of the U.S. are those waters subject to the ebb and flow of the tide shoreward to the mean high water mark, and/or other waters identified as navigable by the Honolulu District. In addition, a Section 10 permit is required for structures or work outside this limit if they affect the course, location, or condition of the waterbody as to its navigable capacity.

Section 404 requires that a DA permit be obtained for the placement or discharge of dredged and/or fill material into waters of the U.S., including wetlands, prior to conducting the work (33 U.S.C. 1344). For regulatory purposes, the U.S. Army Corps of Engineers (Corps) defines wetlands as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. The area of Corps jurisdiction under Section 404 extends to the Ordinary High Water Mark (OHWM) for navigable waters other than the Pacific Ocean, and to the upland boundary of any adjacent wetlands.

Initial information indicates that a culvert crossing at `Eku Stream (aka East Makaha Stream) may be modified and that 5 un-named drainage ditch crossings will be required to install a relief sewer line. The dEA should identify and locate those waters of the United States and describe in appropriate sections the potential for them to be impacted by construction of project structures and associated ground disturbing activities. Upon our receipt of the dEA, we will provide an Approved geographic Jurisdictional Determination whether jurisdictional waters of

the U.S. are present and whether a Department of Army (DA) permit for Section 404 activities of the Clean Water Act may, or may not be, required for activities associated with the proposed Department of Hawaiian Home Lands Residential Community and Kamehameha Schools Learning Complex Project.

Thank you for your consideration of potential impacts to the aquatic environment of the Waianae Moku watershed. Please contact Mr. Farley Watanabe of my staff at 438-7701, facsimile 438-4060, or by email at Farley.K.Watanabe@usace.army.mil if you have any questions or need additional information. Please refer to File Number **POH-2010-00017** in any future correspondence with us.

Sincerely,

George P. Young, P.E.
Chief, Regulatory Branch

PBR HAWAII
& ASSOCIATES, INC.

April 26, 2010

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Mr. George P. Young, P.E.
Chief, Regulatory Branch
Department of the Army
Regulatory Branch-CEPOH-EC-R
Building 230
Fort Shafter, Hawai'i 96858-5440

Attention: Mr. Farley Watanabe
Ms. Amy S. Klein

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED DEPARTMENT OF HAWAIIAN HOME LANDS RESIDENTIAL COMMUNITY AND KAMEHAMEHA SCHOOLS LEARNING COMMUNITY [FORMERLY COMPLEX], MĀKAHA, ISLAND OF O'AHU, DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Young,

Thank you for your letters dated February 3, 2010 (reference number POH-2010-00017) and February 24, 2010 (reference number POH-2010-00037). We appreciate seeing coordination between agencies. This coordination is helpful to us in addressing relevant environmental issues. We offer the following responses to your comments.

We understand that the Draft Environmental Assessment (DEA) will be reviewed pursuant to Section 10 of the Rivers and Harbors Act of 1899, and Section 404 of the Clean Water Act, and that Department of Army (DA) permits may be required.

We acknowledge your request for the DEA to identify and locate waters of the United States and also describe their potential to be impacted by construction of project structures and associated ground disturbing activities. These will be included in the DEA per your request.

We further acknowledge that upon receipt of the DEA, the DA will provide an approved geographic Jurisdictional Determination and indicate whether waters of the U.S. are present and if DA permits are required.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you have any questions regarding this project, please do not hesitate to contact Malia Cox at (808) 521-5631.

Sincerely,

Grant Murakami, AICP, LEED AP
Principal

cc: Mr. Walter Thoemmes, Kamehameha Schools
Mr. Kamuela Cobb-Adams, Department of Hawaiian Home Lands
Mr. Randall Fujiki, The Resort Group

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LINDA LINGLE
GOVERNOR

MAJOR GENERAL ROBERT G. F. LEE
DIRECTOR OF CIVIL DEFENSE

EDWARD T. TEIXEIRA
VICE DIRECTOR OF CIVIL DEFENSE

STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE DIRECTOR OF CIVIL DEFENSE
3949 DIAMOND HEAD ROAD
HONOLULU, HAWAII 96816-4495

PHONE (808) 733-4300
FAX (808) 733-4287

February 17, 2010

Ms. Malia M. Cox
Environmental Planner
PBR Hawaii & Associates, Inc
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Ms. Cox:

Pre-consultation, Proposed Department of Hawaiian Home Lands Residential Community, Kamehameha Schools Learning Complex, Draft Environmental Assessment, Makaha, Oahu, Hawaii

Thank you for the opportunity to comment on these developments. After careful review of the project description, maps and diagrams that were provided, we agree with the inclusion of the results of the "Archaeological Inventory Survey"(AIS), as well as those from the concurrent "Cultural Impact Assessment," into the Draft Environmental Assessment (EA). These projects are adjacent to the Eku Stream flood zone, which experienced serious flooding in December 2008 and could again be subject to heavy rains in the future. It is important that emergency plans and procedures are in place to mitigate the potential risks that arise from these types of weather events.

The new reservoir should also be a focus of the EA, with plans developed to address potential dam breaches, evacuations, and emergency road egress for both flooding as well as for wildland fires, which are another type of event for which this area is at high risk.

We anticipate reviewing the Draft Environmental Assessment when it is completed and will make any further appropriate comments or suggestions at that time.

If you have any questions, please call Mr. Richard Stercho, Hazard Mitigation Planner, at (808) 733-4300, extension 583.

Sincerely,

EDWARD T. TEIXEIRA
Vice Director of Civil Defense

c: Mr. Walter Thommes, Kamehameha Schools
Mr. Kamuela Cobb-Adams, Department of Hawaiian Home Lands

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April 26, 2010

Edward T. Teixeira, Vice Director
State of Hawai'i
Office of the Director of Civil Defense
3949 Diamond Head Road
Honolulu, Hawai'i 96816-4495

Attn: Mr. Richard Stercho, Hazard Mitigation Planner

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED DEPARTMENT OF HAWAIIAN HOME LANDS RESIDENTIAL COMMUNITY AND KAMEHAMEHA SCHOOLS LEARNING COMMUNITY [FORMERLY COMPLEX], MĀKAHA, ISLAND OF O'AHU, DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Teixeira;

Thank you for your letter dated February 17, 2010. We offer the following responses to your comments.

We acknowledge your assessment that the project is adjacent to the 'Eku Stream flood zone which experienced flooding in December 2008, and that plans and procedures should be in place to mitigate potential risks that may arise from this type of event.

We acknowledge your request that the new reservoir should be a focus within the Draft Environmental Assessment (EA) with regard to emergencies from fires and flooding.

Natural hazards such as flooding and wildfires will be addressed within the Draft EA.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you need any additional information or have any questions regarding this project, please do not hesitate to contact Malia Cox at (808) 521-5631.

Sincerely,

Grant Murakami, AICP, LEED AP
Principal

cc: Mr. Walter Thoemmes, Kamehameha Schools
Mr. Kamuela Cobb-Adams, Department of Hawaiian Home Lands
Mr. Randall Fujiki, The Resort Group

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LINDA LINGLE
GOVERNOR

PATRICIA HAMAMOTO
SUPERINTENDENT

STATE OF HAWAI'I
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAI'I 96804

OFFICE OF THE SUPERINTENDENT

April 5, 2010

Ms. Malia M. Cox, Environmental Planner
PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Ms. Cox:

Subject: Pre-Consultation for the Proposed Department of Hawaiian Home Lands Residential Community and Kamehameha Schools Learning Complex, Makaha, Oahu

The Department of Education (DOE) would like to clarify its February 9, 2010 letter sent in response to a pre-consultation request for the proposed Department of Hawaiian Home Lands (DHHL) residential community and Kamehameha Schools (KS) learning complex in Makaha.

In a letter dated September 29, 2009, the DOE indicated that we do not expect Makaha to be designated as part of a school impact fee district, and we do not expect the proposed Makaha DHHL residential community to require a new school. The letter did state that we expect 252 K-6 students, 92 7-8 students, and 76 9-12 students from this project.

In the February 9, 2010 letter, the DOE indicated that it would expect this project to have an impact on its facilities and requested information about the learning complex that is part of the school.

The DOE does expect that this number of students would impact its facilities in Makaha and Waianae. Recent facility enrollment and capacity information are shown below.

	2009-10 Enrollment	2008-9 Capacity
Makaha Elementary	580	656
Waianae Intermediate	875	1093
Waianae High	1909	1902

As the project is not in a school impact fee district, the DOE does not currently expect the project to pay school impact fees to offset this impact. The DOE requests information about the KS learning complex in this project so it can determine if the KS complex will reduce the impact the project will have on the DOE's facilities.

