BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
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HONOLULU, HI 96843

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Manager and Chief Engineer

ELLEN E. HIRAYAMA, P.E.
Deputy Manager and Chief Engineer

April 5, 2012

APR 23 2012
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OFC. OF ENVIRONMENTAL QUALITY CONTROL
'12 APR 10 A10:39
RECEIVED

Mr. Gary Hooser, Director
Office of Environmental Quality Control
State of Hawaii
235 South Beretania Street, Room 702
Honolulu, Hawaii 96813

Dear Mr. Hooser:

Subject: Final Environmental Assessment and Finding of No Significant Impact for the Portable Dip Tanks for Wildland Firefighting Project, Makaha, Lualualei, and Makakilo, Oahu, Hawaii, TMK: Various Parcels

The Board of Water Supply (BWS), City and County of Honolulu, has reviewed the Final Environmental Assessment (FEA) and comments received on the Draft Environmental Assessment (DEA) during the 30-day public comment period which officially ended on October 22, 2011. The FEA was prepared in compliance with the requirements of Chapter 343, Hawaii Revised Statutes and Title 11, Chapter 200, Hawaii Administrative Rules of the Department of Health.

The BWS has determined that this project will not have significant environmental impacts and has issued a Finding of No Significant Impact. Please publish notice of the determination and finding in the April 23, 2012 issue of the Office of Environmental Quality Control (OEQC's), "The Environmental Notice."

We have enclosed a completed OEQC publication form, one copy of the document in pdf format on a CD, and one hard copy of the FEA.

If you have any questions, please contact Rian Adachi at 748-5943.

Very truly yours,

for Ellen E. Hirayama

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

Enclosures

cc: Tracy Fukuda (Wilson Okamoto Corporation)

Publication Form
The Environmental Notice
Office of Environmental Quality Control

Instructions: Please submit one hardcopy of the document along a with determination letter from the agency. On a compact disk, put an electronic copy of this publication form and a PDF of the EA or EIS. Mahalo.

Name of Project: Portable Dip Tanks for Wildland Firefighting Project

Applicable Law: Chapter 343, Hawaii Revised Statutes and Chapter 11-200, Hawaii Administrative Rules

Type of Document: Final Environmental Assessment / Finding of No Significant Impact (DEA comment period ended October 22, 2012)

Island: Oahu

District: Waianae and Ewa Districts (various locations)

TMK: 8-4-002: 11 (Makaha), 8-6-003: 075 (Lualualei), and 9-2-003: 088 (Palehua)

Permits Required: Permits that may be required:

State of Hawaii
Department of Health
- Noise Variance
- National Pollutant Discharge Elimination System (NPDES) General Permits for Storm Water Associated with Construction Activities, Construction Dewatering, Hydrotesting Water

Department of Land & Natural Resources
- Site Plan Approval for Makaha Site

City & County of Honolulu
- Building Permit
- Excavation Permit
- Grading, Grubbing and Stockpiling Permit
- Street Usage Permit

Name of Applicant or Proposing Agency:	Board of Water Supply City & County of Honolulu
Address	630 S. Beretania Street
City, State, Zip	Honolulu, Hawaii 96843
Contact and Phone	Mr. Rian Adachi, 808-748-5943
Approving Agency or Accepting Authority:	Board of Water Supply City & County of Honolulu
Address	630 S. Beretania Street
City, State, Zip	Honolulu, Hawaii 96843
Contact and Phone	Mr. Rian Adachi, 808-748-5943
Consultant	Wilson Okamoto Corporation
Address	1907 South Beretania St., Suite 400

City, State, Zip	Honolulu, HI 96813
Contact and Phone	Ms. Tracy Fukuda, 808- 946-2277

Project Summary: Summary of the direct, indirect, secondary, and cumulative impacts of the proposed action (less than 200 words).

The Board of Water Supply (BWS) is proposing to develop three wildland firefighting portable dip tank sites for the use by the Honolulu Fire Department (HFD). The sites are proposed in Makaha, Lualualei and Palehua on the island of Oahu.

The term "wildland fire" refers to any uncontrolled fire in combustible vegetation that occurs in the countryside or wilderness area. Such wildland fires regularly occur in seasonally dry areas throughout Oahu. Helicopters are often used by HFD to combat wildland fires. Buckets hanging below helicopters on long cables are used to transport and drop water onto fires in remote locations. The helicopter pilots fill the buckets by "dipping" them into water bodies such as the ocean, pond, open reservoir, or a portable dip tank.

BWS is proposing to develop three permanent wildland firefighting dip tank pad sites near areas prone to wildland fires. The dip tank sites will facilitate a quicker response time and more effective firefighting capability in the event of a wildland fire.

The size of the dip tank sites vary, but will include an emergency landing area for the helicopter, roadway access, water line extension for the water connection, and other accessory improvements. The 15-foot diameter, polypropylene buoywall dip tanks are collapsible, with 5-foot high walls providing an operational volume of approximately 3,000 gallons. The dip tanks require a 20-foot by 20-foot (400 square feet) level, hard surface pad for its foundation. When the dip tanks are not in use, they will be collapsed and stored off-site at HFD Facilities.

Final Environmental Assessment/
Finding of No Significant Impact

Portable Dip Tanks for Wildland Firefighting Project

Various Locations, Island of Oahu, Hawaii

Prepared for:
City and County of Honolulu
Board of Water Supply

Prepared by:
Wilson Okamoto Corporation

April 2012

FINAL ENVIRONMENTAL ASSESSMENT/ FINDING OF NO SIGNIFICANT IMPACT

Portable Dip Tanks for Wildland Firefighting Project
Various Locations, Island of Oahu, Hawaii

Prepared for:
Board of Water Supply
City & County of Honolulu

Prepared by:
Wilson Okamoto Corporation

April 2012

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Appendix B: Archaeological Assessment for Board of Water Supply Fire Dip Tank Project, Lualualei Ahupuaa, Waianae District, Oahu Island. TMK [1] 8-6-003-075 por. February 2010.

Appendix C: Archaeological Assessment for Board of Water Supply Fire Dip Tank Project at Honouliuli Ahupuaa, Ewa District, Oahu Island. TMK [1] 9-2-003:088 por. June 2011.

Appendix D: Office of Conservation and Coastal Lands Determination Letter, OA-11-121, December 1, 2010.

Appendix E: Pre-Assessment Consultation Letters

Appendix F: Draft Environmental Assessment Consultation Letters

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PREFACE

This Final Environmental Assessment (EA) has been prepared pursuant to Chapter 343, Hawaii Revised Statutes, and Title 11, Chapter 200, Administrative Rules, Department of Health, State of Hawaii. Proposed is an agency action by the City & County of Honolulu, Board of Water Supply (BWS) to develop three wildland firefighting portable dip tank sites for the use by the Honolulu Fire Department (HFD). The sites are proposed in Makaha, Lualualei and Palehua on the island of Oahu. The preparation of this Final EA arises from the use of State and County lands and funds.

The term "wildland fire" refers to any uncontrolled fire in combustible vegetation that occurs in the countryside or wilderness area. Such wildland fires regularly occur in seasonally dry areas throughout Oahu. Helicopters are often used by HFD to combat wildland fires. Buckets hanging below helicopters on long cables are used to transport and drop water onto fires in remote locations. The helicopter pilots fill the buckets by "dipping" them into water bodies such as the ocean, pond, open reservoir, or a portable dip tank.

The distance between a dip tank location and a wildland fire determines how frequently water drops can be made. Therefore, HFD attempts to set up the portable dip tank at a location reasonably close to a wildland fire and where water is available from a fire hydrant. For helicopters to safely operate, these temporary dip tank sites must also be in a large open area, such as a park or school field that are not always available. In addition, the collapsible polypropylene dip tank requires a flat level surface on which to be setup.

Given these criteria, such locations are difficult to find. Therefore, BWS is proposing to develop three permanent wildland firefighting dip tank pad sites near areas prone to wildland fires. The dip tank sites will facilitate a quicker response time and more effective firefighting capability in the event of a wildland fire.

The size of the dip tank sites vary, but will include an emergency landing area for the helicopter, an unobstructed takeoff flight path into the prevailing wind, roadway access, water line extension for the water connection, and other accessory improvements. The 15-foot diameter, polypropylene buoywall dip tanks are collapsible, with 5-foot high walls providing an operational volume of approximately 3,000 gallons. The dip tanks require a 20-foot by 20-foot (400 square feet) level, hard surface pad (either concrete or asphalt) for its foundation. When the dip tanks are not in use, they will be collapsed and stored off-site at HFD Facilities.

The notice of availability for the Draft EA was published in the Office of Environmental Quality Control's (OEQC) September 23, 2011 issue of *The Environmental Notice. The 30-day public comment period was from September 23, 2011 to October 22, 2011.*

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SUMMARY

Proposing Agency:	Board of Water Supply City & County of Honolulu 630 South Beretania Street Honolulu, Hawaii 96843 Contact: Mr. Rian Adachi
EA Preparer:	Wilson Okamoto Corporation 1907 South Beretania Street, Suite 400 Honolulu, Hawaii 96826 Contact: Ms. Tracy Fukuda
Project Location:	Makaha, Waianae District, Oahu, Hawaii Lualualei, Waianae District, Oahu, Hawaii Palehua, Ewa District, Oahu, Hawaii
Tax Map Key:	Makaha Site: 8-4-002: 011 Lualualei Site: 8-6-003: 075 Palehua Site: 9-2-003: 088
Area:	Makaha Site: 14,000 Square Feet (0.31 acres) Lualualei Site: 55,000 Square Feet (1.25 acres) Palehua Site: 5,000 Square Feet (0.10 acres)
Recorded Fee Owner:	Makaha Site: Board of Water Supply Lualualei Site: Department of Hawaiian Homelands Palehua Site: Edmond C. Olson Trust (Private)
Existing Land Use:	Makaha Site: Booster Station, Water Shaft and Reservoirs Lualualei Site: Vacant and Undeveloped Palehua Site: Cattle Grazing
State Land Use Classification:	Makaha Site: Urban and Conservation Lualualei Site: Agricultural Palehua Site: Urban
Waianae Sustainable Communities Plan Land Use Map:	Makaha Site: Rural Lualualei Site: Preservation
Ewa Development Plan Land Use Map:	Palehua Site: Urban

SUMMARY (continued)

Zoning Designation:	Makaha Site: P-1 Restricted Preservation and Country Lualualei Site: Restricted Agricultural (AG-1) Palehua Site: General Preservation (P-2)
Proposed Action:	Develop three wildland fire dip tank sites for use by the Honolulu Fire Department (HFD).
Impacts:	No significant impacts are anticipated. The project will allow HFD to facilitate a quicker response time and more effective firefighting capability in the event of a wildland fire.
Permits Required:	The following is a list of permits and approvals, which may be required prior to construction of the proposed projects: <u>State of Hawaii</u> Department of Health • National Pollutant Discharge Elimination System (NPDES) General Permits for Storm Water Associated with Construction Activities, Construction Dewatering, Hydrotesting Water • Noise Variance Department of Land and Natural Resources • Site Plan Approval City and County of Honolulu • Building Permit • Excavation Permit • Grading, Grubbing and Stockpiling Permit • Street Usage Permit
Agencies Consulted During Draft EA Process:	<u>Federal</u> United States Army Corps of Engineers U.S. Fish and Wildlife Service <u>State</u> Department of Accounting and General Services Department of Agricultural Department of Business, Economic Development and Tourism Department of Hawaiian Home Lands

SUMMARY (continued)

Department of Health
Department of Land and Natural Resources (DLNR)
DLNR, Historic Preservation Division
Department of Transportation
Office of Hawaiian Affairs
University of Hawaii Environmental Center

City & County of Honolulu
Department of Design and Construction
Department of Facility Maintenance
Department of Parks and Recreation
Department of Planning and Permitting
Department of Transportation Services
Fire Department
Police Department

Makakilo/Kapolei Neighborhood Board No. 34
Waianae Neighborhood Board No. 24

Elected Officials
Representative Jo Jordan
Representative Karen L. Awana
Representative Sharon E. Har
Senator Maile S.L. Shimabukuro
Senator Mike Gabbard

Councilmember Nestor Garcia
Councilmember Tom Berg

Other
Verizon Hawaii
Hawaiian Electric Company, Inc.
Hawaiian Telcom
Edmund C. Olson Trust
Makaha Valley Towers
Makaha Valley Plantation
Makaha Resort and Golf Club

Hawaii State Library
Waianae Public Library
Kapolei Public Library

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1. INTRODUCTION AND PROJECT DESCRIPTION

1.1 Introduction

To combat wildland fires, Board of Water Supply (BWS) is proposing to develop three permanent wildland firefighting dip tank pad sites near areas prone to wildland fires. The distance between a dip tank location and a wildland fire determines how frequently water drops can be made on a fire. These dip tank sites will facilitate a quicker response time and more effective firefighting capability in the event of a wildland fire.

The 15-foot diameter, polypropylene buoywall dip tanks are collapsible, with 5-foot high walls providing an operational volume of approximately 3,000 gallons. The dip tanks require a 20-foot by 20-foot (400 square feet) level, hard surface pad for its foundation.

The size of the dip tank sites vary, but will include an emergency landing area for a helicopter, an unobstructed takeoff flight path into the prevailing wind, roadway access, water line extension for the water connection, and other accessory improvements.

1.2 Project Location

1.2.1 Makaha Site

The project site is located in Makaha, within the Waianae District on the island of Oahu (See Figure 1-1), immediately north of Makaha Golf Course. The project site will occupy approximately 14,000 square feet (0.31 acres) of Tax Map Key (TMK): 8-4-002: 011, which is owned by BWS (See Figure 1-2). The project site is located at an elevation of approximately 200 feet above mean sea level (msl). Vehicular access to the project site is via a driveway off of Kili Drive.

1.2.2 Lualualei Site

The project site is located in Lualualei, within the Waianae District of Leeward Oahu (See Figure 1-3). The project site is located on the north edge of Lualualei Homesteads, immediately north of the intersection of Paheehee Road and Kuwale Road on the south side of Paheehee Ridge in Lualualei Valley. Paheehee and Kuwale Roads are under the jurisdiction of the Department of Land and Natural Resources (DLNR) and the City and County of Honolulu (C&CH), respectively. The project site and access road improvements will cover approximately 55,000 square feet (1.25 acres) of land. The pad site itself will comprise a portion of TMK: 8-6-003: 075, which is owned by the State Department of Hawaiian Home Lands (DHHL) (See Figure 1-4). Vehicular access to the pad site will be via the dirt road portions of Paheehee and Kuwale Roads which will be improved to accommodate HFD vehicles. The project site is located at an elevation of approximately 200 feet above msl. BWS will obtain the required easement from DHHL and approval from DLNR and the C&CH for the roadway improvements.

1.2.3 Palehua Site

The project area is located in Palehua, within the Ewa District of Leeward Oahu (see Figure 1-5). The project site lies just north and northeast of Palehua Road, just southeast of a BWS water tank on the west ridge of Kaloi Gulch in the upper Makakilo/Palehua area. The project site will occupy approximately 5,000 square feet (0.10 acres) of TMK:

9-2-003: 088, which is privately owned by Edmond C. Olson Trust (See Figure 1-6). The project site is located at an elevation of approximately 1,200 feet above msl. Vehicular access to the project is via a driveway off of Umena Street. BWS will obtain the required easement from Edmond C. Olson Trust.

1.3 Existing and Surrounding Land Uses

1.3.1 Makaha Site

The parcel is surrounded by undeveloped land, with Makaha Golf Course located immediately to the south across from Kili Drive. Makaha Valley Towers and Makaha Valley Plantation are located less than a half mile to the east (See Figure 1-7). The project site is located in heavily vegetated area, adjacent to BWS's Makaha 242 reservoirs, Makaha Booster No. 1, and Makaha Shaft (see Figure 1-8). The access road to the reservoirs bounds the project area on the east side.

1.3.2 Lualualei Site

The parcel is undeveloped and surrounded by residences and agricultural farms immediately to the south, Paheehee Ridge to the north, and Lualualei Naval Reservation approximately ½ mile to the east (See Figure 1-9). The project site consists of kiawe trees, koa haole, and exotic grasses (see Figure 1-10).

1.3.3 Palehua Site

The current landowner uses the parcel for cattle grazing. The area north of the project site is undeveloped, while the Makakilo residential subdivision is located immediately to the south (See Figure 1-11). The BWS has their Makakilo 1230 Reservoir located on their own property (TMK 9-2-03: 068) and is adjacent to the project site (see Figure 1-12).

1.4 Project Need

Wildland fires regularly occur in seasonally dry areas throughout Oahu. Historical data from HFD shows a total of 6,537 wildland fires islandwide over the past 10 ½ years. Approximately 58 percent have occurred in the Battalion 4 area of responsibility which extends from Ewa to Kaena Point (See Table 1-1). For the past year and a half, this area has accounted for close to 50 percent of the wildland fires. Therefore, to combat these wildland fires, BWS is proposing to develop three permanent wildland firefighting dip tank pad sites in this area which is more prone to wildland fires. The dip tank sites will facilitate a quicker response time and more effective firefighting capability in the event of a wildland fire.

The distance between a dip tank location and a wildland fire determines the frequency water drops can be made. Therefore, HFD attempts to set up the portable dip tanks at locations reasonably close to a wildland fire and where water is available from a fire hydrant. For helicopters to safely operate, these temporary dip tank sites must also be in a large open area. In addition, the collapsible polypropylene dip tank requires a flat level surface on which to be setup.

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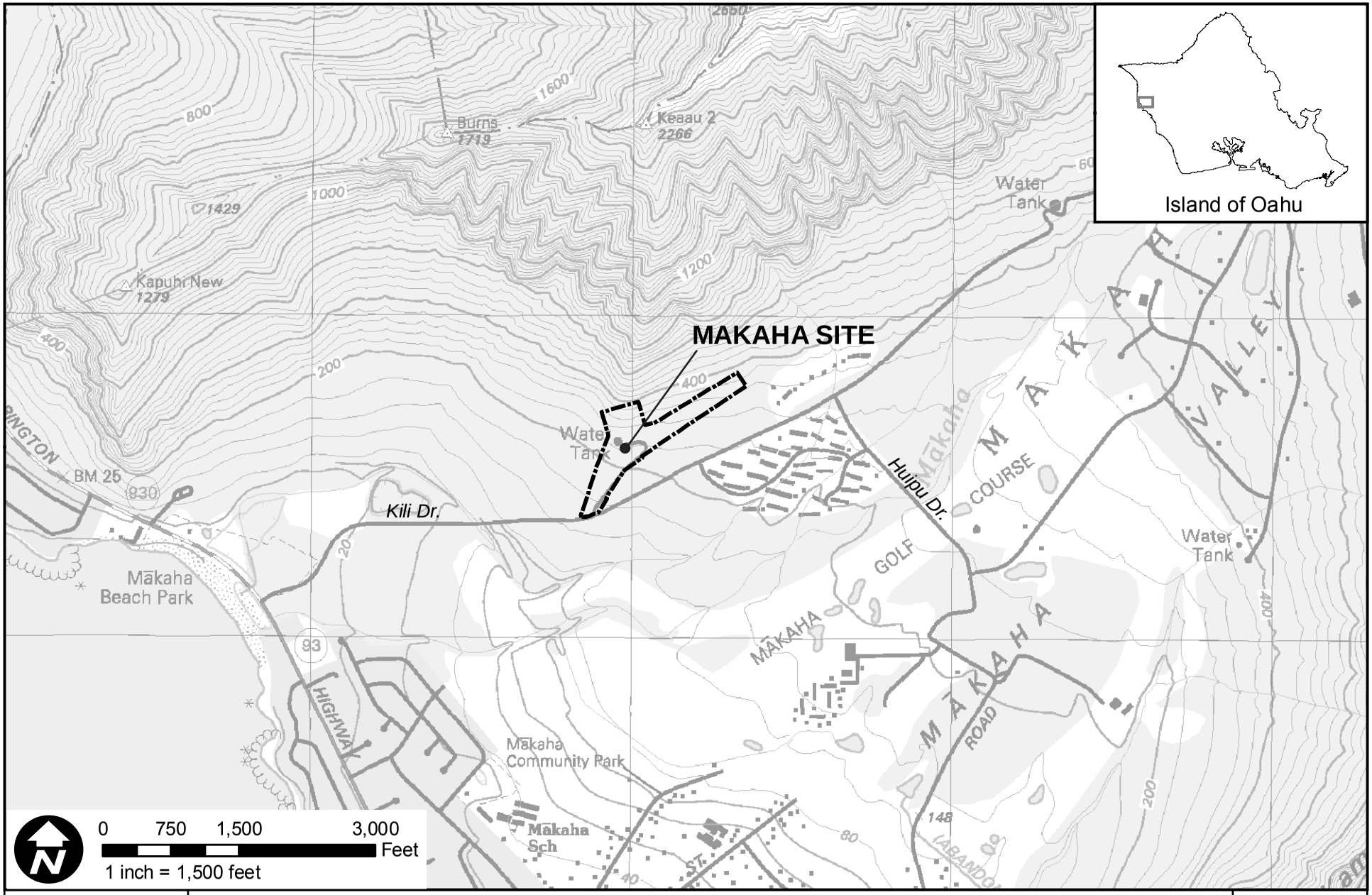

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Portable Dip Tanks for Wildland Firefighting Project

LOCATION MAP - MAKAHA SITE

FIGURE

1-1

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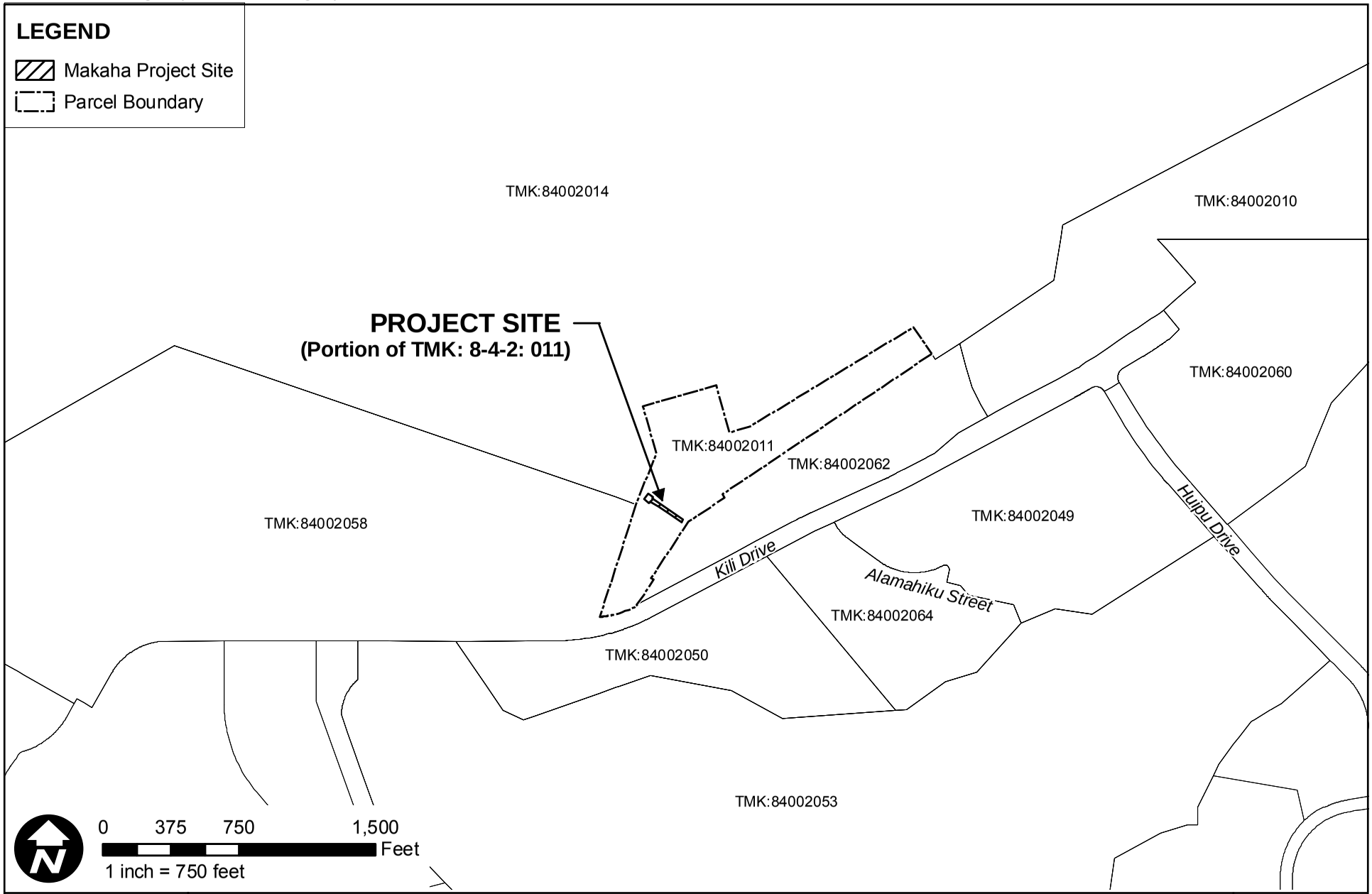

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Portable Dip Tanks for Wildland Firefighting Project

TAX MAP KEY - MAKAHA SITE

FIGURE 1-2

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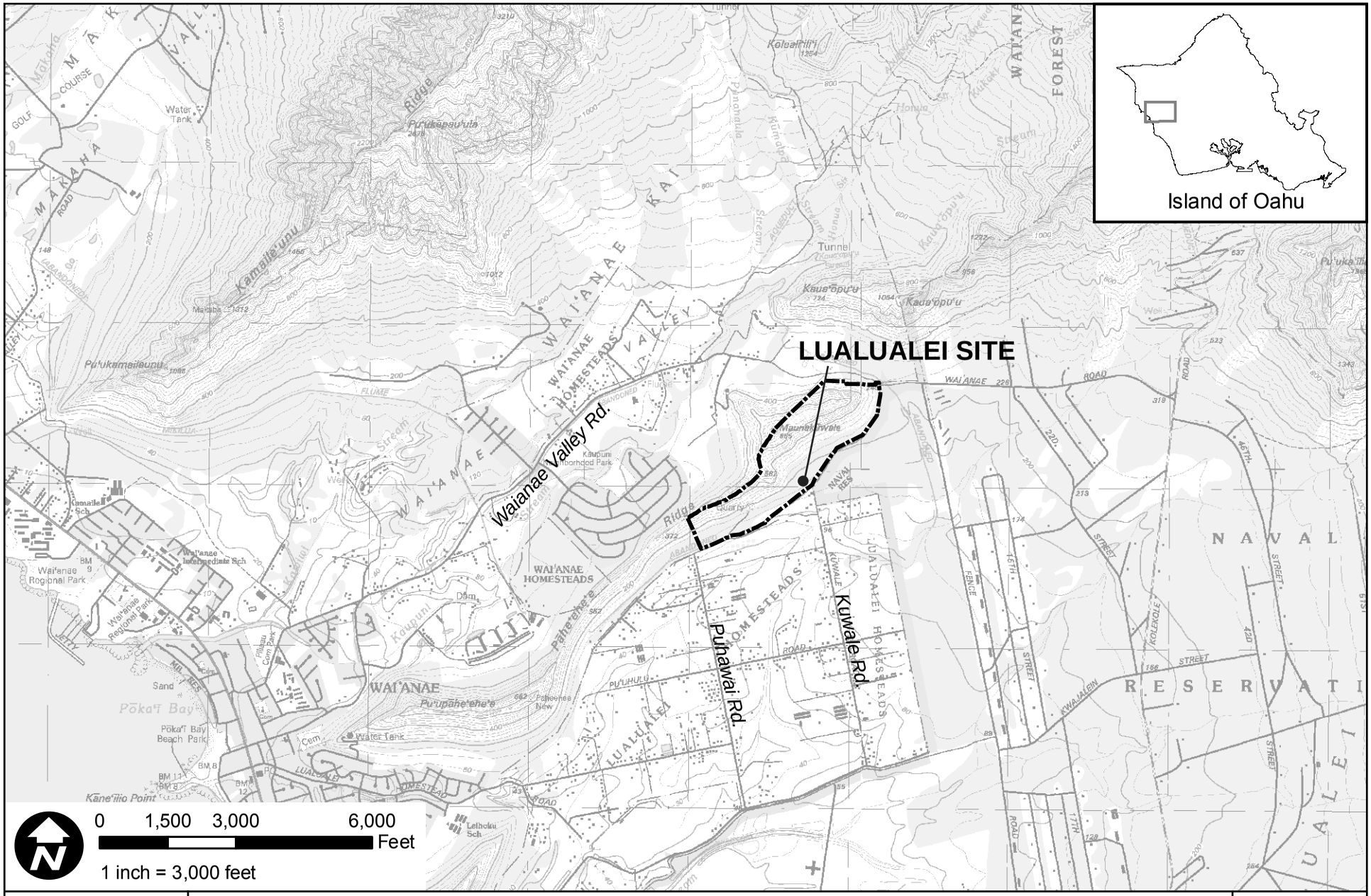

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Portable Dip Tanks for Wildland Firefighting Project

LOCATION MAP - LUALUALEI SITE

FIGURE

1-3

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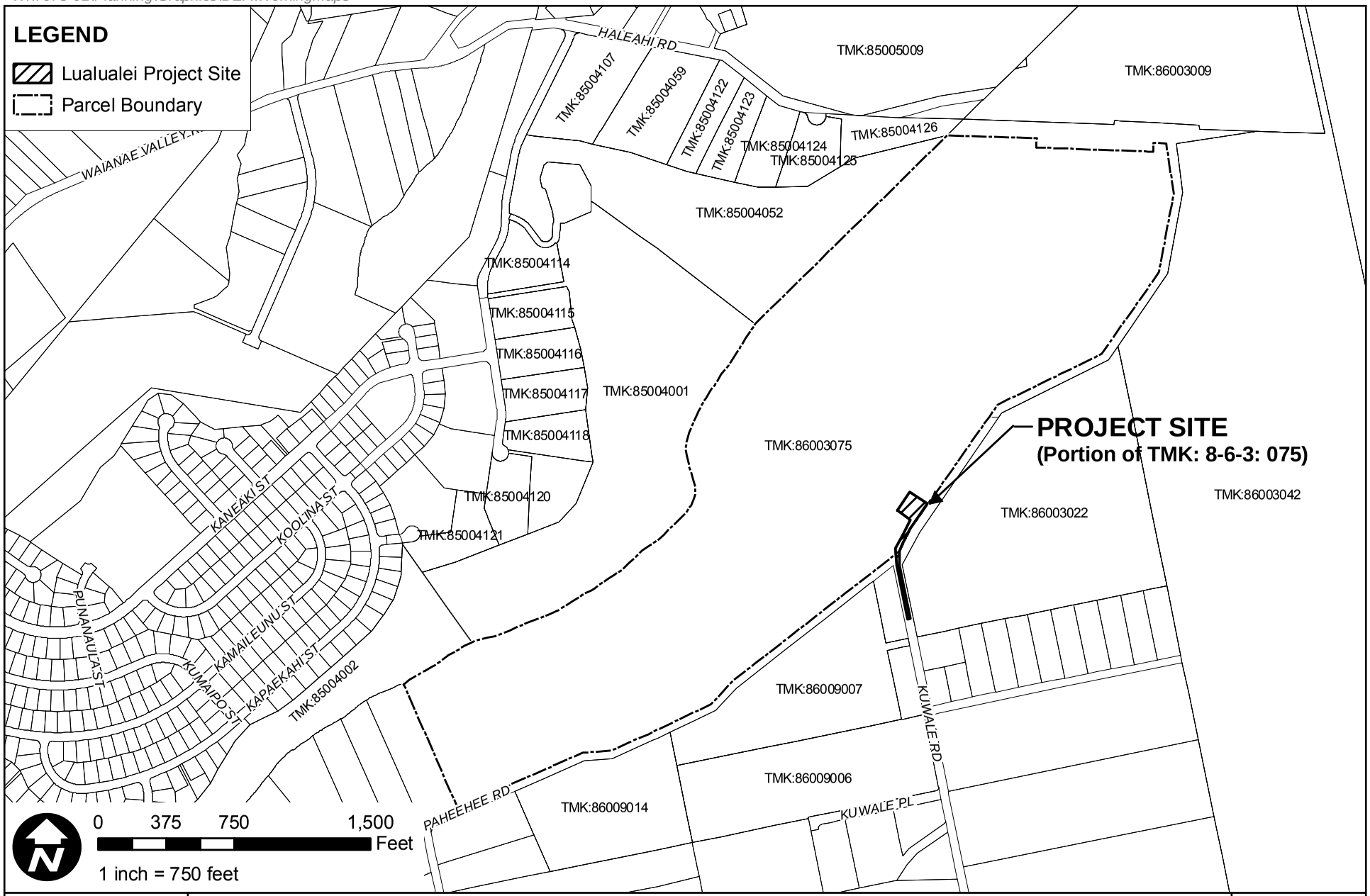

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Portable Dip Tanks for Wildland Firefighting Project

TAX MAP KEY- LUALUALEI SITE

FIGURE

1-4

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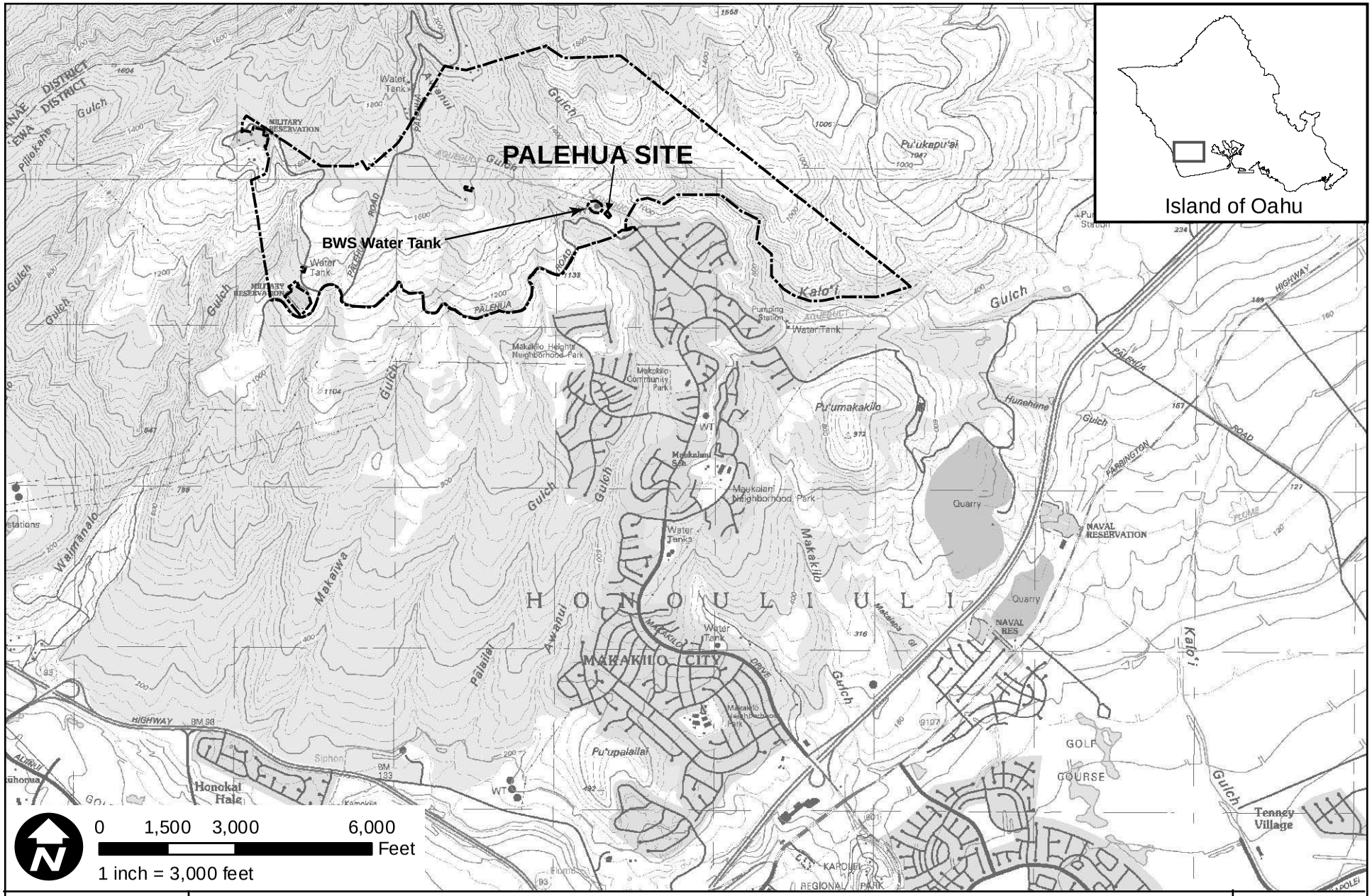

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Portable Dip Tanks for Wildland Firefighting Project

LOCATION MAP - PALEHUA SITE

FIGURE

1-5

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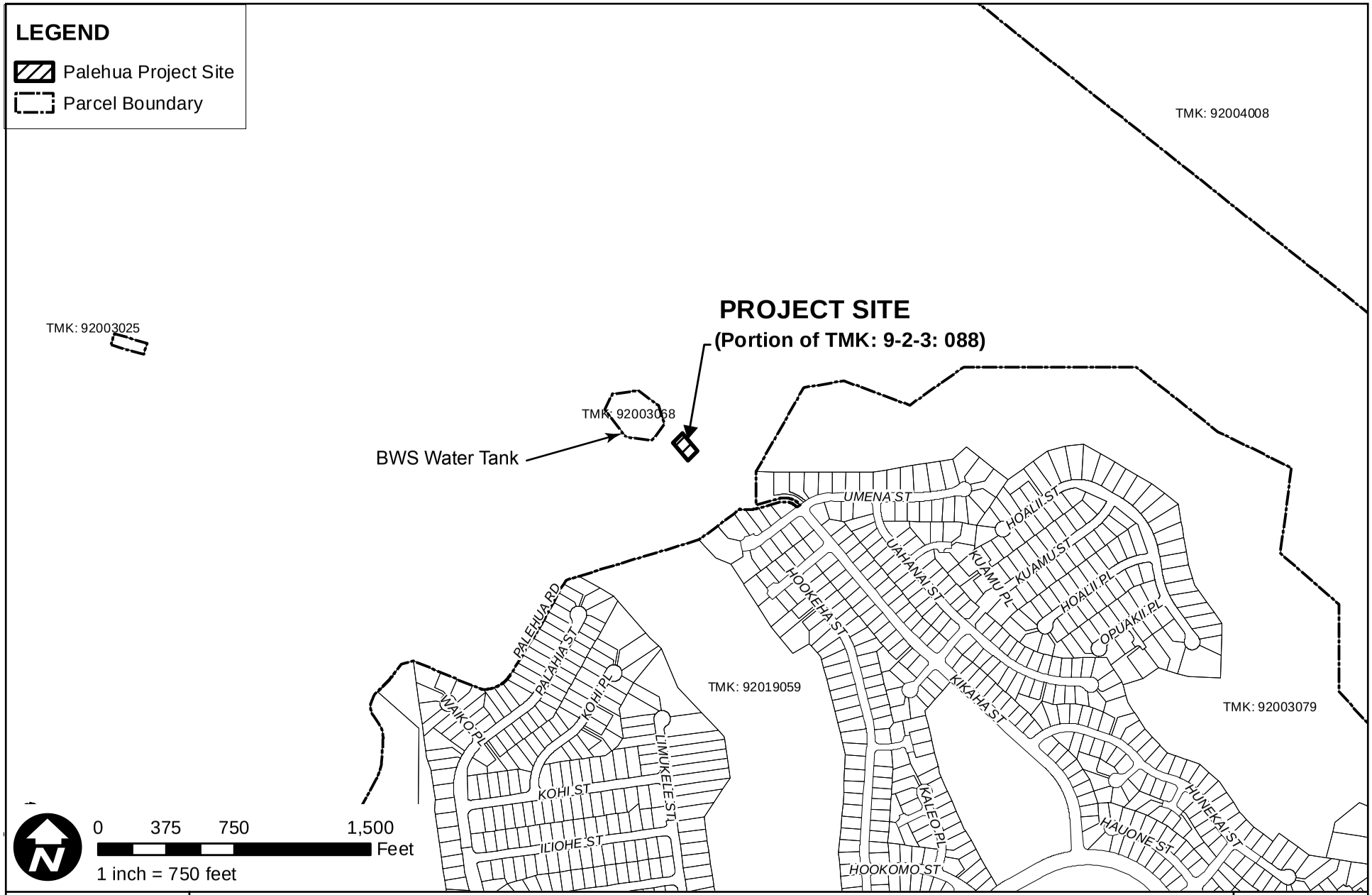

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Portable Dip Tanks for Wildland Firefighting Project

TAX MAP KEY - PALEHUA SITE

FIGURE 1-6

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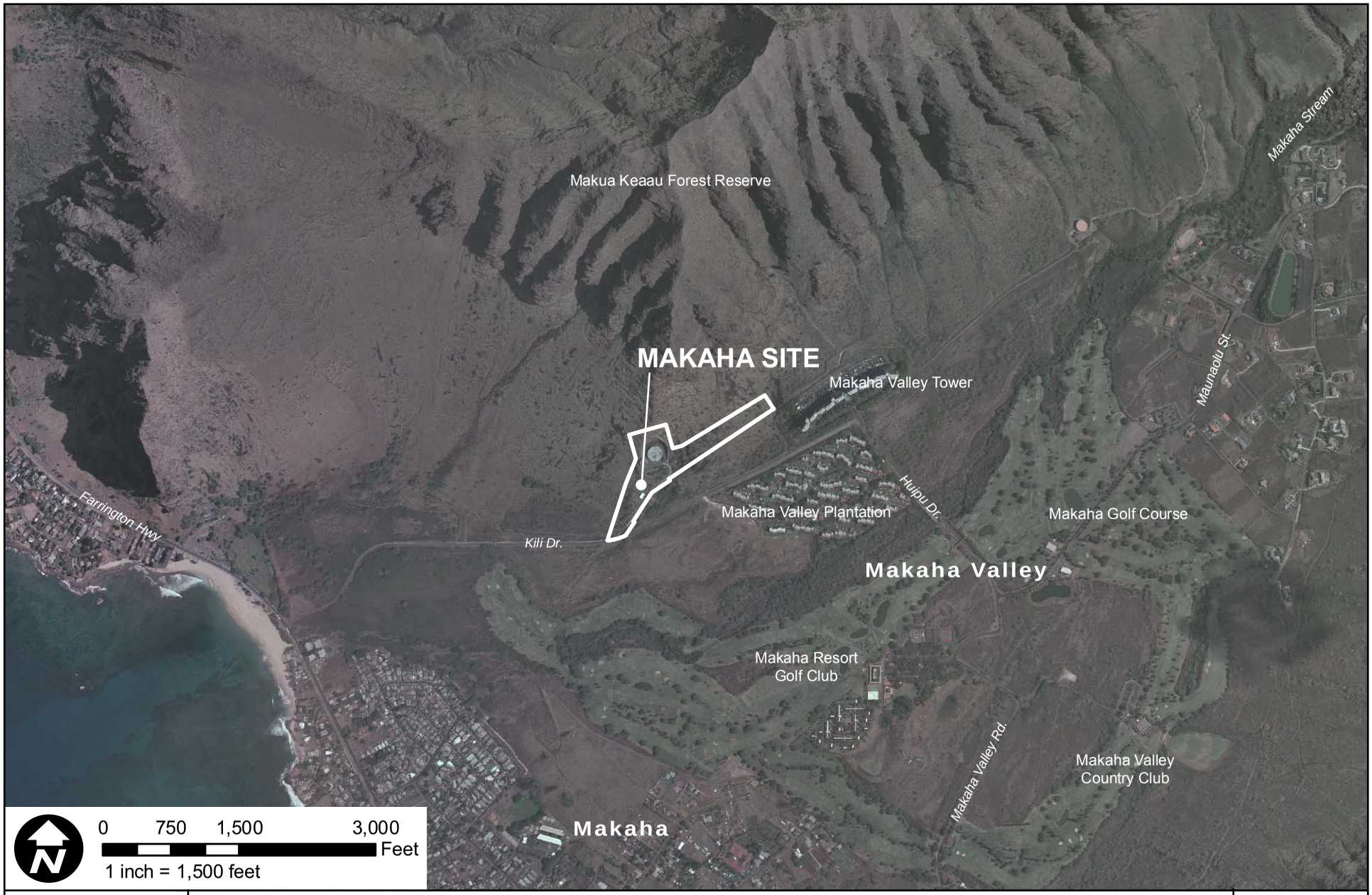

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Portable Dip Tanks for Wildland Firefighting Project

AERIAL MAP - MAKAHA SITE

FIGURE

1-7

Roadway access to the project site off of Kili Drive. Looking south, down the access road.

Looking northwest towards the project site. Pump station to the left within fenced area.

Looking northwest towards project site. BWS reservoir in the background.

Approximate location of project site.