If you have any questions, please call Jeremy Kwock of the Facilities Development Branch at 377-8301.

Very truly yours,

Kathryn S. Matayoshi
Interim Superintendent

KSM:jmb

c: Randolph Moore, Assistant Superintendent, OSFSS
Lisa DeLong, CAS, Nanakuli/Waianae Complex Areas

AN AFFIRMATIVE ACTION AND EQUAL OPPORTUNITY EMPLOYER

LINDA LINGLE
GOVERNOR

~~PATRICIA HAMAMOTO~~
~~XXXXXXXXXXXXXXXXXX~~
KATHRYN S. MATAYOSHI
INTERIM SUPERINTENDENT

STATE OF HAWAI'I
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAI'I 96804

OFFICE OF THE SUPERINTENDENT

February 9, 2010

Ms. Malia M. Cox, Environmental Planner
PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawai`i 96813-3484

Dear Ms. Cox:

Subject: Pre-Consultation for the Proposed Department of Hawaiian Home Lands Residential Community and Kamehameha Schools Learning Complex, Makaha, Oahu

The Department of Education (DOE) has reviewed the pre-consultation request for the proposed Department of Hawaiian Home Lands (DHHL) residential community and Kamehameha Schools (KS) learning complex in Makaha.

The DOE expects that the proposed 600-unit single-family DHHL residential community in this project will impact its educational facilities in Waianae.

The DOE requests additional information on the programs that will be offered at the KS learning complex. The pre-consultation request mentions a preschool. Are there plans for a permanent elementary, middle, or high school within the project?

Thank you for the opportunity to provide comments. If you have any questions, please call Jeremy Kwock of the Facilities Development Branch at 377-8301.

Very truly yours,

Kathryn S. Matayoshi
Interim Superintendent

KSM:jmb

c: Randolph Moore, Assistant Superintendent, OSFSS
Lisa DeLong, CAS, Nanakuli/Waianae Complex Area

AN AFFIRMATIVE ACTION AND EQUAL OPPORTUNITY EMPLOYER

LINDA LINGLE
GOVERNOR

PATRICIA HAMAMOTO
SUPERINTENDENT

STATE OF HAWAI'I
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAI'I 96804

OFFICE OF SCHOOL FACILITIES AND SUPPORT SERVICES

[redacted]

September 29, 2009

Mr. Grant Murakami, Principal
PBR Hawaii & Associates
1001 Bishop Street, Suite 650
Honolulu, Hawai`i 96813

Dear Mr. Murakami:

Subject: Student Generation Rates for Makaha Project

As you requested, the Department of Education has calculated the following student generation rates for the Makaha project:

	SF
K-6	0.420
7-8	0.154
9-12	0.126

For the proposed 600 single-family unit project, the students generated are 252 K-6 students, 92 7-8 students, and 76 9-12 students.

At this time, we do not expect this area to be designated as part of a school impact fee district. We also do not expect that a new school would be required within the proposed development.

Should you have any questions, please call Jeremy Kwock of the Facilities Development Branch at 377-8301.

Sincerely yours,

Duane Y. Kashiwai
Public Works Administrator
Facilities Development Branch

DYK:jmb

AN AFFIRMATIVE ACTION AND EQUAL OPPORTUNITY EMPLOYER

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& ASSOCIATES, INC.

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Tel: (808) 521-5631
Fax: (808) 535-3163

April 26, 2010

Ms. Kathryn S. Matayoshi, Interim Superintendent
State of Hawai'i
Department of Education
P.O. Box 2360
Honolulu, Hawai'i 96804

Attn: Mr. Jeremy Kwock

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED DEPARTMENT OF HAWAIIAN HOME LANDS RESIDENTIAL COMMUNITY AND KAMEHAMEHA SCHOOLS LEARNING COMMUNITY [FORMERLY COMPLEX], MĀKAHA, ISLAND OF O'AHU, DRAFT ENVIRONMENTAL ASSESSMENT

Dear Ms. Matayoshi;

Thank you for your letters dated September 29, 2009, February 9, 2010 and April 5, 2010. We appreciate the clarifications provided. We offer the following responses to your comments.

We acknowledge your assessment of the proposed DHHL Residential Community portion of the proposed project impacts on Department of Education (DOE) facilities in Mākaha and Wai'anae. We understand that the DOE does not currently expect the project to pay school impact fees to offset any impacts.

We acknowledge your request for additional information regarding how the Kamehameha Schools Learning Community may offset or reduce the project's impact on DOE facilities. This has been relayed to the client team.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you need any additional information or have any questions regarding this project, please do not hesitate to contact Malia Cox at (808) 521-5631.

Sincerely,

Grant Murakami, AICP, LEED AP
Principal

cc: Mr. Walter Thoemmes, Kamehameha Schools
Mr. Kamuela Cobb-Adams, Department of Hawaiian Home Lands
Mr. Randall Fujiki, The Resort Group

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LINDA LINGLE
GOVERNOR

BRENNON T. MORIOKA
DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI
JIRO A. SUMADA

IN REPLY REFER TO:
DIR 0087
STP 8.0041

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

February 22, 2010

Ms. Malia M. Cox
PBR HAWAII & Associates, Inc.
1001 Kamokila Boulevard
Kapolei Building, Suite 313
Kapolei, Hawaii 96707-2005

Dear Ms. Cox:

Subject: Department of Hawaiian Home Lands Residential Community and Kamehemeha Schools Learning Complex, Makaha
Pre-Consultation for Draft Environmental Assessment (DEA)

Thank you for requesting the State Department of Transportation's (DOT) review of the subject project, which proposes to develop 600 single-family homes, a community/commercial center and a cultural landscape area on 230 acres in Makaha approximately 1.5 miles mauka of the State highway (Farrington Highway). The project will include off-site modification of the existing sewage conveyance system which includes a new 4,700 linear feet of sewer relief line adjacent to the existing sewer line in Farrington Highway between Waianae Valley Road and the existing Waianae Wastewater Treatment Facility.

Given the project location, Farrington Highway, will be impacted. DOT offers the following comments:

1. Farrington Highway, Route 93, is classified as a principal arterial, intended to provide efficient, safe and fast transportation between regions. While it is under State jurisdiction, it is also a Department of Defense highway and is part of the National Highway System. Further, it is the only continuous public road connecting Ewa district with Waianae and Makaha districts.

2. A Traffic Impact Analysis Report (TIAR) is required for DOT Highways Division's review and approval. The TIAR must analyze the proposed project's local and regional impacts to Farrington Highway at full build out and recommend mitigation measures to be provided at no cost to the State.

Ms. Malia M. Cox
Page 2
February 22, 2010

STP 8.0041

3. Auxiliary lane improvements and changes to the traffic signal timing may be required at the Farrington Highway intersection with Waianae Valley Road to mitigate the resulting increase in peak hour traffic.

4. The TIAR analysis and recommended mitigation must consider bicyclists and pedestrians, especially those who may walk or bicycle to school.

5. Phasing of the project and any required improvements in the State highway right-of-way should be described in the Draft Environmental Impact Statement (DEIS), and the TIAR mitigation measures.

6. The proposed sewer relief line in the Farrington Highway right-of-way should be placed out of the travel way and as close to the right-of-way line as possible.

7. Improvements within the State highway right-of-way must be planned, designed and constructed to meet current State requirements. A permit is required for work within the State highway right-of-way and construction plans must be submitted to DOT Highways Division for review and approval. Construction plans must include a traffic control plan for all work in the State highway right-of-way. All plans for improvements within the State right-of-way shall conform to Hawaii Statewide Uniform Design Manual for Streets and Highways, the Specifications for Installation of Miscellaneous Improvements within State Highways and the Americans with Disabilities Act (ADA).

8. No additional storm water runoff will be permitted in the State highway right-of-way. The applicants shall comply with the National Pollutant Discharge Elimination System (NPDES) permit requirements for construction activity disturbing one (1) or more acres.

DOT appreciates the opportunity to provide comments and requests four copies of the DEA when it is available. If there are any questions, including a need to discuss the highway impacts with Highways Division staff, please contact Mr. David Shimokawa of the DOT Statewide Transportation Planning Office at telephone number (808) 587-2356.

Very truly yours,

Francis Paul Keeno

BRENNON T. MORIOKA, Ph.D., P.E.
Director of Transportation

SLP:km

bc: HWY, HWY-P(PS 10-025), HWY-R, HWY-T, STP(SLP)

PBR HAWAII
& ASSOCIATES, INC.

April 26, 2010

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Fax: (808) 535-3163

Mr. Brennon T. Morioka, Director
State of Hawai'i
Department of Transportation
869 Punchbowl Street, Room 404
Honolulu, Hawai'i 96813-5097

Attn: Mr. David Shimokawa

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED DEPARTMENT OF HAWAIIAN HOME LANDS RESIDENTIAL COMMUNITY AND KAMEHAMEHA SCHOOLS LEARNING COMMUNITY [FORMERLY COMPLEX], MĀKAHA, ISLAND OF O'AHU, DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Morioka;

Thank you for your letter dated February 22, 2010 (your reference number DIR0087, STP8.0041). We offer the following responses to your comments.

We acknowledge your assessment that Farrington Highway, Route 93 is classified as a principal arterial that is also a Department of Defense highway and is part of the National Highway System. We further acknowledge your assessment that Farrington Highway is the only continuous public road connecting 'Ewa district with the Wai'anae and Mākaha Districts.

We understand that a Traffic Impact and Analysis Report (TIAR) should be submitted for review and approval. A report has been prepared for the project. The project proponent and their engineering team have been notified of your request for review.

We acknowledge your assessment that auxiliary lane improvements and traffic signal timing may be required[1].

We acknowledge your request that phasing be included within the Draft Environmental Assessment[2] (Draft EA) and in the TIAR mitigation measures. Per your request, phasing has been included in both documents.

[1] On February 23, 2010, PBR HAWAII clarified with Mr. Elton Teshima that the intersection that may require improvements is Mākaha Valley Road and Farrington Highway rather than Wai'anae Valley Road and Farrington Highway as stated in the letter.
[2] On February 23, 2010, PBR HAWAII clarified with Mr. Elton Teshima that the project proponent was proposing submission of a Draft Environmental Assessment, rather than an Environmental Impact Statement as was stated in the letter. Mr. Teshima concurred that the submission of a Draft EA was acceptable.

We acknowledge your recommendation that the sewer relief line be placed out of the travel way and as close to the right-of-way as possible. The project proponent and their engineering team are working with the City and County of Honolulu in the siting of the relief line. Where possible, based on site constraints, the relief line will be placed out of the travel way. In addition, appropriate permits (including NPDES permits), construction and traffic control plans will be applied for and submitted for work within State right-of-ways. In addition, improvements within State right-of-ways will also conform to the *Hawaii Statewide Uniform Design Manual for Streets and Highways, the Specifications for Installation of Miscellaneous* Improvements within State Highways and the Americans with Disabilities Act.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you need any additional information or have any questions regarding this project, please do not hesitate to contact Malia Cox at (808) 521-5631.

Sincerely,

Grant Murakami, AICP, LEED AP
Principal

cc: Mr. Walter Thoemmes, Kamehameha Schools
Mr. Kamuela Cobb-Adams, Department of Hawaiian Home Lands
Mr. Randall Fujiki, The Resort Group

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DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 7TH FLOOR • HONOLULU, HAWAII 96813
TELEPHONE: (808) 768-8000 • FAX: (808) 768-6041
DEPT. WEB SITE: www.honoluludpp.org • CITY WEB SITE: www.honolulu.gov

MUFI HANNEMANN
MAYOR

DAVID K. TANOUE
DIRECTOR

ROBERT M. SUMITOMO
DEPUTY DIRECTOR

2010/ELOG-147 (BLB)

April 1, 2010

Ms. Malia M. Cox
PBR Hawaii & Associates
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813

Dear Ms. Cox:

Subject: Department of Hawaiian Home Lands (DHHL) Residential Community and Kamehameha Schools Community Learning Complex
84-627 Makaha Valley Road - Makaha
Tax Map Keys 8-4-2: 5, 7, 56, and 57

This responds to your request, received January 22, 2010, for pre-consultation comments concerning the preparation of a Draft Environmental Assessment (EA) for the subject proposed residential community and learning complex in Makaha. We understand that this DHHL project will consist of the development of approximately 600 single-family dwellings, a community and commercial center, a cultural landscaped area of about 230 acres, and a Kamehameha Schools (KS) learning complex of over 250,000 square feet which will involve educational resources, a pre-school, educational labs, multi-learning halls, a multi-media learning center, outdoor multi-functional sports fields, a community gathering area, and Hawaiian gardens. Our preliminary comments are as follows:

A. Planning Division (Community Planning Branch)

1. The EA should include a detailed discussion of the proposed project's consistency with both the current Waianae Sustainable Communities Plan (SCP) and the Public Review Draft of the Revised Waianae SCP, which is available online at the following website:

http://honoluludpp.org/Planning/Waianae/Waianae5yr/WaianaePRD10.1.08.pdf.

2. Key points which should be discussed in the EA include, but are not necessarily limited to:

   a. How the project's population increase will compare with the region's population distribution projections, pursuant to the City's General Plan;

   b. The project's contribution to improving the regional transportation system; and

Post-it® Fax Note 7671	Date 4/1/2010	# of pages ▶ 11
To Malia M. Cox	From DPP	
Co./Dept.	Co. C&C	
Phone #	Phone # 768 8015	
Fax # 523 1402	Fax # 768 6743	

   c. How the project will be designed to protect open space and important views, affordability of the homes to meet area residents' needs, and retention of the area's rural ambiance.

3. The EA should describe how the project compares with the findings of the Makaha Special Area Plan (SAP), the objective of which is to address cultural preservation, appropriate and feasible development of the undeveloped residential-zoned lands, and to balance economic development of Makaha Valley with the overall vision of the Waianae region, which emphasizes preservation of agriculture and open spaces. Key discussion points which should be addressed include, but are not necessarily limited to:

   a. Consistency with the "Rural Development Concept" expressed in the Makaha SAP;

   b. Low density residential and resort development policies;

   c. Improvements to the area's transportation, sewage, and drainage system facilities; and

   d. Agricultural buffer zones and open space preservation.

   The Makaha SAP is available online at the following website:

   http://honoluludpp.org/Planning/Makaha/MakahaSAP.pdf.

4. Other points for discussion in the EA should include:

   a. How the project will address impacts to surrounding roadways such as Kili Drive;

   b. A description of the various uses involved with the "cultural landscape" proposal;

   c. Alternatives, such as combining the proposed DHHL service area with the proposed commercial center; and

   d. How park dedication requirements will be met.

For any questions concerning the Community Planning Branch's comments, please contact Raymond Young at 768-8049.

B. Land Use Permits Division

1. The Attorney General opinion of August 6, 1992 clearly states that lands under the jurisdiction of the DHHL may be exempt from county zoning and Special Management Area (SMA) permits and processes, at the discretion of the DHHL. Upon receipt of a letter from the DHHL exempting the subject site from Land Use Ordinance (LUO) and SMA requirements, the DPP will relinquish authority concerning all matters pertaining to zoning and/or SMA issues for the subject properties.

2. The approximately 67 acres of KS lands being slated for a community learning complex are in the R-20 Residential District; and, are subject to all LUO regulations and development standards. Based on our current understanding of the information provided so far, the proposed KS learning center will require a Conditional Use Permit (CUP, minor) to allow both "meeting facility" and "day-care facility" uses. However, additional information and detailed descriptions of these particular uses (especially with regard to the proposed "P-20" educational system) are needed before a definitive determination can be rendered regarding the specific type(s) of conditional use involved. We have enclosed a copy of our filing instructions for a CUPm, as well as a Land Use Permits Division Master Application Form, for your reference.

3. Lastly, 4,700 linear feet of relief line for the sewage conveyance system is proposed to take place along the existing right-of-way on Bayview Street, a portion of Waianae Valley Road, Pokai Bay Street, and a portion of Farrington Highway. The area encompassing the proposed modifications to the sewer system is within the SMA. The project, however, is exempt from the SMA process under ROH Section 25-1.3 D:

   The repair and maintenance of underground utility lines, including but not limited to water, sewer, power and telephone and minor appurtenant structures such as pad mounted transformers and sewer pump stations.

For any questions concerning LUPD comments, please contact Blake La Benz of our staff at 768-8016.

Thank you for providing us with this opportunity to comment on the proposed project.

Very truly yours,

for David K. Tanoue, Director
Department of Planning and Permitting

DKT:cs
Encls.