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Portable Dip Tanks for Wildland Firefighting Project

PHOTOS – MAKAHA SITE

FIGURE

1-8

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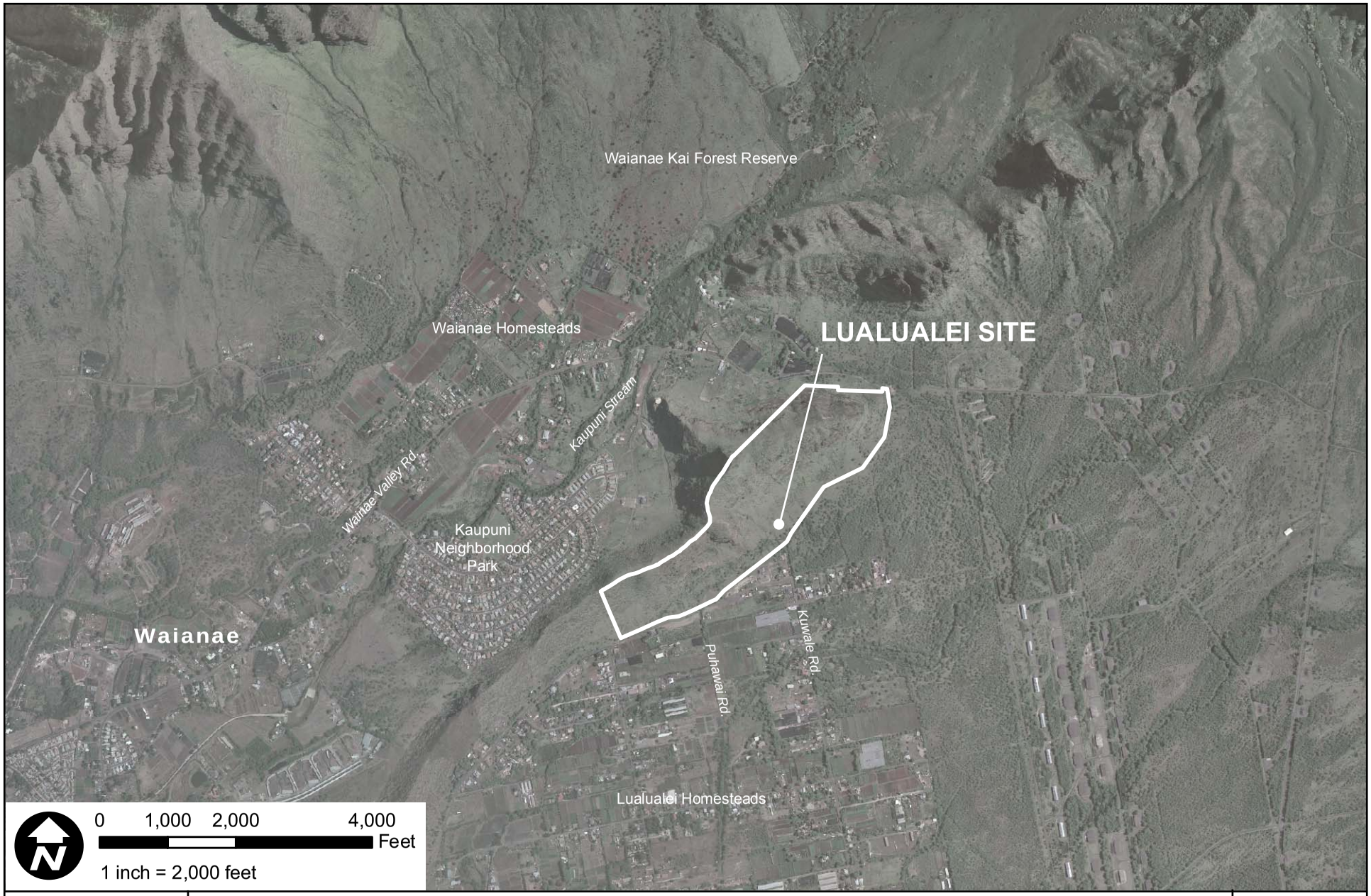

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Portable Dip Tanks for Wildland Firefighting Project

AERIAL MAP - LUALUALEI SITE

FIGURE 1-9

Unpaved roadway access from Kuwale Street. Looking north.

Looking mauka.

Looking north. Paheehee Ridge in the background. Project site in the foreground.

Looking south towards project site.

Looking west towards project site.

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Portable Dip Tanks for Wildland Firefighting Project

PHOTOS – LUALUALEI SITE

FIGURE

1-10

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Portable Dip Tanks for Wildland Firefighting Project

AERIAL MAP - PALEHUA SITE

FIGURE

1-11

Driveway Leading to BWS reservoir in background.
Project site to the right of the driveway

Looking northwest towards project site.

Looking southeast towards project site.

Looking south towards project site.

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PHOTOS – PALEHUA SITE

FIGURE

1-12

Table 1-1

Honolulu Fire Department: 2001 – 2011 Wildland Fire Incident Count by Battalion

YEAR	BATTALION 1	2	3	4	5	TOTAL
2001	28	32	65	306	146	**577**
2002	55	33	64	321	121	**594**
2003	59	67	79	536	224	**965**
2004	18	22	36	385	100	**561**
2005	49	54	50	654	168	**975**
2006	42	39	41	364	121	**607**
2007	29	32	57	404	140	**662**
2008	19	35	44	219	82	**399**
2009	39	37	46	294	106	**522**
2010	26	49	64	255	139	**533**
2011*	7	23	19	64	29	**142**
TOTAL:	**371**	**423**	**565**	**3802**	**1376**	**6537**
%AGE:	**5.7%**	**6.5%**	**8.6%**	**58.2%**	**21.0%**	**100.0%**

* 2011 data from January 1, 2011 to July 31, 2011

Source: Honolulu Fire Department, July 2011

1.5 Project Description

The City & County of Honolulu, Board of Water Supply (BWS) proposes to develop three permanent wildland firefighting portable dip tank sites for the use by the Honolulu Fire Department (HFD).

The 15-foot diameter, polypropylene buoywall dip tanks are collapsible, with 5-foot high walls providing an operational volume of approximately 3,000 gallons. The dip tanks require a 20-foot by 20-foot (400 square feet) level, hard surface pad (either concrete or asphalt) for its foundation. A water connection (standpipe) will be installed for filling the dip tank with water. When the dip tanks are not in use, they will be collapsed and stored off-site at HFD facilities. After a firefighting operation, the remaining water in the dip tank (up to 1,500 gallons) will be disposed of on-site.

The dip tank sites will include an emergency landing area for a helicopter, an unobstructed takeoff flight path into the prevailing wind, roadway access, water line extension for the water connection, and other accessory improvements.

The Makaha Site will encompass approximately 14,000 square feet and consist of an access driveway and 20 foot by 20 foot concrete pad (See Figure 1-13).

The Lualualei Site will encompass approximately 55,000 square feet and consist of paving the existing dirt access road and 65 foot by 65 foot concrete pad (See Figures 1-14A and 1-14B). However, at this time, only the pad area is anticipated to be constructed with the access road remaining as a dirt road. A future construction or maintenance project will be undertaken to improve the road and surface conditions.

The Palehua Site will encompass approximately 5,000 square feet and consist of a 30 foot by 50 foot concrete pad and 10 foot by 50 foot pavement strip (See Figure 1-15).

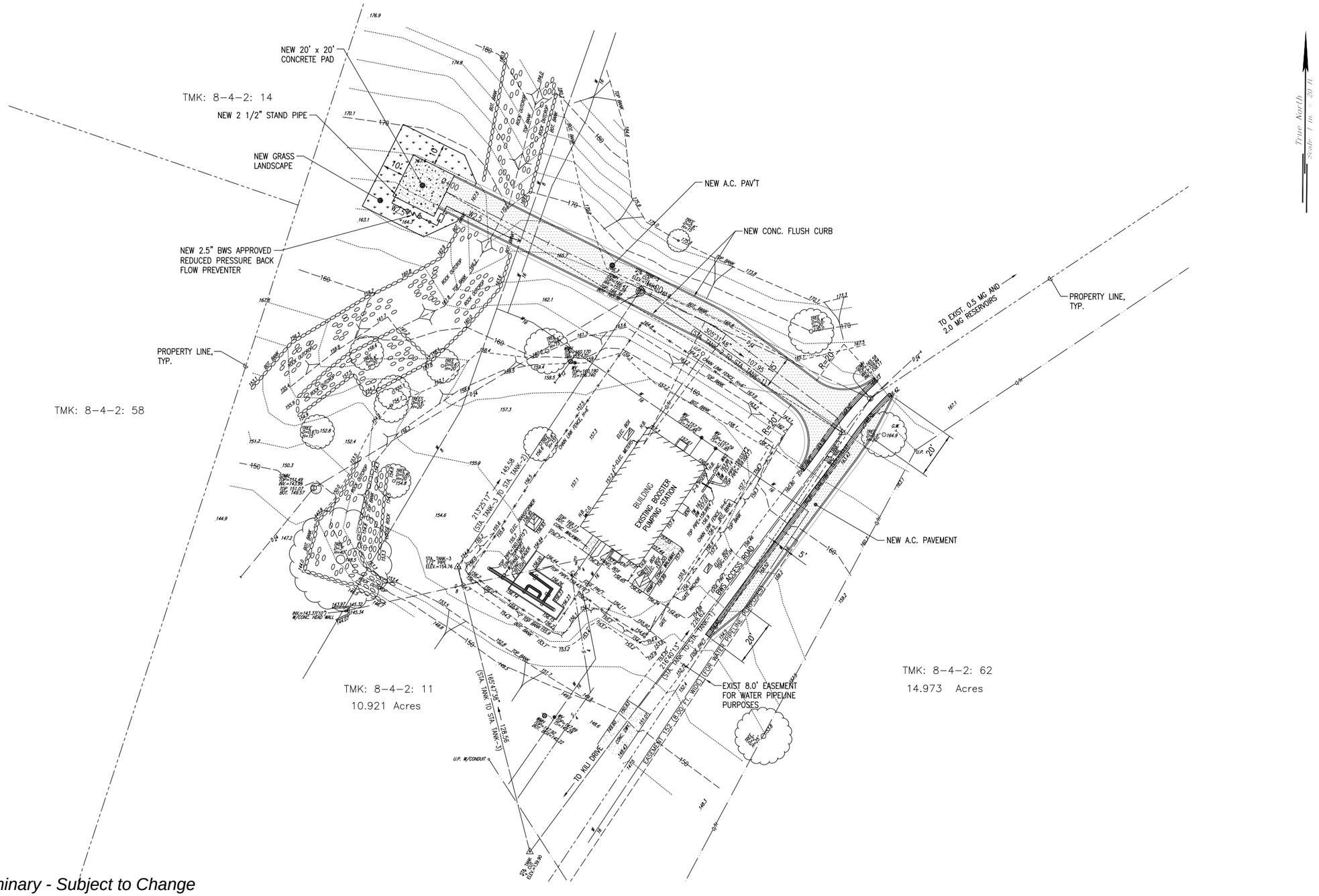
Depending on fire conditions, the HFD may add to the dip tank water PHOS-CHEK® WD 881 Class A Foam (Class A fire retardant), a foam forming additive designed to fight fires. Extensive laboratory and field testing under EPA protocols has shown the product to be non-toxic, biodegradable in water and exhibits no sign of causing adverse impacts to biota. HFD uses retardant according to manufacturer specifications and anticipates no adverse impacts.

1.6 Project Schedule and Cost

At present, BWS has determined the Makaha and Palehua sites will probably be constructed first with Lualualei last. Upon approval of the required permits the expected duration of construction will be up to three months for each site. Table 1-2 summarizes the estimated construction cost for each site. BWS anticipates construction to start mid 2012.

Table 1-2
Estimated Construction Cost Summary

Name of Site	Estimated Construction Cost
Makaha Site	$ 115,000.00
Lualualei Site	
Pad	$ 140,000.00
Access Road	$ 207,000.00
Palehua Site	$ 67,000.00



Preliminary - Subject to Change

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SITE PLAN - MAKAHA SITE

FIGURE

1-13

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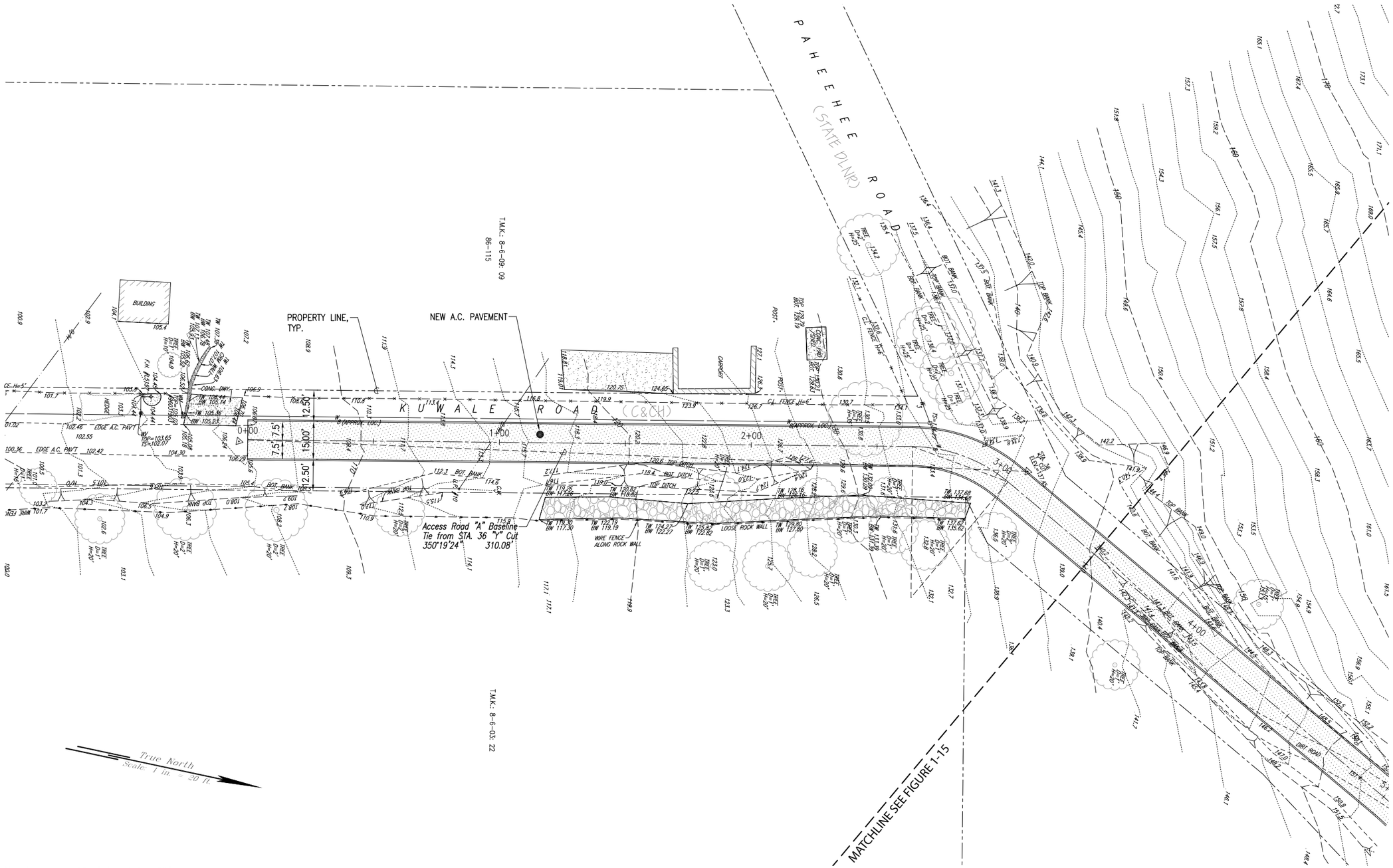

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Portable Dip Tanks for Wildland Firefighting Project

SITE PLAN - LUALUALEI SITE

FIGURE

1-14A

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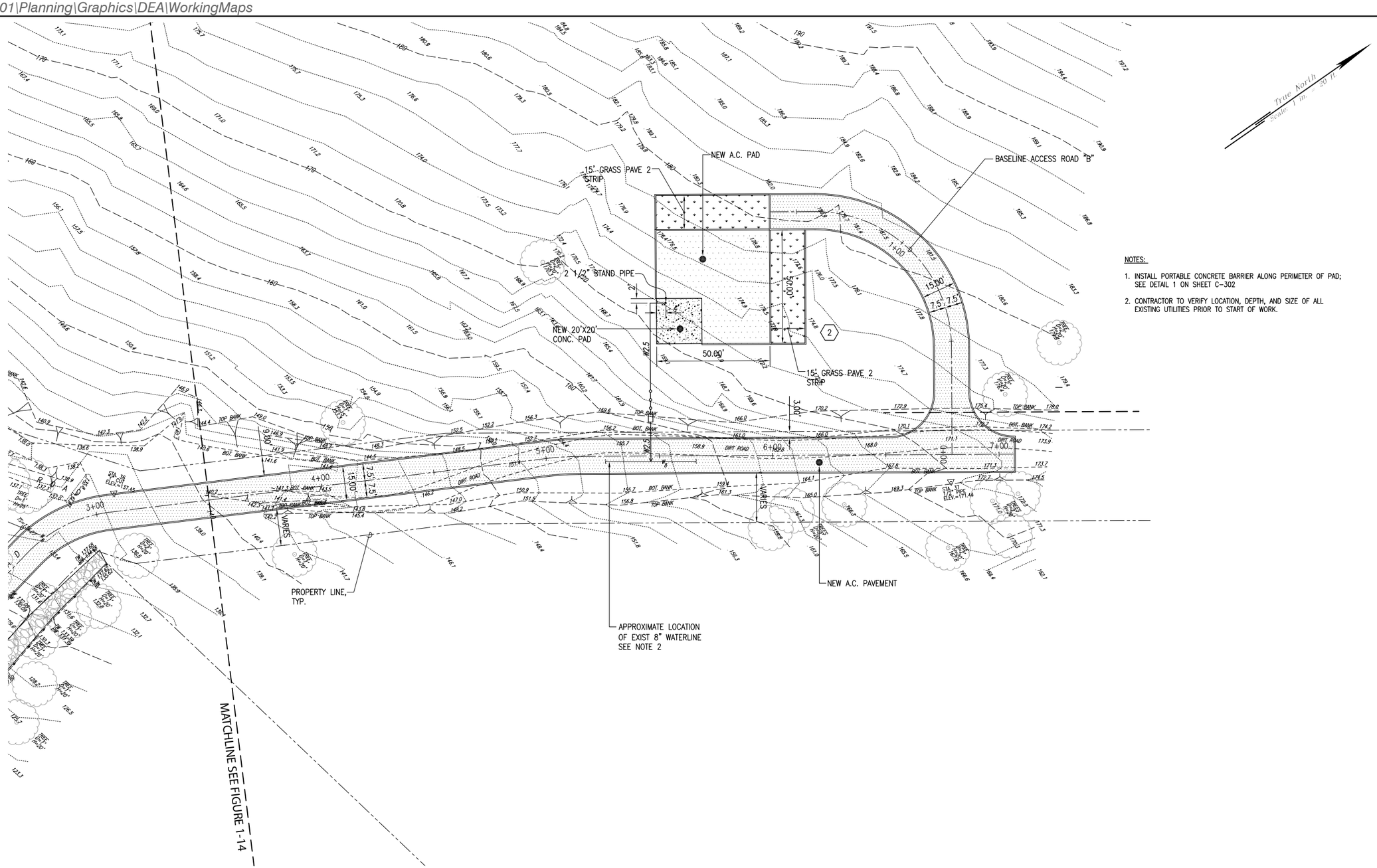

NOTES:

1. INSTALL PORTABLE CONCRETE BARRIER ALONG PERIMETER OF PAD; SEE DETAIL 1 ON SHEET C-302
2. CONTRACTOR TO VERIFY LOCATION, DEPTH, AND SIZE OF ALL EXISTING UTILITIES PRIOR TO START OF WORK.

Preliminary - Subject to Change

WILSON OKAMOTO CORPORATION ENGINEERS • PLANNERS	**Portable Dip Tanks for Wildland Firefighting Project**	FIGURE
	SITE PLAN - LUALUALEI SITE	1-14B

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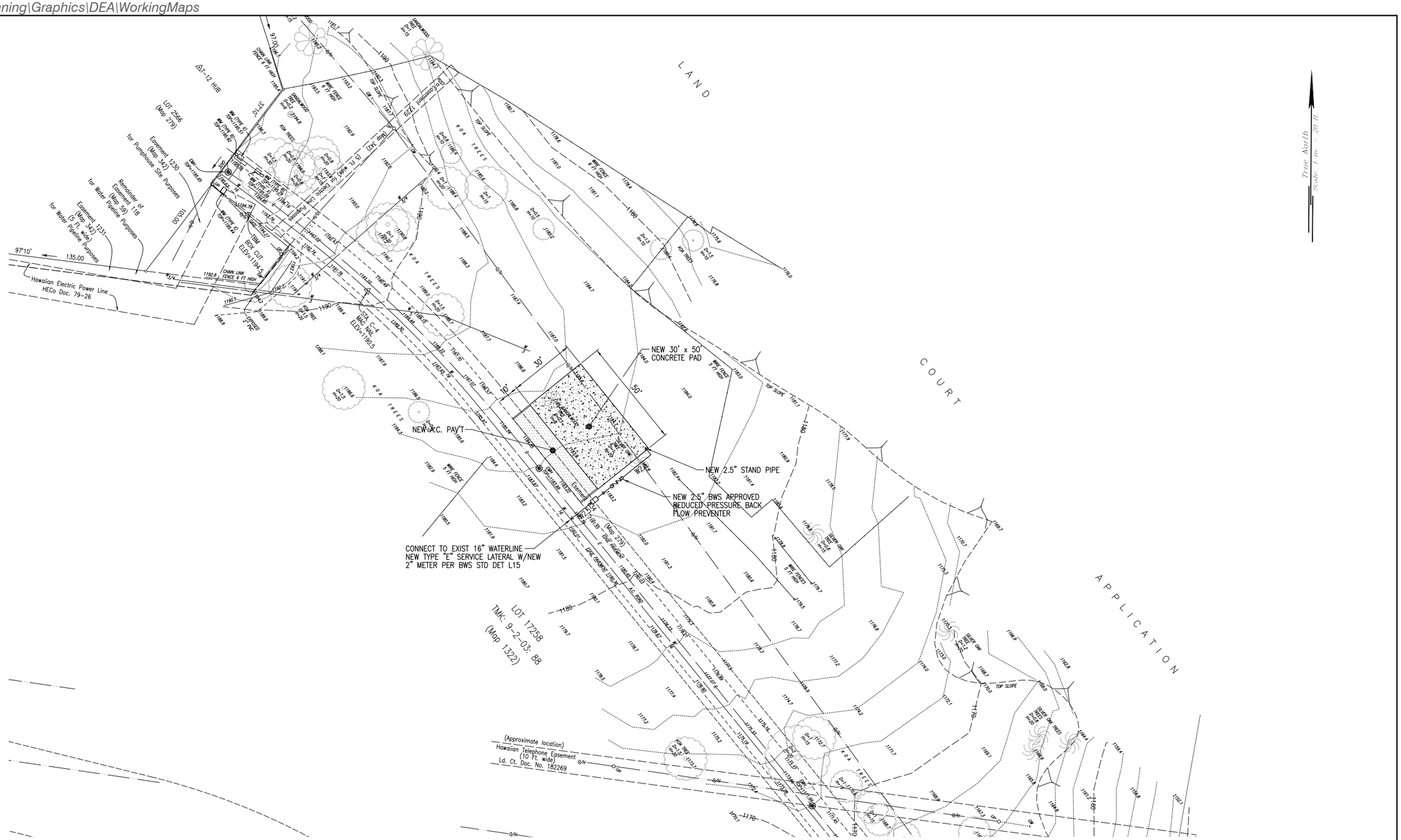

Preliminary - Subject to Change

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Portable Dip Tanks for Wildland Firefighting Project

SITE PLAN - PALEHUA SITE

FIGURE

1-15

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2. DESCRIPTION OF THE EXISTING ENVIRONMENT, IMPACTS AND MITIGATION MEASURES

The following is a description of the existing environment, assessment of potential impacts and proposed measures to mitigate potential adverse impacts resulting from the proposed project.

2.1 Climate

Makaha and Lualualei Sites: The climate of Waianae is generally hot and dry along the coastal areas and in the lower sections of the valleys. Cooler and wetter conditions prevail in the upper sections of the valleys and on up into the Waianae Mountains. The average annual rainfall ranges from less than 20 inches along the coast to more than 75 inches near the summit of Mount Kaala.

Palehua Site: The climate of Makakilo is generally uniform. Average temperatures are relatively constant ranging from 70 degrees Fahrenheit during the coolest month to 76 degrees Fahrenheit during the warmest month. Prevailing winds are the northeasterly trade winds. The average rainfall is approximately 3-4 inches during dryer months and approximately 5-6 inches during wetter months (R.M. Towill Corporation, 2009).

Impacts and Mitigation Measures

No significant impacts on climate in the three project areas are anticipated. The proposed project will not affect temperatures, wind, or rainfall levels at the project sites; however, replacing dense vegetation on the project sites with a concrete pad will alter the microclimate of the site.

2.2 Geology and Topography

The island of Oahu is a volcanic doublet formed by the Waianae range to the west and the younger Koolau Range to the east. Both are remnants of great shield volcanoes, but the term “range” indicates that they have lost most of the original shield outlines and are now long narrow ridges shaped largely by erosion.

The Waianae Mountain Range is composed of three groups of lavas erupted in Tertiary time from three rift zones. The exposed part of the oldest lava is nearly 2,000 feet thick and consists largely of thin-bedded pahoehoe. The middle lavas are separated from the first series in most places by an angular unconformity and talus breccia, and in a few places by an erosional unconformity. The middle basalts are about 2,000 feet thick and closely resemble the lower ones, except that the later beds contain more aa. The upper lavas are about 2,300 feet thick and are mostly massive aa alkalic lavas issued from large cinder cones.

Makaha Site: The project site is located at the base of the north ridge of Makaha Valley. The project site consists of gently sloping rocky talus slope of alluvium and colluvium. Elevations within the project area range from 80 – 360 feet above mean sea level (msl). Moderate to steep sloping terrain exists immediately outside the northern portion of the project area.

Lualualei Site: The north side of the project area is located on the lower slopes of Paheehee Ridge as it ascends from approximately 160-foot elevation at the southwest end of the project area to 180 feet on the north side. Paheehee Ridge is an isolated mass of rhyodacite formed of flows of the Waianae shield volcano (Macdonald et al. 1983). Paheehee Ridge separates Waianae Valley and Waianae Ahupuaa to the northwest from Lualualei Valley and Lualualei Ahupuaa to the southeast. The project area is roughly level ascending gently to the north. The slope of the ridge becomes significantly steeper just to the north.

Palehua Site: The project site is located on the southwestern slopes of the Waianae Mountain Range. The project area slopes moderately upward to the northwest along the southwest ridge of Kaloi Gulch. Elevations within the project area ranged from approximately 1,140-1,200 feet above mean sea level (MSL).

Impact and Mitigation Measures

No significant impact on the geology or overall topography of the three project sites is anticipated during the construction and operation of the proposed facilities.

The proposed project will result in some alteration of the topography within the project sites; however, any impacts on drainage patterns will be minimal, as all three sites are surrounded by vegetation.

Construction of the proposed facilities will require grading activities and excavation for the concrete pad and roadbed/driveway. Graded and excavated areas will be built over, backfilled, or revegetated.

2.3 Soils

The U.S. Department of Agriculture Natural Resources Conservation Service (1972) surveyed and classified soils on all of the major Hawaiian Islands.

The Detailed Land Classification – Island of Oahu published by the University of Hawaii Land Study Bureau (1972) evaluates the quality of productive capacity of certain lands on Oahu for selected crops and overall suitability in agricultural use. A five class productivity rating system was established with “A” representing the highest productivity and “E” the lowest.

The Agricultural Lands of Importance in the State of Hawaii (ALISH) Map, prepared by the State Department of Agriculture, classifies lands into three categories: 1) prime agricultural land, 2) unique agricultural land, and 3) other important agricultural land.

Makaha Site: The project site consists of “Rock Land” (rRK) (See Figure 2-1).

Rock Land (rRK) is made up of areas where exposed rock covers 25 to 90 percent of the surface. Rock Land is characterized by very shallow soils and rock outcrops, mainly basalt and andesite. This land type is nearly level to very steep. Elevations range from nearly sea level to more than 6,000 feet. The land is used for pasture, wildlife habitat and water supply and the natural post-contact vegetation at lower elevations consist of *kiawe*, *klu*, *pili* grass, Japanese tea, and *koa haole*.

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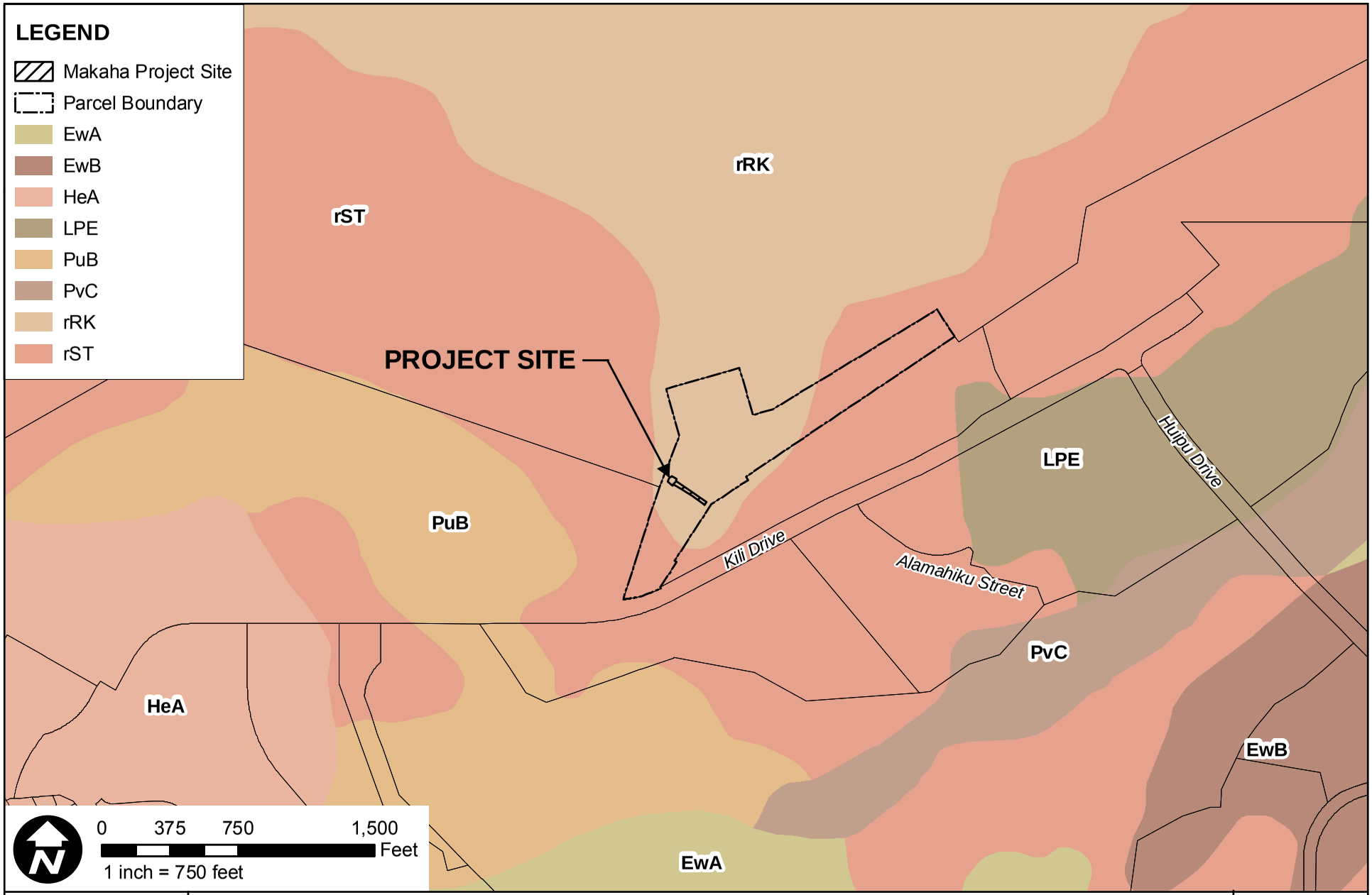

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SOILS MAP - MAKAHA SITE

FIGURE

2-1

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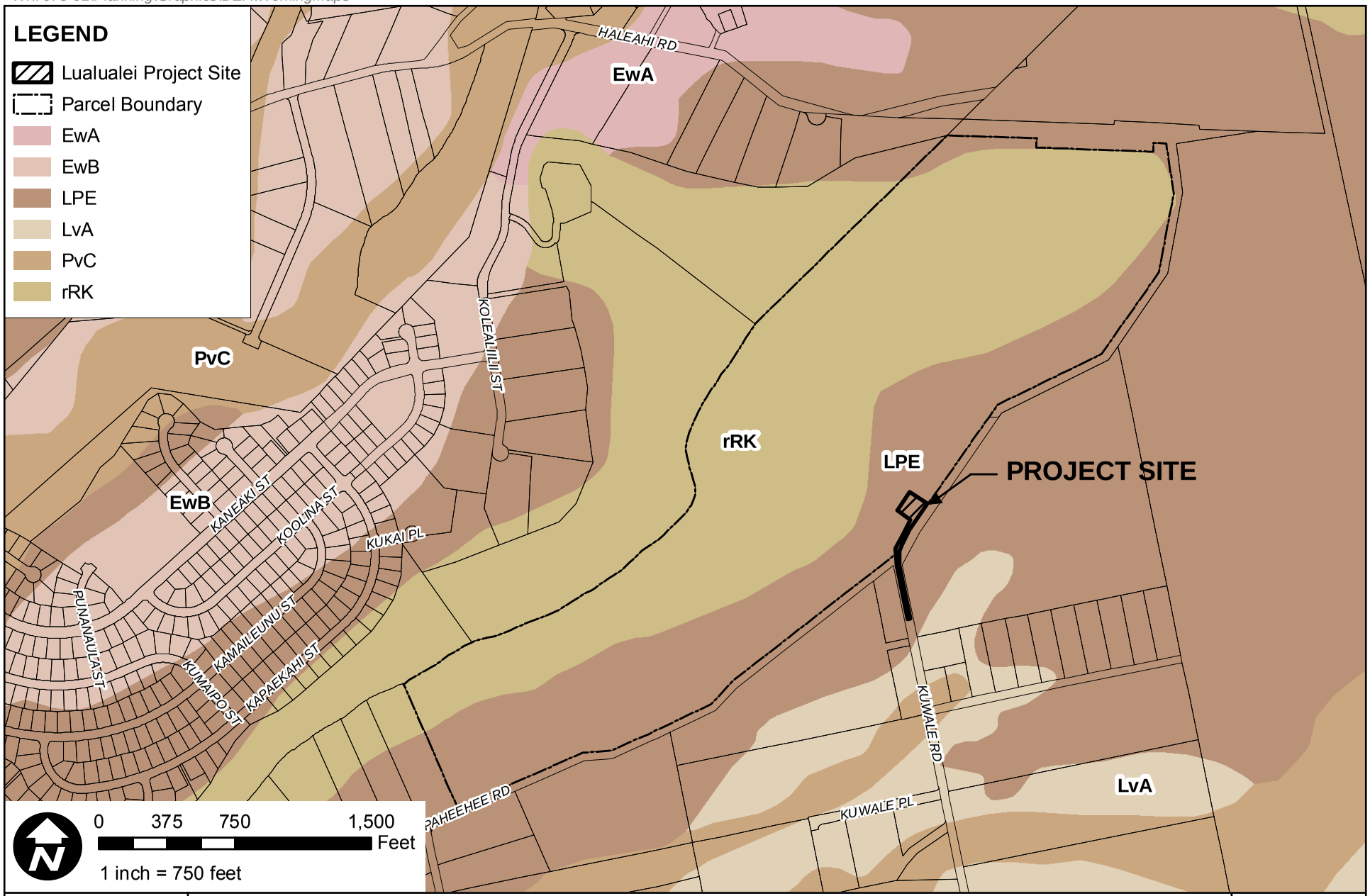

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SOILS MAP - LUALUALEI SITE

FIGURE 2-2

The project site has a LSB rating "E" and is not considered ALISH.

Lualualei Site: The project site consists of Lualualei extremely stony clay (LPE) (See Figure 2-2).

Lualualei extremely stony clay (LPE) occurs on talus slopes on Oahu and Kauai. Lualualei extremely stony clay is a very dark grayish brown clay soil with slow permeability and medium to rapid run-off. Lualualei extremely stony clay slopes range is 3 to 35 percent, but in most places the soil is moderately sloping to steep. It is impractical to cultivate this soil unless the stones are removed.

The project site has a LSB rating "E" and is not considered ALISH.

Palehua Site: The project site consists of Mahana silty clay loam (McD2), 12 to 20 percent slopes, eroded on the southwest side and Mahana-Badland complex (MBL) on the northeast Kaloi Gulch side (See Figure 2-3).

Mahana silty clay loam (McD2) occurs on uplands on the islands of Oahu and Kauai. These soils are developed in volcanic ash. Mahana silty clay loam slopes range from 12 to 20 percent. Most of the surface layer has been removed by erosion, runoff is rapid, and the erosion hazard is very severe. These soils are used for sugarcane, pineapple, and pasture.

Mahana-Badland Complex (MBL) consists of 40 to 70 percent Mahana soils and 30 to 60 percent Badland. Mahana-Badland Complex slopes are moderately steep to very steep, runoff is medium to very rapid, and the erosion hazard is moderate to very severe. These soils are used for pasture.

The project site does not have a LSB rating and is classified as "other important agricultural land."

Impacts and Mitigation Measures

No significant impact on soils at each of the project sites are anticipated with the construction and operation of the proposed project. Excavation and grading activities associated with construction will be regulated by the City and County's grading ordinance and the National Pollutant Discharge Elimination system (NPDES) Permit requirements administered by the DOH. Discharge into State receiving waters is not anticipated as a result of the proposed project and therefore an NPDES permit would not be required. However, if one is needed, separate Notice of Intent forms for each type of discharge will be submitted at least 30 calendar days prior to the start of discharge activity.

A NPDES General Permit for Storm Water Associated with Construction Activities will be required should the area of soil disturbance from activities such as clearing, grubbing, grading, and stockpiling be in excess of one (1) contiguous acre. The permit requires compliance with a Best Management Practices (BMP) plan which, in turn, requires compliance with City ordinances pertaining to grading, grubbing, stockpiling, soil erosion, and sedimentation. Other erosion and sediment control mitigative measures may include appropriately stockpiling materials on-site to

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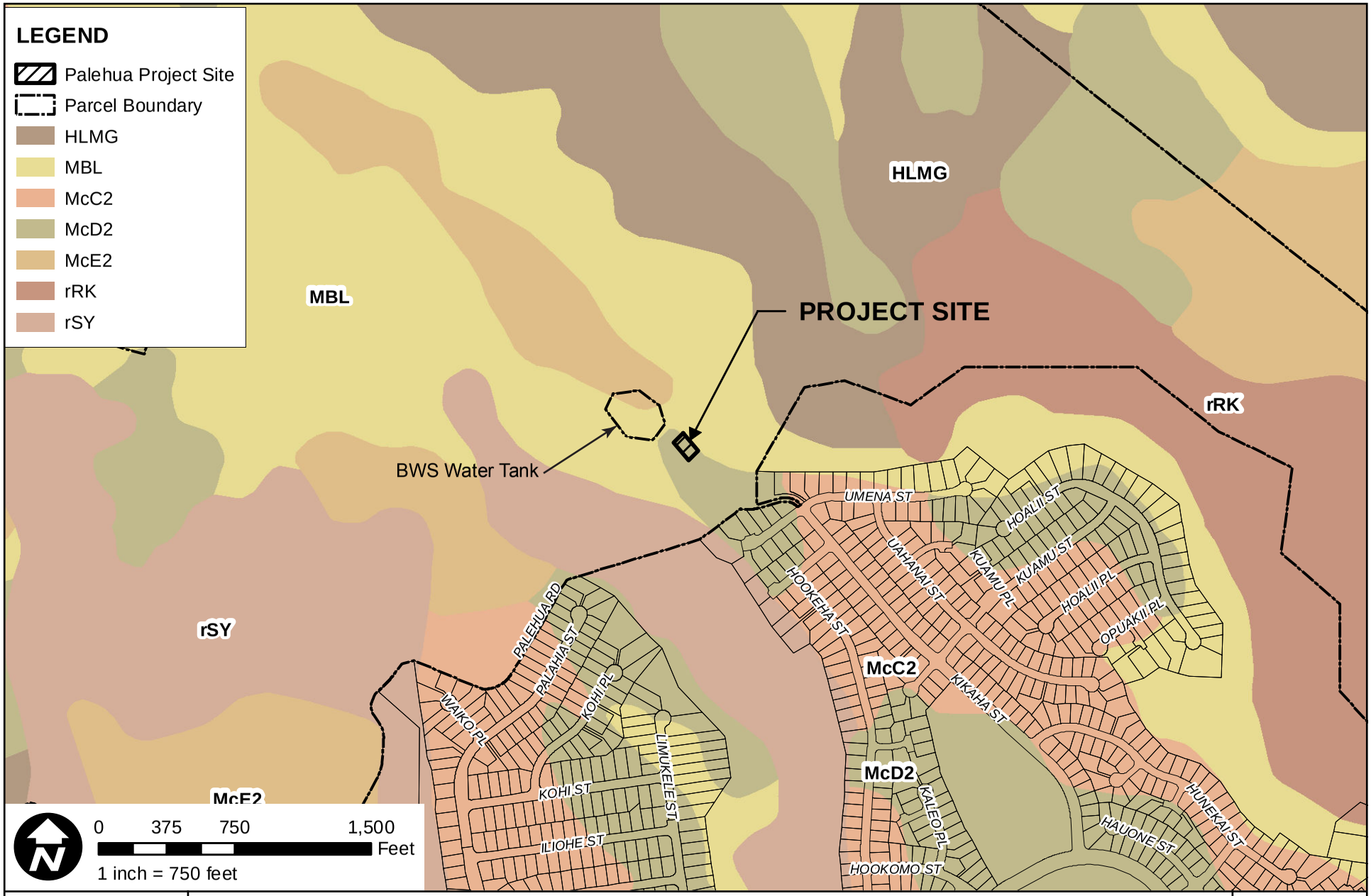

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Portable Dip Tanks for Wildland Firefighting Project

SOILS MAP - PALEHUA SITE

FIGURE

2-3

prevent runoff, covering or stabilizing topsoil stockpiles, use of sediment basins and sediment traps, and establishing revegetation or landscaping as early as possible on completed areas. Following construction, exposed soils will be built over, backfilled, or revegetated.

The proposed project will comply with HAR, Chapters 11-54 and 11-55, as applicable.

2.4 Hydrology

2.4.1 Ground Water

The State Commission on Water Resource Management (CWRM) divides the island's ground water into aquifer sector areas and aquifer system areas. Aquifer sector areas generally define large geological boundaries, such as rift zones, unconformities, or valley fills that separate areas of different water levels. Aquifer system areas are more specifically defined by ground water hydraulic continuity.

Makaha Site: The project site is situated within the Waianae Aquifer Sector Area (303) which is comprised of five Aquifer System Areas identified as Keaau, Makaha, Waianae, Lualualei, and Nanakuli. The project site is located within the Makaha Aquifer System (30304) which yields 3 million gallons a day (mgd) (CWRM, 2008). The aquifer is predominantly composed of basal ground water contained in the Waianae volcanic series. The aquifer is fed by rainfall occurring in the Waianae mountain range, which infiltrates into surface soils to supply the basal ground water. Coralline caprock acts as barrier between the ground surface and the basaltic aquifer (Gray, 1996).

Lualualei Site: The project site is also located within the Waianae Aquifer Sector Area (303). The project site is located within the Lualualei Aquifer System (30302) which yields 4 mgd (CWRM, 2008). The aquifer consists of basal ground water contained in the Waianae volcanic series. The aquifer is fed by rainfall occurring in the Waianae mountain range, which infiltrates into surface soils to supply the basal ground water. Coralline caprock acts as barrier between the ground surface and the basaltic aquifer (Gray, 1996).

Palehua Site: The project site is located within the Pearl Harbor Aquifer Sector Area (302) which is comprised of six Aquifer System Areas identified as Waimalu, Waipahu-Waiawa, and Ewa-Kunia. The project site is located within the Ewa-Kunia Aquifer System (30204) area which yields 16 mgd (CWRM, 2008). The aquifer consists of basal ground waters contained in the Waianae volcanic series. A thick, effective caprock of sediments causes high ground water head (Oceanit, 2007).

<u>Impacts and Mitigation Measures</u>

No significant impacts to groundwater underlying the project sites are anticipated during construction and operation of the proposed project. Construction activities are not likely to introduce to, nor release from the soil any materials which could adversely affect groundwater, including groundwater sources for domestic use. Similarly, operations entail use of only potable water and the fire retardant foam, which as discussed in Section 1.5 will not adversely affect ground water.