CITY AND COUNTY OF HONOLULU
DEPARTMENT OF PLANNING & PERMITTING
650 South King Street
Honolulu, Hawaii 96813

LAND USE PERMITS DIVISION MASTER APPLICATION FORM

Additional data, drawings/plans, and fee requirements are listed on a separate sheet titled "Instructions for Filing". *PLEASE ASK FOR THESE INSTRUCTIONS.*

All specified materials described in the "Instructions for Filing" and required fees must accompany this form; incomplete applications will delay processing. You are encouraged to consult with Zoning Division staff in completing the application. Please call the appropriate phone number given in the "Instructions for Filing."

Please print legibly or type the required information.

SUBMITTED FEE: $_____

PERMIT/APPROVAL REQUESTED (Check one or more as appropriate):

Cluster:
☐ Agricultural
☐ Country
☐ Housing

Conditional Use Permit:
☐ Minor ☐ Major

☐ **Existing Use:** _____ (Indicate Type of Use)

☐ **Minor Shoreline Structures Permit**

☐ **Modify Approved Permit:** _____ (Indicate Reference File No.)

☐ **Plan Review Use**

Planned Development:
☐ Housing
☐ Commercial (WSD Only)
☐ Resort (WSD Only)

☐ **Shoreline Setback Variance**

Special District Permit:
☐ Minor ☐ Major
_____ (Indicate District)

☐ **Downtown Height >350 Feet**

Special Management Area Use Permit:
☐ Minor ☐ Major

☐ **Variance from LUO Sec.(s):** _____

☐ **Waiver from LUO Sec.(s):** _____

☐ **Zoning Adjustment, LUO Sec.(s):** _____

☐ **201G Project**

TAX MAP KEY(S): _____
LOT AREA: _____ **STATE LAND USE DISTRICT:** _____
ZONING DISTRICT(S): _____
STREET ADDRESS/LOCATION OF PROPERTY: _____

RECORDED FEE OWNER:
Name (& title, if any) _____
Mailing Address _____
Phone Number _____
Signature _____

APPLICANT:
Name _____
Mailing Address _____
Phone Number _____
Signature _____

PRESENT USE(S) OF PROPERTY/BUILDING: _____

AUTHORIZED AGENT/CONTACT PERSON:
Name _____
Mailing Address _____
Phone Number _____
Signature _____

PROJECT NAME (if any): _____

REQUEST/PROPOSAL (Briefly describe the nature of the request, proposed activity or project): _____

CITY AND COUNTY OF HONOLULU
DEPARTMENT OF PLANNING AND PERMITTING

Conditional Use Permit (Minor)
Meeting Facility
Day-Care Facility
School: Elementary, Intermediate and High

Application Instructions

This document is intended to assist you in preparing a complete application and should be read in conjunction with the Land Use Ordinance (LUO).

I. Overview

A. Potential Public Hearing. Conditional use permits for the above uses MAY require a public hearing; this will be determined by the Director. In the event such a hearing is deemed necessary, the public notification requirements on page 6 must be met.

B. Time Frame. The time frame for processing this permit is 45 days from acceptance of a completed application, unless the Director determines that a public hearing is required for the proposed project. In such cases, the processing time shall be 90 days from the date of application acceptance. If the DPP fails to process the permit within the required time frame, the permit shall be deemed approved.

II. Pre-Application Procedures

A. Pre-Application Meeting. Prior to submitting the application, the applicant is encouraged to meet with DPP staff to review the project. Please call 768-8014 to schedule a meeting.

B. Presentation to Neighborhood Board. Prior to submitting the application, the applicant must also **present** the project to the neighborhood board of the district where the site is located, or if no such neighborhood board exists, then to an appropriate community association. The applicant must provide written notice of the presentation to all adjoining property owners.

This requirement will be deemed to have been satisfied if either:

A. The neighborhood board (or community association if applicable) fails to provide an opportunity to present the proposed project at a meeting held within 60 days of the date of the written request to make a presentation; **or**

B. The neighborhood board (or community association if applicable) submits a letter confirming that a presentation was made and describing the position of the Board, or stating that such a presentation is not necessary.

In the event that the neighborhood board does not submit a letter, the applicant may submit a copy of the board's minutes which documents that the presentation was made.

Please contact the Neighborhood Commission at 768-3710 for information concerning the appropriate neighborhood board and contact person for the project.

III. Application Requirements

A. DPP Master Application. Complete and submit the DPP Land Use Permits Division Master Application Form. Provide all requested information.

B. Fees. Submit a non-refundable fee of $300 payable to the City and County of Honolulu.

C. Affidavit. Submit a notarized affidavit confirming that adjoining property owners were sent written notification of the required neighborhood board presentation.

D. Written Statement. Your application package must include two copies of the following material. If you are submitting a multi-permit application, please submit two copies for each permit.

Upon completion of the DPP's initial review of your submittal, you will be notified of the number of ADDITIONAL copies required for agency and community review and comment.

The written statement must address the following issues:

1. Site Description. Describe the project site, including topography, abutting uses, and a brief history of the uses of the site, up to the present.

2. Project Description. Describe the proposed project, including the following if applicable:

   a. Details on existing and proposed uses and activities, such as hours of operation, number of clients and staff and use and number of structures.

   b. Details on existing and proposed structures, building and site alterations, including parking areas, grading and landscaping. Provide information on building heights, setbacks and buffering from adjoining parcels.

3. Infrastructure. Describe infrastructure requirements for the project, including the following if applicable (preliminary checks with the appropriate agency are encouraged):

   a. Wastewater disposal

      Contact DPP, Wastewater Branch at 768-8197 or State Department of Health at 586-4294.

   b. Water facilities

      Contact Board of Water Supply, Project Review Section at 748-5440.

   c. Traffic and parking

      A traffic impact analysis may be required. Contact DPP, Traffic Review Branch at 768-8077 and/or State Department of Transportation for details.

4. Neighborhood Board. Describe all issues or concerns relating to the project raised at the presentation to the neighborhood board or community association. Describe the measures, if any, taken to mitigate such issues or concerns.

5. Other Impacts. Describe any other expected project impacts and proposed mitigative measures to address such impacts including the following, if applicable:

   a. Public services

      (1) Refuse collection

      (2) Fire protection

      (3) Police services

      (4) Schools

   b. Physical environment

      (1) Natural landforms

      (2) Public views

      (3) Natural habitats

      (4) Historic sites

      (5) Flood Hazard

   c. Housing and Population

   d. Employment

   e. Parks and recreation

   f. Community concerns

   g. Other impacts (i.e. noise, lights, dust, odor)

6. Justification.

   a. Explain how the proposed project will comply with the following general requirements for conditional uses:

      (1) The proposed use is permitted as a conditional use in the underlying zoning district and conforms to the requirements of the LUO;

      (2) The site is suitable for the proposed use considering size, shape, location, topography, infrastructure and natural features;

(3) The proposed use will not alter the character of the surrounding area in a manner substantially limiting, impairing or precluding the use of surrounding properties for the principal uses permitted in the underlying zoning district; and

(4) The use at its proposed location will provide a service or facility which will contribute to the general welfare of the community-at-large or surrounding neighborhood.

b. Explain how the project will comply with the specific development standards for the applicable conditional use category (refer to LUO Article 5) and the district development standards for the applicable zoning district (refer to LUO Article 3).

E. Drawings/Plans. Submit the following drawings and/or plans applicable to the project. All drawings/plans must be black line prints, drawn to scale and prepared by a draftsman, architect, engineer, or similar professional. For document imaging purposes, one (1) set of drawings shall be a maximum size of 11" x 17" and the second should not exceed 24" x 36". DPP staff may request additional copies after acceptance of the application.

1. Site Plan. Two (2) copies of a site plan drawn to scale, showing existing and proposed structures, including fences and walls. In addition, the site plan should also show the following:

a. Existing structures to be removed and/or modified.

b. On-site traffic circulation patterns and access.

c. Details of parking areas, including dimensions of parking and loading stalls and maneuvering areas.

d. Details for each existing and proposed structure, including building heights, setbacks from property lines, floor area and building area.

2. Building Plans. Detailed plans for all new structures, including the following:

a. Building elevations and section drawings which show finish and existing grades, and setbacks from property lines.

b. Floor plans, including the dimensions of rooms/habitable areas and activity areas.

3. Landscape Plans. Landscape plans indicating the following:

a. Sizes, locations and quantifies of existing and proposed landscaping, including plantings to be removed.

b. Type or kind of plant material by typical name.

c. Details of irrigation system.