Construction activities would inevitably involve land-disturbing activities that may result in some soil erosion. Various mitigative measures will be incorporated in the project's design to minimize potential short-term erosion impacts during construction activities. Excavation and grading activities associated with construction of the proposed project will be regulated by the City and County's grading ordinance and the NPDES permit requirements administered by the DOH, as discussed previously in Section 2.3.

2.4.2 Surface Water

Makaha Site: There are no natural surface water bodies on the project parcel nor project site. Makaha Stream is a perennial stream located south, approximately 0.2 miles from the project site, as shown in Figure 1-1. Makaha Stream begins in the Waianae Mountains and flows southwest through Makaha Valley into the Pacific Ocean.

Lualualei Site: There are no natural surface water bodies on the project parcel nor project site. Mailiili Stream is a perennial stream located south, approximately 0.2 miles from the project site. Mailiili Stream begins in the Waianae Mountains and flows southwest into the Pacific Ocean. Kaupuni Stream is a perennial stream located north, approximately 0.5 miles from the project site. Kaupuni Stream begins in the Waianae Mountains and flows southwest into the Pacific Ocean.

Palehua Site: There are no natural surface water bodies on the project parcel nor project site. Barbers Point Stream is an intermittent stream located west, approximately 0.1 miles from the project site. Barbers Point Stream begins in the Waianae Mountains and flows south into the Pacific Ocean. Kaloi Gulch Stream is an intermittent stream located east, approximately 0.1 miles from the project site. Kaloi Gulch Stream begins in the Waianae Mountains and flows southeast into the Pacific Ocean.

Impact and Mitigation Measures

No significant impacts to streams or drainage systems at the project sites are anticipated with the construction and operation of the proposed project. Construction activities associated with the project would not alter existing streams or drainage patterns associated with any perennial streams. Also, as there are no surface water bodies in the project's vicinity, use of the fire retardant foam will also have no adverse impacts.

Construction activities would inevitably involve land-disturbing activities that may result in some soil erosion. Various mitigative measures will be incorporated in the project's design to minimize potential short-term erosion impacts during construction activities. Excavation and grading activities associated with construction of the proposed project will be regulated by the City and County's grading ordinance and the NPDES permit requirements administered by the DOH, as discussed previously in Section 2.3.

2.4.3 Coastal Waters

Coastal waters along the Waianae Coast from Makua Beach to the southern end of Barbers Point are classified as "A" marine waters by State DOH Administrative Rules, Title 11, Chapter 54, "Water Quality Standards." Class A marine waters are recognized

by DOH with the objective that "their use for recreational purposes and aesthetic enjoyment be protected." This classification allows other uses that are compatible with the protection and propagation of fish, shellfish, and wildlife, and with the recreation in and on these waters.

Impacts and Mitigation Measures

No significant impacts on coastal waters are anticipated as a result of the proposed project. Discharge into State receiving waters is not anticipated as a result of the proposed project and therefore an NPDES permit would not be required. However, if one is needed, separate Notice of Intent forms for each type of discharge will be submitted at least 30 calendar days prior to the start of discharge activity.

During construction, storm runoff has the potential to carry increased amounts of sediment into storm drain systems and streams due to erosion of exposed soils. This runoff could potentially impact the water quality of nearshore coastal waters in the area. Excavation and grading activities associated with construction of the proposed project will be regulated by the City and County's grading ordinance and NPDES permit requirement administered by the DOH, as discussed previously in Section 2.3.

Construction materials wastes will be appropriately disposed of and must also be prevented from leaching into receiving bodies of water.

The proposed project will comply with HAR, Chapters 11-54 and 11-55, as applicable.

2.5 Flood Hazard

Makaha Site: According to the Flood Insurance Rate Map (FIRM), Community Panel Number 15003C0185G (revised January 19, 2011), prepared by the Federal Emergency Management Agency (FEMA), the project site is within Zone X "areas determined to be outside the 0.2% annual chance floodplain" (See Figure 2-4).

Lualualei Site: According to the Flood Insurance Rate Map (FIRM), Community Panel Number 15003C0185G (revised January 11, 2011), prepared by the Federal Emergency Management Agency (FEMA), the project site is within Zone D "areas in which flood hazards are undetermined, but possible" (no figure provided since flood hazards undetermined for the project site).

Palehua Site: According to the Flood Insurance Rate Map (FIRM), Community Panel Number 15003C0302G (panel not printed, 15003CIND0C revised January 19, 2011), prepared by the Federal Emergency Management Agency (FEMA), the project site is within Zone D "areas in which flood hazards are undetermined, but possible".

Impacts and Mitigation Measures

No significant impacts on flood hazards are anticipated as a result of the proposed project. Due to the undeveloped nature of the project sites, development of the proposed project will increase the impervious area, but to such a small extent that

no impacts are expected. It should be also noted the National Flood Insurance Program does not have any regulations for development in these zones.

2.6 Flora and Fauna

Makaha Site: The project site is a relatively open savannah-like landscape. Vegetation within the project site consists primarily of non-native species including dry, exotic grasses with scattered *kiawe* (*Prosopis pallida*) trees, *klu* (*Acacia farnesiana*), *koa haole* (*Leucaena glauca*), and *uhaloa* (*Waltheria americana*) (Cultural Surveys Hawaii Inc., 2010).

Domestic feral animals and rodents are assumed to comprise the majority of mammalian species inhabiting the area. Birds associated with the kiawe and lowland vegetation type in the area include waxbills, sparrows, bulbuls, pigeons, and doves.

According to U.S. Fish and Wildlife Service (USFWS), there are no threatened or endangered species or critical habitat in or near the site (see Appendix E).

Lualualei Site: Vegetation within the project site consists primarily of non-native species including *kiawe* (*Prosopis pallida*) trees, *koa haole* (*Leucaena glauca*), *klu* (*Acacia farnesiana*), *uhaloa* (*Waltheria americana*) and exotic grasses. *Uhaloa* (*Waltheria indica*) was the only native plant observed in the project area (Cultural Surveys Hawaii Inc., 2010).

Domestic feral animals and rodents are assumed to comprise the majority of mammalian species inhabiting the area. Birds associated with the kiawe and lowland vegetation type in the area include waxbills, sparrows, bulbuls, pigeons, and doves.

According to U.S. Fish and Wildlife Service (USFWS), there are no threatened or endangered species or critical habitat in or near the site (see Appendix E).

Palehua Site: The existing vegetation within the project site consists primarily of non-native species including *koa haole* (*Leucaena leucocephala*), *kiawe* (*Prosopis pallida*), Lantana (*Lantana camara*), Christmas Berry (*Schinus terebinthifolius*), and Silk Oak (*Grevillea robusta*). *Uhaloa* (*Waltheria indica*) was the only native plant observed in the project area (Cultural Surveys Hawaii, Inc., 2011).

Domestic feral animals and rodents are assumed to comprise the majority of mammalian species inhabiting the area. Birds associated with the kiawe and lowland vegetation type in the area include waxbills, sparrows, bulbuls, pigeons, and doves. According to U.S. Fish and Wildlife Service (USFWS), there are no threatened or endangered species or critical habitat in or near the site (see Appendix E).

Impacts and Mitigation Measures

There are no rare, threatened, or endangered flora or faunal species located on or near the project sites. Therefore, no significant impacts on floral or faunal resources are anticipated. Furthermore, as discussed in Section 1.5, the use of fire retardant foam will have no adverse impacts on flora or faunal resources.

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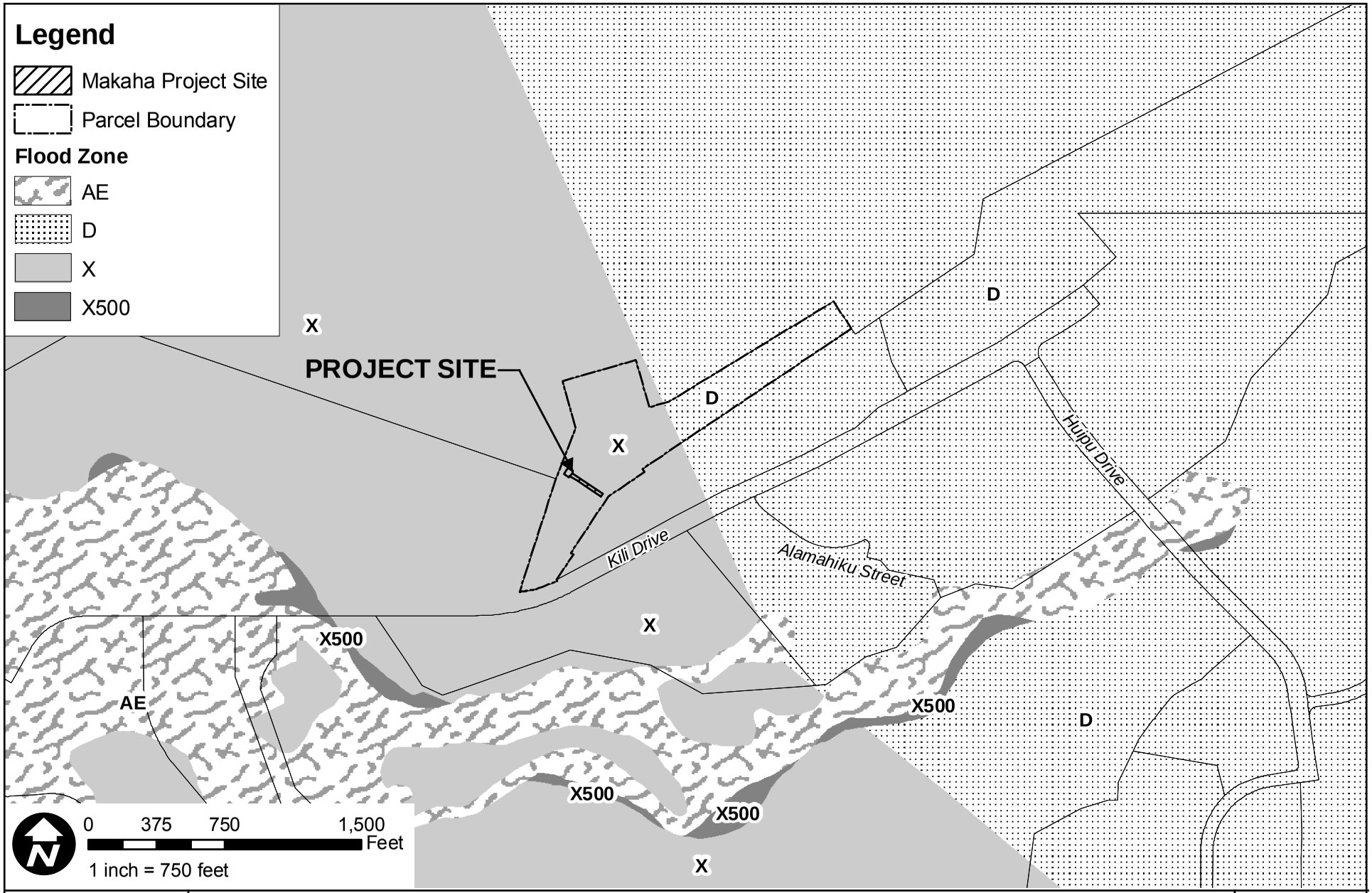

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FLOOD ZONE MAP - MAKAHA SITE

FIGURE 2-4

2.7 Noise

Makaha Site: Ambient noise levels in the project area are generally low. Noise in the vicinity of the project site is predominantly attributable to vehicular traffic along Kili Drive and Farrington Highway. The nearby Makaha Valley Tower and Makaha Valley Plantation are noise sensitive uses in the vicinity of the project site.

Lualualei Site: Ambient noise levels in the project area are generally low. Noise in the vicinity of the project site is predominantly attributable to the agricultural farms. Residences and agricultural farms south of the project site are noise sensitive uses in the vicinity of the project site.

Palehua Site: Ambient noise levels in the project area are generally low. Noise in the vicinity of the project site is predominantly attributable to vehicular traffic along nearby roadways. Residences south of the project site are noise sensitive uses in the vicinity of the project site.

Impacts and Mitigation Measures

In the short-term, noise from construction activities will likely be unavoidable during the entire construction period. Development of the proposed project will involve excavation, grading and construction of the foundation. Various construction phases of the project may generate significant amounts of noise, which may impact nearby residents.

Construction operations will be conducted in compliance with the State DOH Administrative Rules, Title 11, Chapter 46, “Community Noise Control” regulations. These rules require a noise permit if the noise levels from construction activities are expected to exceed the allowable levels stated in Chapter 46 rules. It shall be the contractor’s responsibility to minimize noise by properly maintaining noise mufflers and other noise-attenuating equipment, and to maintain noise levels below allowable regulatory limits. Also, the guidelines for the hours of heavy equipment operation and noise curfew times as set forth by the State DOH noise control regulations must be adhered to.

In the long-term, ambient noise levels in each of the project areas will increase as a result of HFD using the dip tank sites during wildland fire events. These events are anticipated to be temporary.

2.8 Traffic

Makaha Site: Vehicular access to the project site is via a driveway off of Kili Drive. Traffic generated along Kili Drive due to nearby Makaha Valley Towers and Makaha Valley Plantation, and Makaha Resort Golf Club.

Lualualei Site: Vehicular access to the project site is via a dirt road off of Kuwale Road. Traffic generated along Kuwale Road due to residents and agricultural farmers in Lualualei Homesteads.

Palehua Site: Vehicular access to the project is via a driveway off of Umena Street. Traffic generated along Umena Street due to residents.

Impacts and Mitigation Measures

In the short-term, construction activities at each of the project sites will generate traffic associated with commuting construction workers, delivery of construction material, removal of construction wastes, and movement of construction equipment. Associated delays are expected to be intermittent and relatively brief.

If necessary to mitigate potential traffic congestion and delays on nearby roadways, traffic control measures will be implemented during construction. This would include restricting the movement of construction vehicles on roadways during peak traffic hours to limit the degree of inconvenience to motorists. It is anticipated that all construction-related vehicles will park within the project parcel and/or project site and thus, will not affect street parking or traffic flow in the vicinity. Should the proposed project require temporary closure of a traffic lane, parking, etc., on a local street, a Street Usage Permit will be required from the Department of Transportation Services.

2.9 Air Quality

The State DOH operates several ambient air monitoring stations throughout the State. The pollutants monitored by the State are generally done on a regional level, and most of these stations are located at various sites on the Island of Oahu. The U.S. Environmental Protection Agency (EPA) has set national ambient air quality standards (NAAQS) for six criteria pollutants: carbon monoxide, nitrogen dioxide, sulfur dioxide, lead, ozone, and particulate matter (PM_{10} and $PM_{2.5}$). Hawaii has also established a state ambient air standard for hydrogen sulfide.

To protect the State's air quality from degradation, the DOH's Clean Air Branch is responsible for regulating and monitoring pollution sources to ensure that the levels of criteria pollutants remain well below the state and federal ambient air quality standards.

Air pollution is caused by many different man-made and natural sources. There are industrial sources of pollution, such as power plants and refineries; mobile sources, such as cars, trucks, and buses; agricultural sources, such as cane burning; and natural sources, such as windblown dust and volcanic activity. In 2009, the state maintained 13 air monitoring stations on 3 islands. Most commercial, industrial, and transportation activities and their associated air quality effects occur on Oahu, where six of the stations are located. The State DOH's nearest air quality monitoring stations are located in Makaiwa, West Beach and Kapolei. The three stations combined test for SO_2, CO, NO_2, PM_{10}, and $PM_{2.5}$. All three stations were in compliance with State and Federal standards (State of Hawaii Department of Health, 2010).

Air quality in the vicinity of all the project sites is generally good with the primary point source of emissions from vehicles along nearby roadways. There are no point sources of airborne emissions in the immediate vicinity of the project sites. While there is no air quality monitoring station in the vicinity of the project sites, air quality is assumed to be in compliance with State and Federal standards due to the rural character of the area.

Under certain wind conditions, ambient air quality in the vicinity of the Makaha and Lualualei project sites are occasionally affected by odors emanating from agricultural operations.

Impacts and Mitigation Measures

The proposed project will have short-term construction-related impacts on air quality, including the generation of dust and emissions from construction vehicles, equipment and commuting construction workers

The construction contractor is responsible for complying with DOH Administrative Rules, Title 11, Chapter 60, "Air Pollution Control" regarding air pollution, and in particular, fugitive dust and the prohibition of visible dust emissions at property boundaries. Mitigation measures to address short-term impacts include paving and/or re-establishment of vegetated areas early in construction, watering of unpaved areas, and minimizing construction vehicles during peak traffic periods.

Nevertheless, the properties which are anticipated to be most affected by air quality impacts during construction are the residences located in the immediate vicinity of the project sites.

In the long-term, operation of the proposed facilities will have no significant impact on air quality in the vicinity of the project sites.

2.10 Archaeological and Historical Resources

Separate Archaeological Assessment reports consisting of literature reviews and surface surveys for the Board of Water Supply Fire Dip Tank Project at the Makaha, Lualualei, and Palehua project sites were conducted by Cultural Surveys Hawaii, Inc. (CSH), in February 2010 and March 2011, respectively. The results are summarized below and the studies are included as Appendices A, B, and C respectively.

The Archaeological Assessments involved: research on historic and archaeological background, including search of historic maps, written records, and Land Commission Award (LCA) documents, focusing on the specific area with general background on the *ahupuaa* (Hawaiian land division) and district and emphasizes settlement patterns; a complete ground survey of the entire project area for the purpose of historic property inventory; and consultation with knowledgeable members of the community, requesting information on historic properties in the study area.

Makaha Site: Archaeological data suggest that a significant and rather substantial pre-contact population once occupied Makaha Valley. The earliest Hawaiian settlement was probably focused along the coast at the mouth of Makaha 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 *loi* (irrigated taro fields) fed by Makaha Stream.

Increased rainfall in the inland areas of Makaha 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 Makaha

Valley became the focus of settlement, contrary to the typical pre-contact *ahupuaa* settlement pattern of having the population concentrated on the coast. Associated with the inland settlement was the principal *heiau* of Makaha, Kaneaki Heiau.

By the mid-1800s, the traditional Hawaiian way of life in Makaha was in decline. The sandalwood trade undoubtedly had a negative effect on the Native Hawaiian population and the lands that supported them. LCA of the mid-1800s were located in a cluster along Makaha Stream, in the mid-valley area of Makaha Ahupuaa. The location of the LCA cluster corresponds to the aforementioned inland settlement area.

In the early 1900s, the Waianae Sugar Company expanded into Makaha and placed large portions of the lower valley under sugar cane cultivation. Water to irrigate the growing plantation was generally supplied by Makaha Stream, with reservoirs and ditches constructed to divert, store, and distribute the water to the cane fields. Little water remained for irrigation of taro *loi*, contributing to the demise of traditional agriculture in Makaha 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, along with the sale of residential and agricultural lots in the coastal areas of Makaha, much of the lands in the lower valley were disturbed by development activities, including a hotel, recreational facilities, two golf courses and condominiums.

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.

A pedestrian inspection of the project area confirmed that there were no surface historic properties within the project area. The project area is a relatively open savannah-like landscape of 30-50 cm high dry, exotic grasses with scattered *kiawe* (*Prosopis pallida*) trees, *koa haole (Leucaena glauca)*, *klu* (*Acacia farnesiana*), and *'uhaloa* (*Waltheria americana*) brush. Ground visibility was generally good.

A small Makaha Booster # 1 facility lies within the project area. To the southwest is a Makaha Shaft facility. Significant ground disturbance occurred in the context of construction of these two buildings.

No archaeological features were observed or are believed to be present in the vicinity of the project site.

Lualualei Site: Prehistorically, land use in Lualualei was greatest at the sea, where marine resources were plentiful, and in the mountainous interior, where there was sufficient rainfall for agriculture and forest resources. The intervening lands between the sea and the mountains were a dry scrubland. Although potentially useful for dry land agriculture in the wet winter months, it is unlikely that this area would have been largely utilized by Native Hawaiians.

The settlement pattern prior to Western Contact for this region was likely dispersed residences concentrated at the sea and the mountains. Based on the season and the available resources, the resident population most likely used multiple residences, perhaps one at the seaside and another *mauka*, to reduce resource transport time. It is also possible that there existed an informal exchange network where by coastal dwellers traded marine resources for the agricultural and forest resources of the inland dwellers.

The population along the Waianae coast may always have been quite low. The immediate vicinity lacked water for cultivation and was proverbial for its poverty.

By the mid 1800s, the traditional Native Hawaiian lifestyle in the valley of Lualualei was in decline. The sandalwood trade undoubtedly had a negative effect on the Native Hawaiian population. Beginning at this time, Lualualei began its cattle ranching period. The introduction of sugar plantations brought more foreigners and the Oahu Railway and Land Company (OR&L) railroad, which was linked to Waianae in 1895. Based on the paucity of LCA claimed within the area and the early population figures, it appears that the Native Hawaiian population was quite low in the latter half of the nineteenth century.

Population numbers slowly increased when homesteading was instituted in the early 1900s. Military use of the land began in 1917. World War II greatly affected the landscape of the Waianae coast by placing bunkers, gun emplacements, and barbed wire along the waterfront. Numerous archaeological investigations have taken place within Lualualei Valley on the Leeward side of Oahu. The studies have demonstrated a pattern of high intensity land use in only the *mauka* and *makai* portions of Lualualei Valley, with a relative gap in archaeological remains in the middle sections.

The studies of the *mauka* portions of the valley identified more than 500 archaeological sites, which included well over 1,000 features. The identified features included “alignments, C-shapes, L-shapes, U-shapes, walls, terraces, enclosures, mounds, platforms, walled terraces and paved terraces” (Haun 1991; vii). These features were related to habitation, agriculture, rituals, ceremonies, and the procurement and manufacture of stone tools.

Extensive evidence of pre-contact Native Hawaiian activity has also been recorded in *makai* sections of the *ahupuaa*, immediately adjacent to the ocean including seven Native Hawaiian burials documented during water system improvements and two cultural layers that exhibited charcoal deposits, pit hearts, midden, and artifacts associated with prehistoric occupation (Hammatt and Shideler 1991; McDermott and Hammatt 2000).

In contrast to the abundance of traditional Hawaiian sites and features encountered at the *mauka* and *makai* portions of Lualualei Valley, sites recorded during the studies in the central section of Lualualei Valley are relatively minimal in number and are generally of post-contact origin. Pre-contact Hawaiian sites in this area consist of trails, lithic scatters, and temporary habitation sites, pointing to the intermittent use of the central portion of Lualualei Valley. The lack of traditional Hawaiian sites in these areas may reflect not only a general disuse during pre-contact times, but also the extensive disturbance of this area by historic ranching, sugar agriculture, and U.S. Military occupation.

A pedestrian inspection of the project area confirmed that there were no surface historic properties within the project area. The project area is a relatively open savannah-like landscape of 30-50 cm high dry, exotic grasses with scattered *kiawe* (*Prosopis pallida*) trees, *koa haole (Leucaena glauca)*, *klu* (*Acacia farnesiana*), and *uhaloa* (*Waltheria americana*) brush. Ground visibility was generally good.

No archaeological features were observed or are believed to be present in the vicinity of the project site.

Palehua Site: Historical background research of Honouliuli Ahupuaa indicated that pre-contact settlement of the *ahupuaa* would have been centered around the rich cultivated lands of Honouliuli *ili* for extensive wetland taro cultivation and abundant coastal resources. The extensive limestone plain would also include recurrent use habitations for fishermen and gatherers, and sometimes gardeners. The upland dry forest areas would be used for hunting and gathering of forest resources, but likely not for widespread permanent settlement. In the intermediate area between the limestone plain and the upland forests, in the vicinity of the study area, indigenous Hawaiian activities would have been limited to dry land agriculture within gulches or near springs, and *mauka*/*makai* transportation routes (i.e. trails) and associated temporary shelters.

By 1920, the lands of Honouliuli were used primarily for commercial sugar cane cultivation and ranching (Frierson 1972:18). Much of the *mauka* lands in western Honouliuli, including ridges and deep gulches, were unsuitable for commercial sugar cultivation and remained pasture land for grazing livestock. Historic maps indicate a general lack of any significant development within the vicinity of the present project area into the 1940s suggesting that the lands were unsuitable for commercial sugar cane cultivation and were utilized as pasture land for grazing livestock. Modest constructions in the vicinity included Palehua Road, allowing access to the uplands of western Honouliuli, as well as plantation irrigation infrastructure.

Previous archaeological research in the vicinity of the study area has identified numerous pre-contact sites including: habitation structures (temporary and permanent) and agricultural features (terrace and mounds). Of particular interest are three pre-contact sites (SIHP No. -2600, -2601, & -2602) located within Kaloi Gulch. All three sites were determined to be related to erosion control and water management and suggest that in the past water was fairly abundant within the study area.

Historic archaeological sites identified in the vicinity of the study area include Plantation Era infrastructure (ditches, flumes, clearing mounds, etc.) related to the Ewa Plantation Company and Oahu Sugar Company, walls and fences attributed to the Campbell Ranch, and industrial quarry infrastructure (rock crusher, concrete platforms and structures, etc.).

Based on background research, expected finds in the vicinity of the project area are likely to include both pre-contact and historic archaeological sites. Pre-contact archaeological sites may include: dry land agricultural sites, including planting mounds and terraces in the vicinity of springs or drainage gulches; habitation sites, including enclosures and platforms; trail markers (*ahu*); religious sites (*heiau*), including enclosures, terraces, platforms, and/or upright stones located on prominent hills or other significant locations. Historic archaeological sites may include: ranch related structures, including walls,

fences, maintained springs, and water tunnels; irrigation infrastructure, including ditches and flumes related to the Ewa Plantation Company and Oahu Sugar Company; or industrial quarry infrastructure.

A pedestrian inspection of the project area confirmed that there were no surface historic properties located within the project area. The project area is a relatively open savannah-like landscape of short exotic grasses with scattered *kiawe* (*Prosopis pallida*) trees, *koa haole (Leucaena glauca)*, *klu* (*Acacia farnesiana*), and *'uhaloa* (*Waltheria americana*) brush. Ground visibility was generally very good to excellent. Particular attention was directed toward any areas of exposed rocks including in particular an area of the "Mahana-Badland complex" present in the northeast portion of the project area. No indications of traditional Hawaiian occupation were observed.

Remnants of ranching infrastructure were observed including fences and a remnant of a former water storage tank. Some of the ranching infrastructure appears quite new. Some of the ranching infrastructure appears to be a mixture of older and newer fence posts with what appears to be adaptive re-use of older fence posts through re-location. Some of the ranching infrastructure appears to be in remnant condition lacking integrity of function. None of the ranching infrastructure seems likely to be pre-twentieth century and while some of the posts were certainly quite weathered it is not clear they are more than fifty years old. With the uncertainty regarding the antiquity of the ranching infrastructure and the apparent lack of integrity, and given that the assemblage observed represents a very, very small portion of the ranching infrastructure believed to be present in the southern Waianae Range it was thought to be inappropriate to give a formal site designation.

The piece of steel in the study area believed to have been part of a former water tank associated primarily with ranching. Given the lack of geographic context and remnant nature of this out-of-context fragment of water tank no formal site designation was deemed appropriate.

The current investigation identified a 794 meter (m) long segment of what is believed to be the historic Palehua Trail. This trail segment is located approximately 465 m northwest of the project area. The identified trail segment is approximately 1 to 3 m wide and consists of a cut into the slope of the hillside on the southwest side of Kaloi Gulch. The down slope edge of the trail is effectively terraced with an alignment of basalt boulders one to three courses high, abutting the down slope edge of the trail. These modifications serve to delineate the trail's path and act as a retaining wall, stabilizing the down slope edge of the trail.

Once the trail stops running cross-slope and begins to head down the summit of the ridgeline, formal trail modifications (i.e., soil cuts, stone curbing, retaining walls, etc.) begin to become sparse until they disappear completely. There is no clear indication on the ground of the trail within 450 m of the present project area. The trail may always have been minimally demarcated on the lower portion of the ridge and appears likely to have been cut by construction of a rough road servicing power poles, the construction of the large reservoir just upslope and perhaps by pasturage improvements as well.

There is no trace of the Palehua Trail within or in the immediate vicinity of the project area due to extensive land modifications associated with power line installations, BWS infrastructure (i.e., water tank, roads, etc.), and ranching.

A pipeline or aqueduct is noted on a 1953 U.S. Geological Survey map and subsequent maps. A PVC water pipe line on modern supports was observed upslope to the northwest of the project area but no evidence of former pipelines was observed in the present project area.

No archaeological features were observed or are believed to be present in the vicinity of the project site.

Impacts and Mitigation Measures

No significant impacts on archaeological and historical resources are anticipated during construction and operation of the proposed facilities.

Makaha Site: No historic properties or cultural materials (midden, artifacts, etc.) were observed within the project area.

No further historic preservation work is recommended for the proposed fire dip tank project at the Makaha project site. SHPD concurred with the recommendation (see Appendix A). Should any significant historic or archaeological resources be found during construction activities, all work shall cease within the immediate area and SHPD shall be notified immediately.

Lualualei Site: No historic properties or cultural materials (midden, artifacts, etc.) were observed within the project area.

No further historic preservation work is recommended for the proposed fire dip tank project at the Lualualei project site. SHPD concurred with the recommendation (see Appendix B). Should any significant historic or archaeological resources be found during construction activities, all work shall cease within the immediate area and SHPD shall be notified immediately.

Palehua Site: No historic properties or cultural materials (midden, artifacts, etc.) were observed within the project area.

No further historic preservation work is recommended for the proposed fire dip tank project at the Palehua project site. However, it is recommended that, where appropriate with the proposed construction, the modest existing ranching infrastructure and aqueduct section be left where they are as part of the legacy of land-use. SHPD concurred with the recommendation (see Appendix C). Should any significant historic or archaeological resources be found during construction activities, all work shall cease within the immediate area and SHPD shall be notified immediately.

2.11 Visual Aesthetics

Makaha and Lualualei Sites: The project sites are located in Waianae which is characterized by a large-scale, bold landscape. Scenic resources in Waianae include:

the ocean; white sand beaches; green valleys; the rugged *puu* and ridges along the coast, including Puu Heleakala, Puu O Hulu, Puu Mailiilii, and Paheehee Ridge; and the high peaks of the Waianae Range, including Puu Kaua at 3,127 feet, Puu Kalena at 3,504 feet, and Mount Kaala, the highest peek in Oahu, at 4,025 feet.

Scenic resources are not immediately visible from Farrington Highway, the main coastal roadway. Along most of the highway, views of the valleys are blocked by residential and commercial development, however, significant views of open valley lands, steep-walled ridges and mountains can be seen once people leave the highway and turn up into the valleys.

The "Coastal View Study" published in 1987 identifies a number of "significant stationary views": from Makaha Beach Park, Mauna Lahilahi Beach Park, Pokai Bay Beach Park, and Maili Beach Park. There are also many significant *mauka* views, and special views from higher elevations looking toward the coast, including views from the scenic overlook near Kolekole Pass (City and County of Honolulu Department of Planning and Permitting, 2000).

The BWS's Makaha 242 Reservoirs are visible from Farrrington Highway. The Makaha site is located at an elevation approximately 200 feet msl, downslope from the reservoir.

The Lualualei Site is located on the lower slopes of Paheehee Ridge towards the back of the valley.

Palehua Site: The project site is located at an elevation approximately 1,200 feet msl at the top of Makakilo Ridge. Scenic resources in Ewa include: distant views of the shoreline from the H-1 Freeway above the Ewa Plain; views of the ocean from Farrington Highway between Kahe Point and the boundary of the Waianae Development Plan Area; views of the Waianae Mountain Range from H-1 Freeway between Kunia Road and Kaloi Gulch and from Kunia Road; views of na puu at Kapolei, Palailai, and Makakilo; *mauka* and *makai* views; and views of central Honolulu and Diamond Head (City and County of Honolulu Planning Department, 2000).

The Palehua Site is located upslope of Umena Street. The existing BWS Makakilo Reservoir is not visible from Umena Street.

Impacts and Mitigation Measures

No significant impacts on visual resources in the project areas for each of the project sites are anticipated as a result of construction and operation of the proposed project. A concrete pad will be constructed on each site, as described in Section 1.5, to provide a flat surface for the HFD to temporarily place the 15-foot diameter inflatable polypropylene buoywall dip tank to fight wildland fires when they occur. When the dip tanks are not in use, they will be collapsed and stored off-site at HFD facilities; therefore, the proposed project will not have a substantial visual impact, and will not obstruct existing view planes.

2.12 Socio-Economics

Makaha Site: The project site is situated within the Makaha Census Designated Place (CDP). In 2000, the Makaha CDP had a resident population of 7,753 people with a

median age of 30.2 years. The census identified 8.7 percent of the population being 0-5 years of age, 17.3 percent being 5-19 years, 63.7 percent being 20-64 years, and 10.3 percent being 65 years or older. There were 2,388 households out of which 33.7 percent have children under 18 living with them. The 2000 census identified 42.7 percent as Asian and 46.2 percent as White. The average household size in Makaha is 3.2 persons. A summary of the demographic characteristics in the area can be found in Table 2-1 (U.S. Census Bureau, 2000).

A mix of land uses can be found in the vicinity of the project area including residential, commercial and agricultural activities. Commercial activities in the vicinity of the project area are centered in Waianae where numerous retail, office, and other business establishments are located.

Lualualei Site: The project site is situated within the Waianae Census Designated Place (CDP. In 2000, the Waianae CDP had a resident population of 10,506 people with a median age of 28.8 years. The census identified 8.5 percent of the population being 0-5 years of age, 29.5 percent being 5-19 years, 53.8 percent being 20-64 years, and 8.1 percent being 65 years or older. There were 2,595 households out of which 40.5 percent have children under 18 living with them. The 2000 census identified 50.4 percent as Asian and 36.9 percent as White. The average household size in Waianae is 2.95 persons. A summary of the demographic characteristics in the area can be found in Table 2-2 (U.S. Census Bureau, 2000).

A mix of land uses can be found in the vicinity of the project area including residential, commercial and agricultural activities. Commercial activities in the vicinity of the project area are centered in Waianae where numerous retail, office, and other business establishments are located.

Palehua Site: The project site is situated within the Makakilo City Census Designated Place (CDP). In 2000, the Makakilo City CDP had a resident population of 13,156 people with a median age of 35.7 years. The census identified 8.6 percent of the population being 0-5 years of age, 24.3 percent being 5-19 years, 61.1 percent being 20-64 years, and 6.1 percent being 65 years or older. There were 3,898 households out of which 41.1 percent have children under 18 living with them. The 2000 census identified 55.5 percent as Asian and 45.3 percent as White. The average household size in Makakilo City is 29.5 persons. A summary of the demographic characteristics in the area can be found in Table 2-3 (U.S. Census Bureau, 2000).

A mix of land uses can be found in the vicinity of the project area including residential, commercial and agricultural activities. Commercial activities in the vicinity of the project area are centered in Kapolei where numerous retail, office, and other business establishments are located.

Impacts and Mitigation Measures

The proposed project will generally have positive social and economic impacts in the region. In the short-term, the project will confer some positive benefits to the local economy. This would include creation of some construction and construction support jobs, and generation of State and City tax revenue, associated with construction expenditures.

In the long-term, the project will provide much needed facilities for the project areas to better service fire protection needs.

2.13 Infrastructure

2.13.1 Water

Water service for the City & County of Honolulu is provided by the Board of Water Supply (BWS).

Makaha and Lualualei Sites: The potable water system currently servicing the Waianae District consists of six source wells in Makaha, the Makaha shaft, Kamaile Wells, three wells in Waianae Valley, the Waianae City and County Tunnel and the Plantation Tunnels. Potable water is also imported from the Pearl Harbor aquifer to supplement the District's needs.

The Makaha project site is located adjacent to BWS's Makaha 242 reservoirs, Makaha Booster No. 1, and Makaha Shaft. The proposed facility will tap into the BWS Makaha 242 Water System.

The proposed facility at the Lualualei project site will tap into an existing 8 inch waterline located along Kuwale Road.

Palehua Site: The potable water system currently servicing the Ewa District consists of three source wells in Waipahu, the Ewa shaft, Waiawa Wells, three wells in Kunia, and the Mililani Wells. Alternative potable water sources include the Ewa Desalinization Plant. The project site is located adjacent to BWS's Makakilo 1230 Reservoir. The proposed project will tap into the BWS Makakilo 1230 Water System.

Impacts and Mitigation Measures

No significant impacts are anticipated on the existing water system in the vicinity of the project sites as a result of the construction and operation of the proposed project. The proposed facilities will provide water to HFD during wildland fire events.

2.13.2 Wastewater

Makaha and Lualualei Sites: Wastewater for the Waianae district is collected at the Waianae Wastewater Treatment Plant (WWTP) located north of Puu Mailiilii and south of Waianae Mall. The treatment plant has been designed for average dry weather flows of 5.2 mgd with a peak flow of 13.8 mgd.

The major sewer lines generally follow Farrington Highway and the major valley roads, with the exception of Lualualei Valley, where the sewer lines do not extend beyond the more densely developed coastal zone.

Table 2-1
Demographic Characteristics: 2010

Subject	Makaha CDP		Waianae CDP		Makakilo CDP		Oahu	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total Population	**8,278**	**100**	**13,177**	**100**	**18,248**	**100**	**953,207**	**100**
AGE								
Under 5 years	745	9.0	1297	9.8	1,398	7.7	61,261	6.4
5 – 19 years	1871	22.5	3493	26.5	4,336	23.8	174,309	18.3
20 – 64 years	4779	57.8	7193	54.6	10,994	60.3	579,147	60.8
65 years and over	883	10.7	1194	9.1	1,520	8.3	138,490	14.4
Median age (years)	32.5	(x)	29.8	(x)	33.4	(x)	37.8	(x)
RACE (alone or in combination with other races)								
White	3,873	46.8	4,820	36.6	8,741	47.9	350,690	36.8
Black or African American	359	4.3	443	3.4	1,000	5.5	32,780	3.4
American Indian and Alaska Native	385	4.7	585	4.4	518	2.8	20,482	2.1
Asian	3,671	44.3	6,497	49.3	10,511	57.6	590,926	62.0
Native Hawaiian and other Pacific Islander	4,982	60.2	9,141	69.4	5,581	30.6	233,637	24.5
Other	270	3.3	314	2.4	521	2.9	21,915	2.3
Two or more races	3,573	43.2	5,900	44.8	5,968	32.7	213,036	22.3
HOUSEHOLD (by type)								
Total Households	2,528	100.0	2,980	100.0	5,449	100.0	311,047	100.0
Family households (families)	1,686	66.7	2,523	84.7	4,470	82.0	217,842	70.0
Married-couple family	942	37.3	1,593	53.5	3,440	63.1	161,172	51.8
With own children under 18 years	353	14.0	709	23.8	1,640	30.1	65,995	21.2
Female householder, no husband present	530	21.0	639	21.4	709	13.0	39,435	12.7
With own children under 18 years	306	12.1	297	10.0	397	7.3	15,027	4.8
Nonfamily households	842	33.3	457	15.3	979	18.0	93,205	30.0
Average household size	3.21	(x)	4.25	(x)	3.35	(x)	2.95	(x)
HOUSING OCCUPANCY AND TENURE								
Total Housing Units	3,202	100.0	3,283	100.0	5,768	100.0	336,899	100.0
Occupied units	2,528	79.0	2,980	90.8	5,449	94.5	311,047	92.3
By owner	1,057	41.8	1,983	66.5	3,827	70.2	174,387	56.1
By renter	1,471	58.2	997	33.5	1,622	29.8	13,660	43.9
Vacant units	674	21.0	303	9.2	319	5.5	25,852	7.7

Source: U.S. Census Bureau, Census 2010

Palehua Site: Wastewater for the Ewa District is collected at the Honouliuli Wastewater Treatment Plant (WWTP) located east of Barbers Point Naval Air Station. The treatment plant has the capacity for dry weather flows of 38 mgd.

Impacts and Mitigation Measures

No significant impacts are anticipated on the existing wastewater systems in the vicinity of the project sites as a result of the construction and operation of the proposed project. During design and construction of the proposed project, close coordination will be maintained with the respective government agencies and utility companies to ensure that the wastewater systems will not be adversely impacted and the appropriate services will not be interrupted to adjacent areas.

The proposed project will not generate wastewater nor will it require wastewater service.

2.13.3 Electrical/Communication

Electrical services for the island of Oahu are provided by Hawaiian Electric Company, Inc. (HECO) through a network of underground duct lines and aerial power lines.

Telephone services are provided by Hawaiian Telecom through underground and aerial telephone lines are located throughout the island, serving private residential and commercial properties.

Cable services are provided by Oceanic Time Warner Cable through underground and aerial cable lines are located throughout the island, serving private residential and commercial properties.

Impacts and Mitigation Measures

No significant impacts on the existing electrical and communication systems are anticipated as a result of the construction and operation of the proposed project. During the design phase of the proposed project, coordination will be undertaken with HECO, Hawaiian Telcom, and Oceanic Time Warner Cable to ensure that functions of the utilities are not impacted or impeded.

The proposed project will not require electrical service. Operation of the proposed project will not result in a significant increase in energy consumption.

2.14 Public Services and Facilities

2.14.1 Police Protection

Police protection is provided by the Honolulu Police Department which has six district stations located in Kalihi, Pearl City, Kapolei, Wahiawa, and Kaneohe and 5 substations located in Waianae, Kailua, Kahuku, Waikiki and Chinatown. The Honolulu Police Department is comprised of divided into eight patrol districts, District 1 (Central Honolulu), District 2 (Wahiawa / North Shore), District 3 (Pearl City), District 4 (Kailua / Kaneohe / Kahuku), District 5 (Kalihi), District 6 (Waikiki), District 7 (East Honolulu), and District 8 (Kapolei / Waianae).

Makaha Site: The project area is serviced by the Waianae Substation, located at 85-939 Farrington Highway, approximately 2.9 miles from the project site.

Lualualei Site: The project area is also serviced by the Waianae Substation, approximately 2.4 miles from the project site.

Palehua Site: The project area is serviced by the Kapolei District Station, located at 1000 Kamokila Boulevard, approximately 2.75 miles from the project site.

Impacts and Mitigation Measures

Due to the nature of the proposed projects, significant impacts to police services and demand for police services are not anticipated.

2.14.2 Fire Protection

Fire protection services for the island of Oahu are provided by the Honolulu Fire Department (HFD). HFD has 44 stations islandwide, consisting of 42 engine companies, 13 ladder or quint companies, 2 rescue companies, 2 hazardous material companies, 2 tower companies, 1 fireboat company, 6 tankers, and 2 helicopters. Also supporting the HFD's mission are several personal watercrafts and 3 rescue boats.

Makaha Site: The project area is serviced by the Waianae Fire Station (Station 26), located at 85-645 Farrington Highway, approximately 2.5 miles from the project site.

Lualualei Site: The project area is also serviced by the Waianae Fire Station (Station 26), approximately 2.5 miles from the project site.

Palehua Site: The project area is serviced by the Makakilo Fire Station (Station 35), located at 92-885 Makakilo Drive, approximately 1.3 miles from the project site.

Impacts and Mitigation Measures

Due to the nature of the proposed projects, significant impacts to fire protection and demand for fire protection services are not anticipated. The proposed project will have a beneficial impact on fire protection throughout the three project areas by allowing HFD to facilitate a quicker response time and more effective firefighting capability in the event of a wildland fire.

2.14.3 Health Care Services

Makaha and Lualualei Sites: Health care services in the project area are provided by the Hawaii Medical Center West Hospital located at 91-2141 Fort Weaver Road in Ewa Beach. Hawaii Medical Center West provides comprehensive general hospital care for residents of Leeward Oahu and the Waianae Coast. Various medical offices are also located in the Waianae area including the Waianae Coast Comprehensive Health Center located at 86-260 Farrington Highway in Waianae and Kaiser Permanente's Nanaikeola Clinic located at 87-2116 Farrington Highway in Waianae.

Palehua Site: Health care services in the project area are also provided by the Hawaii Medical Center West Hospital located at 91-2141 Fort Weaver Road in Ewa Beach.

Various medical offices are also located in the Kapolei area including Kaiser Permanente's Kapolei Clinic located at 599 Farrington Highway in Kapolei.

Impacts and Mitigation Measures

Due to the nature of the proposed projects, significant impacts to health care services are not expected.

2.14.4 Public Education Services

The State Department of Education (DOE) operates 288 public schools in the island of Oahu. The island of Oahu is divided into nine complex-areas. A "complex" consists of a high school and all of the intermediate/middle and elementary schools that flow into it. A "complex-area" consists of two to four complexes.

Makaha Site: The project area is located within the Waianae complex. The Waianae complex consists of Waianae High School, Waianae Intermediate School, Waianae Elementary, Leihoku Elementary, Maili Elementary, and Makaha Elementary. There are also two charter schools, Kamaile Academy Public Charter School and Ka Waihona o ka Naauao New Century Public Charter School, in the Waianae complex.

The public library serving the Makaha area is the Waianae Public Library which is part of the State of Hawaii Library System. The Waianae Public Library is located at 85-625 Farrington Highway.

Lualualei Site: The project site is located also located in the Waianae complex.