F. Photos. Submit photos of the project site showing the following:

1. Street access (ingress and egress) to the project site;

2. Uses on adjoining properties; and

3. Building setbacks from property lines, distances to neighboring buildings, parking areas, and other uses, on the site.

(Note: all photos should be labeled and keyed to a general site map.)

PUBLIC NOTIFICATION AND PUBLIC HEARING. In the event that the Director deems a public hearing to be necessary for the project, the applicant must comply with the notification requirements of LUO Sec. 21-2.40-2(c)(2) (Notice of Pending Permit Sign) and Sec. 21-2.40-2(c)(3) (Notification of owners of property within 300 feet).

Note: All scaled plans and drawings **must** include a graphic ("bar") scale in addition to or in lieu of a verbal scale.

Note: ELECTRONIC DOCUMENT SUBMITTALS: Electronic document submittals shall adhere to the following specified formats: PDF, JPEG, Word (preferred for text documents) or Wordperfect 8. Electronic documents **must** be submitted on either CD (preferred) or 3.5-inch floppy disk. ALL maps, drawings and/or plans **must** be drawn to an appropriate scale, and **must** include a graphic ("bar") scale accurately representing the applicable scale of the document.

For further assistance or information on how to complete the application, please call the DPP at 768-8014.

CONDITIONAL USE PERMIT (MINOR)
MEETING FACILITY
DAY-CARE FACILITY
SCHOOL: ELEMENTARY, INTERMEDIATE AND HIGH

APPLICATION CHECK LIST

1.	Pre-Application meeting with DPP	
2.	Neighborhood Board (NB) Presentation (letter or meeting minutes attached; or copy of applicant's request to NB if no presentation opportunity provided)	
3.	Master Application Form	
4.	Fees	
5.	Affidavit (confirming Notification of Adjoining Property Owners of NB Presentation, and list of those notified)	
6.	Written Statement (2 copies)	
7.	Drawings/Plans - 2 sets drawn to scale, 1 set max. 11" x 17" and 2nd set max. 24" x 36"	
	Site Plans	
	Building/Floor Plans	
	Landscape Plans	
8.	Photos (labeled and keyed to a general site map)	

*Note: This list is intended as a general reference for applicants. Please refer to the attached permit instruction sheets for **complete** application requirements.

The adequacy/completeness of application submittals for acceptance will be determined by the DPP within 10 working days of application submittal.

PBR HAWAII
& ASSOCIATES, INC.

April 26, 2010

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Mr. David K. Tanoue, Director
City and County of Honolulu
Department of Planning and Permitting
630 South Beretania Street
Honolulu, Hawai'i 96813

Attn: Mr. Raymond Young, Community Planning Branch
Mr. Blake La Benz, Land Use Permits Division

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED DEPARTMENT OF HAWAIIAN HOME LANDS RESIDENTIAL COMMUNITY AND KAMEHAMEHA SCHOOLS LEARNING COMMUNITY [FORMERLY COMPLEX], MĀKAHA, ISLAND OF O'AHU, DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Tanoue,

Thank you for your letter dated April 1, 2010 (your reference number 2010/ELOG-147(BLB)). We offer the following responses to your comments.

We acknowledge your request that the Draft Environmental Assessment (Draft EA) include a discussion of the following:

- Consistency with the current WSCP, and the draft currently under public review
- DHHL Residential Community project population relative to projections
- Regional transportation
- Protection of open space, views, home affordability, and retention of existing area character
- The Mākaha Special Area Plan
- Project impacts to surrounding roadways
- Proposed uses involved in the "cultural landscape"
- Alternatives
- Park dedication

We acknowledge your assessment that the Attorney General opinion of August 6, 1992, clearly states that DHHL may be exempt from county zoning, Special Management Area (SMA) permits and processes and that DPP will relinquish authority concerning all matters pertaining to zoning and/or SMA issues to DHHL.

We acknowledge your assessment that the Kamehameha Schools (KS) Learning Community [formerly Complex] proposed within a R-20

Residential District is subject to all Land Use Ordinance regulations and standards. In addition, we acknowledge your assessment, based on the information provided, that the KS Learning Community will require a Conditional Use Permit, minor. We understand that additional information regarding "P-20" educational system is necessary for a definitive determination regarding the specific type of conditional use.

We acknowledge your assessment that while the 4,700 linear foot relief line is located within the SMA, it is exempt from the SMA process under ROH §25-1.3.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you need any additional information or have any questions regarding this project, please do not hesitate to contact Malia Cox at (808) 521-5631.

Sincerely,

Grant Murakami, AICP, LEED AP
Principal

cc: Mr. Walter Thoemmes, Kamehameha Schools
Mr. Kamuela Cobb-Adams, Department of Hawaiian Home Lands
Mr. Randall Fujiki, The Resort Group

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DEPARTMENT OF PARKS AND RECREATION
CITY AND COUNTY OF HONOLULU
1000 ULUOHIA STREET, SUITE 309 • KAPOLEI, HAWAII 96707
TELEPHONE: (808) 768-3003 • FAX: (808) 768-3053 • CITY WEB SITE: www.honolulu.gov

MUFI HANNEMANN
MAYOR

LESTER K. C. CHANG
DIRECTOR

RICHARD HARU
DEPUTY DIRECTOR

March 9, 2010

Ms. Malia M. Cox
Environmental Planner
PBR Hawaii & Associates Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813

Dear Ms. Cox:

Subject: DRAFT ENVIRONMENTAL ASSESSMENT PRE-CONSULTATION FOR THE PROPOSED DEPARTMENT OF HAWAIIAN HOME LANDS RESIDENTIAL COMMUNITY AND KAMEHAMEHA SCHOOLS LEARNING COMPLEX, MAKAHA, ISLAND OF OAHU

Thank you for the opportunity to review and comment at the pre-consultation stage of the Draft Environmental Assessment for the Hawaiian Home Lands Residential Community and Kamehameha Schools Learning Complex Project.

The Department of Parks and Recreation considers the proposed walking/bicycle path inadequate to support the park and recreation needs of a new 600 unit residential development in Makaha. We encourage the developer to expand the area dedicated to park and recreational activities to at least the minimum required under the City and County of Honolulu's Park Dedication Ordinance.

We request the developers provide us an opportunity to inform them of the park and recreational facilities that we believe are necessary to support the residential element of this development. Please have them contact my office at 768-3001, to schedule an appointment.

Should you have any questions, please contact Mr. John Reid, Planner, at 768-3017.

Sincerely,

LESTER K. C. CHANG
Director

LKCC:jr
(350321)

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April 26, 2010

Mr. Lester Chang
City and County of Honolulu
Department of Parks and Recreation
1000 Uluohia Street, Suite 309
Kapolei, Hawai'i 96707

Attn: Mr. John Reid

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED DEPARTMENT OF HAWAIIAN HOME LANDS RESIDENTIAL COMMUNITY AND KAMEHAMEHA SCHOOLS LEARNING COMMUNITY [FORMERLY COMPLEX], MĀKAHA, ISLAND OF O'AHU, DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Chang;

Thank you for the response dated March 9, 2010.

We acknowledge your assessment the proposed walking/bicycle greenways may not provide for the recreational needs of a 600-unit residential community. This will be addressed in the Draft Environmental Assessment.

We acknowledge that the City and County of Honolulu has offered to inform the Department of Hawaiian Home Lands of what the City and County of Honolulu believes is necessary to support the residential element of the proposed project. This has been relayed to the client team.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you need any additional information or have any questions regarding this project, please do not hesitate to contact Malia Cox at (808) 521-5631.

Sincerely,

Grant Murakami, AICP, LEED AP
Principal

cc: Mr. Walter Thoemmes, Kamehameha Schools
Mr. Kamuela Cobb-Adams, Department of Hawaiian Home Lands
Mr. Randall Fujiki, The Resort Group

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DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 3RD FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8305 • Fax: (808) 768-4730 • Internet: www.honolulu.gov

MUFI HANNEMANN
MAYOR

WAYNE Y. YOSHIOKA
DIRECTOR

SHARON ANN THOM
DEPUTY DIRECTOR

TP1/10-350288R

February 22, 2010

Ms. Malia M. Cox
PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Ms. Cox:

Subject: Hawaiian Home Lands Residential Community and
Kamehameha Schools Learning Complex
Makaha, Hawaii

This responds to your letter dated January 21, 2010, requesting a pre-consultation and comments in preparing the Draft Environmental Assessment (DEA) for the subject project.