The public library serving the Lualualei area is also the Waianae Public Library.

Palehua Site: The project area is located in the Kapolei complex. The Kapolei Complex consists of Kapolei High School, Kapolei Middle School, Kapolei Elementary School, Barbers Point Elementary School, Mauka Lani Elementary School, and Makakilo Elementary School.

The public library serving the Kapolei area is the Kapolei Public Library which is part of the State of Hawaii Library System. The Kapolei Public Library is located at 1020 Manawai Street.

Impacts and Mitigation Measures

Due to the nature of the proposed projects, significant impacts to public education services are not expected.

2.14.5 Recreational Facilities

Park facilities on Oahu are operated by the State and the County. The State's Department of Land and Natural Resources Division of State Parks operates 21 parks that offer outdoor recreation and heritage resources. The nearest State park to the project sites is Kaena Point State Park which is located at the end of Farrington Highway in the Waianae District.

The City & County of Honolulu's Department of Parks & Recreation operates 20 parks in the Leeward Oahu area including 13 community parks, 6 neighborhood parks, and one beach park. The County also operates six swimming pools in Leeward Oahu.

Impacts and Mitigation Measures

Due to the nature of the proposed projects, significant impacts to recreational facilities are not expected.

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3. RELATIONSHIP TO PLANS, POLICIES AND CONTROLS

The plans and policies relating to the proposed project range from broad program guidance to land use controls governing the project sites. Construction of the proposed project is in consonance with the various plans, policies, and regulatory controls as discussed below.

3.1 State of Hawaii

3.1.1 Hawaii State Plan

The Hawaii State Plan (Chapter 226, Hawaii Revised Statutes, as amended) provides the overall theme, goals, objectives, policies and priority guidelines for statewide planning. The Hawaii State Plan also directs the appropriate State agencies to prepare functional plans for their respective program areas. The proposed project supports and is consistent with the following State Plan objectives:

§226-26 *Objectives and policies for socio-cultural advancement – public safety.*

(a)(1) Assurance of public safety and adequate protection of life and property

(d)(1) Ensure that responsible organizations are in a proper state of readiness to respond to major war-related, natural, or technological disasters and civil disturbances at all times.

Comment: The proposed project will have a beneficial impact on public health and safety (fire protection) in Leeward Oahu, by facilitating a quicker response time and more effective firefighting capability in the event of a wildland fire.

3.1.2 State Land Use District

The State Land Use Law is intended to preserve, protect, and encourage the development of lands in the State for uses which are best suited to the public health and welfare of Hawaii's people. The Hawaii Land Use Law of Chapter 205, Hawaii Revised Statutes (HRS), classifies all lands in the State into four land use districts: Urban, Agricultural, Conservation and Rural.

Makaha Site: The project site is designated within the Urban and Conservation Districts (See Figure 3-1).

Lualualei Site: The project site is designated within the Agricultural District (See Figure 3-2).

Palehua Site: The project site is designated within the Urban District and is a permissible use, as previously discussed (See Figure 3-3).

3.1.3 Conformance to the Conservation District Standards

Makaha Site: The project site is located within the Resource (R) subzone. The objective of this subzone is *to develop, with proper management, areas to ensure sustained use of the natural resources of those areas* (HAR §13-5-13). According to HAR §13-5-24, all

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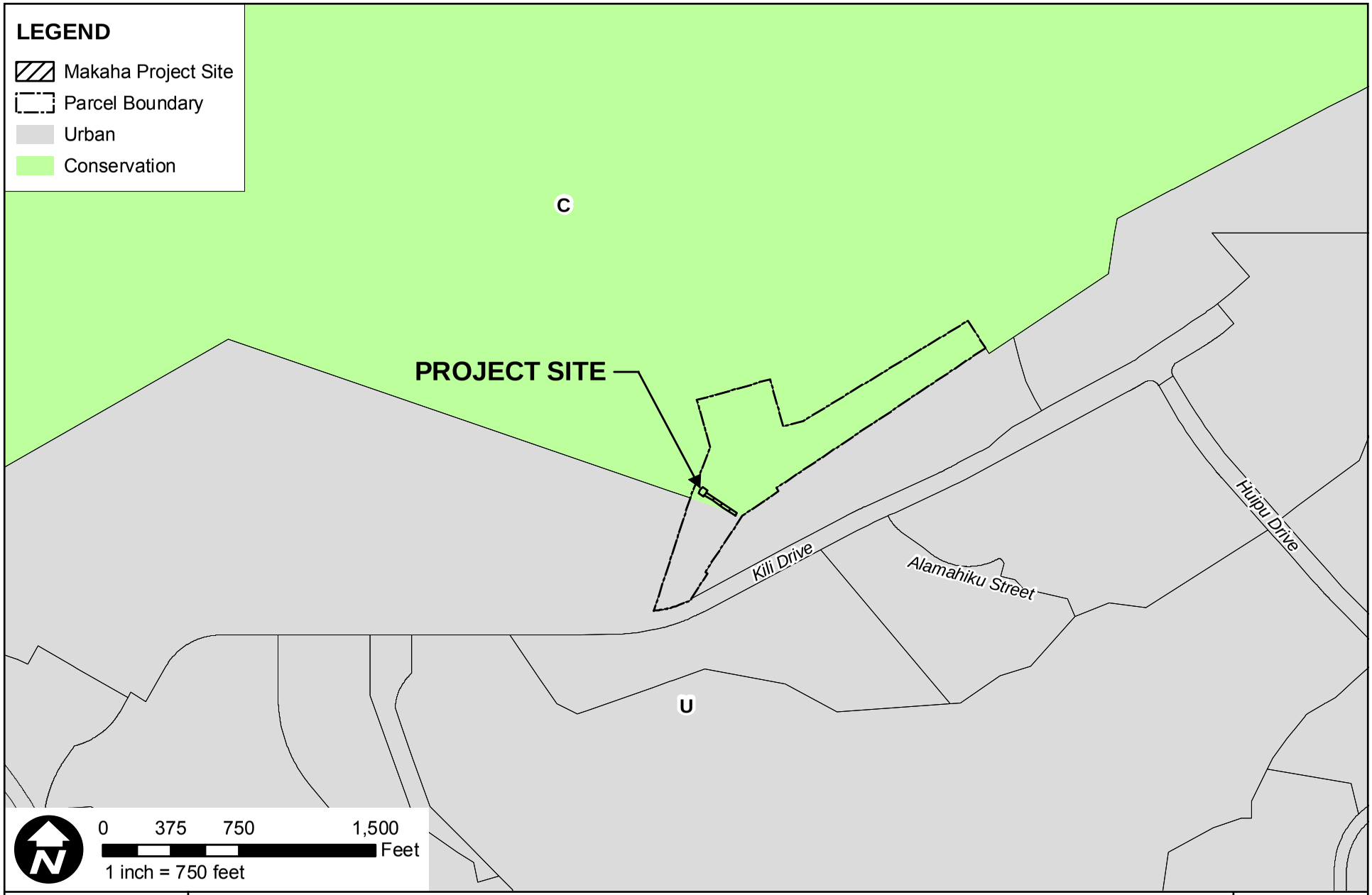

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STATE LAND USE DISTRICT MAP - MAKAHA SITE

FIGURE 3-1

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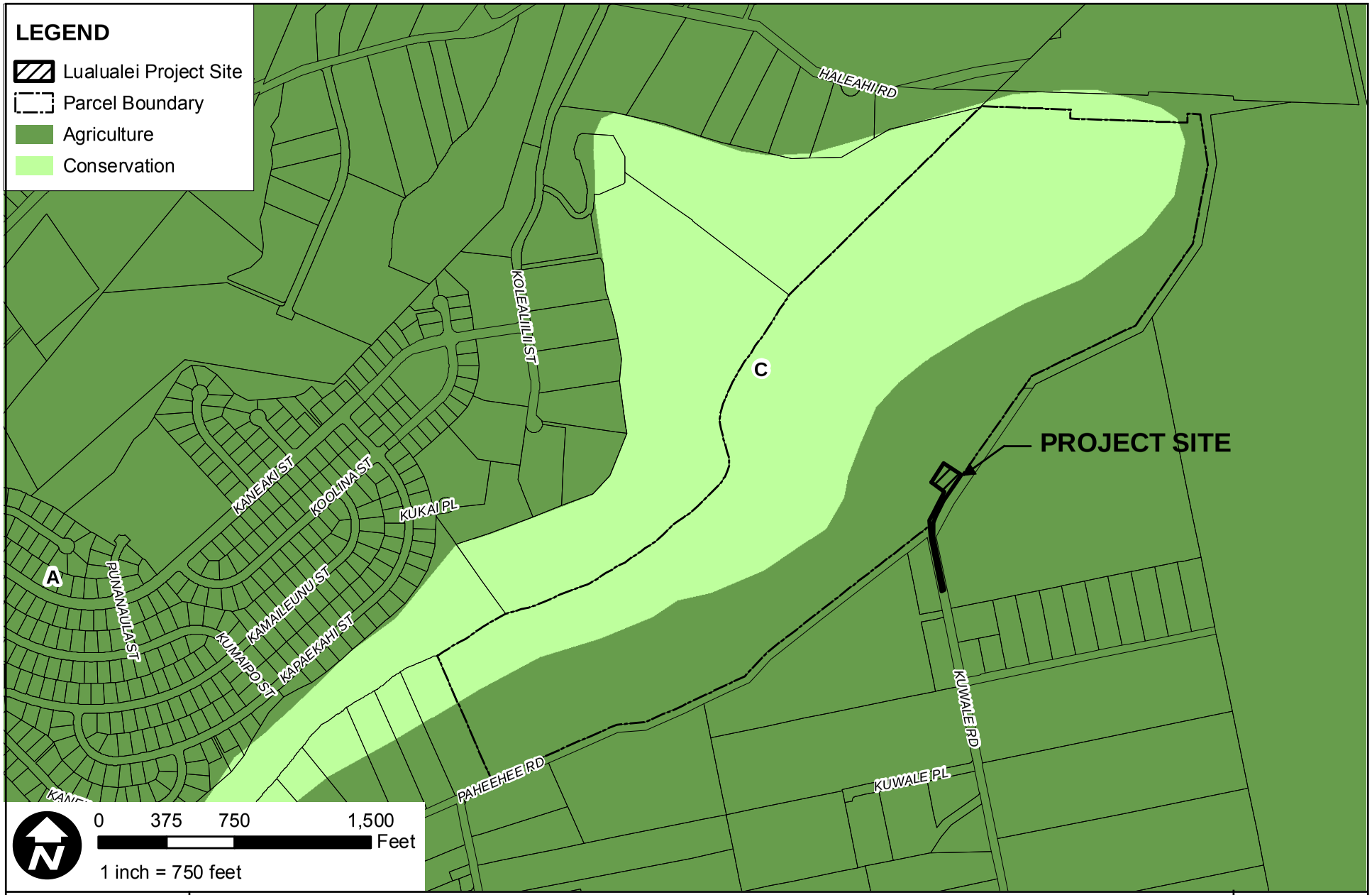

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STATE LAND USE DISTRICT MAP - LUALUALEI SITE

FIGURE 3-2

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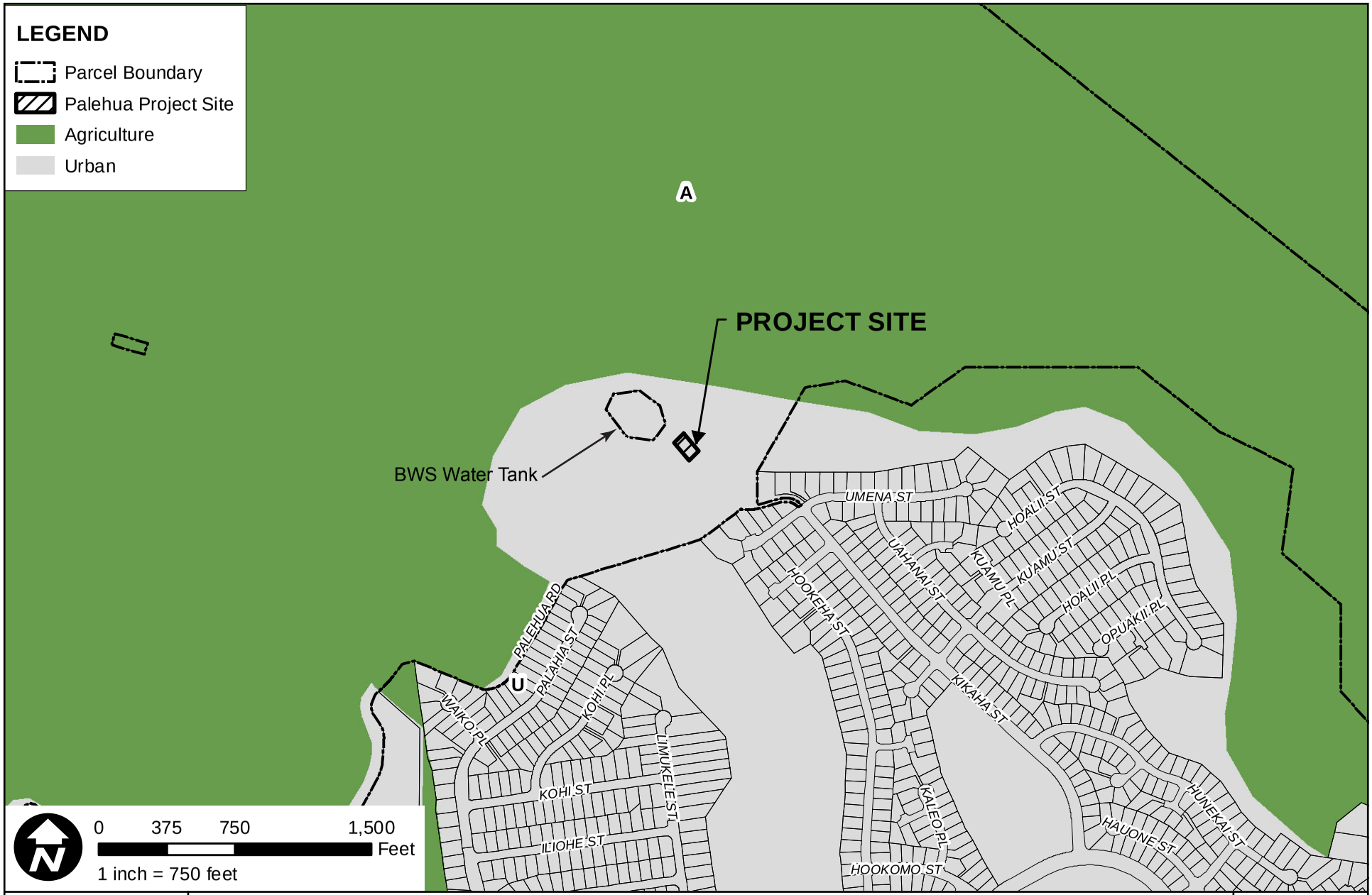

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STATE LAND USE DISTRICT MAP - PALEHUA SITE

FIGURE 3-3

identified land uses listed in the Protective and Limited subzones also apply to the Resource subzone.

According to the State of Hawaii Department of Land and Natural Resources Office of Conservation and Coastal Lands (OCCL), there is an existing Conservation District Use Permit (CDUP) OA-2389, approved on May 9, 1997, for a storage tank and transmission lines (See Appendix D). The proposed project is an identified land use in the Conservation District pursuant to §13-5-24 Identified Land Uses in the Limited Subzone:

L-7 Structures, Accessory

> *B-1 Construction or placement of structures accessory to an existing structure, building, or facility under an existing placement of structures accessory to an existing structure, building, or facility under an existing conservation district use permit. Accessory uses shall be allowed only if they are consistent with the purpose of the conservation district.*

The proposed project at Makaha will require a Site Plan Approval.

3.1.4 Conformance to the Agricultural District Standards

Lualualei Site: The Lualualei site has a LSB rating of E. According to HRS Chapter 205-4.5 and 205-5(b) the proposed project is a permissible use within the Agricultural District.

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

3.2 City & County of Honolulu

3.2.1 City & County of Honolulu General Plan

The General Plan for the City & County of Honolulu (adopted 1977) was amended by the City Council in 1992. The plan is a statement of the long-range social, economic, environmental, and design objectives for the general welfare and prosperity of the people of Oahu. The plan is also a statement of broad policies that facilitate the attainment of the objectives of the plan. Eleven subject areas provide the framework for the City's expression of public policy concerning the needs of the people and functions of government. These areas include population; economic activity; the natural environment; housing; transportation and utilities; energy; physical development and urban design; public safety; health and education; culture and recreation; and government operations and fiscal management. The relationship of the proposed project to the relevant objectives and policies of the General Plan are as follows:

VIII. Public Safety

Objective B: To protect the people of Oahu and their property against natural disasters and other emergencies, traffic and fire hazards, and unsafe conditions.

Policy 7: Provide adequate fire protection and effective fire prevention programs.

Comment: The proposed project will have a beneficial impact on public health and safety (fire protection) in Leeward Oahu, by facilitating a quicker response time and more effective firefighting capability in the event of a wildland fire.

3.2.2 Sustainable Communities Plan/Development Plans

The City & County of Honolulu's Development/Sustainable Communities Plan (SCP) program provides a relatively detailed framework for implementing the objectives and policies of the General Plan on an area wide basis. Eight community-oriented plans have been adopted covering the entire island. Each of the plans is intended to help guide public policy, investment, and decision making within their representative region.

3.2.2.1 Waianae Sustainable Communities Plan

Makaha Site: The project site is located within the Waianae SCP area, which extends from Nanakuli to Kaena Point (City and County of Honolulu, DPP, July 2000). The Waianae SCP's vision statement and supporting provisions are oriented to maintaining and enhancing the region's ability to sustain its unique character, current population, growing families, rural lifestyle, and economic livelihood, all of which contribute to the region's vitality and future potential.

The project site is located within the rural community boundary. The rural community boundary is established to define, protect, and contain communities in areas which the General Plan designates "rural" and which exhibit the physical characteristics of rural lifestyles. The purpose of this boundary is to provide adequate lands for facilities needed to support established communities, to protect such communities from more intense land uses and patterns of development associated with more urban areas and to protect areas outside the boundary for agriculture or other resource or open space values (City and County of Honolulu Department of Planning and Permitting, 2000).

The preservation of open space and scenic resources should be a high priority consideration for any and all public programs and projects that may affect the coastal lands, valleys, and mountains of the Waianae District. Any proposed project that may be planned for coastal, valley, or mountain sites within the Waianae District should include a detailed analysis of the project's potential impact on open spaces and scenic resources.

Lualualei Site: The project site is also located within the Waianae SCP area. The project site is located within the agricultural boundary. According to the Waianae SCP, the agricultural boundary is established to protect important agricultural lands for their economic and open space values, and for their value in helping to give a region its identifiable character.

The important forest lands of the Waianae District include the steep ridges and the slopes and peaks of the Waianae Mountains which form the scenic backdrop of the region. The preservation of these mountain forest lands in their natural state are of great importance to the Waianae community. Guidelines for the preservation of forest lands include avoiding or minimizing development and human impacts in areas known to provide important habitats for rare species, especially those that are listed as threatened or endangered and preventing the introduction of alien plant, mammal, bird, and insect species that could compete with, prey upon, or hybridize with native species (City and County of Honolulu Department of Planning and Permitting, 2000).

3.2.2.2 Ewa Development Plan

The Ewa Development Plan presents a vision for Ewa's future development consisting of conceptual schemes which serve as a policy guide for more detailed zoning maps and regulations and for public and private sector investment.

Palehua Site: The project site is located within the Urban Growth Boundary. The Urban Growth Boundary was drawn to give long-range protection from urbanization for over 3,000 acres of prime agricultural land and for preservation of open space while providing adequate land for urban development. Within the Urban Growth Boundary, significant acreage will be retained in open space in parks, wildlife habitats, golf courses, and natural and grass-lined drainage ways. Open space provides long range protection for diversified agriculture on lands outside the Urban Growth Boundary, protects scenic views and provides recreation, defines the boundaries of communities, provide a fire safety buffer where developed areas border "wildlands" either in preservation areas within the Urban Growth Boundary or in the State Conservation District, and create linkages between communities through a network of Greenways along transportation and utility corridors and drainage ways.

3.2.3 Land Use Ordinance and Zoning

The City & County of Honolulu Land Use Ordinance (LUO) regulates land use in accordance with adopted land use policies, including the General Plan and SCPs. The provisions are also referred to as the zoning ordinance. The LUO presents permitted uses and structures, development standards, and height controls for each zoning district (City and County of Honolulu, 2003).

Makaha Site: The project site is zoned P-1 Restricted Preservation District and Country District (See Figure 3-4). The purpose of preservation districts is to preserve and manage major open space and recreation lands and lands of scenic and other natural resource value. All uses, structures and development standards within the P-1 Restricted Preservation District shall be governed by the appropriate state agencies. Lands designated P-1 are in the State Conservation District and are administered by the DLNR Office of Conservation and Coastal Lands.

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.

It is the intent that basic public services and facilities be available to support the district but that the full range of urban services at urban standards need not be provided. The Country District would be applied to areas outside the primary and secondary urban centers.

Utility installations include accessory uses and structures directly associated with the distribution of the utility service, such as, but not limited to: accessory antennas, maintenance, repair, equipment, and machine rooms; tool sheds; generators and calibration equipment; and accessory offices. Type A utility installations are permitted in Country Districts and are subject to the standards of Article 5 Section 21-5.650. Type A utility installations are those with minor impact on adjacent land uses and include water wells and tanks and distribution equipment.

As discussed in Section 3.1.2 the proposed project is permissible use within the Conservation District and will require a Site Plan Approval.

Lualualei Site: The project site is zoned AG-1 Restricted Agricultural District (See Figure 3-5). The purpose of agricultural districts is to maintain a strong agricultural economic base, to prevent unnecessary conflicts among incompatible uses, to minimize the cost of providing public improvements and services and to manage the rate and location of physical development consistent with the city's adopted land use policies. The intent of the AG-1 Restricted Agricultural District is to conserve and protect important agricultural lands for the performance of agricultural functions by permitting only those uses which perpetuate the retention of these lands in the production of food, feed, forage, fiber crops and horticultural plants.

Utility installations include accessory uses and structures directly associated with the distribution of the utility service, such as, but not limited to: accessory antennas, maintenance, repair, equipment, and machine rooms; tool sheds; generators and calibration equipment; and accessory offices. Type A utility installations are permitted in AG-1 Restricted Agricultural Districts and are subject to the standards of Article 5 Section 21-5.650. Type A utility installations are those with minor impact on adjacent land uses and include water wells and tanks and distribution equipment.

Palehua Site: The project site is zoned P-2 General Preservation District (See Figure 3-6). The P-2 General Preservation District includes lands which have been removed from either the State Conservation District or from Federal jurisdiction, 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, and areas unsuitable for other uses because of topographical considerations related to public health, safety and welfare.

Utility installations include accessory uses and structures directly associated with the distribution of the utility service, such as, but not limited to: accessory antennas, maintenance, repair, equipment, and machine rooms; tool sheds; generators and calibration equipment; and accessory offices. Type A utility installations are permitted in P-2 General Preservation Districts and are subject to the standards of Article 5 Sec. 21-5.650. Type A utility installations are those with minor impact on adjacent land uses and include water wells and tanks and distribution equipment.

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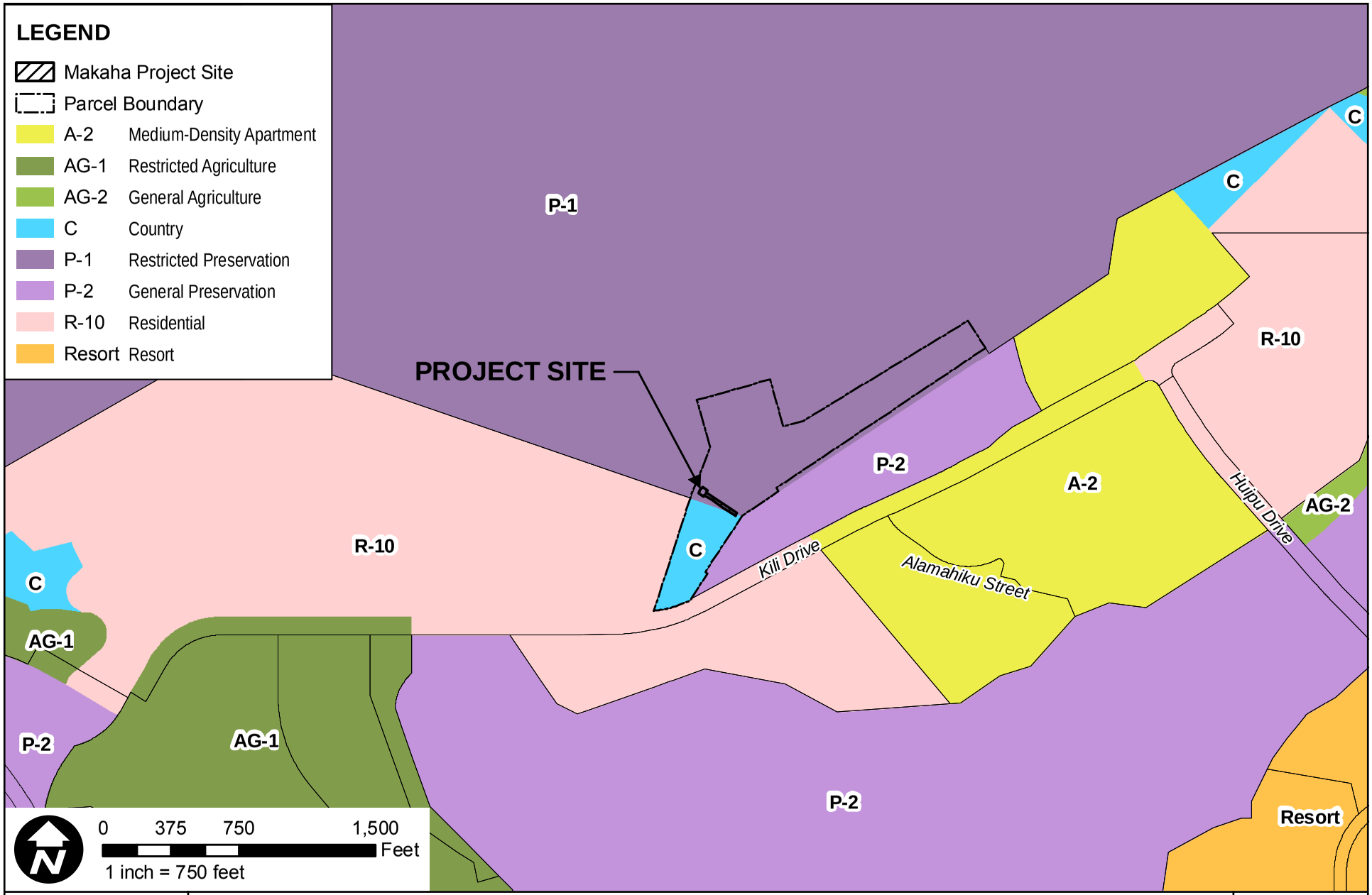

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CITY AND COUNTY OF HONOLULU ZONING MAP - MAKAHA SITE

FIGURE 3-4

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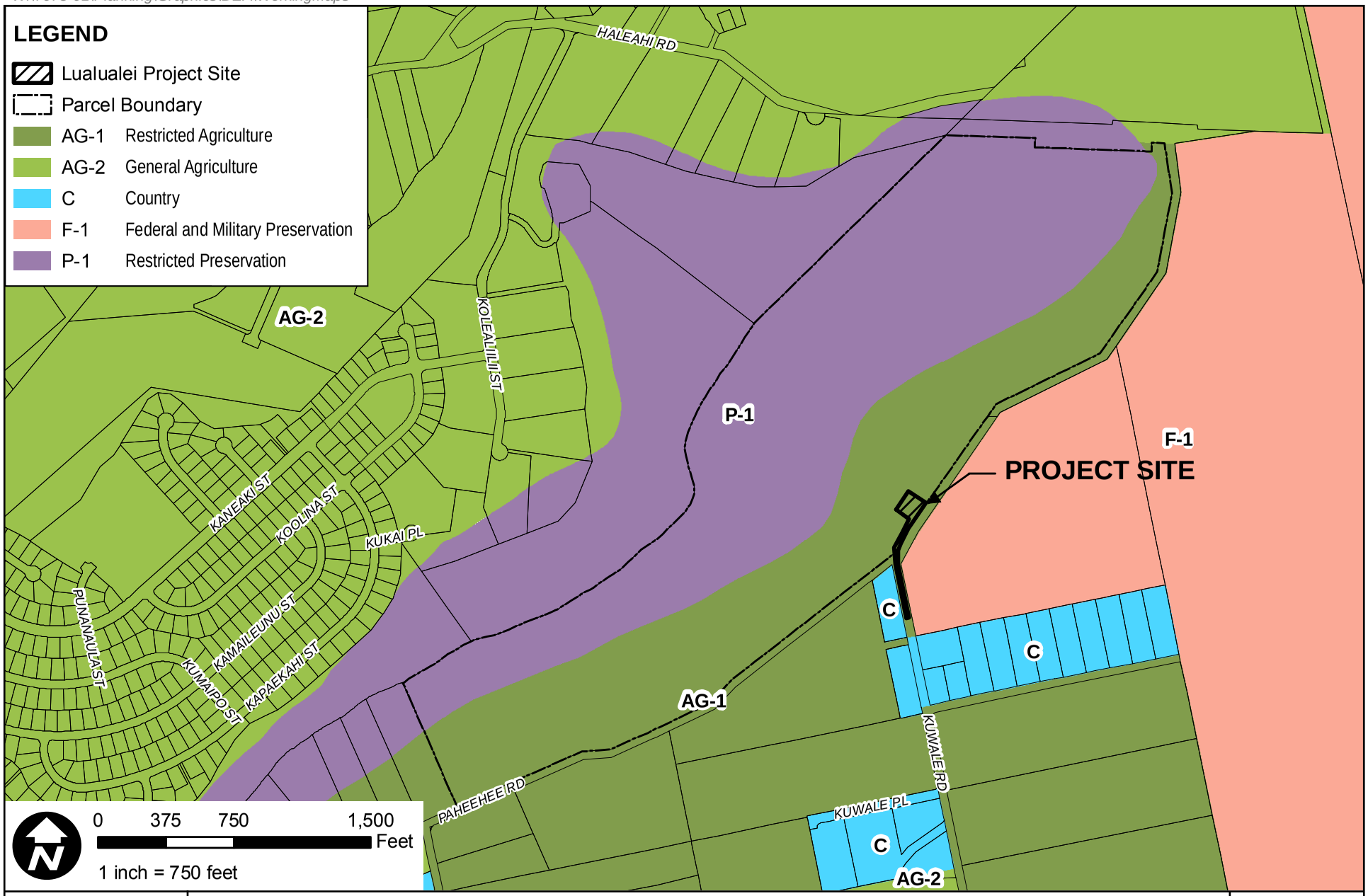

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CITY AND COUNTY OF HONOLULU ZONING MAP - LUALUALEI SITE

FIGURE 3-5

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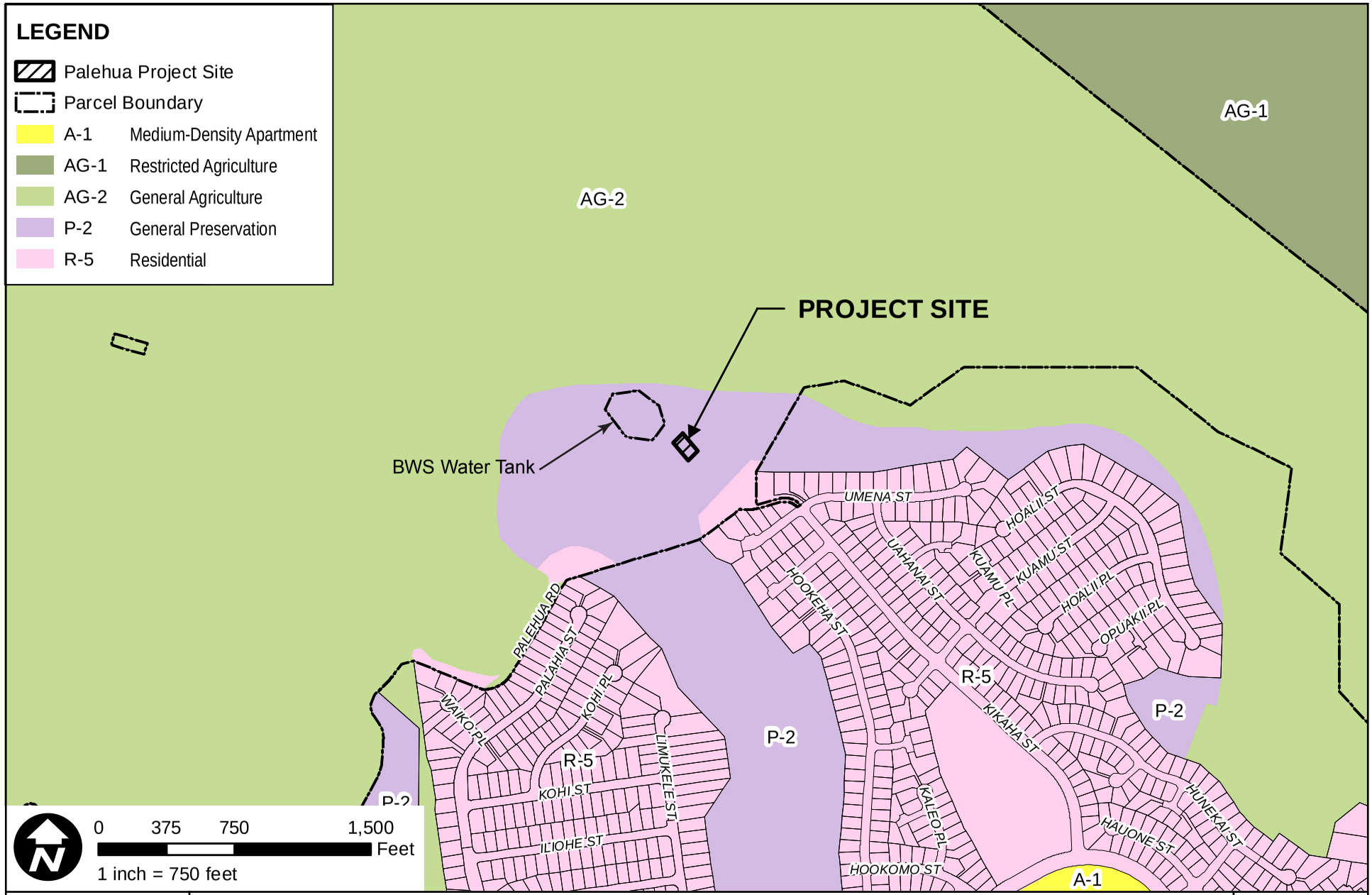

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CITY AND COUNTY OF HONOLULU ZONING MAP - PALEHUA SITE

FIGURE 3-6

3.2.4 Special Management Area

The Coastal Zone Management Act contains the general objectives and policies upon which all counties within the State have structured specific legislation which created Special Management Areas (SMA). Any "development" within the SMA requires a SMA Use Permit, which is administered by the DPP pursuant to Ordinance No. 84-4, 85-105. Approval of a SMA Use Permit is granted by the Honolulu City Council.

According to Chapter 205A-22, Hawaii Revised Statutes, "development" means any of the uses, activities or operations on land or in or under water within the SMA. "Development" does not include repair and maintenance of underground utility lines and minor appurtenant structures such as sewer pump stations; repair, maintenance or interior alterations to existing structures; and, installation of underground utility lines and appurtenant aboveground fixtures less than four feet in height along existing corridors.

The project sites are not located within the SMA (See Figure 3-7).

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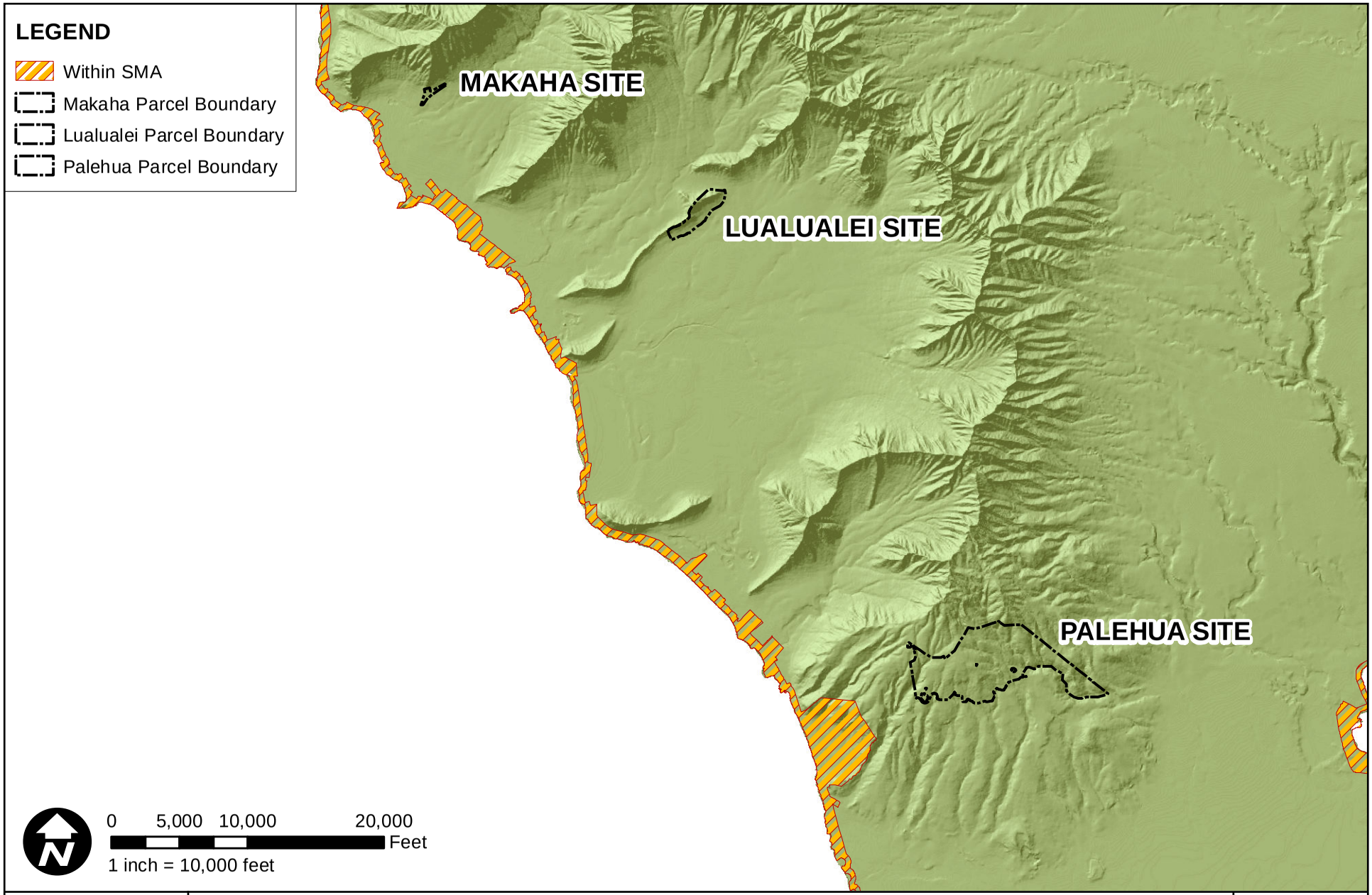

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SPECIAL MANAGEMENT AREA MAP

FIGURE 3-7

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4. ALTERNATIVES TO THE PROPOSED ACTION

4.1 No Action

Under the No Action Alternative the Board of Water Supply (BWS) would not be able to provide sites that would facilitate a quicker response time and more effective firefighting capability in the event of a wildland fire. Thus, the no action alternative would not fulfill the purpose and need for the proposed action.

The no action alternative would preclude all short- and long-term beneficial and adverse physical, environmental and socio-economic impacts described in this EA.

4.2 Alternative Location

A total of seventeen sites were considered for the siting of a wildland firefighting dip tank, including the three sites (*) assessed in this environmental assessment:

1. Honouliuli
2. Kapolei
3. Nanakuli
4. Puu Hulu, along Hakimo Road
5. Lualualei *
6. Makaha *
7. Makaha Valley Road
8. Kahuku
9. Kamehame
10. Hawaii Loa Ridge
11. Waiau
12. Pearl City
13. Waiawa
14. Palehua *
15. Pupukea
16. Mililani WWTP
17. Kahuku Military Training Area

These locations were considered because of the occurrences of wildland fires in these areas. The majority of the sites proposed are near existing BWS reservoirs. The following criteria were used as part of the analysis: land ownership, available land area, State land use, zoning, access, wind patterns (up drafts/down drafts) for helicopters, proximity to residential areas, and locations of overhead electrical lines.

The alternative sites (excluding Lualualei, Makaha and Palehua sites) were dismissed from further consideration due to disadvantages related to access to project site, proximity of overhead electrical lines, and/or land being privately owned.

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5. DETERMINATION OF FINDING OF NO SIGNIFICANT IMPACT

This Final EA was prepared in accordance with Chapter 343, HRS. Based on the significance criteria set forth in Section 11-200-12 of Title 11, Chapter 200, Administrative Rules, State Department of Health, the BWS determined that the proposed project will not have a significant effect on the environment and that a Finding of No Significant Impact ("FONSI") will be filed with the State Office of Environmental Quality Control (OEQC). The reasons supporting this determination are described below according to these significance criteria.

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

The proposed project will not involve the loss or destruction of any natural or cultural resources at any of the three project sites, as discussed in Chapter 2. No candidate, proposed or listed threatened or endangered species are expected to inhabit any of the project sites.

No historic properties or cultural materials (midden, artifacts, etc.) were observed within the project sites. In the event that any burials are found during construction activities, all work will immediately cease pending consultation with the Department of Land and Natural Resources State Historic Preservation Division. The treatment of any remains will be in accordance with procedures approved by the Hawaii Island Burial Council and the State Historic Preservation Division.

(2) Curtail the range of beneficial uses of the environment;

The proposed project will not curtail the beneficial uses of the environment. The proposed project sites are either undeveloped or used for existing BWS facilities.

(3) Conflict with the state's long-term environmental policies or goals and guidelines as expressed in Chapter 343, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders;

The proposed project will not conflict with the State's long-term environmental policies, goals and/or guidelines. As presented in this EA, the project's potential temporary impacts are associated with short-term construction-related activities and can be mitigated through adherence to standard construction mitigation practices.

(4) Substantially affect the economic or social welfare of the community or state;

The proposed project will not adversely impact the economic or social welfare of the community. In the short-term, the proposed project will have beneficial economic impacts due to the hiring of construction workers and purchasing of materials from local suppliers. In addition, the location of permanent dip tanks will facilitate a quicker response time and more effective firefighting capability in the event of a wildland fire.

(5) Substantially affect public health;

The proposed project will not adversely impact public health. Short-term impacts are related to construction-related activities such as air and noise. The appropriate mitigation measures will be implemented to minimize the impact of construction-related activities. In the long-term, the proposed project will have a beneficial impact on public health and safety by facilitating a quicker response time and more effective firefighting capability in the event of a wildland fire in Leeward Oahu.

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

No substantial secondary impacts are anticipated as a result of the proposed project since the project does not affect population change or diminish the quality of public facilities.

(7) Involve a substantial degradation of environmental quality;

The proposed project is not anticipated to have a negative impact upon the environment. Construction activities associated with the proposed project are anticipated to result in short-term impacts to noise, air quality, water quality and traffic in the immediate vicinity. With the incorporation of mitigation measures during the construction period, the project will not result in long-term degradation to the environmental quality.

(8) Individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions;

The proposed project will not create a commitment for any larger actions, nor will it contribute to cumulative negative effect upon the environment. The project's purpose is to facilitate a quicker response time and more effective firefighting capability in the event of a wildland fire.

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

There are no known rare, threatened or endangered species of flora or fauna or associated habitat on the project site that could be adversely affected by the proposed action, as discussed in Section 2.6.

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

Operation of construction equipment would temporarily elevate ambient noise and concentrations of exhaust emission in the immediate vicinity of the project sites. The proposed project will have no significant short- or long-term impact on air or water quality or ambient noise levels in the vicinity, as discussed in Sections 2.4, 2.7, and 2.9, respectively.

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

The Makaha project site is within Zone “D” and Lualualei and Palehua Project Sites are within Zones “X”, as discussed in Section 2.5. No significant impacts to flood hazards are anticipated as a result of the proposed project. The project sites are located outside of the tsunami inundation zone.

(12) Substantially affect scenic vistas and viewplanes identified in county or state plans or studies; or

The proposed project will not significantly impact views or visual resources at any of the three project sites. When the dip tanks are in use, the dip tanks will not be visible from nearby roadways nor disrupt viewplanes. When the dip tanks are not in use, they will be collapsed and stored off-site at HFD facilities, as discussed in Section 1.5.

(13) Require substantial energy consumption.

Construction and operation of the project will not require substantial energy consumption.