The DEA should describe the Public Transit serving the general area of your project, and the impact of your project on Public Transit during construction, and after the project is completed. Basic information is available on our websites: www.thebus.org and www.honolulu.gov/dts. For more details, you may contact our staff at 768-8370.

Also, the DEA should include a Traffic Impact study. The department reserves comment on the project pending the preparation of the associated traffic impact study, which should include an assessment of impacts on local area roads as well as the State owned Farrington Highway. Upon completion of the traffic study, we request that a copy be forwarded to our department for review and comment.

Should you have any questions on the matter, you may contact Ms. Virginia Bisho of my staff at 768-5461.

Very truly yours,

WAYNE Y. YOSHIOKA
Director

PBR HAWAII
& ASSOCIATES, INC.

April 26, 2010

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Mr. Wayne Yoshioka, Director
City and County of Honolulu
Department of Transportation Services
650 South King Street, 3rd Floor
Honolulu, Hawai'i 96813

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED DEPARTMENT OF HAWAIIAN HOME LANDS RESIDENTIAL COMMUNITY AND KAMEHAMEHA SCHOOLS LEARNING COMMUNITY [FORMERLY COMPLEX], MĀKAHA, ISLAND OF O'AHU, DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Yoshioka;

Thank you for your letter dated February 22, 2010 (your reference number TP1/10-350288R). We acknowledge your assessment that the project may affect public transit operations. The potential impacts will be addressed in the Draft Environmental Assessment (DEA).

We further acknowledge your recommendation to include Traffic Impact Study in the DEA.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you have any questions regarding this project, please do not hesitate to contact Malia Cox at (808) 521-5631.

Sincerely,

Grant Murakami, AICP, LEED AP
Principal

cc: Mr. Walter Thoemmes, Kamehameha Schools
Mr. Kamuela Cobb-Adams, Department of Hawaiian Home Lands
Mr. Randall Fujiki, The Resort Group

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HONOLULU FIRE DEPARTMENT

CITY AND COUNTY OF HONOLULU

636 South Street
Honolulu, Hawaii 96813-5007
Phone: 808-723-7139 Fax: 808-723-7111 Internet: www.honolulu.gov/hfd

MUFI HANNEMANN
MAYOR

KENNETH G. SILVA
FIRE CHIEF

ROLLAND J. HARVEST
DEPUTY FIRE CHIEF

February 23, 2010

Ms. Malia Cox
Environmental Planner
PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Ms. Cox:

Subject: Draft Environmental Assessment
Preconsultation for the Proposed Department of Hawaiian Home Lands
Residential Community and Kamehameha Schools Learning Complex
Tax Map Keys: 8-4-002: 005, 056, and 057 and 8-4-002: 007

In response to your letter dated January 21, 2010, regarding the above-mentioned subject, the Honolulu Fire Department reviewed the material provided and requires that the following be complied with:

1. Provide a fire apparatus access road for every facility, building, or portion of a building hereafter constructed or moved into or within the jurisdiction when any portion of the facility or any portion of an exterior wall of the first story of the building is located more than 150 feet (45 720 mm) from a fire apparatus access road as measured by an approved route around the exterior of the building or facility. (1997 Uniform Fire Code, Section 902.2.1.)

2. Provide a water supply, approved by the county, capable of supplying the required fire flow for fire protection to all premises upon which facilities or buildings, or portions thereof, are hereafter constructed or moved into or within the county.

   On-site fire hydrants and mains capable of supplying the required fire flow shall be provided when any portion of the facility or building is in

   excess of 150 feet (45 720 mm) from a water supply on a fire apparatus access road, as measured by an approved route around the exterior of the facility or building. (1997 Uniform Fire Code, Section 903.2, as amended.)

3. Submit civil drawings to the HFD for review and approval.

Should you have any questions, please call Battalion Chief Socrates Bratakos of our Fire Prevention Bureau at 723-7151.

Sincerely,

KENNETH G. SILVA
Fire Chief

KGS/SY:jl

PBR HAWAII
& ASSOCIATES, INC.

April 26, 2010

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Mr. Kenneth G. Silva, Fire Chief
City and County of Honolulu
Fire Department
636 South Street
Honolulu, Hawai'i 96813

Attn: Battalion Chief Socrates Bratakos

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED DEPARTMENT OF HAWAIIAN HOME LANDS RESIDENTIAL COMMUNITY AND KAMEHAMEHA SCHOOLS LEARNING COMMUNITY [FORMERLY COMPLEX], MĀKAHA, ISLAND OF O'AHU, DRAFT ENVIRONMENTAL ASSESSMENT

Dear Fire Chief Silva;

Thank you for the letter dated February 23, 2010. We appreciate your participation in the preparation of the upcoming Draft Environmental Assessment.

We understand that fire apparatus access roads are to be provided in accordance with the 1997 Uniform Fire Code (UFC) §902.2.1. We further understand that water supply capable of supplying required fire flow are to be provided along with on-site fire hydrants and mains, when any portion of a facility or building is in excess of 150 feet from the water supply on a fire apparatus access road, in accordance with UFC §903.2, as amended.

Civil drawings will be submitted by the project proponent, or the engineer of their choosing, for the Fire Department's review and approval.

Thank you again for your participation in the preparation of the upcoming Draft Environmental Assessment. If you need any additional information or have any questions regarding this project, please do not hesitate to contact Malia Cox at (808) 521-5631.

Sincerely,

Grant Murakami, AICP, LEED AP
Principal

cc: Mr. Walter Thoemmes, Kamehameha Schools
Mr. Kamuela Cobb-Adams, Department of Hawaiian Home Lands
Mr. Randall Fujiki, The Resort Group

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawaii 96850

In Reply Refer To:
2010-TA-0193

MAR 22 2010

Malia M. Cox
PBR Hawaii & Associates
1001 Bishop St, Suite 650
Honolulu, Hawaii, 96813

Subject: Comments on the Pre-consultation of the Draft Environmental Assessment for Hawaiian Home Lands Residential Community and Kamehameha Schools Learning Complex, Makaha.

Dear Ms. Cox:

Thank you for the opportunity to provide comments for the development of the Draft Environmental Assessment (DEA) for the Hawaiian Home Lands Residential Community and Kamehameha Schools Learning Complex in Makaha on Oahu. We received your January 27, 2010, letter via electronic mail on March 11, 2010. It appears that we did not receive a hard copy of this letter. The Department of Hawaiian Home Lands (DHHL) and Kamehameha Schools (KS) are proposing a combined residential community and educational complex in the lower Makaha Valley.

The combined proposed development will encompass 297 acres owned by Ko Olina Makaha East LLC and Honolulu Ltd. Development of 230 acres for construction of approximately 600 single-family homes is being proposed by DHHL. An additional 67 acres will be developed by KS as a learning complex. The project includes a modification to the existing sewerage system along Pokai Bay Beach Park and Lualualei Beach. Approximately 4,700 feet of additional sewerage lines will be installed adjacent to the existing line. Proposed development also includes the construction of a new off-site reservoir (size unspecified in your letter), in order to accommodate expected increased water needs. This reservoir would be located on Board of Water Supply lands, near an existing water storage site.

According to information in our files and the Hawaii Biodiversity and Mapping Program, the threatened green sea turtle (*Chelonia mydas*) could nest along the beaches in the project area. We are not aware of other threatened or endangered species or critical habitat in the project vicinity. However, we recommend precautionary conservation measures regarding sea turtles, wildfires and erosion.

TAKE PRIDE® IN AMERICA

The threatened green sea turtle is known to nest on Oahu beaches. To minimize potential impacts to sea turtles which may utilize beaches in the project area, we recommend the avoidance of direct and ambient lighting of the beach and dune habitats within and adjacent to the project site. In addition, we recommend that project equipment and staging areas be situated in areas that are not used by nesting turtles to avoid nest crushing.

Development may result in an increased fire risk. A number of recent human-caused fires have escaped containment by the available interagency initial attack fire suppression forces, resulting in significant impacts to listed species and critical habitat in the Waianae Mountains. Measures to minimize fire risk should be incorporated into the project. The Waianae Mountains Watershed Partnership, in partnership with the U.S. Army, Hawaii Department of Land and Natural Resources, City and County of Honolulu Fire Department, and others, is coordinating the development of fuelbreaks, water sources for firefighting, fire prevention projects, and an increased fire suppression response to minimize the impact of human-caused wildfires to listed species and critical habitat in the Waianae Mountains. We recommend you coordinate with the City and County of Honolulu Fire Department wildland fire management specialists and their partner organizations to ensure any wildland fire risk, indirectly resulting from the proposed development, is adequately minimized.