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6. PERMITS AND APPROVALS

The following is a list of permits and approvals, which may be required prior to construction of the proposed projects:

State of Hawaii

Department of Health

- National Pollutant Discharge Elimination System (NPDES) General Permits for Storm Water Associated with Construction Activities, Construction Dewatering, Hydrotesting Water
- Noise Variance

Department of Land and Natural Resources

- Site Plan Approval for Makaha Site

City and County of Honolulu

- Building Permit
- Excavation Permit
- Grading, Grubbing and Stockpiling Permit
- Street Usage Permit

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7. CONSULTATION

7.1 Pre-Assessment Consultation

The following agencies and organizations were contacted during the preparation of the Draft EA. Where indicated, the agency, organization, or individual submitted comments. All written comments and responses are reproduced herein (Appendix E).

Agency/Organization/Individual	Date of Comment
Federal	
U.S. Army Corps of Engineers	
U.S. Fish and Wildlife Service	May 6, 2011
State	
Department of Agricultural	
Department of Business, Economic Development and Tourism	
Department of Hawaiian Home Lands	April 21, 2011
Department of Health Environmental Planning Office	 April 15, 2011
Department of Land and Natural Resources (DLNR) Division of Forestry & Wildlife Land Division, Oahu District Office of Conservation & Coastal Lands	 April 27, 2011 April 27, 2011 April 27, 2011
State Historic Preservation Division (SHPD)	
Department of Transportation	May 24, 2011
Office of Hawaiian Affairs	April 26, 2011
City & County of Honolulu	
Department of Planning and Permitting	
Department of Transportation Services	April 20, 2011
Fire Department	April 25, 2011
Police Department	April 18, 2011
Makakilo/Kapolei Neighborhood Board No. 34	
Waianae Neighborhood Board No. 24	
Elected Officials	
Representative Jo Jordan	
Representative Karen L. Awana	
Representative Sharon E. Har	
Senator Maile S.L. Shimabukuro	
Senator Mike Gabbard	
Councilmember Nestor Garcia	
Councilmember Tom Berg	
Other	
Verizon Hawaii	
Hawaiian Electric Company, Inc.	
Hawaiian Telcom	
Edmund C. Olson Trust	
Makaha Valley Towers	

Agency/Organization/Individual	Date of Comment
Makaha Valley Plantation	
Makaha Resort and Golf Club	No date. Received on April 19, 2011
Shad Kane	April 24, 2011

7.2 Draft EA Consultation

The Draft EA was distributed to the following agencies and organizations. The notice of availability of the Draft EA was published in the September 23, 2011 issue of *The Environmental Notice.* The 30-day public comment period was from September 23 to October 22, 2011. Where indicated, the agency, organization, or individual submitted comments. All written comments and responses are reproduced herein (Appendix F).

In addition, presentations were made at the Kapolei/Makakilo and Waianae Neighborhood Boards on September 28, 2011 and October 4, 2011, respectively.

Agency/Organization/Individual	Date of Comment
Federal	
U.S. Army Corps of Engineers	
U.S. Fish and Wildlife Service	
State	
Department of Accounting & General Services	October 4, 2011
Department of Agricultural	
Department of Business, Economic Development and Tourism (DBEDT) Office of State Planning	
Department of Hawaiian Home Lands	
Department of Health Clean Water Branch Indoor & Radiological Health Branch Environmental Planning Office	 November 9, 2011 October 6 & 17, 2011 October 17, 2011
Department of Land and Natural Resources (DLNR) Division of Forestry & Wildlife Land Division, Oahu District Engineering Division Division of State Parks Office of Conservation & Coastal Lands	 November 2, 2011 November 2, 2011 November 4, 2011 November 4, 2011 November 4, 2011
State Historic Preservation Division (SHPD)	
Department of Transportation	October 28, 2011
Office of Hawaiian Affairs	September 28, 2011
University of Hawaii Environmental Center	
City & County of Honolulu	
Department of Design & Construction	October 25, 2011
Department of Facility Maintenance	October 10, 2011
Department of Parks & Recreation	October 11, 2011

Agency/Organization/Individual	**Date of Comment**
Department of Planning and Permitting	October 6, 2011
Department of Transportation Services	
Fire Department	October 31, 2011
Police Department	October 3, 2011
Makakilo/Kapolei Neighborhood Board No. 34	
Waianae Neighborhood Board No. 24	
Elected Officials	
Representative Jo Jordan	
Representative Karen L. Awana	
Representative Sharon E. Har	
Senator Maile S.L. Shimabukuro	
Senator Mike Gabbard	
Councilmember Nestor Garcia	
Councilmember Tom Berg	
Other	
Verizon Hawaii	
Hawaiian Electric Company, Inc.	
Hawaiian Telcom	October 3, 2011
Edmund C. Olson Trust	
Makaha Valley Towers	
Makaha Valley Plantation	
Makaha Resort and Golf Club	
Libraries	
Hawaii State Library	
Waianae Library	
Kapolei Library	

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8. REFERENCES

City and County of Honolulu. *Honolulu General Plan*. 1992.

City and County of Honolulu. *Land Use Ordinance*. April 2003.

City and County of Honolulu Planning Department. *Ewa Development Plan*. August 1997 (May 2000).

City and County of Honolulu Department of Planning and Permitting. *Waianae Sustainable Communities Plan*. July 2000.

Gray, Hong, Bills & Associates, Inc. *Final Environmental Impact Statement for the Makaha 242 Reservoir No. 2*. Prepared for City & County of Honolulu Board of Water Supply. April 1996.

Mink, John F. and Lau, Stephen L. *Aquifer Identification and Classification For O'ahu: Groundwater Protection Strategy for Hawai'i. Technical Report No. 179.* Prepared for Water Resources Research Center. November 1987.

Oceanit, Townscape, Inc., and Dashiell, Eugene. *Central Oahu Watershed Study*. Prepared for Honolulu Board of Water Supply, U.S. Army Corps of Engineers, and City and County of Honolulu Department of Environmental Services. May 2007.

R.M. Towill Corporation. *Final Environmental Assessment for Makakilo Drive Extension*. Prepared for City and County of Honolulu Department of Environmental Services. February 2009.

State of Hawaii Department of Health. *State of Hawaii Annual Summary 2009 Air Quality Data.* September 2010.

State of Hawaii Department of Land and Natural Resources. *Commission on Water Resource Management Aquifer Map.* 2008.

United States Census Bureau. *Census 2010 Data for the State of Hawaii.* Internet. Available at: http://2010.census.gov/2010census/data/

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Appendix A

Archaeological Assessment for
Board of Water Supply Fire Dip Tank Project
Makaha Ahupuaa, Waianae District, Oahu Island
TMK (1) 8-4-002:011 por.
Cultural Surveys Hawaii, Inc.
February 2010

LINDA LINGLE
GOVERNOR OF HAWAII

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
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
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

June 28, 2010

Dr. Hallet Hammatt
Cultural Surveys Hawaii
P.O. Box 1114
Kailua, Hawaii 96734

LOG NO: 2010.2381
DOC NO: 1006MV52
Archaeology

Dear Dr. Hammatt:

SUBJECT: HAR § 13-13-276 Review –
Archaeological Assessment for the Board of Water Supply Fire Dip Tank Project, Makaha, Ahupua'a, Wai'anae District, Island of Oahu.
TMK: [1] 8-4-002:011 por. (DRAFT)

Thank you for the opportunity to review this draft of an Archaeological Assessment (AA) that was received by our office on June 17, 2010. The fieldwork for this project began as a formal Archeological Inventory Survey (AIS). As part of the AIS an extensive pedestrian survey (depicted in figure 19) covered 100% of this less than 1 acre project area. This survey did not encounter any historic properties and the AIS was changed to an AA pursuant to HAR § 13-13-275-5. In addition, the surrounding area has been thoroughly surveyed. While a few historic sites have been recorded in the area, these remains consist mainly of surface features, and none of which are within 200m of the project area. The extensive survey of this project area revealed no surface features, and the aerial photos of the project area indicate that the land was previously altered by grading for the construction of a building and a road. Therefore it is unlikely that the proposed development will have an impact on archeological or historic resources in the area, and we agree with your recommendation that no further archaeological work is required.

Please submit a copy of this report, marked "**FINAL,**" along with a copy of this review letter and a text-searchable PDF version on CD to the attention of the **"SHPD Library"** at the Kapolei SHPD office.

Please call Mike Vitousek at (808) 692-8029 if you have any questions or concerns regarding this letter.

Aloha,

Nancy A. McMahon

Nancy McMahon, Deputy SHPO/State Archaeologist
and Historic Preservation Manager

Final
Archaeological Assessment for the Board of Water Supply Fire Dip Tank Project Mākaha Ahupuaʻa, Waiʻanae District, Island of Oʻahu TMK: [1] 8-4-002:011 por.

Prepared for

Wilson Okamoto Corporation

Prepared by

Constance R. O'Hare, B.A.,

David W. Shideler, M.A.,

and

Hallett H. Hammatt, Ph.D.

Cultural Surveys Hawaiʻi, Inc.

Kailua, Hawaiʻi

(Job Code: MAKAHA 9)

February 2010

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Management Summary

Reference	Archaeological Assessment for the Board of Water Supply Fire Dip Tank Project Mākaha Ahupuaʻa, Waiʻanae District, Island of Oʻahu TMK: [1] 8-4-002:011 por. (O'Hare et al. 2010)
Date	February 2010
Project Number (s)	Cultural Surveys Hawaiʻi, Inc. (CSH) Job Code: MAKAHA 9
Investigation Permit Number	The fieldwork component of the archaeological assessment 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 lies on the north side of Mākaha Valley north of Kili Drive and south of an existing water tank at approximately 200-ft elevation (U. S. Geological Survey 7.5 Minute Series Topographic Map, Waiʻanae Quadrangle – see Figure 1)
Land Jurisdiction	The project area is understood as currently owned by the City and County of Honolulu.
Agencies	State of Hawaiʻi Department of Land and Natural Resources/State Historic Preservation Division (DLNR/SHPD) Board of Water Supply (source of project funding)
Project Description	The project area is proposed for the development of a fire dip tank facility to facilitate helicopter transport of water to aid in the fighting of brush fires in the vicinity
Project Acreage	Less than 1 acre
Area of Potential Effect (APE) and Survey Acreage	Based on available information, the proposed Fire Dip Tank Project on the north ridge of Mākaha Valley in Mākaha Ahupuaʻa will not impose adverse visual, auditory or other environmental impact to any known historic properties, including standing architecture, located outside the project area. Accordingly, the proposed project, based on available information lacks potential to affect historic properties outside the project area. As a result the project's APE is the same as the project area. The survey area for the current investigation included the entire approximately 1-acre APE/project area.
Historic Preservation Regulatory Context	The proposed Fire Dip Tank Project on the north ridge of Mākaha Valley requires compliance with and review under state of Hawaiʻi historic preservation legislation [Hawaiʻi Revised Statutes (HRS) Chapter 6E-8 and Hawaiʻi Administrative Rules (HAR) Chapter 13-13-275]. At the request of Wilson Okamoto Corporation and on behalf of the City & County of Honolulu Board of Water Supply, Cultural Surveys Hawaiʻi Inc. began this study as an archaeological inventory survey, per the requirements of HAR Chapter 13-13-276. Because no historic properties were located, this investigation became an archaeological assessment, per the language of HAR Chapter 13-13-

	275-5. This archaeological assessment report was prepared to support the proposed project's historic preservation review (under HAR 13-13-275) and any project-related historic preservation consultation.
Fieldwork Effort	The fieldwork effort was carried out by David W. Shideler, M.A. under the general supervision of Hallett H. Hammatt, Ph.D. The fieldwork took place on September 14, 2009 taking less than one person-day to complete.
Number of Historic Properties Identified	None
Historic Properties Recommended Eligible to the Hawai‘i Register of Historic Places (Hawai‘i Register)	None
Historic Properties Recommended Ineligible to the Hawai‘i Register	None
Effect Recommendation	"No historic properties Affected"
Mitigation Recommendation	No further archaeological field work is recommended. As always, in the unlikely event that previously unidentified subsurface historic properties are encountered by project construction, the project proponents should immediately stop work in the vicinity and contact SHPD's O‘ahu Office [Tel. (808) 692-8015].

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Section 1 Introduction

1.1 Project Background

At the request of Wilson Okamoto Corporation and on behalf of the City & County of Honolulu Board of Water Supply, Cultural Surveys Hawaii, Inc. (CSH) conducted an archaeological assessment for a proposed Fire Dip Tank Project on the north ridge of Mākaha Valley in Mākaha Ahupua‘a, Wai‘anae District, O‘ahu Island, TMK [1] 8-4-002:011 (por.) as shown on a U.S. Geological Survey Wai‘anae quad map (Figure 1) Tax Map Key plat (Figure 2) and aerial photograph (Figure 3).

The project area is being proposed for a fire dip tank location. It is understood that improvements would include grading for access and construction of a level slab approximately 60-feet square. A temporary buoy wall tank would be set up on this slab to facilitate rapid replenishment of a helicopter-borne water bucket for fire fighting. Based on available information, the proposed Fire Dip Tank Project on the north side of Kili Drive would not impose adverse visual, auditory, or other environmental impact to any known historic properties, including standing architecture, located outside the project area. Accordingly, the proposed project, lacks potential to affect historic properties outside the project area. As a result the project’s APE is the same as the project area. The survey area for the current investigation included the entire approximately 1-acre APE/project area.

The Fire Dip Tank Project on the north side of Kili Drive in Mākaha Ahupua‘a constitutes a project requiring compliance with and review under state of Hawai‘i historic preservation legislation [Hawai‘i Revised Statutes (HRS) Chapter 6E-8 and Hawai‘i Administrative Rules (HAR) Chapter 13-13-275]. At the request of Wilson Okamoto Corporation, CSH completed what began as an archaeological inventory survey investigation of the project area, per the requirements of HAR Chapter 13-13-276. Because no historic properties were located, this investigation became an archaeological assessment, per the language of HAR Chapter 13-13-275-5. This archaeological assessment report was prepared to support the proposed project’s historic preservation review (under HAR 13-13-275) and any other project-related historic preservation consultation.

1.2 Scope of Work

The following archaeological inventory survey scope of work was developed and implemented to satisfy SHPD (State Historic Preservation Division) requirements. The scope of work for this inventory survey (which later became an archaeological assessment because no historic properties were located within the project) was designed in accord with SHPD rules governing standards for archaeological inventory surveys and reports (HAR 13-13-276):

1. A complete ground survey of the entire project area for the purpose of historic property inventory. If historic properties were located the following would be applicable: All historic properties would be located, described, and mapped with evaluation of function, interrelationships, and significance; and documentation in the form of photographs and scale drawings of selected sites and complexes.

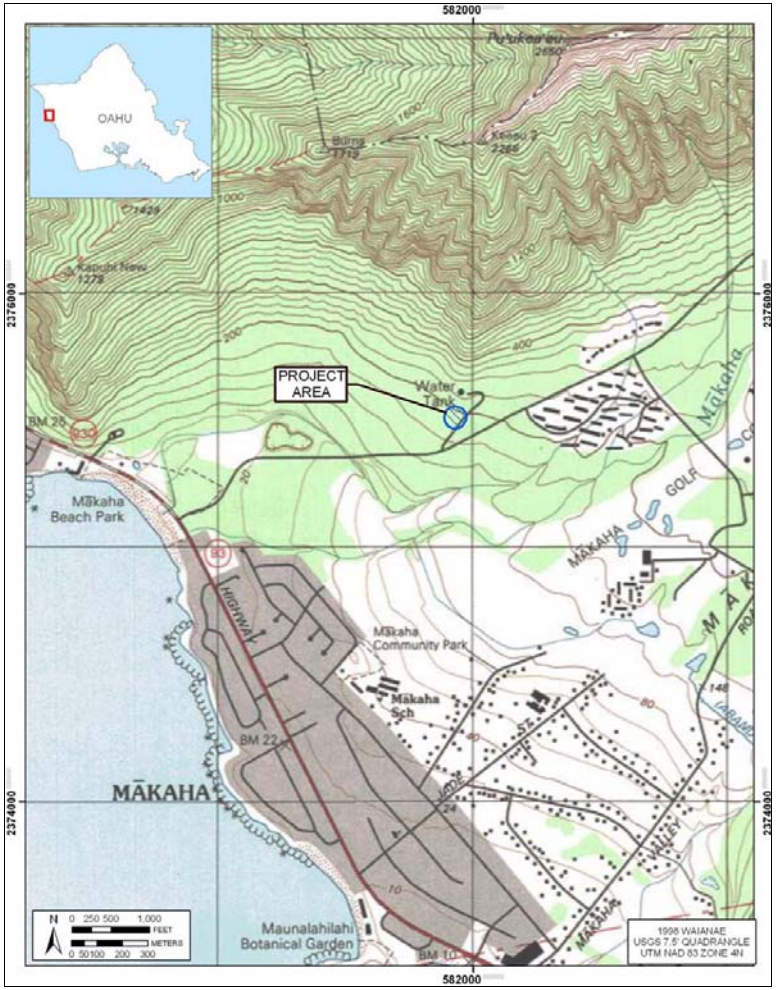

Figure 1. U. S. Geological Survey 7.5 Minute series topographic Map (1998 Wai‘anae Quadrangle), with outline of current project area parcels

Figure 3. Aerial photograph (2005 U. S. Geological Survey Orthoimagery) of lower Mākaha Valley, with project area outlined

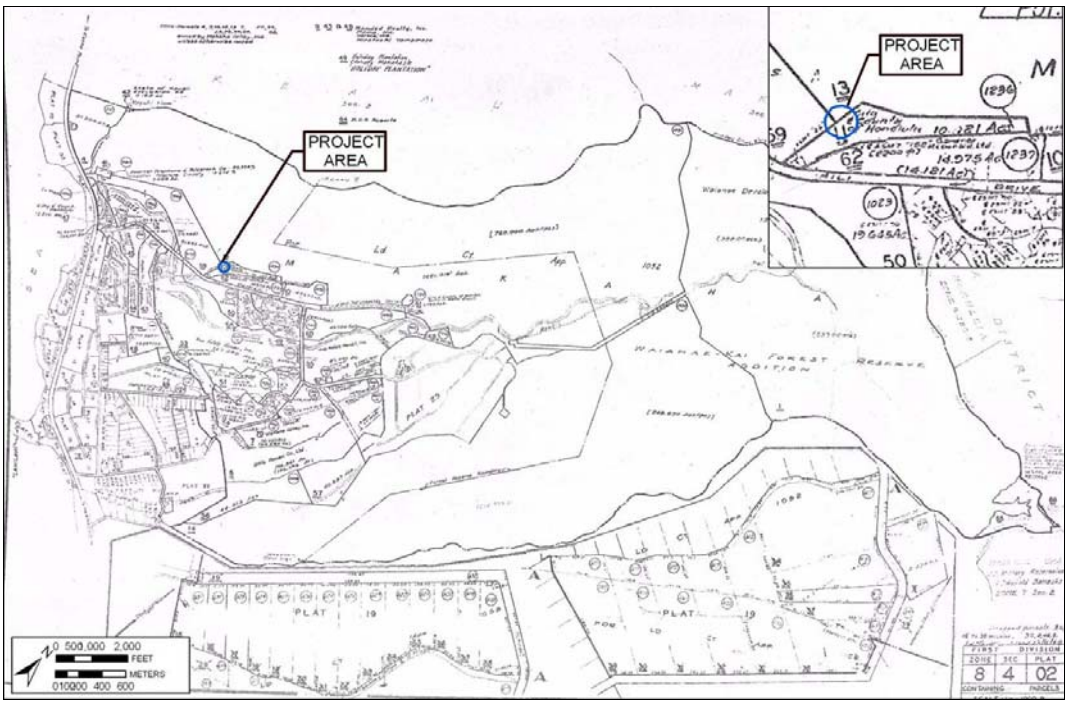

Figure 2. Tax Map 1-8-4, showing project area in 1-8-4-002:011 (por.)

2. Research on historic and archaeological background, including search of historic maps, written records, and Land Commission Award documents. This research focused on the specific area with general background on the *ahupua‘a* (Hawaiian land division) and district and emphasizes settlement patterns.
3. Preparation of this inventory survey report including the following:
   - A project description;
   - A topographic map of the survey area showing all record historic properties;
   - Descriptions of all historic properties, including selected photographs, scale drawings, and discussions of age, function, and significance, per the requirements of HAR Title 13, Subtitle 13, Chapter 276 “Rules Governing Standards for Archaeological Inventory Surveys and Reports.” Cultural resources were assigned State Inventory of Historic Properties (SIHP) numbers;
   - Historical and archaeological background sections summarizing prehistoric and historic land use of the project area and its vicinity;
   - A summary of cultural resource categories and significance based upon the Hawai‘i Register of Historic Places (Hawai‘i Register) criteria;
   - A project effect recommendation; and,
   - Treatment recommendations to mitigate the project’s adverse effect on historic properties recommended eligible to the Hawai‘i Register (i.e. “significant historic properties”).

This scope of work includes full coordination with the State Historic Preservation Division (SHPD), and the City and 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 land within the project area consists of gently sloping rocky talus slope of alluvium and colluvium terrain at the base of the north ridge bounding Mākaha Valley. Moderate to steep sloping terrain exists immediately outside the northern portion of the project area.

Elevations within the project area range from approximately 24-110 meters (80-360 feet) above mean sea level (AMSL). The project area receives an average of approximately 800-1000 millimeters (31-39 inches) of annual rainfall (Giambelluca et al. 1986).

Soils within the project area (Foote et al. 1972) consist overwhelmingly of “Rock Land” (rRK) with a sliver of “Stony Land” (rST) in the southwest edge, as shown in Figure 4.

Rock Land (rRK) is made up of areas where exposed rock covers 25 to 90 percent of the surface and are characterized by rock outcrops and very shallow soils. The land is used for

pasture, wildlife habitat and water supply and the natural post-contact vegetation at lower elevations such as the project area consists of *kiawe*, *klu*, *pili* grass, Japanese tea, and *koa haole*,.

Stony Land (rST) is found in valleys and on the side slopes of drainageways 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. The land is used for wildlife habitat and recreation and the natural post-contact vegetation consists of *kiawe*, *koa haole*, lantana, bermudagrass (*Cynodon dactylon*), and annuals.

1.3.2 Built Environment

Kili Drive, the main artery to the condominiums and residences on the north side of the valley lies just south of the project area. An access road to an existing water tank bounds the project area on the east side. The major residential and condominium development of the central valley lie approximately 500 meters to the east.

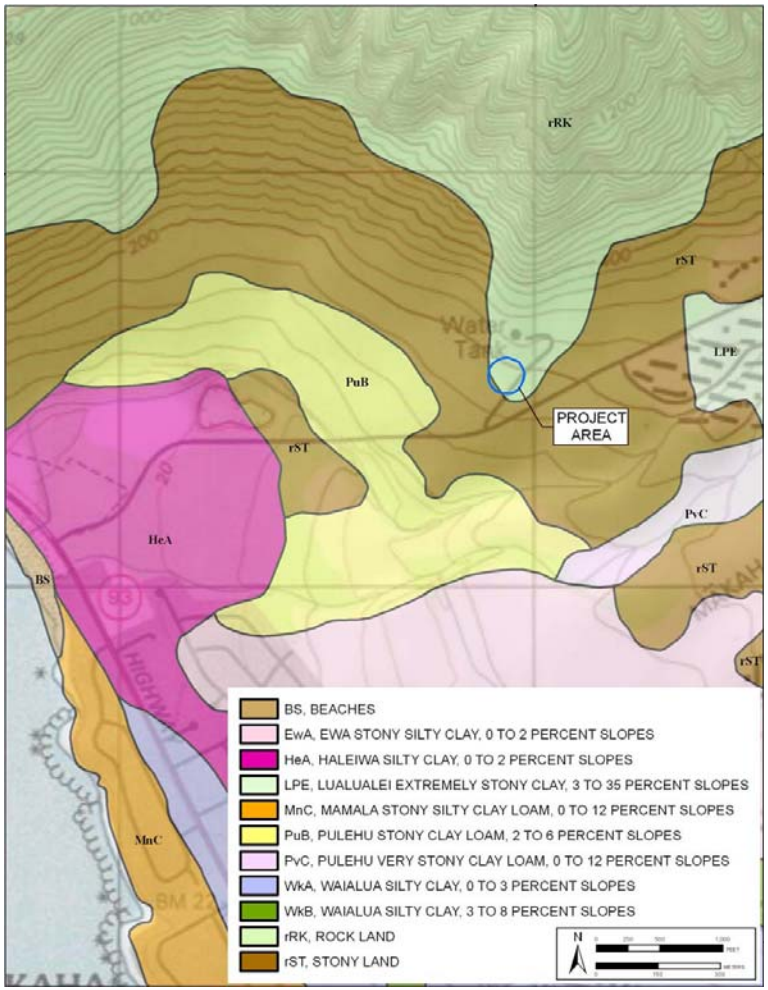

Figure 4. Soils Map over U.S. Geological Survey map (1998 Wai‘anae Quadrangle); soil area from Foote et al. 1972; project area outlined in red

Section 2 Methods

2.1 Field Methods

David W. Shideler, M.A. carried out the field effort, which required less than 1 person-day to complete. Fieldwork took place on September 14th 2009 under the general supervision of Hallett H. Hammatt, Ph.D. (principal investigator). Fieldwork in this report has been performed under CSH’s annual archaeological research permit, No. 09-20, issued by DLNR/SHPD. No historic properties were observed.

One hundred percent of the project area was subjected to pedestrian inspection. The project boundaries were loaded into a hand-held GPS unit (Garmin GPS Map 60 CSX). The GPS unit’s tracking feature was used to record the extent of the pedestrian inspection within the project area and its vicinity. Because no historic properties were observed in the project area, field recordation was limited to photographs and general observations of past land disturbance.

2.2 Laboratory Methods

No materials were collected during the inventory survey and thus, no laboratory methods were applied.

2.3 Document Review

Background research included: a review of previous archaeological studies on file at the State Historic Preservation Division (SHPD) of the Department of Land and Natural Resources (DLNR); a review of geology and cultural history documents at Hamilton Library of the University of Hawai‘i, the Hawai‘i State Archives, the Mission Houses Museum Library, the Hawai‘i Public Library, and the Archives of the Bishop Museum; a study of historic photographs at the Hawai‘i State Archives and the Archives of the Bishop Museum; and, a study of historic maps at the Survey Office of the DLNR. Information on Land Commission Awards (LCA) was accessed through Waihona ‘Āina Corporation’s Māhele Data Base (<www.waihona.com>).

This research provided the environmental, cultural, historic, and archaeological background for the project area. The sources studied were used to formulate a predictive model regarding the expected type and location of sub-surface pre and post-contact historic properties in the project area.

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 placed on Figure 5, 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 Mākaha

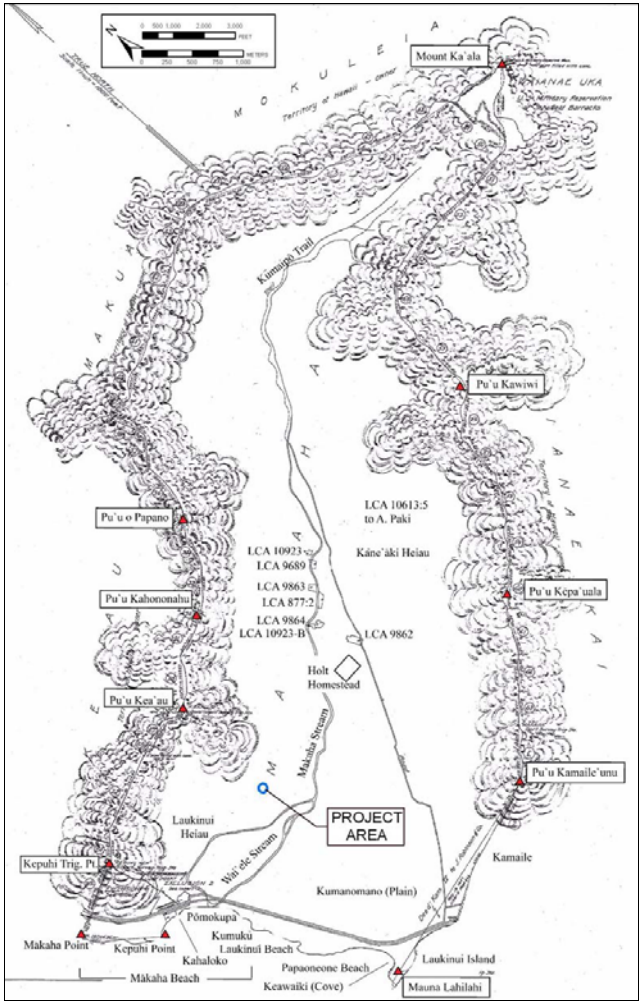

Figure 5. 1932 Map of Waianae Company Lands in Mākaha (Hawai‘i Land Survey Division, Land Court Application 1052), with the addition of place name information

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 Lawai‘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 6). 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.

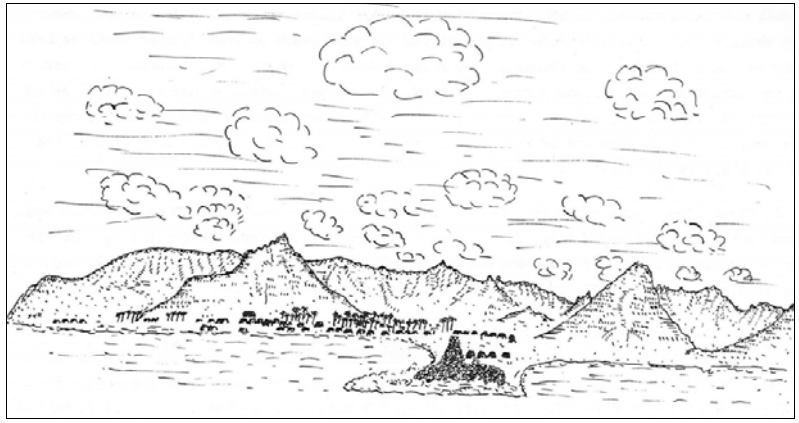

Figure 6. 1826 sketch of Wai‘anae and Mākaha Ahupua‘a by the missionary Hiram Bingham (original sketch in the Hawaiian Mission Children’s Society Library; reprinted in Green 1980:9). Places shown are: Kāne‘īlio Point on the right side; Mauna Lahilahi and Kamaile‘unu Ridge in the center; Kepuhi Point 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 7) 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 7). 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 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.”

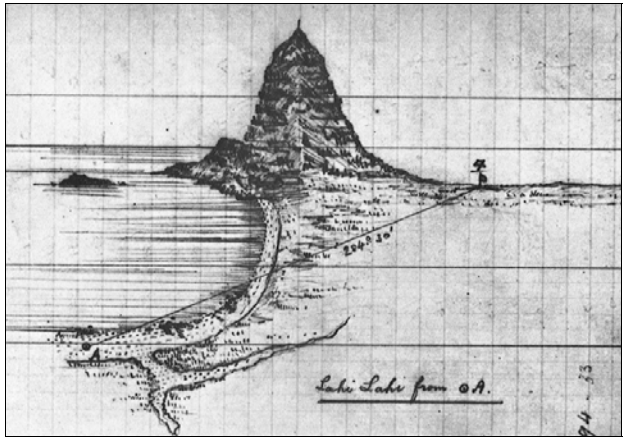

Figure 7. 1884 Sketch of Mauna Lahilahi and Laukinui Island from Kamaile, drawn by George Jackson during his survey of the Wai‘anae Coast (Jackson notebook 1884)

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 near and within the project area. 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 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 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 8), 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.

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.

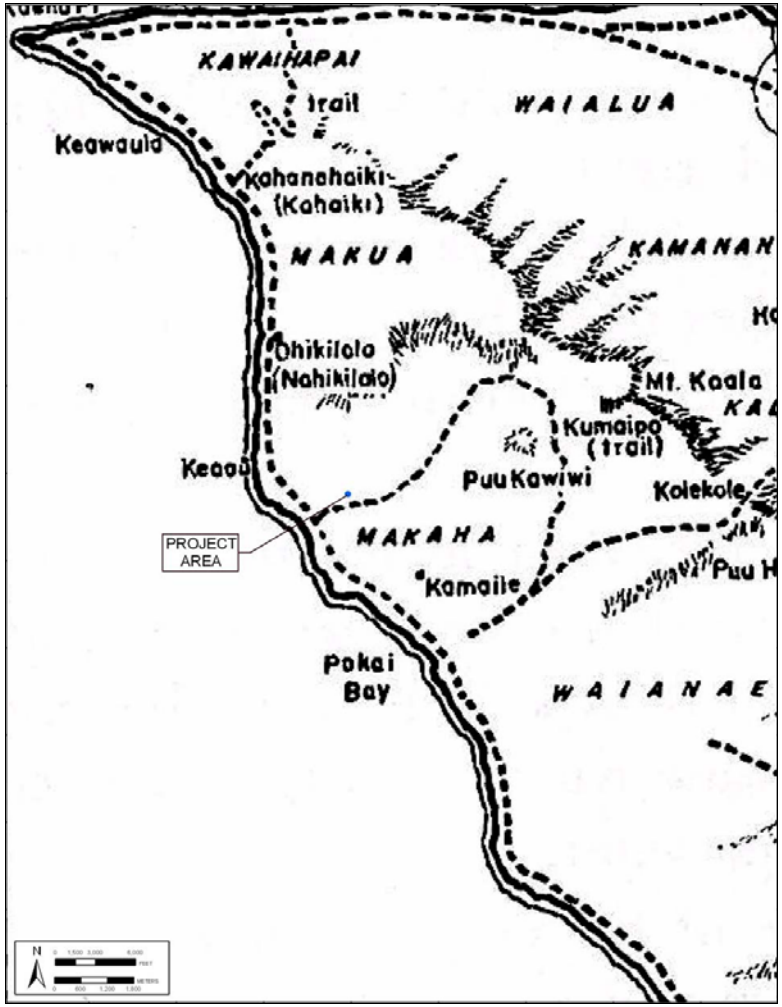

Figure 8. Trails of Leeward O‘ahu, ca. 1810, map by Paul Rockwood (reprinted in ‘Ī‘ī 1959:96)

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 1933:117). 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 9). 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 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).

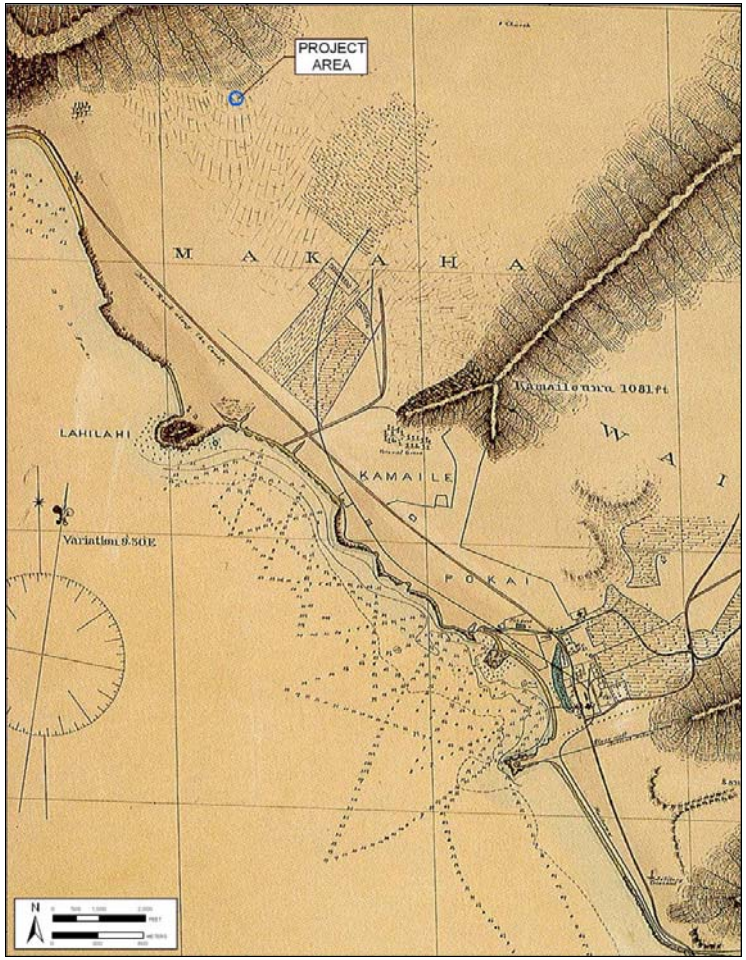

Figure 9. 1884 Hawaiian Government Survey Map of Waianae and Adjacent Coast, O‘ahu, George E. G. Jackson Surveyor (Hawai‘i Land Survey Division, Registered Map 1348), showing the location of the project area

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 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 Mākaha people 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.*

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).

Table 1. Land Commission Claims in Mākaha Ahupua‘a.

LCA #	Claimant	‘Ili	Land Use	Awarded*
877:2	Kaana/ 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	No
9860	Kalua	Luulauwaa	House lot	No
9861	Nahina	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

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 5). 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.

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 5). 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 9) shows sugar cane fields east 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.

The project area is shown within large fenced area on several late nineteenth century maps, such as on a 1881 map of O‘ahu and a 1902 map of O‘ahu (Figure 10 and Figure 11). It does not appear on subsequent O‘ahu maps, such as the 1919 U.S. War Department map (Figure 12). Green (1980:20) discusses this large enclosure in his historical study of Mākaha Valley:

> A large stone-walled enclosure, 32 ha. [hectares] in size, appears in the lower valley, on the Kea‘au side of the Makua Stream, on the 1881 Hawai‘i Government and the 1902 Hawai‘i Territory Survey maps. Analysis of the latter map, showing land use such as functioning areas of wet taro or rice land in the upper Makaha Valley, indicated that the protection of taro fields is a very unlikely purpose for the enclosure. It would have been rather difficult to get water to the rising ground along the Kea‘au side and inland end of the enclosure. This situation and the distance to the sugar mill—this area was not yet served by the Wai‘anae Plantation railway—also effectively precludes the likelihood of a sugarcane crop. Yet the enclosure's size, shape and location suggest a historic origin; if it was not used to keep animals out, the usual function of walls in this period, then it was probably used to keep some in. A remnant of the land end of a wall near the Makaha Stream, running west for more than 100 meters, may have been the end part of the enclosure. This site (50-80-07-776 [11]), described as a thick, high, double-faced core-filled wall, and/or the stone walled enclosure shown on the map, I believe date from the ranching period of the 1860 to 1880s and could well have served to hold cattle, horses, or sheep. It is during the later part of this period, for example, that Lahilahi Point was fenced across to keep sheep in and seven "beach cottages" were built for the herders as well as the Holt family fisherman (Taylor 1954), this further augmenting coastal settlement.

Subsequent maps in 1927,-28, 1943, and 1956 (Figure 13, Figure 14, and Figure 15) emphasize the lack of development in the area. The 1956 map is the first to show the construction of a reservoir and pump near the project area. The maps also show the extent of plantation infrastructure related to sugar cane cultivation near the 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 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

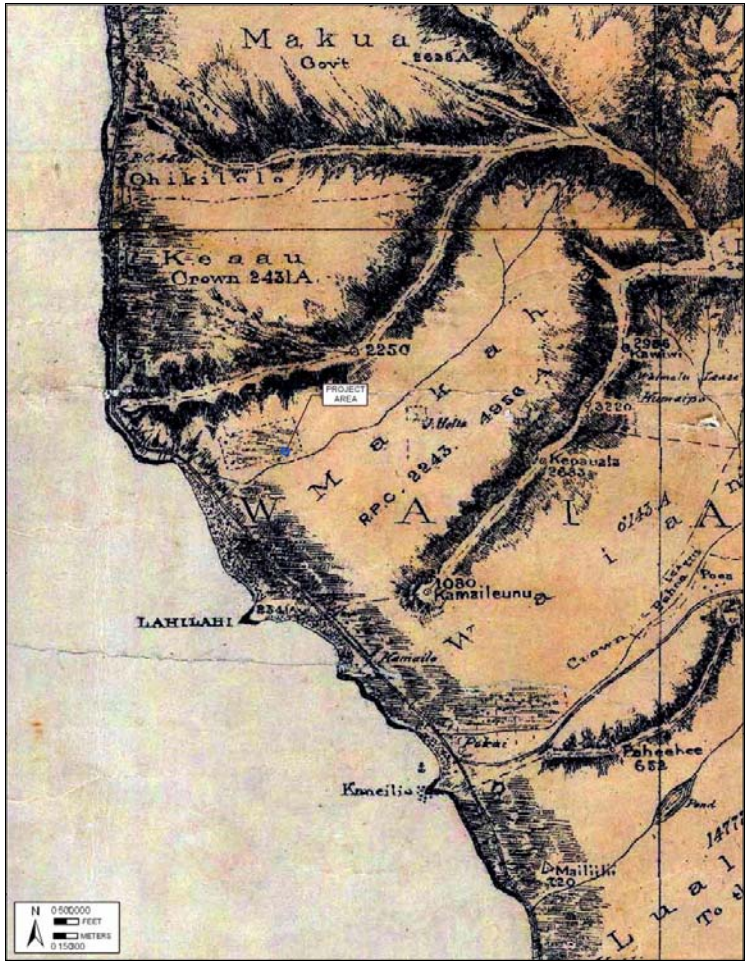

Figure 10. 1881 map of O‘ahu (portion) by R. Covington (Hawai‘i Land Survey Division, Registered Map No. 1381); project area is within an enclosure, possible a cattle paddock

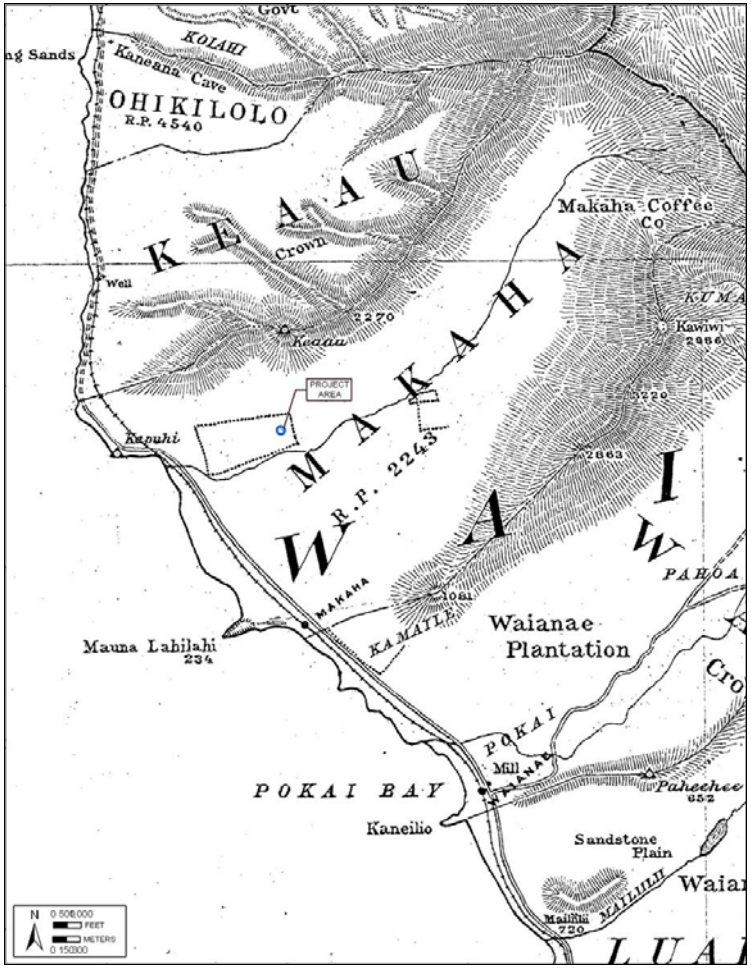

Figure 11. 1902 map of O‘ahu; (portion) by J. M. Donn (Hawai‘i Land Survey Division, Registered Map No. 2374); project area is within an enclosure, possible a cattle paddock

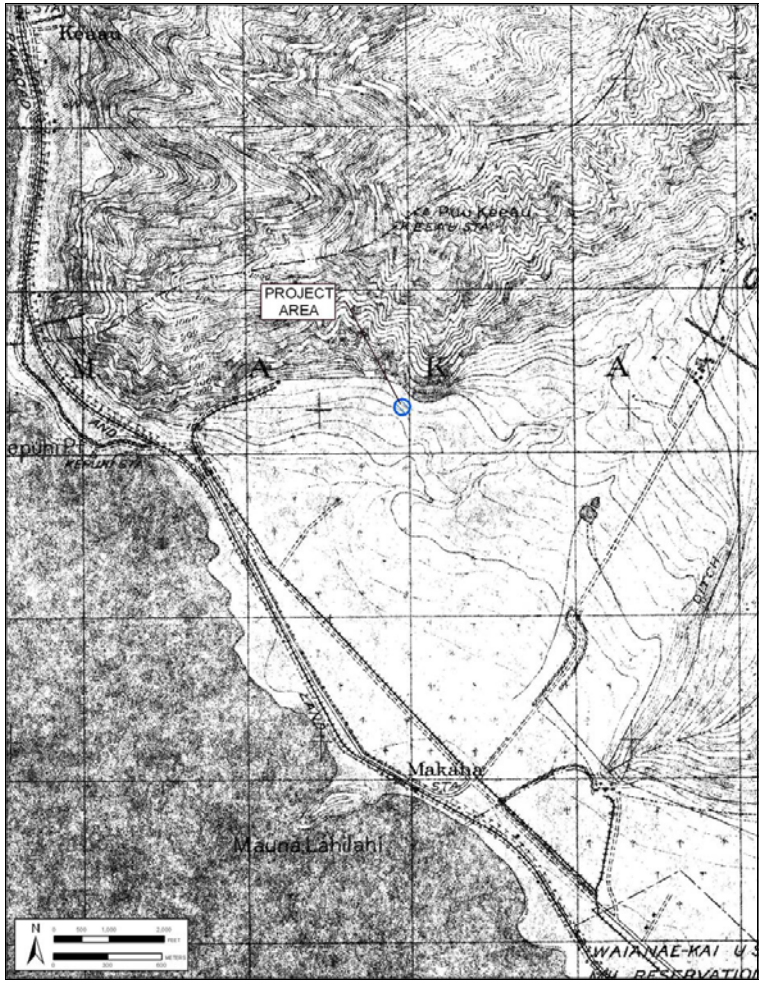

Figure 12. 1919 U.S. War Department Fire Control Map, Waianae Quadrangle, showing the location of the project area and features discussed in the text

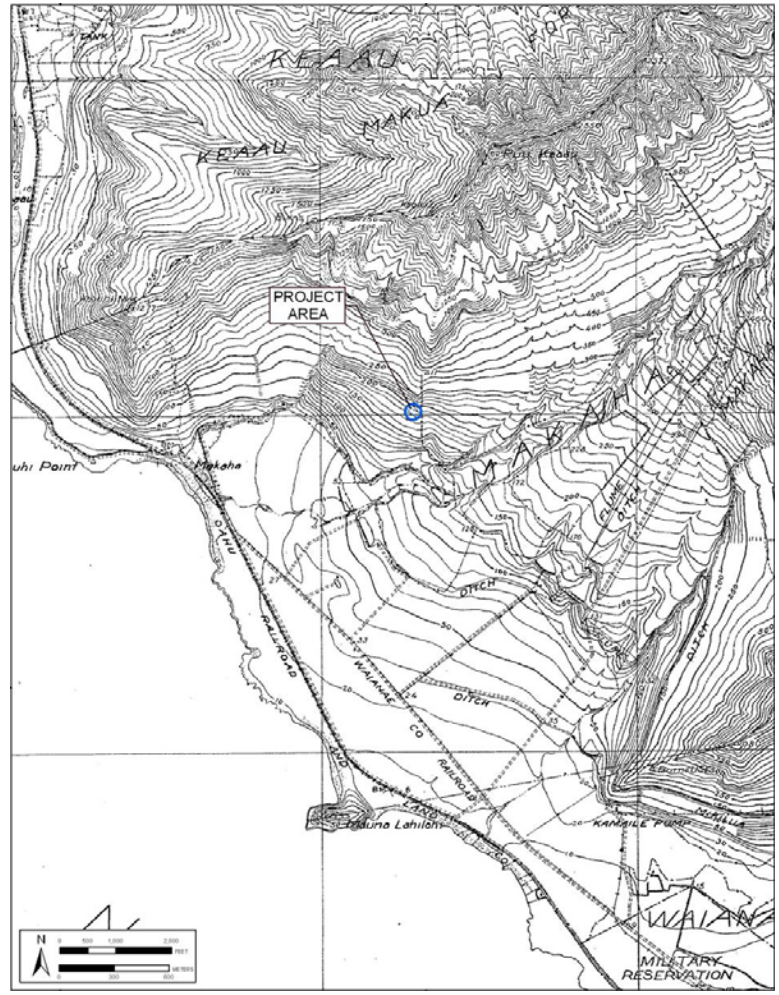

Figure 13. 1927-28 U.S. Geological Survey Topographic Map, Kaena Quadrangle, showing the location of the project area and features discussed in the text

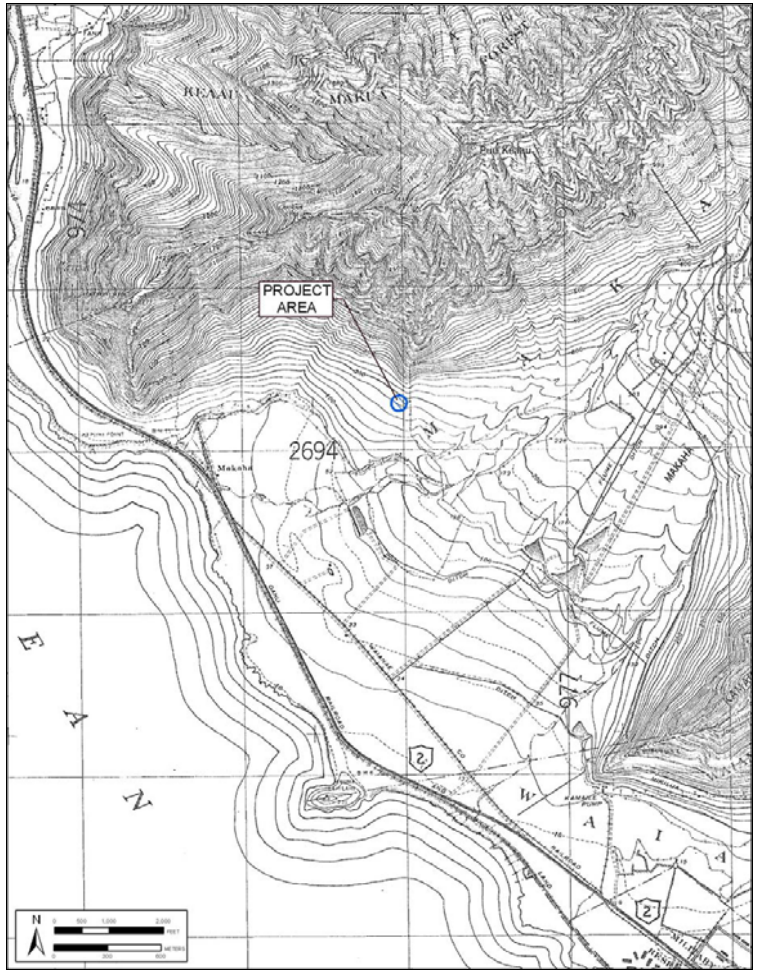

Figure 14. 1943 U.S. War Department Topographic Map, Waianae Quadrangle, showing the location of the project area and features discussed in the text

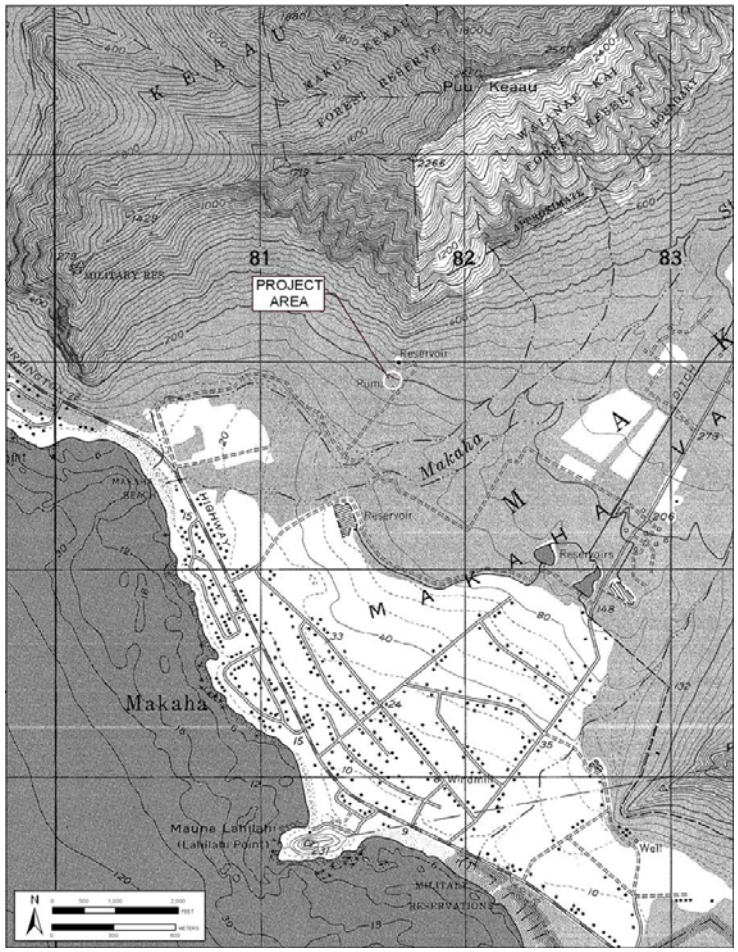

Figure 15. 1956 U.S. Army Mapping Service Topographic Map, Waianae Quadrangle, showing the location of the project area and features discussed in the text

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).

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. Some of the former plantation irrigation infrastructure near the project area, including ditches and reservoirs, remained in-place. 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 envisioned Mākaha 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 (Figure 16).

Figure 16. 1973 photograph of the Makaha Inn (tall buildings in background and the Makaha Golf Course (foreground) soon after opening (Hawai‘i Leeward Community College; reprinted in McGrath et al. 1973:169)

3.2 Previous Archaeological Research

Previous archaeological studies in Mākaha Ahupua'a are summarized in Table 2 and their location is plotted on Figure 17. Studies in the vicinity of, and pertinent to the current project area are described in the following section.

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 (1933:119-122) 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 (see Figure 17).

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:

> 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

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	Makaha 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 Makaha Valley.
Bordner 1981, 1983	Corridor for "Makaha Wells" in Upper Makaha 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
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
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.

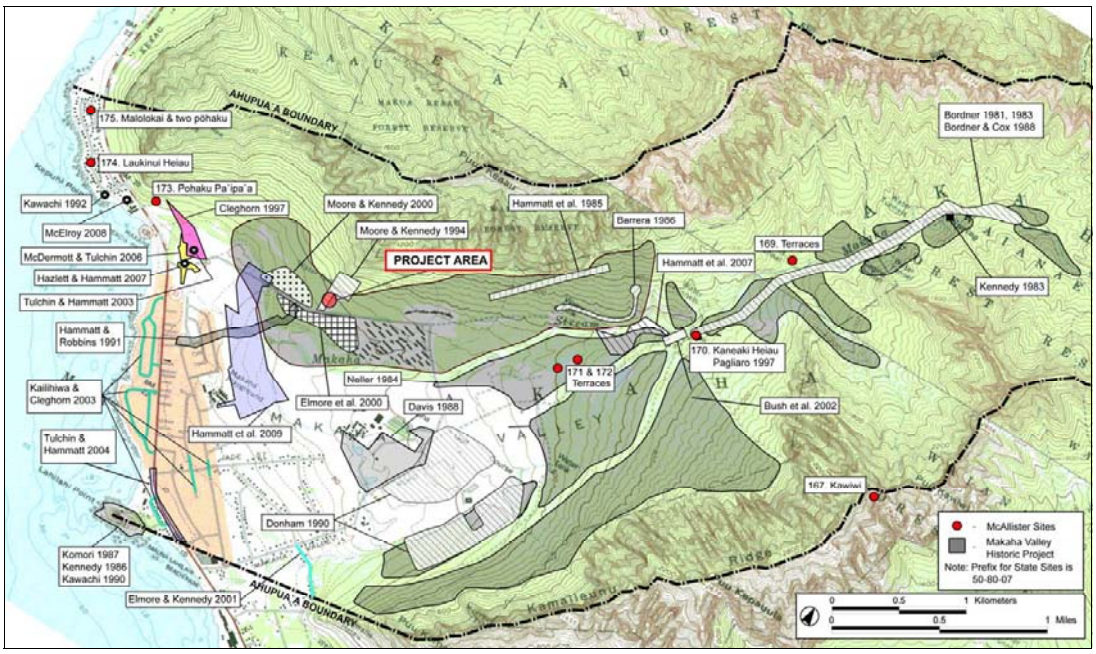

Figure 17. U. S. Geological Survey 7.5-Minute Series Topographic Map, Waianae Quadrangle (1998), showing the locations of previous archaeological studies in lower Mākaha Valley

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.
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 sugar cane cultivation

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 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. The current project area is within the Makaha Valley Historical Project Survey area, and a part of the enclosure shown on late nineteenth century maps was possibly identified during the survey and recorded as Site 50-80-07-776, Feature 11 (Figure 18).

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,

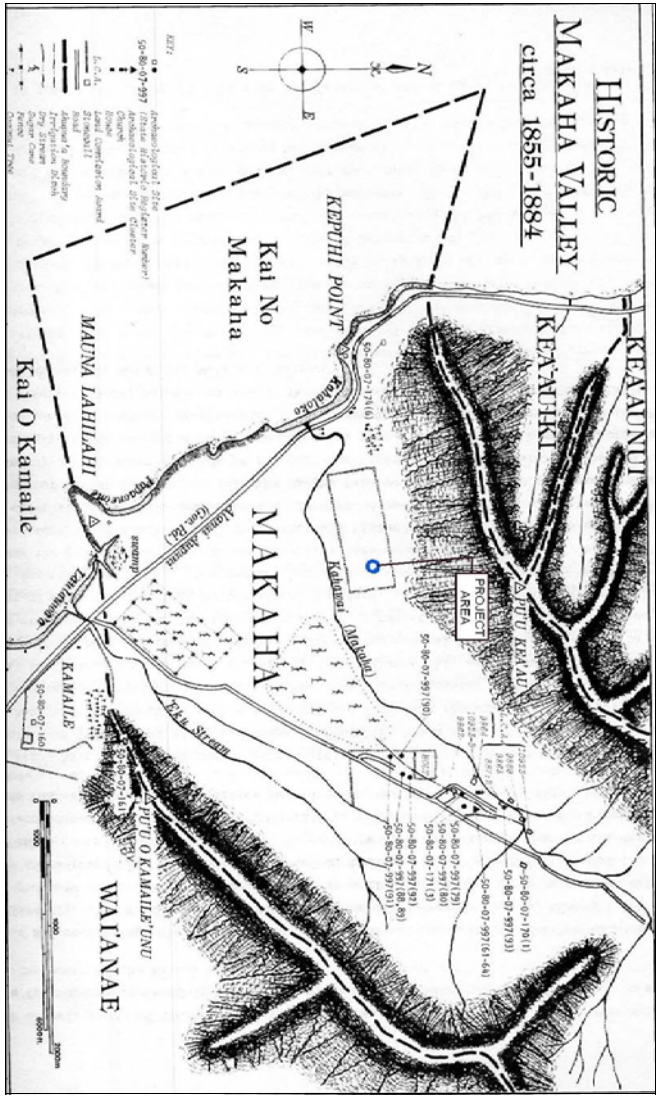

Figure 18. Location of sites identified during the Mākaha Valley archaeological project in relation to historic structures and properties shown on mid to late nineteenth century maps (figure modified from Green1980:22)

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).

In summary, Green (1980:70) 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). The Moore and Kennedy study area appears to have included a large portion of the present study area (see Figure 17). 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).

3.3 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 Mākaha 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

A 100 percent pedestrian inspection of the project area's surface confirmed that there were no surface historic properties within the project area. The project area (Figures 19 to 22) is a relatively open savannah-like landscape of 30-50 cm high dry, exotic grasses with scattered *kiawe* (*Prosopis pallida*) trees, and *koa haole (Leucaena glauca)*, *klu* (*Acacia farnesiana*), and *‘uhaloa* (*Waltheria americana*) brush. Ground visibility was generally good. A small Mākaha Booster # 1 facility lies within the project area. To the SW is a Mākaha Shaft facility. Significant ground disturbance occurred in the context of construction of these two buildings.

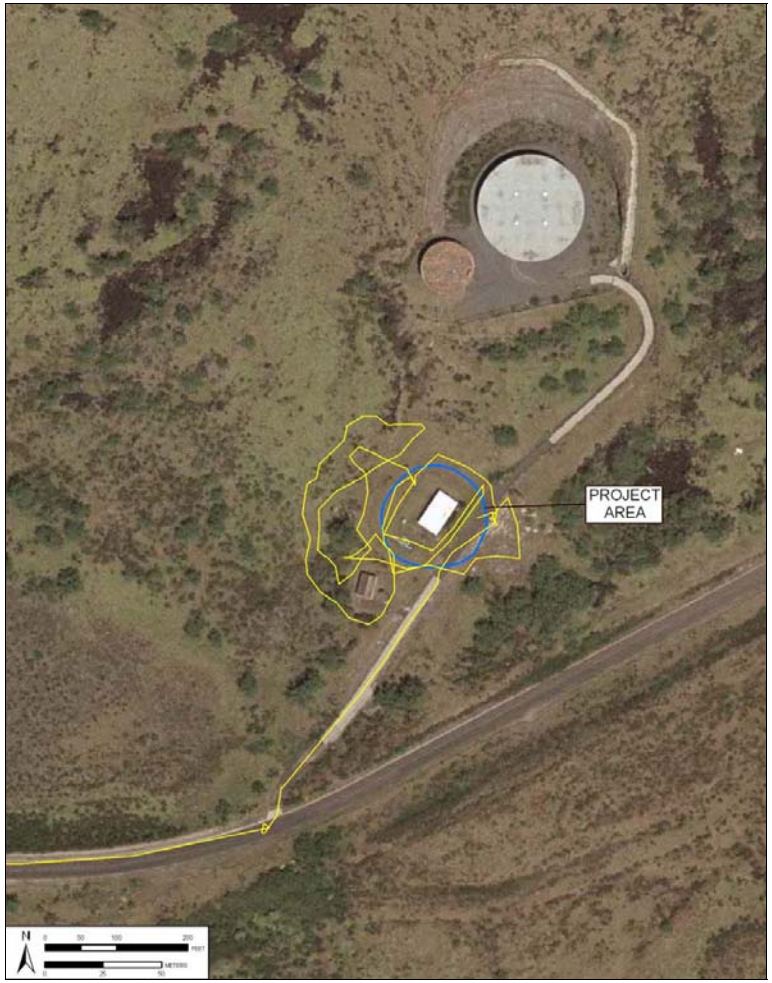

Figure 19. Pedestrian Track of September 14, 2009 field inspection (aerial photograph: U.S. Geological Survey Orthoimagery 2005)

Figure 20. General view of the central portion of the area proposed for Mākaha Dip Tank (Mākaha 242 # 1 tank in background); view to NNE

Figure 21. General view of the area proposed for the Mākaha Dip Tank (Mākaha Booster # 1 station at left); view to NE

Figure 22. General view of the SW portion of the area proposed for Mākaha Dip Tank; view to SW

Section 5 Project Effect and Mitigation Recommendations

5.1 Project Effect

Based on the current investigation, there are no historic properties within the project's APE. This corroborates the results of a prior study by Archaeological Consultants of the Pacific (Moore and Kennedy 1994) in the immediate vicinity that appears to have overlapped with the present project area somewhat (see Figure 17) that identified no historic properties. Accordingly CSH recommends a project-specific effect determination of "no historic properties affected."

5.2 Mitigation

No further historic preservation work is recommended for the proposed fire dip tank project at the indicated Mākaha location.

As always, in the unlikely event that previously unidentified subsurface historic properties are encountered by project construction, the project proponents should immediately stop work in the vicinity and contact SHPD's O‘ahu Office [Tel. (808) 692-8015].

5.3 Disposition of Materials

No cultural materials (midden, artifacts, etc.) were observed or collected during the fieldwork effort for this project.

Section 6 References Cited

Ahlo, Henry Keanu, Agnes Kim, Emma Rio, and Josephine Simmons
1986 *Mauna Lahilahi: Oral Histories (TMK 8-4-01:8, 9).* Environmental Impact Study Corporation, Honolulu, Hawai‘i.

Alexander, W. D.
1902 Hawaiian Geographic Names. Compiled by W. D. Alexander. In, *U.S. Coast and Geodetic Survey Report for 1902, Appendix No. 7,* pp. 367-425. U.S. Gov't. Printing Office, Washington, D. C.

Barrera, William, Jr.
1986 *Makaha Valley, Oahu: Archaeological Survey of Midvalley Wellsite, (TMK 8-4-02:1),* Chiniago, Inc., Honolulu, Hawai‘i.

Barrere, Dorothy B.
1970 Survey of Historical Materials Pertaining to Mākaha Valley. In, *Mākaha Valley Historical Project*, edited by R.C. Green. Pacific Anthropological Records 10, Bernice P. Bishop Museum, Honolulu, Hawai‘i.

Bingham, Hiram
1826 Sketch of the Waianae Coast, by Rev. Hiram Bingham. Original Sketch at the Hawaiian Mission Children's Society Library, 560 Kawaiaha‘o Street, Honolulu, Hawai‘i 96813. Reprinted in Roger C. Green, 1980, *Mākaha Before 1880 A.D*, p. 9. Pacific Anthropological Records No. 31, Department of Anthropology, Bishop Museum Press, Honolulu, Hawai‘i.
1847 *A Residence of Twenty-One Years in the Sandwich Islands.* Huntington, Hartford Conn., and Convers, New York.

Bishop, Sereno Edwards
1916 *Reminiscences of Old Hawaii.* Hawaiian Gazette Co., Ltd., Honolulu, Hawai‘i.

Bordner, Richard M.
1981 *Archaeological Surface Survey Makaha Wells. Appendix D.* Environmental Impact Study Corporation, Honolulu, Hawai‘i.
1983 *Makaha Valley Well III-V Re-survey*. Environmental Impact Study Corporation, Honolulu, Hawai‘i.

Bordner, Richard, and David W. Cox
1988 *Upper Makaha Valley Mapping Project, Unit 1: Sites 764 and 996 and Unit 2: Site 771.* Social Research Systems Co-op, Honolulu, Hawai‘i.

Bowser, George
1880 An Account of the Sugar Plantations and the Principal Stock Ranches of the Hawaiian Islands. *Hawaiian Kingdom Statistical and Commercial Directory* 1880-1881:401-32. Honolulu, Hawai‘i.

Bush, Tony, David Shideler, and Hallett H. Hammatt
2002 *Archaeological Monitoring Report for the Mauna Olu Non-Potable Reservoir Infrastructure Repair Project, Mākaha Ahupua‘a, Wai‘anae District, O‘ahu* (*TMK: 8-4-02:13, 8-4-29:43, 134, 135.*) Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

Chamberlain, Levi
1956a Trip Around Oahu by Levi Chamberlain in 1826. *65th Annual Report of the Hawaiian Historical Society for the Year 1956.* Hawaiian Mission Children’s Society, Honolulu, Hawai‘i.
1956b Tour Around Oahu, 1828. *65th Annual Report of the Hawaiian Historical Society for the Year 1956.* Hawaiian Mission Children’s Society, Honolulu, Hawai‘i.

Chinen, Jon J.
1985 The Great Mahele: Hawaii's Land Division of l848. University of Hawai‘i Press, Honolulu, Hawai‘i.

Clark, John R. K.
1977 *The Beaches of O‘ahu.* University of Hawai‘i Press, Honolulu, Hawai‘i.
2002 *Hawai‘i Place Names, Shores, Beaches, and Surf Sites*. University of Hawai‘i Press, Honolulu, Hawai‘i.

Cleghorn, Paul L.
1997 *The Results of An Archaeological Inventory Survey in Coastal Mākaha, Wai‘anae, O‘ahu, Hawaii (TMK 8-4-2:47).* Pacific Legacy, Inc., Kailua, Hawai‘i.

Covington, R.
1881 Oahu, Hawaiian Islands. Map by R. Covington, Registered Map No. 1381. On file at the Hawai‘i Land Survey Division, Department of Accounting and General Services, 1151 Punchbowl St., Room 210, Honolulu, Hawai‘i.

Davis, Bertell D.
1988 *Archaeological Reconnaissance of a Proposed Resort Expansion in Makaha Valley, Leeward O‘ahu.* International Archaeological Research Institute, Inc., Honolulu, Hawai‘i.

Day, A. Grove
1984 *History Makers of Hawaii.* Mutual Publishing, Honolulu, Hawai‘i.

Donham, Theresa K.
1990 *Archaeological Inventory Survey, Planned Development-Housing and Makaha Golf Course Extension Project Areas, Land of Makaha, Waianae District, Island of Oahu.* Paul H. Rosendahl, Ph.D., Inc., Hilo, Hawai‘i.

Donn, J. M.
1902 “O‘ahu, Hawaiian Islands.” Hawaiian Territorial Survey Map by J. M. Donn, Registered Map No. 2374. On file at the Hawai‘i Land Survey Division, Department of Accounting and General Services, 1151 Punchbowl St., Room 210, Honolulu, Hawai‘i.

Elmore, Michelle, James R. Moore, and Joseph Kennedy
2000 *An Archaeological Inventory Survey Report for TMK: 8-4-02:50 Located in Makaha Ahupua‘a, Waianae District, Island of O‘ahu.* Archaeological Consultants of the Pacific, Inc., Honolulu, Hawai‘i.

Emerson, Nathaniel B.
1965(1909) *Unwritten Literature of Hawaii: The Sacred Songs of the Hula.* Bureau of American Ethnology, Bulletin 38. Smithsonian Institution, Washington D.C. Charles E. Tuttle, Rutland, Vermont.

Foote, Donald E., E.L. Hill, S. Nakamura, and F. Stephens
1972 *Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawai‘i.* U.S. Dept. of Agriculture, U.S. Government Printing Office, Washington, D.C.

Giambelluca, Thomas W., Michael A. Nullet, and Thomas A. Schroeder
1986 *Rainfall Atlas of Hawai‘i.* Department of Land and Natural Resources, Honolulu, Hawai‘i.

Green, Roger C.
1969 *Mākaha Valley Historical Project: Interim Report No. 1.* Pacific Anthropological Records 4, Bernice P. Bishop Museum, Honolulu, Hawai‘i.
1970 *Makaha Valley Historical Project: Interim Report No. 2.* Pacific Anthropological Records, No. 2, Bernice P. Bishop Museum, Honolulu, Hawai‘i.
1980 Mākaha Before A.D. 1880. *In, Mākaha Valley Historical Project Summary Report No. 5.* Pacific Anthropological Records No. 31, Dept. of Anthropology, Bernice P. Bishop Museum, Honolulu, Hawai‘i.

Hall, .E. O.
1839 Notes of a Tour around Oahu. *Hawaiian Spectator*, vol. 2, Honolulu, Hawai‘i.

Hammatt, Hallett H., and Jennifer Robins
1991 *An Archaeological Inventory Survey for the Proposed Kili Drive/Water Street 20 inch Watermain, Mākaha, Wai‘anae, O‘ahu.* Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

Hammatt, Hallett H., Darienne Dey, and Todd Tulchin
2007 *Archaeological Inventory Survey of an Approximately 13-Acre Parcel for the Proposed Mākaha Cultural Learning Center Project, Phase I, Mākaha Ahupua‘a, Wai‘anae District, Island of O‘ahu (TMK: [1] 8-4-002:014 por.).* Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

Hammatt, Hallett H., David W. Shideler, and Douglas Kahanele Borthwick
1985 *Reconnaissance Survey of the Proposed Mākaha Mid-Valley Well, Mākaha, Wai‘anae, O‘ahu.* Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

Hammatt, Hallett H., Trevor Yucha, and Whitney Petrey
2009 *Archaeological Literature Review and Field Inspection for a Approximately 61-Acre Parcel, Mākaha Ahupua‘a, Wai‘anae District, Island of O‘ahu, TMK: [1] 8-4-002: 043, 044, 048 & 063.* Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

Hawai‘i Land Survey Division

1932 Applicant: Waianae Company, Being Portions of the Ahupuaas of Makaha and Waianae Kai and various kuleanas located therein situated in the District of Waianae, Oahu, T. H. Land Court Application No. 1052 (Map 1). On file at the Hawai‘i Land Survey Division, Department of Accounting and General Services, 1151 Punchbowl St., Room 210, Honolulu, Hawai‘i.

Hawai‘i TMK Service

2009 *Tax Map Key [1] 8-4.* On file at Hawai‘i TMK Service, 222 Vineyard Street, Suite 401, Honolulu, Hawai‘i.

Hazlett, Alexander, and Hallett H. Hammett

2007 *Archaeological Monitoring Report for the Emergency Repairs to Mākaha Bridge 3, Farrington Highway, Mākaha Ahupua‘a, Wai‘anae District, Island of O‘ahu[Portions of TMK: [1] 8-4-002:047and 8-4-018:014].* Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

Ho‘oulumāhiehie

2006 *The Epic Tale of Hi'iakaikapoliopele.* As Told by Ho‘oulumāhiehie. Translated by M. Puakea Nogelmeier. Awaiaulu Press, Honolulu.

‘Ī‘ī, John Papa

1959 *Fragments of Hawaiian History* (Pukui Translation). Bishop Museum Press, Honolulu, Hawai‘i.

Jackson, George E. Gresley

1884 Jackson’s Land Survey Notes. Manuscript. Copy on file at Department of Land and Natural Resources, State Historic Preservation Division, Kapolei, Hawai‘i.

1884 Waianae and Adjacent Coast, Hawaiian Government Survey map by George E. Gresley Jackson, Registered Map Mo. 1348. On file at the Hawai‘i Land Survey Division, Department of Accounting and General Services, 1151 Punchbowl St., Room 210, Honolulu, Hawai‘i.

Kailihiwa III, Solomon, and Paul L. Cleghorn

2003 *Archaeological Monitoring of Mākaha Water System Improvements Phase II, For Ten Streets in the Ahupua‘a of Mākaha (TMK: 8-4-03m 05-08, 11, 12, 14, 16), Island of O‘ahu.* Pacific Legacy, Inc., Kailua, Hawai‘i.

Kamakau, Samuel Manaiakalani

1976 *The Works of the People of Old. Na Hana a ka Po‘e Kahiko*. Bernice P. Bishop Museum Special Publication 61. Bishop Museum Press, Honolulu, Hawai‘i.

1991 *Tales and Traditions of the People of Old: Nā Mo‘oleleo a ka Po‘e Kahiko.* Bishop Museum Press, Honolulu, Hawai‘i.

1992 *Ruling Chiefs of Hawai‘i (Revised Edition)*. The Kamehameha Schools Press, Honolulu, Hawai‘i.

Kawachi, Carol T.

1990 *Mauna Lahilahi Crevice Burials Mākaha, Wai‘anae, O‘ahu.* Department of Land and Natural Resources, State Historic Preservation Division, Kapolei, Hawai‘i.

1992 *Memo Report: Mākaha Burials Exposed by Hurricane ‘Iniki, TMK 8-4-09:5, Site 50-80-07-4527.* Department of Land and Natural Resources, State Historic Preservation Division, Kapolei, Hawai‘i.

Kealanahele, Edward Iopa

1975 *A Legend: How Mākaha got its Name.* Reprinted at http://www.k12.hi.us/~waianaeh/waianhi/makahleg.html. Downloaded 9-1-2009.

Kelsey, Theo.

n.d. A Few Wai‘anae Names. Unpublished manuscript, Hawai‘i State Archives, Kekahuna Collection, Box M-445, File # 82 Wai‘anae. Hawai‘i State Archives, Honolulu, Hawai‘i.

Kennedy, Joseph

1983 *An Archaeological Monitoring Report at Well IV, Makaha Valley, Oahu (TMK 8-4-02)*. Archaeological Consultants of Hawai‘i, Inc., Honolulu, Hawai‘i.

1986 *Archaeological Investigations at Mauna Lahilahi, Wai‘anae, Island of O‘ahu, (TMK 8-4-1:8 & 9; 8-4-3:11, 8-4-4:1,5 & 9.* Archaeological Consultants of Hawai‘i, Inc., Honolulu, Hawai‘i.

Komori, Eric

1987 *Archeological Survey and Testing at Mauna Lahilahi, Wai‘anae District, Island of O‘ahu.* Department of Anthropology, Bernice P. Bishop Museum, Honolulu, Hawai‘i.

Ladd, Edmund J.

1973 *Mākaha Valley Historical Project, Interim Report No.4.* Pacific Anthropological Records No. 19, Bernice P. Bishop Museum, Honolulu, Hawai‘i.

Ladd, Edmund J., and D. E. Yen (editors)

1972 *Mākaha Valley Historical Project, Interim Report No. 3*. Pacific Anthropological Records No. 18, Bernice P. Bishop Museum, Honolulu, Hawai‘i.

McAllister, J. Gilbert

1933 *Archaeology of Oahu*. Bishop Museum Bulletin 104, Bernice P. Bishop Museum, Honolulu, Hawai‘i.

McDermott, Matt, and Jon Tulchin

2006 *Archaeological Inventory Survey for the Proposed Replacement of Mākaha Bridges 3 and 3A, Farrington Highway, Mākaha Ahupua‘a, Wai‘anae District, Island of O‘ahu, TMK: [1] 8-4-001:012, 8-4-002:045, 47, 8-4-018:014, 122, 123, 8-4-08:018, 019, 020.* Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

McElroy, Windy K.

2008 *Letter Report: Emergency Archaeological Monitoring at TMK: (1) 8-4-009:005, Mākaha Ahupua‘a, Wai‘anae District, O‘ahu.* Garcia and Associates, Honolulu, Hawai‘i.

McGrath, E. J., Jr., K. M. Brewer, and Robert Krauss

1973 *Historic Wai‘anae, A Place of Kings.* Island Heritage Ltd., Norfolk Island, Australia.

1973 Photograph of the Makaha Inn and Golf Course. Unknown photographer. Photograph on file at Leeward Community College-Wai‘anae, 86-088 Farrington Hwy, Suite 201. Reprinted in McGrath et al. 1973:166.

Wai‘anae, HI 96792

Makalena, J. W.
1860 “Keaau, Waianae, Oahu.” Map by J. W. Makalena. Hawai‘i Land Survey Division, Registered Map No. 95. On file at the Hawai‘i Land Survey Division, Department of Accounting and General Services, 1151 Punchbowl St., Room 210, Honolulu, Hawai‘i.

Mitchell, Hugh C.
1930 Triangulation in Hawaii. U. S. Dept. Of Commerce. Coast & Geodetic Survey Special Publication 156. Gov’t. Printing Office, Washington, D. C.

Monsarrat, M. D.
ca. 1875-1900 “Waianae, Oahu.” Map by M. D. Monsarrat. Registered Map No. 600. On file at the Hawai‘i Land Survey Division, Department of Accounting and General Services, 1151 Punchbowl St., Room 210, Honolulu, Hawai‘i.

Moore, James R., and Joseph Kennedy
1994 *Archaeological Investigations for the Board of Water Supply’s Proposed Makaha 242 Reservoir site Located at TMK: 8-4-02:11 (Lot 1236) in Makaha Ahupua‘a, Waianae District, on the Island of Oahu, (TMK 8-4-02)*, Archaeological Consultants of Hawai‘i, Inc, Haleiwa, Hawai‘i.

2000 *An Archaeological Inventory Survey Report for a Portion of TMK: 8-4-02: 58 Located in Makaha Ahupua‘a, Waianae District, Island of O‘ahu*, Archaeological Consultants of the Pacific, Inc., Honolulu, Hawai‘i.

Mouritz, A.
1934 Thermal Terrene Waters in Hawaii Nei, July 5, 1934, p. 128. Bishop Museum Scrap Book Vol. 1931. Portion reprinted in Elspeth P. Sterling and Catherine C. Summers, 1978, *Sites of Oahu*, p. 68. Bishop Museum Press, Honolulu, Hawai‘i.

Neller, Earl
1984 *An Archaeological Reconnaissance Survey of Site Area 997 Mākaha Valley, O‘ahu, Hawai‘i. (TMK 8-4-02:2, 14)*. Department of Land and Natural Resources, State Historic Preservation Division, Kapolei, Hawai‘i.

Pagliaro, Emily
1997 *Kane‘aki Heiau Restoration 1996.* Fields Masonry, Kailua-Kona, Hawai‘i.

Poe, Mr. Harry G.
n.d. Place Names of the Waianae District. Obtained by Mr. James I. P. Kekahuna, 84-844 Fricke St., Makaha, Wai-‘anae, O‘ahu. Unpublished manuscript, Hawai‘i State Archives, Kekahuna Collection, Box M-445, File # 82. Hawai‘i State Archives, Honolulu, Hawai‘i.

Pukui, Mary Kawena, and Samuel H. Elbert
1986 *Hawaiian Dictionary, 2nd Edition*. University of Hawai‘i Press, Honolulu, Hawai‘i.

Pukui, Mary K., Samuel H. Elbert, and Ester T. Mookini
1974 *Place Names in Hawai‘i*. University Press of Hawai‘i, Honolulu, Hawai‘i.

Rockwood, Paul
1959 - Maps depicting trails in O‘ahu ca. 1810. Printed in, *Fragments of Hawaiian History*, by John Papa ‘Ī‘ī, 1959, pp. 90, 93. Bishop Museum Press, Honolulu.

Schmitt, Robert C.
1977 *Historical Statistics of Hawai‘i*. The University of Hawai‘i Press, Honolulu, Hawai‘i.

Schoofs, Robert
1978 *Pioneers of the Faith. History of the Catholic Mission in Hawaii (1827-1940).* Sturgis Printing Co., Honolulu, Hawai‘i.

Soehren, Lloyd
2009 Hawaiian Place Names database. On line at http//ww.ulukau.org. Downloaded June 1, 2009.

Sterling, Elspeth P., and Catherine C. Summers (compilers)
1978 *Sites of O‘ahu*. Department of Anthropology, Bernice P. Bishop Museum, Honolulu, Hawai‘i.

Taylor, C. B.
1954 Tales about Hawaii. *Honolulu Star-Bulletin*, June 23-29, July 28.

Thrum, Thomas G.
1909 Ancient Hawaiian Religions Beliefs and Ceremonies. Translated from the Writings of S. M. Kamakau. *Hawaiian Almanac and Annual for 1909*, pp. 149-158. Thos. G. Thrum, Honolulu, Hawai‘i.

1922 Hawaiian Place Names. In Lorrin Andrews, 1922, *A Dictionary of the Hawaiian Language*, pp. 625-674. Board of Commissioners of Public Archives of the Territory of Hawaii, Honolulu, Hawai‘i.

Tulchin, Todd, and Hallett H. Hammatt
2003 *Archaeological Inventory Survey in Support of the Proposed Sandwich Isles Fiber Optic Cable Landing at Kili Drive, Mākaha Ahupua’a, Wai‘anae District, Island of O‘ahu.* Cultural Surveys Hawai‘i, Inc. Kailua, Hawai‘i.

2004 *Archaeological Monitoring Report for BWS Farrington Highway Part III Project, Jade Street to Kaulawaha Road, Mākaha and Wai‘anae Ahupua‘a, Wai‘anae District, Island of O‘ahu* (*TMK 8-4-01,03,04,11,13, 14; 8-5-02, 14-18*). Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

U.S. Army Mapping Service
1956 U.S. Army Mapping Service 7.5 minute topographic map, Waianae Quadrangle. On file at USGS Information Services, Box 25286, Denver, Colorado.

U.S. Geological Survey
1998 U.S. Geological Survey 7.5 minute topographic map, Waianae Quadrangle. On file at USGS Information Services, Box 25286, Denver, Colorado.

1928-29 U.S. Geological Survey 7.5 minute topographic map, Kaena Quadrangle. On file at USGS Information Services, Box 25286, Denver, Colorado.

2005 U.S. Geological Service Orthoimagery (Aerial photograph). On file at USGS Information Services, Box 25286, Denver, Colorado.

U.S. War Department

1919 U.S. War Department 7.5 minute topographic map, Waianae Quadrangle. On file at USGS Information Services, Box 25286, Denver, Colorado.

1943 U.S. War Department 7.5 minute topographic map, Waianae Quadrangle. On file at USGS Information Services, Box 25286, Denver, Colorado.

Vancouver, George

1798 *A Voyage of Discovery to the North Pacific Ocean and Round the World Performed in the Years 1790-95*, 3 Volumes, G.G. and J. Robinson and J. Edwards, London, England.

Waihona ‘Āina Corp.

2000 *The Māhele Database*, www.waihona.com. Downloaded September 1, 2009.

Westervelt, William D.

1963 *Hawaiian Legends of Old Honolulu*. Charles E. Tuttle Co., Rutland, Vermont.

Wilkes, Charles

1845 *Narrative of the United States Exploring Expedition, During the Years 1838, 1839, 1840, 1841, 1842.* 5 Volumes. Lea and Blanchard, Philadelphia, Pennsylvania.

Appendix B

Archaeological Assessment for
Board of Water Supply Fire Dip Tank Project
Lualualei Ahupuaa, Waianae District, Oahu Island
TMK (1) 8-6-003:075 por.
Cultural Surveys Hawaii, Inc.
February 2010

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

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CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
601 KAMOKILA BOULEVARD, ROOM 555
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June 23, 2010

Dr. Hallet Hammatt
Cultural Surveys Hawaii
P.O. Box 1114
Kailua, Hawaii 96734

LOG NO: 2010.2380
DOC NO: 1006MV51
Archaeology

Dear Dr. Hammatt:

SUBJECT: HAR § 13-13-276 Review –
Archaeological Assessment for the Board of Water Supply Fire Dip Tank Project, Lualualei Ahupua'a, Wai'anae District, Island of Oahu.
TMK: [1] 8-6-003:075 por. (DRAFT)

Thank you for the opportunity to review this draft of an Archaeological Assessment (AA) that was received by our office on June 17, 2010. The fieldwork for this project began as a formal Archeological Inventory Survey (AIS). As part of the AIS an extensive pedestrian survey (depicted in figure 13) covered 100% of this approx. 1 acre project area. This survey did not encounter any historic properties and the AIS was changed to an AA pursuant to HAR § 13-13-275-5. Because there are no historic properties recorded in this project area it is unlikely that the proposed development will have an impact on archeological or historic resources in the area. Therefore we agree with your recommendation that no further archaeological work is required.

Please submit a copy of this report, marked "**FINAL**," along with a copy of this review letter and a text-searchable PDF version on CD to the attention of the **"SHPD Library"** at the Kapolei SHPD office.

Please call Mike Vitousek at (808) 692-8029 if you have any questions or concerns regarding this letter.

Aloha,

Nancy A. McMahon

Nancy McMahon, Deputy SHPO/State Archaeologist
and Historic Preservation Manager

Final
Archaeological Assessment for the Board of Water Supply Fire Dip Tank Project, Lualualei Ahupuaʻa, Waiʻanae District, Oʻahu Island TMK [1] 8-6-003:075 por.

Prepared for

Wilson Okamoto Corporation

Prepared by

Hallett H. Hammatt, Ph.D.,

David W. Shideler M.A.

and,

Constance R. O'Hare, B.A.

Cultural Surveys Hawaiʻi, Inc.

Kailua, Hawaiʻi

(Job Code: LUALUALEI 9)

February 2010

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Management Summary

Reference	Archaeological Assessment for the Board of Water Supply Fire Dip Tank Project, Lualualei Ahupuaʻa, Waiʻanae District, Oʻahu Island TMK [1] 8-6-003:075 por. (Hammatt et al. 2010)
Date	February 2010
Project Number (s)	Cultural Surveys Hawai'i (CSH) Job Code: LUALUALEI 9
Investigation Permit Number	Fieldwork for this investigation was performed under archaeological fieldwork permit number 09-20, issued by the Hawaiʻi Department of Land and Natural Resources/State Historic Preservation Division (DLNR / SHPD)
Project Location	The project area is located immediately north of the intersection of Pāheʻeheʻe Road and Kūwale Road on the south side of Pāheʻeheʻe Ridge in Lualualei Ahupuaʻa, Waiʻanae District, Oʻahu Island, TMK [1]8-6-003:075 por. (U. S. Geological Survey 7.5 Minute Series Topographic Map, Waiʻanae Quadrangle – see Figure 1)
Land Jurisdiction	The project area is understood as currently owned by the State of Hawaii Department of Hawaiian Home Lands.
Agencies	State of Hawaiʻi Department of Land and Natural Resources/State Historic Preservation Division (DLNR/SHPD) Board of Water Supply (source of project funding)
Project Description	The project area is proposed for the development of a fire dip tank facility to facilitate helicopter transport of water to aid in the fighting of brush fires in the vicinity. It is understood that improvements would include grading for access and construction of a level slab approximately 60-feet square. A temporary buoy wall tank would be set up on this slab to facilitate rapid replenishment of a helicopter borne water bucket for fire fighting
Project Acreage	Approximately 1 acre
Area of Potential Effect (APE) and Survey Acreage	Based on available information, the proposed Fire Dip Tank Project on the south edge of Pāheʻeheʻe Ridge in Lualualei Ahupuaʻa will not impose adverse visual, auditory or other environmental impact to any known historic properties, including standing architecture, located outside the project area. Accordingly, the proposed project, based on available information lacks potential to affect historic properties outside the project area. As a result the project's APE is the same as the project area. The survey area for the current investigation included the entire approximately 1-acre APE/project area.