To minimize erosion, sedimentation, and other adverse impacts to aquatic resources and nearby coral reef ecosystems, we recommend that applicable measures identified in the enclosed list of Standard Best Management Practices for aquatic resources be incorporated, as appropriate, into project plans.

We hope this information assists you in developing a thorough and complete DEA. If, as project planning progresses, you determine the project may adversely impact federally listed species or critical habitats, please contact our office for further assistance. If you have questions regarding these comments, please contact Jodi Charrier, Fish and Wildlife Biologist, (phone: 808-792-9400, fax: 808-792-9581).

Sincerely,

Christa Russell

for Loyal Mehrhoff
Field Supervisor

Enclosure(s)

TAKE PRIDE® IN AMERICA

U.S. Fish and Wildlife Service
Recommended Standard Best Management Practices

The U.S. Fish and Wildlife Service recommends that the measures below be incorporated into projects to minimize the degradation of water quality and minimize the impacts to fish and wildlife resources.

1. Turbidity and siltation from project-related work shall be minimized and contained within the vicinity of the site through the appropriate use of effective silt containment devices and the curtailment of work during adverse tidal and weather conditions.

2. Dredging/filling in the marine environment shall be scheduled to avoid coral spawning and recruitment periods and sea turtle nesting and hatching periods.

3. Dredging and filling in the marine/aquatic environment shall be designed to avoid or minimize the loss special aquatic site habitat (beaches, coral reefs, wetlands, etc.) and the function of such habitat shall be replaced.

4. All project-related materials and equipment (dredges, barges, backhoes, etc.) to be placed in the water shall be cleaned of pollutants prior to use.

5. No project-related materials (fill, revetment rock, pipe, etc.) should be stockpiled in the water (intertidal zones, reef flats, stream channels, wetlands, etc.) or on beach habitats.

6. All debris removed from the marine/aquatic environment shall be disposed of at an approved upland or ocean dumping site.

7. No contamination (trash or debris disposal, non-native species introductions, attraction of non-native pests, etc.) of adjacent habitats (reef flats, channels, open ocean, stream channels, wetlands, beaches, forests, etc.) shall result from project-related activities. This shall be accomplished by implementing a litter-control plan and developing a Hazard Analysis and Critical Control Point Plan (HACCP – see http://www.haccp-nrm.org/Wizard/default.asp) to prevent attraction and introduction of non-native species.

8. Fueling of project-related vehicles and equipment should take place away from the water and a contingency plan to control petroleum products accidentally spilled during the project shall be developed. Absorbent pads and containment booms shall be stored on-site, if appropriate, to facilitate the clean-up of accidental petroleum releases.

9. Any under-layer fills used in the project shall be protected from erosion with stones (or core-loc units) as soon after placement as practicable.

10. Any soil exposed near water as part of the project shall be protected from erosion (with plastic sheeting, filter fabric etc.) after exposure and stabilized as soon as practicable (with native or non-invasive vegetation matting, hydroseeding, etc.).

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& ASSOCIATES, INC.

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April 26, 2010

Mr. Loyal Mehrhoff, Field Supervisor
United States Department of the Interior
Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawai'i 96850

Attn: Ms. Jodi Charrier

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED DEPARTMENT OF HAWAIIAN HOME LANDS RESIDENTIAL COMMUNITY AND KAMEHAMEHA SCHOOLS LEARNING COMMUNITY [FORMERLY COMPLEX], MĀKAHA, ISLAND OF O'AHU, DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Mehrhoff;

Thank you for the response dated March 22, 2010. We offer the following responses to your comments.

We acknowledge that based on information in the FWS files and the Hawai'i Biodiversity and Mapping Program, the threatened green sea turtle could nest along beaches near the project area. We further acknowledge that FWS is not aware of any other threatened or endangered species or critical habitat in the project vicinity.

We acknowledge your recommendation to take precautionary measures regarding sea turtles, wildfires and erosion. Thank you for providing a listed of Standard Best Management Practices for aquatic resources. The Draft Environmental Assessment addresses these concerns and incorporates these recommendations.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you need any additional information or have any questions regarding this project, please do not hesitate to contact Malia Cox at (808) 521-5631.

Sincerely,

Grant Murakami, AICP, LEED AP
Principal

cc: Mr. Walter Thoemmes, Kamehameha Schools
Mr. Kamuela Cobb-Adams, Department of Hawaiian Home Lands
Mr. Randall Fujiki, The Resort Group

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POLICE DEPARTMENT
CITY AND COUNTY OF HONOLULU
801 SOUTH BERETANIA STREET · HONOLULU, HAWAII 96813
TELEPHONE: (808) 529-3111 · INTERNET: www.honolulupd.org

MUFI HANNEMANN
MAYOR

LOUIS M. KEALOHA
CHIEF

DELBERT T. TATSUYAMA
RANDAL K. MACADANGDANG
DEPUTY CHIEFS

OUR REFERENCE DAT-DK

February 8, 2010

Ms. Malia Cox
Environmental Planner
PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Ms. Cox:

This is in response to your letter of January 21, 2010, requesting comments on a Pre-Consultation, Draft Environmental Assessment, for the proposed Department of Hawaiian Home Lands Residential Community and Kamehameha Schools Learning Complex project in Makaha.

The Honolulu Police Department (HPD) looks forward to receiving further details about the project as it progresses. Substantial numbers of new housing units will require proportionate increases in police resources, which the HPD will have to budget for well in advance of the project's completion.

If there are any questions, please call Major Michael Moses of District 8 at 692-4253.

Sincerely,

LOUIS M. KEALOHA
Chief of Police

By
DEBORA A. TANDAL
Assistant Chief of Police
Support Services Bureau

Serving and Protecting With Aloha

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April 26, 2010

Mr. Louis M. Kealoha, Police Chief
City and County of Honolulu
Police Department
801 South Beretania Street
Honolulu, Hawai'i 96813

Attn: Major Michael Moses

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED DEPARTMENT OF HAWAIIAN HOME LANDS RESIDENTIAL COMMUNITY AND KAMEHAMEHA SCHOOLS LEARNING COMMUNITY [FORMERLY COMPLEX], MĀKAHA, ISLAND OF O'AHU, DRAFT ENVIRONMENTAL ASSESSMENT

Dear Chief Kealoha;

Thank you for the letter dated February 8, 2010 (reference number DAT-DK). We acknowledge your assessment that a substantial increase in new housing will require proportionate increases in police resources. Additional details about the project will be included within the Draft Environmental Assessment.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you need any additional information or have any questions regarding this project, please do not hesitate to contact Malia Cox at (808) 521-5631.

Sincerely,

Grant Murakami, AICP, LEED AP
Principal

cc: Mr. Walter Thoemmes, Kamehameha Schools
Mr. Kamuela Cobb-Adams, Department of Hawaiian Home Lands
Mr. Randall Fujiki, The Resort Group

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PHONE (808) 594-1888

FAX (808) 594-1865

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

HRD10/4748B

February 9, 2010

Malia M. Cox
PBR Hawai'i & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, HI 96813-3484

RE: Pre-consultation for an Environmental Assessment for a proposed residential community and learning complex in Mākaha, O'ahu, TMK: (1) 8-4-02: 005, 007, 056 and 057.

Aloha e Malia M. Cox,

The Office of Hawaiian Affairs (OHA) received your letter requesting comments on the above-mentioned project. The Department of Hawaiian Home Lands (DHHL) and Kamehameha Schools (KS) propose to develop a residential community and learning complex on 297 acres in Mākaha. The DHHL residential community would consist of 600 single-family homes and a community/commercial center on 230 acres. The KS learning center would include a preschool, educational learning labs, multi-learning halls and possibly a multi-media center. OHA has reviewed the project and offers the following comments.

We appreciate that a Cultural Impact Assessment (CIA) is being developed for the project, in accordance with Chapter 343 of the Hawaii Revised Statutes (HRS). The CIA should include information relating to the Native Hawaiian practices and beliefs associated with the general area of the project site, and it is recommended that the community be involved in this assessment. Consideration must also be afforded to any individuals accessing the project area for constitutionally protected traditional and customary purposes, in accordance with Article XII, Section 7 of the Hawai'i State Constitution. In addition, OHA will rely on the applicant's assurances that should iwi kūpuna or Native Hawaiian cultural or traditional deposits be found during the construction of the project, work will cease, and the appropriate agencies will be contacted pursuant to applicable law.