Historic Preservation Regulatory Context	The proposed Fire Dip Tank Project on the south edge of Pāhe‘ehe‘e Ridge in Lualualei Ahupua‘a requires compliance with and review under state of Hawai‘i historic preservation legislation [Hawai‘i Revised Statutes (HRS) Chapter 6E-8 and Hawai‘i Administrative Rules (HAR) Chapter 13-13-275]. At the request of Wilson Okamoto Corporation and on behalf of the City & County of Honolulu Board of Water Supply, Cultural Surveys Hawai‘i, Inc. began this study as an archaeological inventory survey investigation of the project area, per the requirements of HAR Chapter 13-13-276. Because no historic properties were located, this investigation became an archaeological assessment, per the language of HAR Chapter 13-13-275-5. This archaeological assessment report was prepared to support the proposed project's historic preservation review (under HAR 13-13-275) and any other project-related historic preservation consultation.
Fieldwork Effort	The fieldwork effort was carried out by David W. Shideler, M.A., under the general supervision of Hallett H. Hammatt, Ph.D. The fieldwork took place on September 14, 2009, taking less than one person-day to complete.
Number of Historic Properties Identified	None
Historic Properties Recommended Eligible to the Hawai‘i Register of Historic Places (Hawai‘i Register)	None
Historic Properties Recommended Ineligible to the Hawai‘i Register	None
Effect Recommendation	"No historic properties affected"
Mitigation Recommendation	No further archaeological field work is recommended. As always, in the unlikely event that previously unidentified subsurface historic properties are encountered by project construction, the project proponents should immediately stop work in the vicinity and contact SHPD's O‘ahu Office [Tel. (808) 692-8015].

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Section 1 Introduction

1.1 Project Background

At the request of Wilson Okamoto Corporation and on behalf of the City & County of Honolulu Board of Water Supply, Cultural Surveys Hawai‘i, Inc. (CSH) conducted an archaeological assessment for a proposed Fire Dip Tank Project on the south edge of Pāhe‘ehe‘e Ridge in Lualualei Ahupua‘a, Wai‘anae District, Island of O‘ahu (TMK: [1]8-6-003:075 por.) as shown on a U.S. Geological Survey Wai‘anae quad map (Figure 1) Tax Map Key plat (Figure 2) and aerial photograph (Figure 3). The project area is located immediately north of the intersection of Pāhe‘ehe‘e Road and Kūwale Road on the south side of Pāhe‘ehe‘e Ridge.

The project area is being proposed for a fire dip tank location. It is understood that improvements would include grading for access and construction of a level slab approximately 60-feet square. A temporary buoy wall tank would be set up on this slab to facilitate rapid replenishment of a helicopter borne water bucket for fire fighting. Based on available information, the proposed Fire Dip Tank Project on the south edge of Pāhe‘ehe‘e Ridge will not impose adverse visual, auditory, or other environmental impact to any known historic properties, including standing architecture, located outside the project area. Accordingly, the proposed project, based on available information lacks potential to affect historic properties outside the project area. As a result the project’s APE is the same as the project area. The survey area for the current investigation included the entire approximately 1-acre APE/project area.

The Fire Dip Tank Project on the south edge of Pāhe‘ehe‘e Ridge in Lualualei Ahupua‘a constitutes a project requiring compliance with and review under state of Hawai‘i historic preservation legislation [Hawai‘i Revised Statutes (HRS) Chapter 6E-8 and Hawai‘i Administrative Rules (HAR) Chapter 13-13-275]. At the request of Wilson Okamoto Corporation, CSH completed what began as an archaeological inventory survey investigation of the project area, per the requirements of HAR Chapter 13-13-276. Because no historic properties were located, this investigation became an archaeological assessment, per the language of HAR Chapter 13-13-275-5. This archaeological assessment report was prepared to support the proposed project’s historic preservation review (under HAR 13-13-275) and any other project-related historic preservation consultation.

1.2 Scope of Work

The following archaeological inventory survey scope of work was developed and implemented to satisfy SHPD (State Historic Preservation Division) requirements. The scope of work for this inventory survey (which later became an archaeological assessment because no historic properties were located within the project) was designed in accord with SHPD rules governing standards for archaeological inventory surveys and reports (HAR 13-13-276):

1. A complete ground survey of the entire project area for the purpose of historic property inventory. If historic properties were located the following would be applicable: All historic properties would be located, described, and mapped with

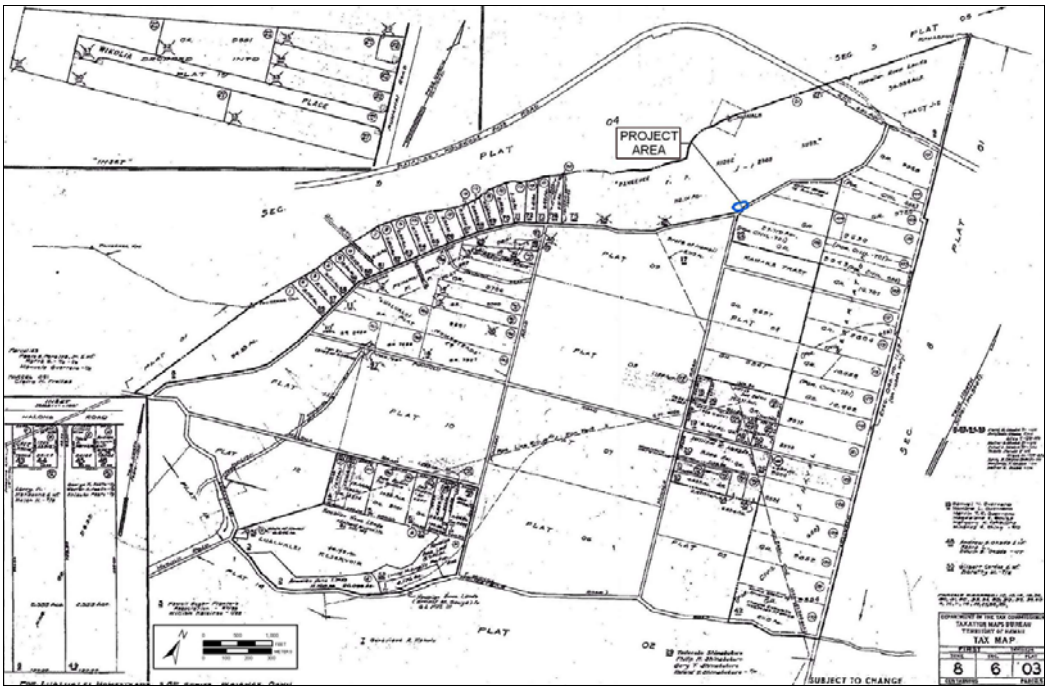

Figure 2. Tax Map Key (TMK): (1) 8-6-003 showing project area location (Hawai‘i Tax Map Service)

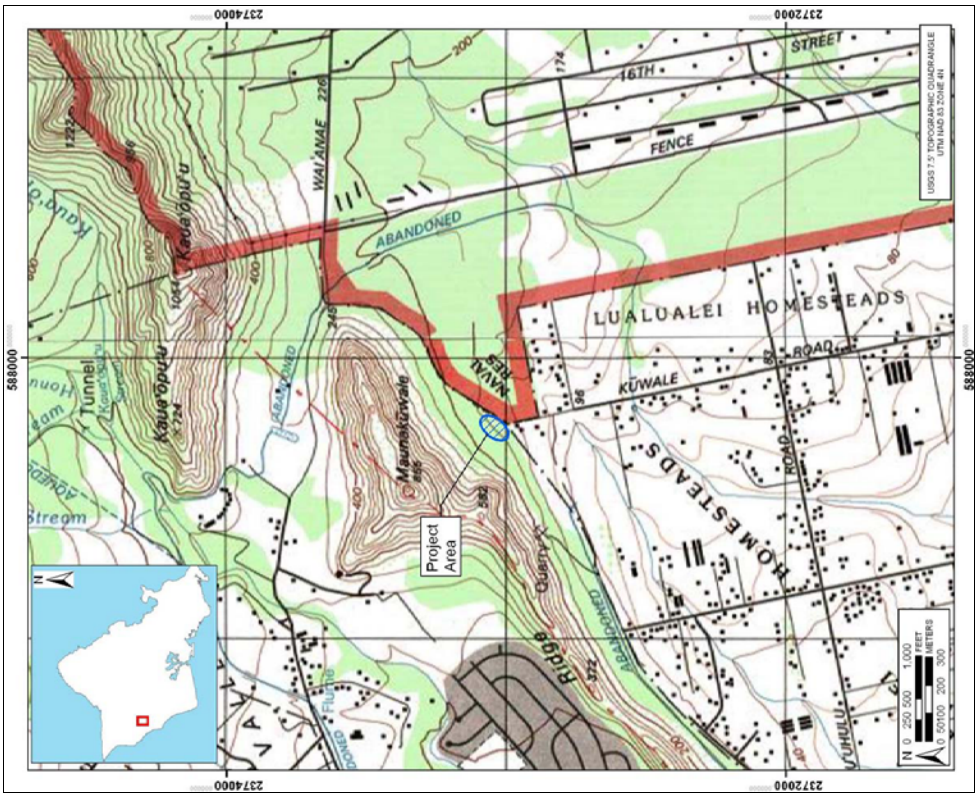

Figure 1. U. S. Geological Survey 7.5 Minute Series Topographic Map, Wai‘anae Quadrangle (1998), showing the location of the project area

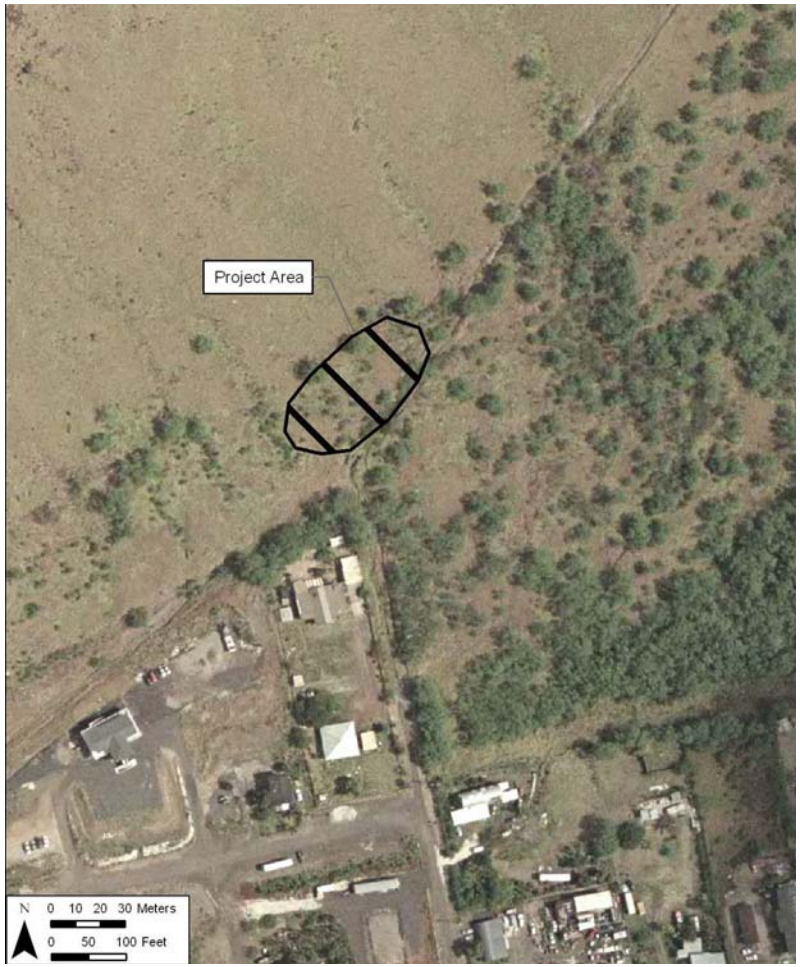

Figure 3. Aerial photograph, showing the location of the project area (source: USGS Orthoimagery 2005)

evaluation of function, interrelationships, and significance; and documentation in the form of photographs and scale drawings of selected sites and complexes.

2. Research on historic and archaeological background, including search of historic maps, written records, and Land Commission Award documents. This research focused on the specific area with general background on the *ahupua‘a* (Hawaiian land division) and district and emphasizes settlement patterns.

3. Preparation of this inventory survey report including the following:
   - A project description;
   - A topographic map of the survey area showing all record historic properties;
   - Descriptions of all historic properties, including selected photographs, scale drawings, and discussions of age, function, and significance, per the requirements of HAR Title 13, Subtitle 13, Chapter 276 “Rules Governing Standards for Archaeological Inventory Surveys and Reports.” Cultural resources were assigned State Inventory of Historic Properties (SIHP) numbers;
   - Historical and archaeological background sections summarizing prehistoric and historic land use of the project area and its vicinity;
   - A summary of cultural resource categories and significance based upon the Hawai‘i Register of Historic Places (Hawai‘i Register) criteria;
   - A project effect recommendation; and,
   - Treatment recommendations to mitigate the project’s adverse effect on historic properties recommended eligible to the Hawai‘i Register (i.e. “significant historic properties”).

This scope of work includes full coordination with the State Historic Preservation Division (SHPD), and the City and 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

Pāhe‘ehe‘e Ridge is an isolated mass of rhyodacite (the only location in Hawai‘i where rhyodacite is found) formed of flows of the Wai‘anae shield volcano (Macdonald et al. 1983). The soils in this study area are Lualualei extremely stony clay (LPE) with a large exposure of rock land (rRK) just upslope to the northwest (Foote et al. 1972) (Figure 4). Lualualei extremely stony clay is a very dark grayish brown clay soil with slow permeability and medium to rapid run-off. As a generalization, such stony clay soils are suggested to be relatively less likely to have human remains or cultural layers in comparison with sand or loam soils. Rock Land has exposed rock covering 25 to 90 percent of the surface.

Pāhe‘ehe‘e Ridge separates Wai‘anae Valley and Wai‘anae Ahupua‘a to the northwest from Lualualei Valley and Lualualei Ahupua‘a to the southeast, but does not connect with the Wai‘anae Mountain Range, which allows the valley floors to join inland of the ridge. The north side of the project area is the lower slopes of Pāhe‘ehe‘e Ridge as it ascends from approximately 160-foot elevation at the southwest end of the project area to 180 feet on the north side. The project area is roughly level ascending gently to the north. The slope of the ridge becomes significantly steeper just to the north.

The major streams of Wai‘anae Valley (Kaupuni Stream) and Lualualei Valley (Mā‘ili‘ili‘i Stream lie approximately 800 meters (m) north and south (respectively) of the project area. This area receives approximately 600 millimeters (23 inches) of rainfall per year (Giambelluca et al. 1986:73), which is generally regarded as insufficient for non-irrigated agriculture. Vegetation within the project area consisted primarily of *kiawe* (*Prosopis pallida*) trees, *koa haole (Leucaena glauca)*, *klu* (*Acacia farnesiana*), *‘uhaloa* (*Waltheria americana*) and exotic grasses.

1.3.2 Built Environment

The project area lies on the north edge of the Lualualei Homesteads north of the north end of Kūwale Road. The extensive Lualualei Naval Reservation lies to the east.

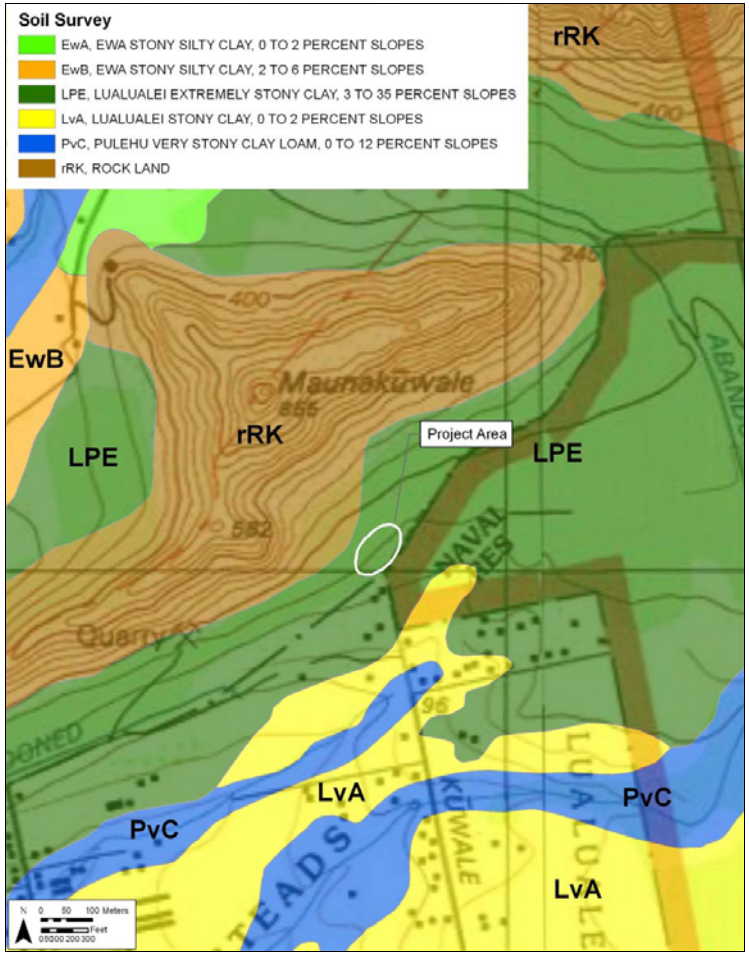

Figure 4. Overlay of Soil Survey of the State of Hawai‘i (Foote et al. 1972), indicating soil types within the project area

Section 2 Methods

2.1 Field Methods

David W. Shideler, M.A. carried out the field effort, which required less than 1 person-day to complete. Fieldwork took place on September 14th 2009 under the general supervision of Hallett H. Hammatt, Ph.D. (principal investigator). Fieldwork in this report has been performed under CSH's annual archaeological research permit, No. 09-20, issued by DLNR/SHPD. No historic properties were observed.

One hundred percent of the project area was subjected to pedestrian inspection. The project boundaries were loaded into a hand-held GPS unit (Garmin GPS Map 60 CSX). The GPS unit's tracking feature was used to record the extent of the pedestrian inspection within the project area and its vicinity. Because no historic properties were observed in the project area, field recordation was limited to photographs and general observations of past land disturbance.

2.2 Laboratory Methods

No materials were collected during the inventory survey and thus, no laboratory methods were applied.

2.3 Document Review

Background research included: a review of previous archaeological studies on file at the State Historic Preservation Division (SHPD) of the Department of Land and Natural Resources (DLNR); a review of geology and cultural history documents at Hamilton Library of the University of Hawai‘i, the Hawai‘i State Archives, the Mission Houses Museum Library, the Hawai‘i Public Library, and the Archives of the Bishop Museum; a study of historic photographs at the Hawai‘i State Archives and the Archives of the Bishop Museum; and, a study of historic maps at the Survey Office of the DLNR. Information on Land Commission Awards (LCA) was accessed through Waihona ‘Āina Corporation's Māhele Data Base (<www.waihona.com>).

This research provided the environmental, cultural, historic, and archaeological background for the project area. The sources studied were used to formulate a predictive model regarding the expected type and location of sub-surface pre and post-contact historic properties in the project area.

Section 3 Background Research

The District of Wai‘anae extends from Nānākuli on the west coast of O‘ahu north to Ka‘ena Point, and once incorporated eight *ahupua‘a*, including Wai‘anae. In ancient times, the District of Wai‘anae was known for its multitude of fish and especially for deep-sea fishing off Ka‘ena, where the ocean currents meet. The meaning of Wai‘anae (mullet water) also implies an abundance of fish, named for the *‘anae*, which is the full-grown mullet (*Mugil cephalus*) (Pukui et al. 1974). In 1840, the leader of the U.S. Exploring Expedition, Lt. Charles Wilkes, made the following comment: "The natives are much occupied in catching and drying fish, which is made a profitable business, by taking them to O‘ahu, where they command a ready sale" (Wilkes 1845:81-82). Handy and Handy (1972:468) attribute the naming of Wai‘anae to a large fresh water pond for mullet called Pueha [sic] (Puehu). Today, Wai‘anae is still considered one of the best fishing grounds on O‘ahu.

Wai‘anae was also known for the independent lifestyle and attitudes of its inhabitants, another trend that continues into the modern day. This independence was a factor in many of the political struggles of the prehistoric and early historic period when the district was the scene of battles and rebellions, and often the refuge of dissident and/or contentious factions. This independent spirit is often attributed to the conditioning of generations having to cope with marginal environments, as many areas of Wai‘anae especially Lualualei, were notorious for their inhospitable climate.

3.1 Traditional and Legendary Accounts

3.1.1 Place Names of Lualualei

Lualualei Ahupua‘a extends from the coast upwards to the upland plateau (now Schofield Barracks area in Wahiawā Ahupua‘a). It is bounded by the Pacific to the west, by Wai‘anae Ahupua‘a to the northwest, by Wahiawā to the northeast, by Honouliuli Ahupua‘a to the east and by Nānākuli to the southeast. The boundary is defined by a number of peaks, ridges, and streams. Many of these place names have been added to a 1919 map of O‘ahu (Figure 5), and their location and meaning (when known) is presented in the following paragraphs. All place name meanings are based on the book "Place Names of Hawai‘i" (Pukui et al. 1974), unless otherwise noted.

There are two suggestions for the meaning of Lualualei, "flexible wreath" and "beloved one spared" (Sterling and Summers 1978:63). Both concern legendary traditions and stories about Lualualei discussed in Section 3.1.2. The *ahupua‘a* of Lualualei is divided from coastal Wai‘anae to the west on a line from the eastern side of Kāne‘īlio Point up to Pāhe‘ehe‘e Ridge. Pāhe‘ehe‘e means "slippery" and probably refers to a *hōlua* slide on the ridge slope built and once used by the Hawaiians. At the northeast end, Pāhe‘ehe‘e Ridge ends at Mauna Kūwale ("stand alone mountain"). The project area is on the eastern lower slope of Pāhe‘ehe‘e Ridge, east of Mauna Kūwale. There is a gap in the mountain ridge at this point; the ridge continues again northward from the peak called Kaua‘ōpu‘u (possibly meaning "swelling battle"; Thrum 1922:646). The boundary with Wai‘anae ends of Pu‘u Kamali‘i (or Pu‘u Kamakalu on some maps).

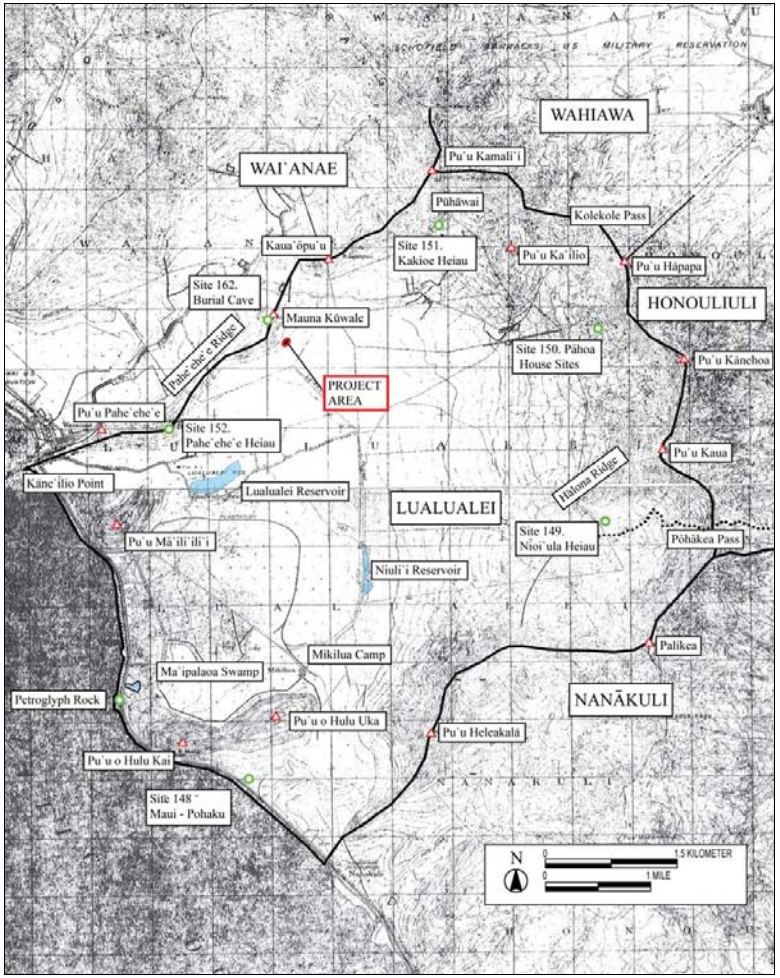

Figure 5. 1919 U. S. War Department map (Wai‘anae and Nānākuli Quadrangles), with place names added

Lualualei borders Wahiawā from Pu‘u Kamali‘i (“Cherished Child Hill”) to the north along the Wai‘anae mountain range southeast to Kolekole Pass. The pass may have been named for a woman in the form of a *pōhaku* (stone) that guarded the pass. Pukui et al (1974:116) note that the name literally means “raw or scarred,” and may refer to the story of a woman at the pass who saw a blind man approach. Doubting his blindness, she exposed herself, and the man opened his eyes and exclaimed “*A ula, kole kole*, Red, raw!”

Lualualei borders Honouliuli Ahupua‘a in ‘Ewa District on Lualualei’s northeast side extending from the south side of Kolekole Pass, along the Wai‘anae summit ridge including the peaks Pu‘u Hāpapa (“rock stratum”), Pu‘u Kānehoa (named for a native shrub; *Abrus precatorius* Black-eyed Susan) and Pu‘u Kaua (“war hill” or “fort hill”) south to Pōhākea Pass (“white stone”) where an east/west trail led across the Wai‘anae Range. The border with Nānākuli Ahupua‘a begins south of Pōhākea Pass arcing to the southwest traversing the peaks Palikea (“white cliff”), and Pu‘u Heleakalā (or Helekalā). The boundary with Nānākuli ends at the coast at the base of Heleakalā Ridge.

The coastal section of Lualualei is broken up by the prominences Pu‘u Mā‘ili‘ili‘i and the double peak Pu‘u o Hulu Kai (“seaward Hulu’s hill”) and Pu‘u o Hulu Uka (“upland Hulu’s hill”). There is some controversy over the meaning and spelling of “Mailiilii”. If it is spelled Ma‘ili‘ili‘i, it means “tiny genitals” (Soehren 2009). Pukui et al. (1974) believe that the correct spelling if Pu‘u Mā‘ili‘ili‘i, meaning “pebbly.” Between the two prominences is a coastal flatland, once part of a wetland called Ma‘ipalaoa Swamp. North and *mauka* (inland) of the swamp was a plantation camp for cane field workers called Mikilua Camp. Soehren (2009) believes that Mikilua might be an old name for the surrounding ‘*ili* (small land division within an *ahupua‘a*).

There are three streams in the upper western valley, Pūhāwai, Mā‘ili‘ili‘i, and Hālona, which joined together and entered the sea on the east side of Pu‘u Mā‘ili‘ili‘i. They now drain into the Lualualei Reservoir and the Niuli‘i Reservoir. Pūhāwai means “water bursting out” or “water hollow,” and probably refers to the spring in the ‘*ili* of Pūhāwai in the northwestern section of the upper valley. All of the mid-nineteenth century Land Commission Awards to native Hawaiian farmers were in Pūhāwai ‘Ili, the water from the spring was used to irrigate taro terraces. Hālona is also the name of a ridge. As the name means “peering place,” it was probably named for this ridge, which looks down the eastern valley. The lone stream on the eastern side is Ulehawa, (literally “filthy penis”), said to be named for a chief. This stream once drained into Ma‘ipalaoa Swamp at the beach area also called Ulehawa.

In the early 1930s, Gilbert McAllister of the Bishop Museum surveyed important sites on the island of O‘ahu. In Lualualei, he discussed four sites, and two sites on the border with Wai‘anae. These are Site 148, Maui Pōhaku, Site 152, Pāhe‘ehe‘e Heiau on Pāhe‘ehe‘e Ridge, Site 162, a burial cave on the western tip (Wai‘anae side) of Mauna Kūwale, Site 151, Kakioe Heiau in the Pūhāwai area, Site 150, several houses or *heiau* in the Pāhoa area (along the Pāhoa Ridge), and Site 149, Nīoi‘ula Heiau, at the base of Hālona Ridge. McAllister also noted several rocks with petroglyphs (rock carvings) near a fishpond on the coastal section fronting Ma‘ipalaoa Swamp.

3.1.2 Traditional and Legendary Accounts

There are two traditional meanings given to the name Lualualei. One meaning, “flexible wreath” is attributed to a battle formation used by Mā‘ilikūkahi against four invading armies in the battle of Kīpapa in the early fifteenth century (Sterling and Summers, 1978: 68). A second, and perhaps more recent meaning, offered by John Papa ‘Ī‘ī, is “beloved one spared”. This meaning relates to a story of a relative who was suspected of wearing the king’s *malo* (loincloth). The punishment was death by fire. ‘Ī‘ī writes:

> The company, somewhat in the nature of prisoners spent a night at Lualualei. There was a fish pond there on the plain and that was where the night was spent...
>
> After several days had passed, the proclamation from the king was given by Kula‘inamoku, that there was no death and that Kalakua did not wear the king’s loin cloth. Thus was the family of Luluku spared a cruel death. For that reason, a child born in the family later was named Lualualei. (‘Ī‘ī 1959: 23)

Mary Pukui believed the first meaning, “flexible wreath,” to be the more appropriate one for Lualualei (Sterling and Summers 1978: 63). According to Kelley (1991: 317), the fish pond on the plain is Puehu fish pond, which is actually located just over the border in Wai‘anae Ahupua‘a. The fish pond no longer exists today and was probably destroyed during the sugar plantation era. Perhaps, a third association to the name Lualualei is an older reference to one of Māui’s sisters, who went by the same name.

Numerous Hawaiian legends, in addition to archaeological evidence, reveal the Wai‘anae coast and *mauka* (towards the mountains) interior to be an important center of Hawaiian history. It is here, in Wai‘anae, that the famous exploits of Māuiakalana (Māui) are said to have originated. Traditional accounts of Lualualei focus on the mischievous adventures of the demi-god Māui. It was here that Māui learned the secret of making fire for mankind and perfected his fishing skills. Other famous accounts tell of the place where Māui’s adzes were made, and of the magic fishhook, Mānaiakalani and the snare for catching the sun, and his kite-flying expedition. Pu‘u Heleakalā is the ridge that separates Nānākuli from Lualualei. It was at Pu‘u Heleakalā where Hina, Māui’s mother, lived in a cave and made her *kapa* (bark cloth) (Sterling and Summers 1978: 62).

Samuel Kamakau tells us that Māui’s genealogy can be traced from the ‘Ulu line thru Nana‘ie:

> Wawena lived with Hina-mahuia, and Akalana, a male, was born; Akalana lived with Hina-kawea, and Maui-mua, Maui-waena, Maui-ki‘iki‘i, and Maui-akalana, all males, were born.
>
> Ulehawa and Kaolae, on the south side of Waianae, Oahu, was their birthplace. There may be seen the things left by Maui-akalana and other famous things: the tapa-beating cave of Hina, the fishhook called Manai-a-kalani, the snare for catching the sun, and the places where Maui’s adzes were made and where he did his deeds. However, Maui-akalana went to Kahiki after the birth of his children in Hawai‘i. (Kamakau 1991:135)

3.2 Historic Background

3.2.1 Early Historic Period

In January of 1778, Captain James Cook sighted Wai‘anae from a distance, but chose to continue his journey and landed off Waimea, Kaua‘i instead. Fifteen years later, Captain George Vancouver approached the coast of Wai‘anae from Pu‘uloa and wrote in his log:

> The few inhabitants who visited us [in canoes] from the village earnestly entreated our anchoring . . . And [they] told us that, if we would stay until morning, their chief would be on board with a number of hogs and a great quantity of vegetables; but that he would not visit us then because the day was taboo poory [a kapu day]. The face of the country did not however, promise an abundant supply [of water]; the situation was exposed.” (Vancouver, quoted in McGrath et al. 1973:17)

Vancouver was not impressed with what he saw of the Wai‘anae coastline, stating in his log that the entire coast was “one barren, rocky, waste nearly destitute of verdure, cultivation or inhabitants” (Vancouver, quoted in McGrath et al. 1973:17).

Vancouver did not anchor at Wai‘anae. But had he done so, he would have been pleasantly surprised, at least by portions of the coastline. Even though the dry, arid coast presented a dismal forecast, the ocean provided an abundant supply of fish, the lowlands provided ‘*uala* (*Ipomoea batatas*) and *niu* (*Cocos nucifera*), and the inland valley areas were planted in *kalo* (*Colocasia esculenta*) and *wauke* (*Broussonetia papyrifera*). The upland forest regions provided various woods needed for weapons and canoes.

By 1811, sandalwood merchants began actively exploiting the Hawai‘i market and huge amounts of sandalwood were exported to China. Traditionally, Hawaiians used sandalwood for medicinal purposes and as a scent to perfume their *kapa*. Kamehameha I and a few other chiefs controlled the bulk of the sandalwood trade. Kamakau (1992:204) writes, “The chiefs also were ordered to send out their men to cut sandalwood. The chief immediately declared all sandalwood to be the property of the government.”

The sandalwood trade greatly impacted Hawaiian culture, and the traditional lifestyle Hawaiians had always pursued was altered drastically. In an effort to acquire western goods, ships, guns and ammunition, the chiefs had acquired massive debts to the American merchants (‘Ī‘ī 1959:155). These debts were paid off in shiploads of sandalwood. When Kamehameha found out how valuable the sandalwood trees were, he ordered the people not to let the felled trees fall on the young saplings, to ensure their protection for future trade (Kamakau 1992:209-210). According to Samuel Kamakau:

> The debts were met by the sale of sandalwood. The chiefs, old and young, went into the mountains with their retainers, accompanied by the king and his officials, to take charge of the cutting, and some of the commoners cut while others carried the wood to the ships at the various landings; none was allowed to remain behind. Many of them suffered for food . . . and many died and were buried there. The land was denuded of sandalwood by this means. (Kamakau 1992:252)

Kamakau comments about the plight of the common people and the general state of the land during this time:

> This rush of labor to the mountains brought about a scarcity of cultivated food throughout the whole group. The people were forced to eat herbs and tree ferns, hence the famine called Hīlaulele, Hāhāpilau, Laulele, Pualele, ‘Ama‘u, or Hāpu‘u, from the wild plants resorted to. (Kamakau 1992:204)

In 1816, Boki Kama‘ule‘ule was made governor of O‘ahu and chief of the Wai‘anae district. He served in that capacity until 1829, when he sailed to New Hebrides in search of sandalwood. ‘Ī‘ī writes:

> It was Boki’s privilege to assign work, for he had been governor of the island of O‘ahu from the time Kamehameha I ordered all the chiefs to O‘ahu in 1816 to expel the Russians. (‘Ī‘ī 1959: 145)

The sandalwood era was short-lived, and by 1829, the majority of the sandalwood trees had been harvested, and the bottom fell out of the trade business. It is unclear how extensive Lualualei’s sandalwood resources were, however, the effects of the sandalwood gathering, the population shifts, and disruption of traditional lifestyles and subsistence patterns would undoubtedly have affected the population of Lualualei.

The Reverend William Ellis visited the Hawaiian Islands in 1823. At that time, he estimated the population on the island of O‘ahu to be about 20,000 (Ellis 1974:19). The missionaries were the first to gather systematic figures regarding population statistics throughout the various districts on each island. The first census figures were gathered from 1831-1832 and 1835-1836. Population figures for Lualualei were not given, however population numbers given for all of Wai‘anae were 1,868 and 1,654 respectively (Schmitt 1973:9).

Following the western encroachment into the Wai‘anae Coast, a swift decline in population occurred due to disease and a "tendency to move to the city where there was more excitement" (McGrath et al. 1973:25). The *‘ōku‘u* epidemic of 1804 (thought to be cholera) undoubtedly had some effect on the native population, not only in Wai‘anae, but throughout the rest of the islands as well. 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. In 1835, a missionary census listed 1,654 residents on the Wai‘anae Coast. The population of the Wai‘anae Coast was decimated by a smallpox epidemic in late 1853. In 1855, the Wai‘anae tax collector recorded 183 taxpayers on the leeward coast, which is thought to represent a total population of about 800 people. This catastrophic depopulation facilitated the passing of large tracts of land into the hands of a few landholders, and led to the decline of the traditional economy that once supported the region (Hammatt et al. 1993:10-11).

3.2.2 Mid- to late-1800s: Land Commission Awards (LCA)

The Organic Acts of 1845 and 1846 initiated the process of the Māhele - the division of Hawaiian lands - that introduced private property into Hawaiian society. In 1848, the crown and the *ali‘i* (royalty) received their land titles. *Kuleana* awards to commoners for individual parcels within the *ahupua‘a* were subsequently granted in 1850. At the time of the Māhele, the *ahupua‘a*

of Wai‘anae, which included Lualualei, was listed as Crown lands and was claimed by King Kamehameha III as his personal property (Board of Commissioners 1929: 28). As such, the land was under the direct control of the King. Many of the chiefs had run up huge debts to American merchants throughout the early historic period and continuing up into the mid 1800s. A common practice at the time was to lease (or mortgage) large portions of unused land to other high chiefs and foreigners to generate income and pay off these earlier debts.

Until the passage of the Act of January 3, 1865, which made Crown Lands inalienable, Kamehameha III and his successors did as they pleased with the Crown Lands, selling, leasing, and mortgaging them at will (Chinen 1958:27).

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

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

A total of twelve land claims were made in Lualualei, however only six were actually awarded. All six awards were located upland in the *‘ili* of Pūhāwai, far *mauka* of the current project area. No quiet land titles were claimed near the coast. From the claims, it can be determined that at least eight families were living in Pūhāwai at the time of the Māhele in 1848. Together, they cultivated a minimum of 163 *lo‘i* (wetland agriculture). The numerous *lo‘i* mentioned in the claims indicate the land was ideal for growing wetland taro and that this livelihood was actively pursued by the awardees. In addition, dry land crops were grown on the *kula* (plains), *wauke* was being cultivated, and one claimant was making salt.

Information on the occupation at Lualualei at the time of the Māhele, aside from the historical accounts of scattered coastal hamlets, is from archival records indicating there were nine taxpayers at Mā‘ili near the coast and 11 taxpayers at Pūhāwai in the upper valley (Cordy et al 1998:36). Mā‘ili is located along the eastern edge of the *ahupua‘a* and Pūhāwai is well *mauka*. Based on these numbers, Cordy estimates a population of 90 people for coastal Lualualei and 55 people for the upper valley in 1855 (Cordy et al. 1998:36). Regardless of the population estimate, the existence of 20 taxpaying adults in Lualualei indicates that the area was being inhabited and worked. In this case, the Māhele documents are only a partial reflection of the population and actual land use during the time.

3.2.3 1850 - 1900

With strong financial backing from King Kalākaua, Hermann A. Widemann, a German immigrant, was able to initiate the Wai‘anae Sugar Plantation in 1879. This plantation would

extend into Lualualei. Although it was never a large-scale plantation by modern standards, it was one of the first and last to be served by a plantation railroad. Some 15 miles of 30-inch narrow-gauge railroad delivered harvested cane to the mill. All the sugar was shipped by inter-island vessels to Honolulu departing from Wai‘anae Landing, until the O‘ahu Railway and Land Company (OR&L) railroad was extended to Wai‘anae and beyond in 1889. The OR&L railroad ran along the *makai* (toward the sea) side of Farrington Highway. The J. M. Dowsett Estate sold the plantation to American Factors (now Amfac/JMB-Hawai‘i) in 1931, and the OR&L railroad closed in 1947.

The first longhorn cattle were brought to O‘ahu from Hawai‘i Island in 1809 by John Young and Kamehameha I (Kamakau 1992:268). One of the first areas to be utilized for ranching on the Wai‘anae coast was Lualualei. Hawai‘i Bureau of Land Conveyances [B.C.], 1845-1869, (Archived at the DLNR) records show that William Jarrett leased approximately 17,000 acres of land from Kamehameha III in 1851. This was the beginning of Lualualei Ranch. The lease was written for 30 years with a lease fee of $700 per year (DLNR, B.C. Liber 4:616-618). It seems that Jarrett sold Paul F. Marin, son of Don Francisco de Paula Marin, one-half of his interest in the ranch. Marin lived on the ranch and managed it until 1864, when a dispute arose over the profits of the ranch. Apparently, Marin had never turned over any ranch profits to Jarrett during the time he managed it. After the dispute was settled, Jarrett took on George Galbraith as a new partner (DLNR, B.C. Liber 18:31).

In 1869, Jarrett sold the remaining years of his son’s interest in Lualualei Ranch to James Dowsett (DLNR, B. C. Liber 29:16-18). James Dowsett was a descendant of a British sea captain and is noted for being the first Anglo-Saxon child born in Honolulu (Nakamura and Pantaleo 1994:21). Dowsett was an entrepreneur of sorts and dabbled in many different business ventures, such as:

> …a whaling fleet, a dairy, a salt works, an extensive trade in awa (a Hawaiian narcotic drink) and numerous land holdings . . . He also ran cattle at different times in Nānākuli, Mikilua and Lualualei. (McGrath et al. 1973:32)

In 1880, George Bowser traveled through Wai‘anae and wrote about Lualualei in his journal:

> Leaving Wai‘anae, a ride of about two miles brought me to the Lualualei Valley, another romantic place opening to the sea and surrounded in every direction by high mountains. This valley is occupied as a grazing farm by Messrs. Dowsett & Galbraith, who lease some sixteen thousand acres from the Crown. Its dimensions do not differ materially from those of the Wai‘anae Valley, except that it is broader – say, two miles in width by a length of six or seven miles. The hills which enclose it, however, are not so precipitous as those at Wai‘anae, and have, therefore, more grazing land on their lower slopes, a circumstance which adds greatly to the value of the property as a stock farm. Although only occupied for grazing purposes at present, there is nothing in the nature of the soil to prevent the cultivation of the sugar cane, Indian corn, etc. Arrangements for irrigation, however, will be a necessary preliminary to cultivation. (Bowser 1880:493-494)

Bowser’s comments imply that though water was still a problem, Lualualei seemed to have some potential for development.

In 1894, Link McCandless entered the ranching scene:

> …he and a man named Tom King chartered the brigantine Oakland in Seattle, filled her hole with cattle and the cabins with feed, and sailed for Hawai‘i. By the turn of the century, McCandless’ ranching empire covered much of the Wai‘anae Coast, including land at Nānākuli, 4,000 acres at Lualualei, San Andrews’ property in Mākua and pastures toward Ka‘ena Point. (McGrath et al. 1973:31)

An 1894 description of Lualualei by the Commissioner of Crown Lands described the land as “one of the best and most valuable of the Crown lands on the Island of O‘ahu…surpassing any of the other lands for richness and great fertility of the soil” (Commissioner of Crown Lands 1894:36).

The sugar industry came to the Wai‘anae coast in 1878 when the first sugar cane was planted in upper Wai‘anae Valley. By 1892, at least 300 acres of cane was planted in Lualualei. In addition to the cultivated lands, a railroad, irrigation ditches, and flumes, reservoirs and plantation housing were constructed to support the sugar industry. The cane from the *mauka* areas of Lualualei was loaded onto a railroad and transported to the mill at Wai‘anae. One sugar cane flume called Puea extended near or through the project area, according to a 1914 map (Figure 6).

The O‘ahu Railway and Land Company (OR&L) signed its charter on February 4, 1889. The Railway was the brainchild of Benjamin Franklin Dillingham. Along with James Castle and others, he had invested in large tracts of land for speculation and resale, but the idea was slow to catch on because “the land lay too far from Honolulu, at least 12 miles” (McGrath et al.1973:54) He foresaw an economic opportunity. The railway was a means to provide transportation to the country and promote development of unoccupied lands, as well as connect with the sugar plantations in ‘Ewa, Wai‘anae, Waialua, and Kahuku. Construction on the railway began in March of 1889. The first length of the railway was completed and opened to the public by January 1, 1890. Five years later, on July 4, 1895, the railway finally reached Wai‘anae. The Railway served the Wai‘anae coast until 1946 when the Wai‘anae Sugar Plantation closed down.

3.2.4 Early 1900s to Present

3.2.4.1 Sugar and Cattle

By 1901, the Wai‘anae Sugar Company had obtained a five-year lease on 3,332 acres of land at Lualualei to be used for raising cane as well as for ranching (Commissioner of Crown Lands 1902). Sugar and ranching continued to dominate the Lualualei landscape during the early years of the twentieth century. The determining factor in the success of Lualualei for sugar production was always the water.

Throughout the first half of the twentieth century, the Waianae Sugar Company continued cultivating their sugar lands in Lualualei. By the 1940’s, Waianae Sugar Company could no longer compete with foreign labor. This, in addition to drought problems, labor unions and land battles, caused the undermining of Waianae Sugar Company. In 1946, the Company was liquidated, and the land was sold.