In addition, OHA recommends that the applicant use native vegetation in its landscaping plan for the project. Landscaping with native plants furthers the traditional Hawaiian concept of mālama 'āina and creates a more Hawaiian sense of place.

Thank you for the opportunity to comment. If you have further questions, please contact Sterling Wong by phone at (808) 594-0248 or e-mail him at sterlingw@oha.org.

'O wau iho nō me ka 'oia'i'o,

Clyde W. Nāmu'o
Chief Executive Officer

PBR HAWAII
& ASSOCIATES, INC.

April 26, 2010

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Fax: (808) 535-3163

Mr. Clyde Nāmuʻo
Administrator
Office of Hawaiian Affairs
711 Kapiʻolani Blvd., Suite 1250
Honolulu, Hawaiʻi 96813

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED DEPARTMENT OF HAWAIIAN HOME LANDS RESIDENTIAL COMMUNITY AND KAMEHAMEHA SCHOOLS LEARNING COMMUNITY [FORMERLY COMPLEX], MĀKAHA, ISLAND OF OʻAHU, DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Nāmuʻo;

Thank you for the response dated February 9, 2010.

An assessment of cultural impacts will be included in the Draft EA. The current draft includes information relating to the Native Hawaiian practices and beliefs associated with the area.

We acknowledge that consideration must be afforded to individual accessing the project area for constitutionally protected traditional and customary purposes in accordance with Article XII, Section 7 of the State Constitution.

Should the inadvertent discovery of historic resources including iwi occur during construction, all work in the immediate area of the find will cease and SHPD will be notified.

We acknowledge your recommendation that native vegetation be utilized within the landscaping plan for the project to further traditional Hawaiian concepts such as mālama ʻāina. Preparation of landscape architectural plan will occur at the appropriate stage in the design process and will take into consideration the use of native plants.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you need any additional information or have any questions regarding this project, please do not hesitate to contact Malia Cox at (808) 521-5631.

Sincerely,

Grant Murakami, AICP, LEED AP
Principal

cc: Mr. Walter Thoemmes, Kamehameha Schools
Mr. Kamuela Cobb-Adams, Department of Hawaiian Home Lands
Mr. Randall Fujiki, The Resort Group

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DEPARTMENT OF ENVIRONMENTAL SERVICES
CITY AND COUNTY OF HONOLULU
1000 ULUOHIA STREET, SUITE 308, KAPOLEI, HAWAII 96707
TELEPHONE: (808) 768-3486 ● FAX: (808) 768-3487 ● WEBSITE: http://envhonolulu.org

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TIMOTHY E. STEINBERGER, P.E.
DIRECTOR

MANUEL S. LANUEVO, P.E., LEED AP
DEPUTY DIRECTOR

ROSS S. TANIMOTO, P.E.
DEPUTY DIRECTOR

IN REPLY REFER TO:
PRO 10-53

April 15, 2010

Ms. Malia M. Cox
PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Ms. Cox:

Subject: Pre-Consultation for the Proposed Department of Hawaiian Home Lands Residential Community and Kamehameha Schools Learning Complex Draft Environmental Assessment

We have reviewed your pre-consultation letter dated January 21, 2010, regarding the subject project.

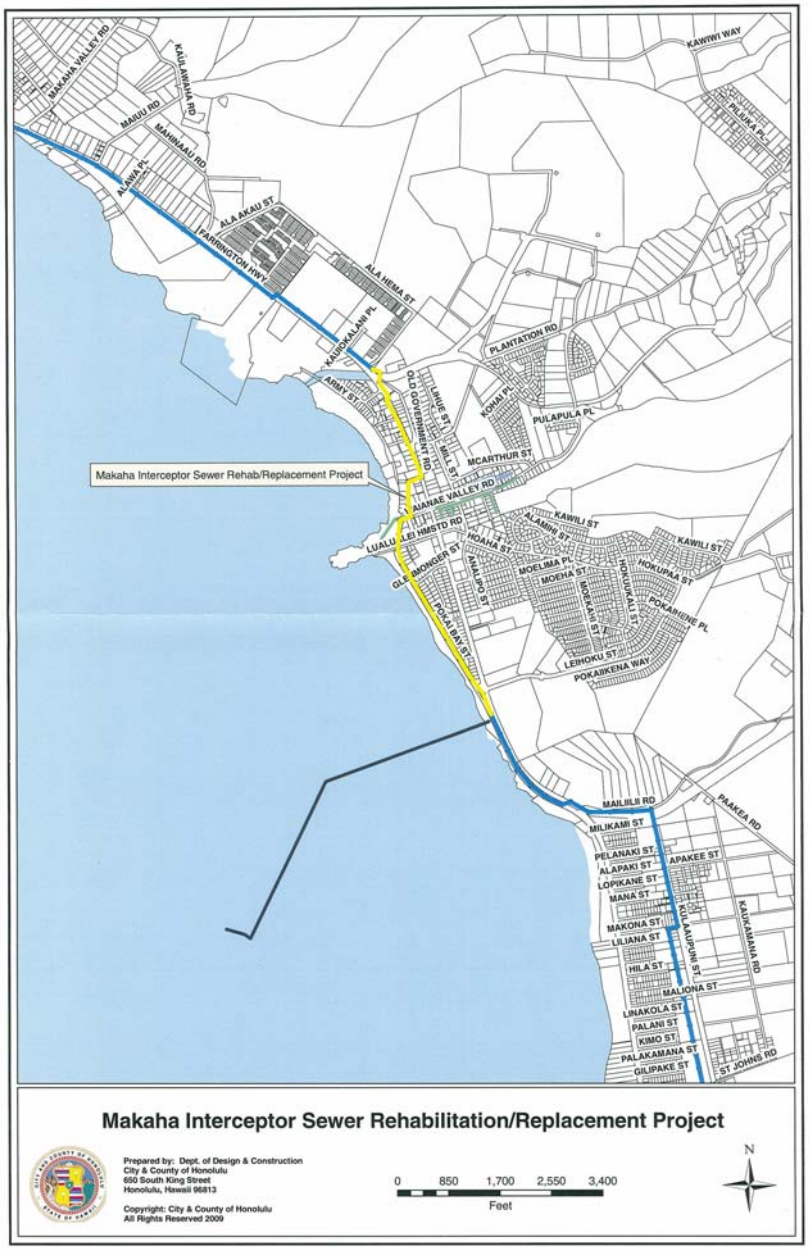
Our Makaha Interceptor Sewer Rehabilitation/Replacement Project will install a cured-in-place lining (CIPP) in the existing 36-inch diameter sewer line between Bayview Street and the Waianae Wastewater Treatment Plant. See the attached site map showing the limits of our project. Construction funds for this project are budgeted for fiscal year 2010. This project will not provide additional capacity for the proposed development; however, we will work with you and DHHL as needed to coordinate our project with the proposed Offsite Relief Sewer for the subject development.

Should you have any questions, please call Jack Pobuk, CIP Program Coordinator, at 768-3464.

Sincerely,

David Nagamine, P.E.
Executive Assistant

Attachment



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April 26, 2010

David Nagamine, Executive Assistant
City and County of Honolulu
Department of Environmental Services
1000 Uluohia Street, Suite 308
Kapolei, Hawai'i 96707

Attn: Jack Pobuk, CIP Program Coordinator

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED DEPARTMENT OF HAWAIIAN HOME LANDS RESIDENTIAL COMMUNITY AND KAMEHAMEHA SCHOOLS LEARNING COMMUNITY [FORMERLY COMPLEX], MĀKAHA, ISLAND OF O'AHU, DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Nagamine;

Thank you for your letter dated April 15, 2010. We offer the following responses to your comments.

We acknowledge that the City and County of Honolulu will be installing a cured-in-place lining in the existing 36-inch diameter sewer line as part of its Mākaha Interceptor Sewer Rehabilitation/Replacement Project. We further acknowledge that this project will not provide additional capacity.

We appreciate the City and County of Honolulu's desire to work with the project proponent regarding coordination of the Proposed Project's offsite sewer improvement.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you need any additional information or have any questions regarding this project, please do not hesitate to contact Malia Cox at (808) 521-5631.

Sincerely,

Grant Murakami, AICP, LEED AP
Principal

cc: Mr. Walter Thoemmes, Kamehameha Schools
Mr. Kamuela Cobb-Adams, Department of Hawaiian Home Lands
Mr. Randall Fujiki, The Resort Group

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