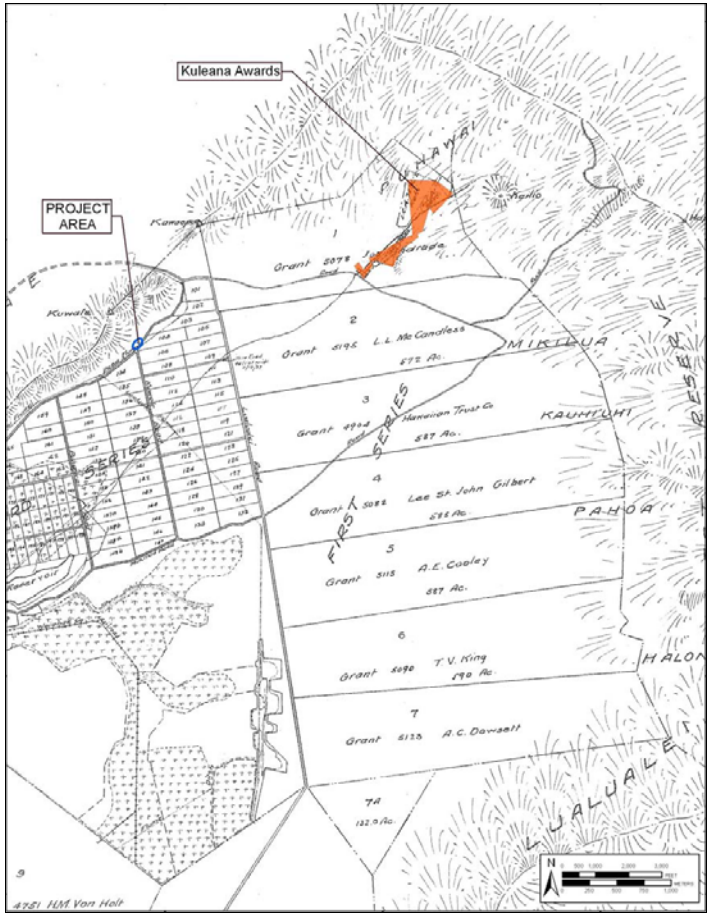

Figure 6. 1914 map (portion) of the “Lualualei Homesteads,” Walter E. Wall, surveyor, showing relation of LCA *kuleana* awards in Pūhāwai to project area; also note location of “Puea Flume” on south side of project area (Hawai‘i Land Survey Division, Hawai‘i Territorial Survey Plat Map No. 2026)

3.2.4.2 Homesteading

After the overthrow of the Hawaiian monarchy in 1893, the Crown Lands and the Government Lands were combined to become Public Lands. The Crown Lands were no longer indistinguishable and inalienable. In 1895, the Republic of Hawai‘i decided to open up lands for homesteading in the hopes of attracting a “desirable class of immigrants” — Americans and those of Caucasian decent (Kuykendall and Day 1961:204). In anticipation of the Dowsett-Galbraith lease expiring in 1901, the Government intended to auction off these lands to the highest bidder.

There were two waves of homesteading on the Wai‘anae Coast (McDermott and Hammatt 2000). The first impacted Lualualei and coincided with homesteading occurring at Wai‘anae Kai. In 1902, the government ran ads in the local newspapers stating their intent to open up land in Lualualei for homesteads (Kelly 1991:328). Due to the lack of water, the lots were classified as second-class pastoral land, rather than agricultural land. The homesteads were sold in three series between the years 1903 and 1912. In Lualualei, the first series was for *mauka* lots purchased by McCandless, who ranched most of his land until 1929, subletting use rights to the Sandwich Island Honey Company. The second and third series were for lots in the lower valley and along the coast, *mauka* of the government road. By the early 1920s, about forty families had settled on homestead lots in Lualualei (Kelly 1991:331-332). The big-name families that obtained homestead lots at this time were Von Holt, McCandless, and Dowsett.

Despite promises by the government to supply water, there was none, and what little there was, was not enough to go around. Competition between the Waianae plantation and the homesteaders for water caused friction within the community. The lack of water placed a hardship on the homesteaders. Water had to be carried in, and many lost their crops. The Waianae Sugar Company had a lease with the government to take 2.5 million gallons of water daily from government lands, but even after their lease had expired, the plantation continued to take the water. In 1924, the government made an agreement with the plantation to release 112,000 gallons of water daily for the homesteaders.

3.2.5 Modern Land Use for Pāhe‘ehe‘e Ridge and the Current Project Area

Examination of the U.S. Geological Survey quadrangle maps (or U.S. War Department maps) for 1919, 1928-29 and 1943 (Figure 7, Figure 8, and Figure 9) show little development in the current project area, although by 1928, the upper road of the Mā‘ili Tract of Lualualei Homesteads extends adjacent to the southern boundary, as shown in a 1978-79 aerial photograph (Figure 10). Currently, the project area is not being utilized and is overgrown with grasses, shrubs, and various trees.

The steep and rocky slope of Pāhe‘ehe‘e Ridge appears to have been a significant deterrent to development (Kolb et al. 1995:10). Ranching in the vicinity began in 1851 when William H. Jarrett received a lease for livestock ranching. By the 1880s, Hermann Widemann’s Wai‘anae Plantation began commercial sugarcane cultivation in Lualualei Valley. This was expanded significantly following 1901 when a lease was obtained by the Wai‘anae Company for 3,332 acres of Lualualei from the Territory. While it is not believed that sugar cane cultivation ever took place on Pāhe‘ehe‘e Ridge, the Puea Flume on the project’s down slope is related to that cultivation (Kolb et al. 1995:13).

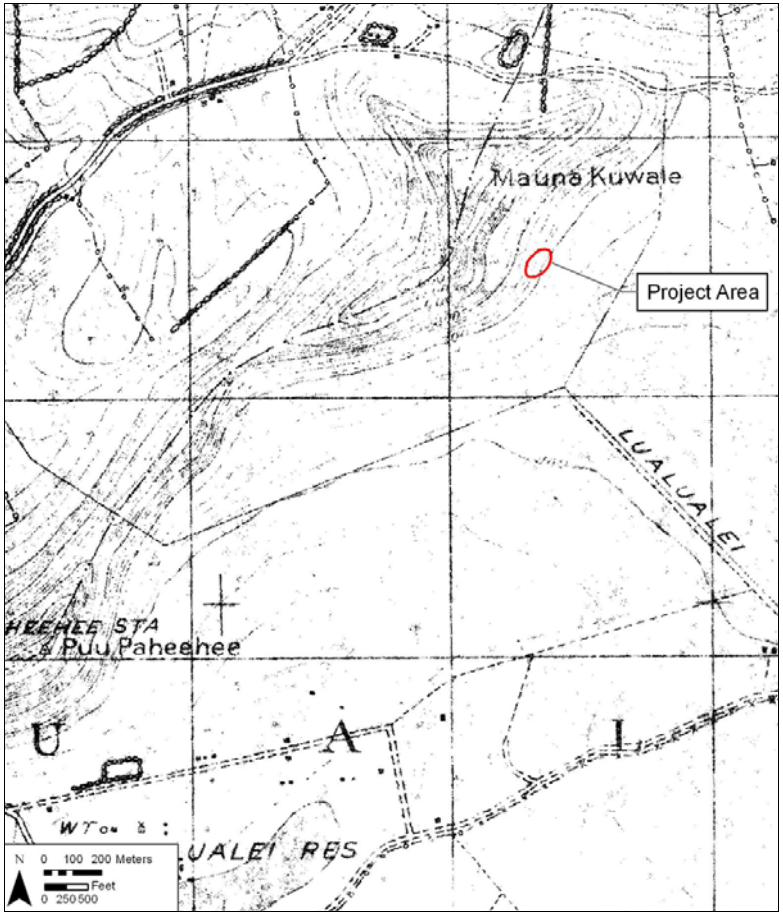

Figure 7. 1919 U.S. War Department topographic map, Wai‘anae Quadrangle, with the project area location on the eastern slope of Mauna Kūwale along Pāhe‘ehe‘e Ridge

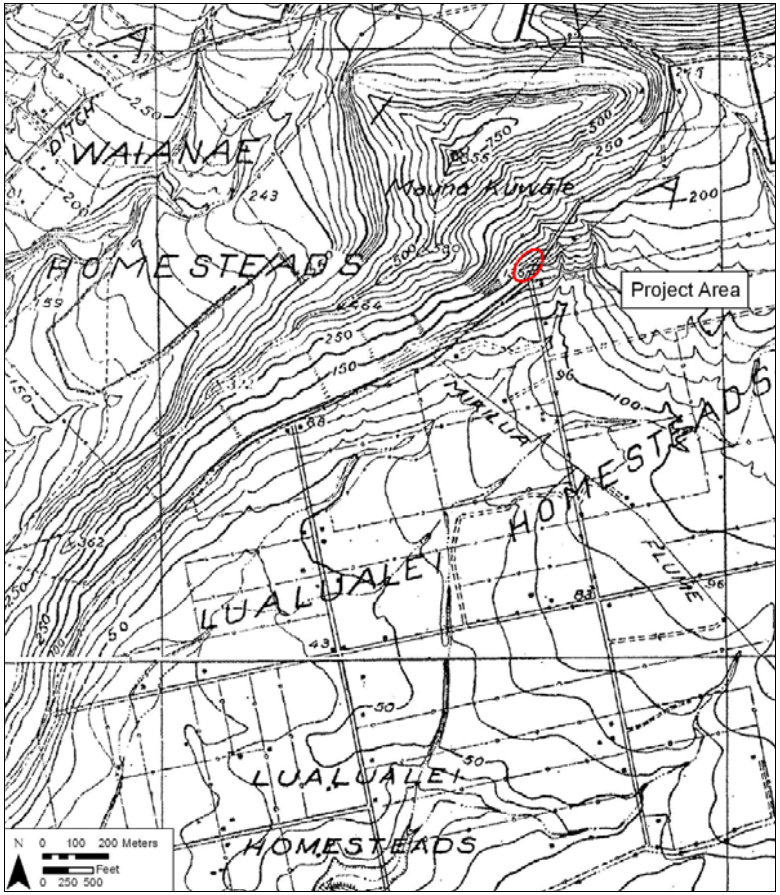

Figure 8. 1928-29 U.S. Geological Survey topographic map, Nānākuli Quadrangle, with the project area indicated

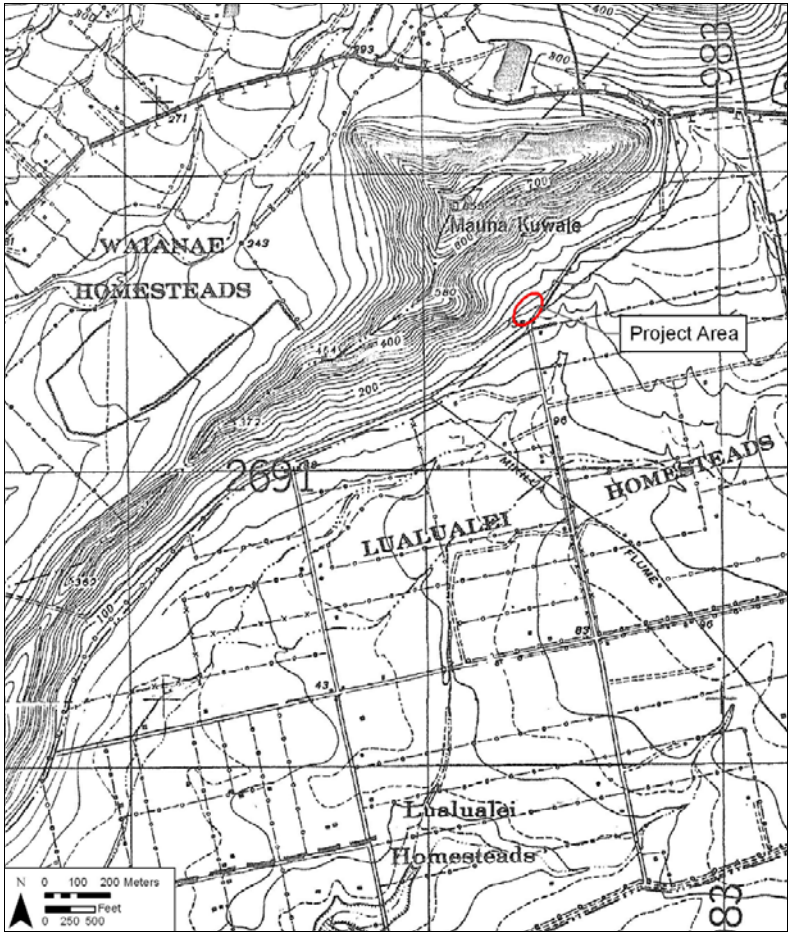

Figure 9. 1943 U.S. War Department terrain Map, Nānākuli Quadrangle, with the project area indicated

Figure 10. 1977/1978 aerial photograph with the project area (source: R.M. Towill Corp.)

3.3 Previous Archaeological Research

3.3.1 Archaeological Studies in Lualualei

The locations of prior archaeological studies near the project area are shown Figure 11 and summarized in Table 1.

The earliest attempt to record archaeological sites in Lualualei was in the 1930’s by J. Gilbert McAllister. McAllister recorded four sites in Lualualei (see Figure 5):

> Site 148. Large rock said to be named Maui, about 1.1 mile from Nanakuli station toward Pu‘u o Hulu…it was here that Maui reposed and sunned himself. In the bluff just northeast of the rock is a shelter in which he lived, and in the vicinity was a spring where he obtained water. The large rock is now split in half and adorned with many small, oddly-shaped rocks. It is said to be bad fortune to build one’s house across a line drawn directly from the rock to the shore. (McAllister 1933: 110)
>
> Site 149. Nioiula Heiau, Hālona Ridge in Lualualei. A paved and walled heiau said to be of the pō‘okanaka class. The temple is said to have been very ancient, belonging to the chief, Kakuihewi. The heiau is in remnant condition due to stones being taken from the site to be used for a cattle pen on the McCandless property. (McAllister 1933: 111)
>
> Site 150. House sites or heiau at the foot of the cliffs in Pāhoa. Cattle have destroyed much of the walls and terraces. (McAllister 1933: 110)
>
> Site 151. Kakioe Heiau (destroyed) located at Pūhāwai. A small heiau of which now nothing remains but its sacred spring. (McAllister 1933: 110)

McAllister recorded two sites on the Lualualei/Wai‘anae boundary; both were probably in Wai‘anae Ahupua‘a, but they are both close to the present project area.

> Site 152. Puupaheehee Heiau, on the sea end of Puupaheehee Ridge. Completely destroyed with the enlargement of the Oriental cemetery.
>
> Site 162. Burial C, Mauna Kuwale. A small cave near the top of the peak facing Kawiwi. Contains fragments of material, but none of the objects said to have been buried with the dead.

McAllister also noted the presence of house sites and a petroglyph rock at Ulehawa Beach Park (see Figure 5). McAllister notes that:

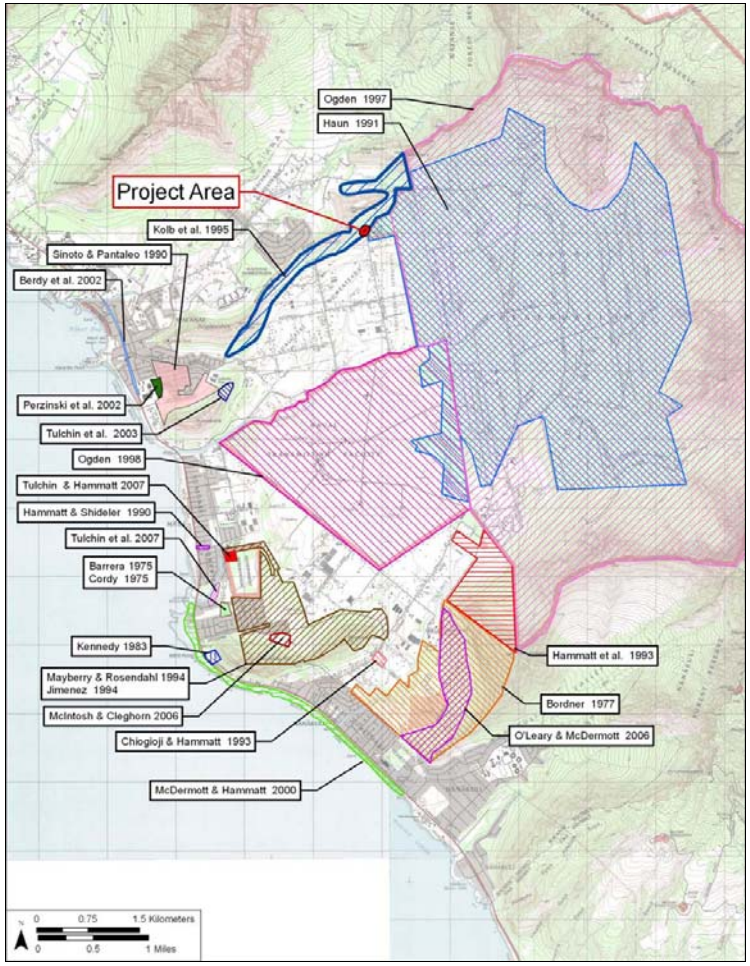

Figure 11. Previous archaeological work in Lualualei near the project area (base map: U.S. Geological Survey 1998, Wai‘anae Quadrangle)

Table 1. Previous Archaeological Studies in Lualualei Ahupua‘a near the project area

Reference	Location	Description and Results
McAllister 1933	Island-wide, including Lualualei Ahupua‘a	McAllister recorded eight sites in or near Lualualei: Site 147. ‘Ilihune Heiau; Site 148, rock called Maui; Site 149, Nīoi‘ula Heiau on Hālona ridge; Site 150, House sites or *heiau* at Pahoa cliffs; Site 151, Kakioe Heiau at Pūhāwai; Site 152 Pu‘u Pāhe‘ehe‘e Heiau; Site 153, Kū‘īlioloa Heiau; and, Site 162, Mauna Kūwale burial cave, House sites and a Petroglyph rock in the Ulehawa Beach Park
Barrera 1975	80-acre parcel in Mā‘ili	Barrera recorded six sites: four modern stone configurations, a single midden scatter and one stone feature, Site Ch-Oa-1, judged probably traditional Hawaiian.
Cordy 1975	Mā‘ili area	Excavations at Barrera’s Site Ch-Oa-1. No underlying cultural deposits found. Cordy interpreted the feature as modern.
Bordner 1977	Nānākuli Landfill, TMK 8-7-9	Reconnaissance Survey: Performed on the proposed site for the Nānākuli landfill. The area included land on both sides of Lualualei Naval Road, continuing up the slope to Pu‘u Heleakalā. No archaeological sites were found.
Kennedy 1983	Wai‘anae Corporation yard, Mā‘ili Coast	No surface sites were found during the survey.
Hammatt & Shideler 1990	Mā‘ili Coastal Area	Seven burials were found in beach sand during work on Mā‘ili water system. Five of the burials were disinterred.
Sinoto and Pantaleo 1990	Pōka‘i Bay Subdivision, near SW corner of Lualualei	Reconnaissance, no significant remains
Haun 1991	Naval Magazine and Naval Communications Area Transmission Facility TMK 8-6; 8-7; 8-8-01	Archaeological Reconnaissance Survey: Included an 8,184-acre parcel, and a 700-acre parcel encompassing the entire inland portion of Lualualei Valley. A total of 131 sites and 1,004 features were identified. The features included “alignments, C-shapes, L-shapes, U-shapes, walls, terraces, enclosures, mounds, platforms, walled terraces and paved terraces” (Haun 1991; vii). The features are related to habitation, rituals, ceremonies, agriculture, the procurement of lithic material, and the manufacture of stone tools. Historical and recent structures associated with cattle ranching and military use were also identified.

Reference	Location	Description and Results
Chiogioji & Hammatt 1993	5-Acre Parcel, TMK 8-7-21:17	Archaeological Survey and Testing: (Revised from the 1992 ‘Archaeological Investigations’ report). This five acre parcel, formerly a basil farm, was situated between Pu‘u o Hulu to the northwest and Ulehawa Stream to the southeast. The results of the survey found an absence of intact archaeological remains.
Hammatt et al. 1993	Lualualei Golf Course TMK 8-7-9:2; 8-7-10:6&10; 8-7-19:1	Archaeological Inventory Survey: Identified eight sites within the project area, two traditional Hawaiian sites that included one habitation complex and the remnants of one wall, and six historic sites that included a cattle wall, a furnace, wells, a house lot, and cement foundation structure. These findings have also been included in the Final Environmental Impact Statement produced by Hida, Okamoto, & Associates, April 1991.
Mayberry & Rosendahl 1994	Mā‘ili Kai Property project area	The report documented 12 new sites and the reinvestigation of 14 sites previously recorded by Barrera and Cordy. Twenty-four of the 26 sites in the project area were dated to the 20th century. Only two small sites, rock features without associated artifacts, may predate the 20th century
Jimenez 1994	Mā‘ili Kai Property project area	Subsurface testing at sites surveyed by Mayberry & Rosendahl 1994. Only one site had pre-contact cultural material.
Kolb et al. 1995	Pāhe‘ehe‘e Ridge, TMK 8-6-03: Por. 25 and 8-4-04: Por. 52	Archaeological survey and excavations conducted on the Lualualei side of the slopes of Pāhe‘ehe‘e Ridge. No pre A.D. 1900 habitation or farming activities occurred with the project area. Two enclosures interpreted as ritual shrines were located and were confirmed to date after A.D. 1400. It was recommended that both Sites 4432 and 4433 be preserved.
Ogden Environ-mental and Energy Services Co., Inc. 1997	Lualualei Navel Magazine	Cultural Resource Review Survey: This survey reviewed existing information on sites in the previously listed locations. Sites reviewed within NAVMAG-LLL included 197 sites with 1020 recorded features and also an additional 400 sites that had been reported but not recorded; in NAVMAG-Waikele five sites with 11 features; in NAVMAG-West Loch two sites; and Kolekole Rock was located near NAVMAG-LLL. Three sites listed in the National Register of Historic Places (NRHP) were located in the project area. They include Nīoi‘ula

Reference	Location	Description and Results
		Heiau, NAVMAG-LLL; ‘Oki‘okiolepe Fishpond, NAVMAG-West Loch; and Pearl Harbor National Historic Landmark, NRHP site 50-80-13-9992
Ogden Environ-mental and Energy Services 1998	Lualualei Naval Station, Radio Transmission Facility	Phase I Archaeology Reconnaissance Survey: This survey was conducted to locate archaeological sites and incorporate them into a Cultural Resource Management Plan. Three sites were located on a 260-acre parcel. Site 5591 is composed of features associated with the sugarcane industry of the 19th and 20th centuries. Sites 1886 and 5592 are considered traditional Hawaiian sites; they include a permanent habitation site and a rock mound.
McDermott & Hammatt 2000	Ulehawa Beach Park	During the inventory survey, two cultural layers were found, Sites SIHP #50-80-08-5762 and SIHP #50-80-08-5763consisting of midden, and indigenous and historic artifacts.
Berdy et al. 2002	Farrington Hwy., Wai‘anae & Lualualei	Describes one historic property (SIHP #6400, a historic trash pit) during monitoring of road work
Perzinski et al. 2002	Proposed Wai‘anae Comm. Transit Ctr TMK 8-6-1:29	No significant finds
Souza & Hammatt 2003	Fiber Optic Cable Line At Pāhe‘ehe‘e Ridge	Archaeological Monitoring encountered no significant finds
Tulchin et al. 2003	Lualualei Ahupua‘a, Pu‘u Mā‘ili‘ili‘i	Cultural Surveys Hawai‘i conducted an inventory survey of the proposed Wai‘anae 242 Reservoir and Access Road project area, on the northeast ridge of Pu‘u Mā‘ili‘ili‘i. Two possible field shelters and a cave were investigated, but there was little evidence that these were traditional Hawaiian sites.
McIntosh & Cleghorn 2006	Ulehawa Beach Park	During monitoring at Site 50-80-07 6771, a pre-Contact cultural layer with at least two human burials was recorded.
O’Leary & McDermott 2006	Southwestern slopes of Pu‘u Heleakalā	Two historic properties identified: SIHP No. 50-80-08-6699 (pre-Contact rockshelter) and SIHP No. 50-80-08-6681 (WWII concrete bunker)
Tulchin & Hammatt 2007	Leeward Coast Homeless Shelter, Mā‘ili, TMK: [1] 8-7-010:007	Archaeological Assessment: No historic properties identified.
Tulchin et al. 2007	Wai‘anae Sustainable Communities Plan TMK [1] 8-7-023:060	Archaeological Assessment

> Near the dried swamp, opposite light pole #152 in the public park along the beach edge, house or camping sites were found. Also a rock with petroglyphs was found which had previously been reported to the Museum. This was on a sandstone slab and was removed to the Bishop Museum. (McAllister 1933:76)

3.3.2 Insights from Archaeological Studies in the Vicinity of the Pāhe‘ehe‘e Ridge and the Current Project Area

The vast majority of Lualualei Ahupua‘a has been covered in various archaeological surveys. Lualualei was also surveyed in the 1930s by J. Gilbert McAllister. McAllister’s nearest site to the current project area is Site 152 Pu‘u Pāhe‘ehe‘e Heiau and a burial cave at Mauna Kūwale.

The Historic Preservation Division (DLNR, State of Hawai‘i) undertook an archaeological survey (Kolb et al. 1995) that appears to have included the entire present Pāhe‘ehe‘e Ridge project area (Figure 12). Pedestrian inspection was undertaken of approximately 75% of the Historic Preservation Division project area:

> Approximately 25% of the project area was inaccessible given the steep cliffs of Pāhe‘ehe‘e Ridge. It is improbable that any features were present in these areas, but if they are, they will be adequately protected from any commercial or residential impact. (Kolb et al. 1995:12).

Only two sites (4432 and 4433) were identified in the Historic Preservation Division Pāhe‘ehe‘e Ridge study and they are both well northeast (outside) of the present study area (Figure 12). The Kolb et al. study appears to have no concerns for further cultural resource management within their project area other than in the immediate vicinity of two sites identified. The flume which appears on the Kolb et al. (1995:14) project area figure to run for over 900 m within their project area (and near the present Pāhe‘ehe‘e Ridge study area) and to have been more than 50 years old at the time of their study (1995) receives virtually no attention at all. There is no description, photo, site designation, or discussion. No sign of this flume was noted in the present project fieldwork suggesting that the flume may have been removed prior to 1995.

An *Archaeological Monitoring Report for the Fiber Optic Cable Line at the Pāhe‘ehe‘e Ridge DHHL Sub-division* (Souza, and Hammatt 2003) documented trench excavations along Pāhe‘ehe‘e Road that forms the down slope edge of the Pāhe‘ehe‘e Ridge study area. There were no significant finds.

3.3.3 Background Summary and Predictive Model

Prehistorically, land use in Lualualei was greatest at the sea, where marine resources were plentiful, and in the mountainous interior, where there was sufficient rainfall for agriculture and forest resources. The intervening lands between the sea and the mountains were a dry scrubland. Although potentially useful for dry land agriculture in the wet winter months, it is unlikely that this area would have been largely utilized by Native Hawaiians. The settlement pattern prior to Western Contact for this region was likely dispersed residences concentrated at the sea and the mountains. Based on the season and the available resources, the resident population most likely used multiple residences, perhaps one at the seaside and another *mauka*, to reduce resource transport time. It is also possible, as is suggested by the account provided by Pukui (cited in

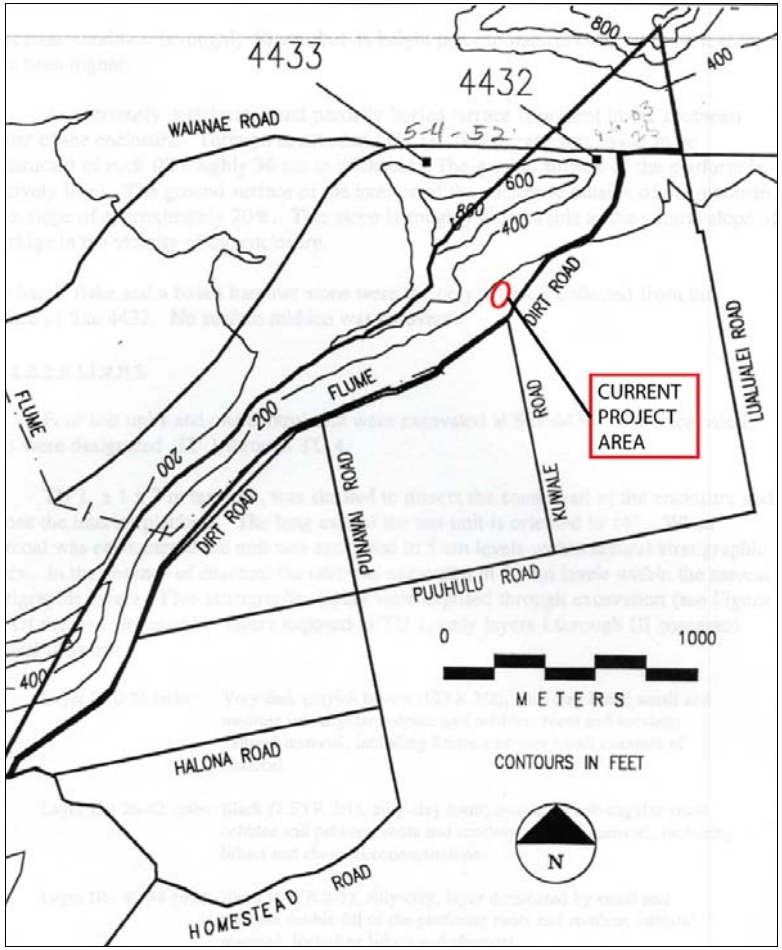

Figure 12. Kolb et al. (1995:14) Pu‘u Pāhe‘ehe‘e project area map showing location of flume and designated site locations on Mauna Kūwale (outside of present study area)

McGrath et al. 1973:10), that there existed an informal exchange network where by coastal dwellers traded marine resources for the agricultural and forest resources of the inland dwellers.

The population along the Wai‘anae coast may always have been quite low. The immediate vicinity lacked water for cultivation and was proverbial for its poverty. Vancouver in 1785 noted “few inhabitants” in “the barren, rocky waste.” Oral history accounts emphasize the “crops were always poor and miserable.”

By the mid 1800’s the traditional Native Hawaiian lifestyle in the valley of Lualualei was in decline. The sandalwood trade, which ended circa 1829, undoubtedly had a negative effect on the Native Hawaiian population. Beginning at this time, Lualualei began its cattle ranching period. The introduction of sugar plantations brought more foreigners and the OR&L railroad, which was linked to Wai‘anae in 1895. Based on the paucity of LCA’s claimed within the area and the early population figures, it appears that the Native Hawaiian population was quite low in the latter half of the nineteenth century.

Population numbers slowly increased when homesteading was instituted in the early 1900's. Military use of the land began in 1917. WWII greatly affected the landscape of the Wai‘anae coast by placing bunkers, gun emplacements, and barbed wire along the waterfront.

Numerous archaeological investigations have taken place within Lualualei Valley on the Leeward side of O‘ahu. The studies have demonstrated a pattern of high intensity land use in only the *mauka* and *makai* portions of Lualualei Valley, with a relative gap in archaeological remains in the middle sections.

The studies of the *mauka* portions of the valley (Haun 1991, Ogden Environmental Services 1997) identified more than 500 archaeological sites, which included well over 1,000 features. The identified features included “alignments, C-shapes, L-shapes, U-shapes, walls, terraces, enclosures, mounds, platforms, walled terraces and paved terraces” (Haun 1991; vii). These features related to habitation, agriculture, rituals, ceremonies, and the procurement and manufacture of stone tools.

Extensive evidence of pre-contact Native Hawaiian activity has also been recorded in *makai* sections of the *ahupua‘a,* immediately adjacent to the ocean (Hammatt and Shideler 1991; McDermott and Hammatt 2000). Hammatt and Shideler (1991) documented 7 Native Hawaiian burials during water system improvements. And McDermott and Hammatt identified two cultural layers that exhibited charcoal deposits, pit hearts, midden, and artifacts associated with prehistoric occupation.

In contrast to the abundance of traditional Hawaiian sites and features encountered at the *mauka* and *makai* portions of Lualualei Valley, the sites recorded during the studies in the central section of Lualualei Valley are relatively minimal in number and are generally of post-contact origin. Pre-Contact Hawaiian sites in this area consist of trails, lithic scatters, and temporary habitation sites, pointing to the intermittent use of the central portion of Lualualei Valley. The lack of traditional Hawaiian sites in these areas may reflect not only a general disuse during pre-Contact times, but also the extensive disturbance of this area by historic ranching, sugar agriculture, and U.S. Military occupation.

The “Puea Flume” was shown on a 1914 Walter E. Wall map of the “Lualualei Homesteads” (see Figure 6), and also shown in the Kolb et al. (1995) project maps (see Figure 12), as running

along the south side of Pu‘u Pāhe‘ehe‘e Ridge. As there is no description, photo, site designation, or discussion of the flume within the Kolb et al. study the flume may have been removed prior to 1995.

Section 4 Results of Fieldwork

A 100 percent pedestrian inspection of the project area’s surface confirmed that there were no surface historic properties within the project area. The project area (Figures 13 to 17) is a relatively open savannah-like landscape of 30-50 cm high dry, exotic grasses with scattered *kiawe* (*Prosopis pallida*) trees, and *koa haole (Leucaena glauca)*, *klu* (*Acacia farnesiana*), and *‘uhaloa* (*Waltheria americana*) brush. Ground visibility was generally good.

Access to the project area was via Lualualei Homestead Road to Pūhāwai Road to Pu‘u Hulu Road to Kūwale Road. An unimproved access road approaches the south side of the project area and then turns to the northeast extending up the east side of the project area (Figures 13 and 14). No sign of the former “Puea Flume” indicated on certain old maps including a 1914 Walter E. Wall map of the “Lualualei Homesteads” (see Figure 6 and Figure 12) was observed.

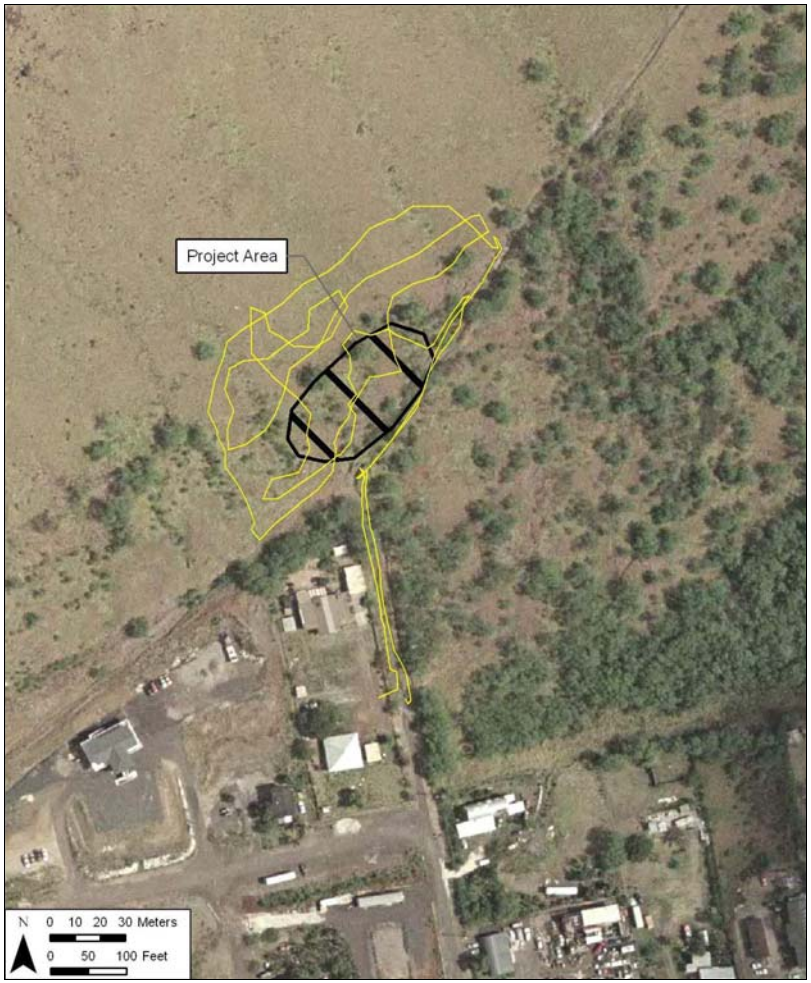

Figure 13. Pedestrian traverse of proposed dip tank project area

Figure 14. General view from access road, view to north

Figure 15. General view of project area, view to northeast

Figure 16. General view of project area, view to south

Figure 17. General view of project area, view to southwest

Section 5 Project Effect and Mitigation Recommendations

5.1 Project Effect

Based on the current investigation, there are no historic properties within the project’s APE. This corroborates the results of a prior study by the Historic Preservation Division (Kolb et al. 1995) that appears to have included the present project area but that identified no historic properties in the vicinity (see Figure 12). Accordingly CSH recommends a project-specific effect determination of “no historic properties affected.”

5.2 Mitigation

No further historic preservation work is recommended for the proposed fire dip tank project at the indicated Pāhe‘ehe‘e Ridge location.

As always, in the unlikely event that previously unidentified subsurface historic properties are encountered by project construction, the project proponents should immediately stop work in the vicinity and contact SHPD’s O‘ahu Office [Tel. (808) 692-8015].

5.3 Disposition of Materials

No cultural materials (midden, artifacts, etc.) were observed or collected during the fieldwork effort for this project.

Section 6 References Cited

Barrera, W. Jr.
1975 *Archaeological Site Survey at Maili, O‘ahu.* Chiniago, Inc., Honolulu, Hawai‘i.

Berdy, Catherine, Michelle Elmore, and Joseph Kennedy
2002 *An Archaeological Monitoring Report for the Farrington Highway Lighting Improvements Project Located in Wai‘anae Kai and Lualualei Ahupua‘a, Wai‘anae District, Island of O‘ahu.* Archaeological Consultants of the Pacific, Inc., Hale‘iwa, Hawai‘i.

Board of Commissioners (B.C.)
1929 *Indices of Awards made by the Board of Commissioners to Quiet Land Titles in the Hawaiian Islands.* Star-Bulletin Publishing, Honolulu, Hawai‘i.

Bordner, Richard M.
1977 *Archaeological Reconnaissance of the Proposed Nanakuli Landfill Site, Wai‘anae, O‘ahu Island.* Archaeological Research Center Hawai‘i, Lawa‘i, Kaua‘i, Hawai‘i.

Bowser, George
1880 *The Hawaiian Kingdom: Statistical and Commercial Directory and Tourist Guide, 1880-1881*. G. Bowser & Co, Honolulu and San Francisco.

Chinen, Jon J.
1958 *The Great Māhele, Hawai‘i's Land Division of 1848*, University of Hawai‘i Press, Honolulu, Hawai‘i.

Chiogioji, Rodney, and Hallett H. Hammatt
1993 *Archaeological Investigations of a 5-acre Parcel in the Ahupua‘a of Lualualei, Island of O‘ahu (TMK 8-7-21:17).* Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

Commissioner of Crown Lands
1894 *Reports of the Commissioner of Crown Lands, Provisional Government, Honolulu, Hawai‘i*. Hawai‘i State Archives: Honolulu.
1902 *Reports of the Commissioner of Crown Lands, Provisional Government, Honolulu, Hawai‘i*. Hawai‘i State Archives: Honolulu.

Cordy, Ross
1975 *Archaeological Excavation at CH-Oa-1, Maili, O‘ahu*. Department of Land and Natural Resources, State Historic Preservation Division, Kapolei, O‘ahu, Hawai‘i.

Cordy, Ross, W. Bruce Masse, Nathaniel Pak, Lou Jane Moana Lee, and Carina Johnson
1998 *Ka Moku O Wai‘anae: He Mo‘olelo O Ka Wa Kahiko*. Department of Land and Natural Resources, State Historic Preservation Division, Kapolei, O‘ahu, Hawai‘i.

DLNR (Department of Land and Natural Resources)
1845-1869 Liber. (Land Record Books). Territory of Hawai‘i: Bureau of Land Conveyances. Archives at the Hawai‘i Department of Land and Natural Resources, Hawai‘i.

Ellis, William
1974 *Polynesian Researches, Hawai‘i.* Charles E. Tuttle Company, Rutland, Vermont.

Foote, Donald E., E.L. Hill, S. Nakamura, and F. Stephens
1972 *Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii*. U.S. Dept. of Agriculture, U.S. Government Printing Office, Washington, D.C.

Giambelluca, Thomas W., Michael A. Nullet, and Thomas A Schroeder
1986 *Rainfall Atlas of Hawai‘i,* Department of Land and Natural Resources, Honolulu, Hawai‘i.

Hammatt, Hallett H., and David W. Shideler
1990 *Archaeological Monitoring at Liopolo Street, Mā‘ili 8" Water System, Part III, Mā‘ili, Wai‘anae, O‘ahu (With a Discussion of Burials S.S. No. 50-80-08-4244),* Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.
1991 *Archaeological Monitoring at Liopolo Street, Mā‘ili 8" Water System, Part III, Mā‘ili, Wai‘anae, O‘ahu (With a Discussion of Burials S.S. No. 50-80-08-4244),* Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

Hammatt, Hallett H., Jennifer Robins, and Mark Stride
1993 *An Archaeological Inventory Survey for the Proposed Lualualei Golf Course, Lualualei, Wai‘anae, O‘ahu*. Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

Handy, E. S. Craighill, and Elizabeth Green Handy
1972 Native Planters in Old Hawai‘i: Their Life, Lore, and Environment. Bishop Museum Press, Honolulu, Hawai‘i.

Haun, Alan E.
1991 *An Archaeological Survey of the Naval Magazine & Naval Communications Area Transmission Facility, Lualualei, O‘ahu, Hawai‘i.* Ms. 100191, B.P. Bishop Museum, Honolulu, Hawai‘i.

Hawai‘i TMK Service
2009 Tax Map Key [1] 8-6-003. On file at Hawai‘i TMK Service, Honolulu, Hawai‘i.

‘Ī‘ī, John Papa
1959 *Fragments of Hawaiian History*, Bishop Museum Press, Honolulu, Hawai‘i.

Jimenez, Joseph A.
1994 *Additional Archaeological Inventory Survey, Maili Kai Project Area, Land of Lualualei, Waianae District, Island of O‘ahu.* Paul H. Rosendahl, Ph.D., Inc., Hilo, Hawai‘i.

Kamakau, Samuel Manaiakalani
1991 *Tales and Traditions of the People of Old: Nā Mo‘olelo o Ka Po‘e Kahiko*. The Bishop Museum, Honolulu, Hawai‘i.

1992 *Ruling Chiefs of Hawai‘i.* Revised Edition. Kamehameha Schools Press, Honolulu, Hawai‘i.

Kelly, Marion
1991 Notes on the History of Lualualei, IN: *An Archaeological Survey of the Naval Magazine & Naval Communications Area Transmission Facility*, by Alan E. Haun, Bernice P. Bishop Museum, Honolulu, Hawai‘i.

Kennedy, Joseph
1983 *A Walk-Through Surface Survey of the Proposed Waianae Corporation Yard (TMK:8-7-06:32) at Lualualei, Island of Oahu.* Archaeological Consultants of Hawaii, Inc., Honolulu, Hawai‘i.

Kolb, Michael J., Patty, J. Conte, Michael McFadden, Christi A Mitchell ,and Ross Cordy
1995 *Archaeological Survey and Excavations at Pahe‘ehe‘e Ridge, Wai‘anae Ahupua‘a, Wai‘anae District, Island of Hawaii, Oahu.* Department of Land and Natural Resources, State Historic Preservation Division, Kapolei, Hawai‘i.

Kuykendall, Ralph S., and A. Grove Day
1961 *Hawai‘i: A History From Polynesian Kingdom to American Statehood.* Prentice-Hall, Inc., Englewood Cliffs.

Macdonald, G.A., A.T. Abbott, and Frank L. Peterson
1983 *Volcanoes in the Sea*. Second Edition. University of Hawai‘i Press, Honolulu, Hawai‘i.

Mayberry, J.D., and P.H. Rosendahl
1994 *Archaeological Reconnaissance Survey for Environmental Impact Statement (EIS) Maili Kai Property, Land of Lualualei, Waianae District, Island of O‘ahu (TMK: 8-7-10:2, 14).* Paul H. Rosendahl, Ph.D. Inc., Hilo, Hawai‘i.

McAllister, J. Gilbert
1933 *Archaeology of Oahu*. Bulletin 104. Bishop Museum, Honolulu, Hawai‘i.

Mc Dermott, Matt, and Hallett H. Hammatt
2000 *Archaeological Inventory Survey of the 57.65 Acre ‘Ulehawa Beach Park Parcel, Ahupua‘a of Lualualei, Wai‘anae District, Island of O‘ahu (TMK: 8-7-05:01, 03 and 05; 8-7-06:03; 8-7-08:01, 8-7-08:26; 8-7-08:26).* Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

McGrath, E. J., Jr., K. M. Brewer, and Robert Krauss
1973 *Historic Wai‘anae, A Place of Kings.* Island Heritage Ltd., Norfolk Island, Australia.

McIntosh, James, and Paul L. Cleghorn
2006 *Archaeological Monitoring Services during Construction at Ulehawa Beach Park, Ahupua‘a of Lualualei, District of Wai‘anae, Island of O‘ahu, TMK: (1) 8-7-008:001.* Pacific Legacy, Inc., Kailua, Hawai‘i.

Nakamura, Barry, and Jeffrey Pantaleo
1994 *Aspects of the History of Lualualei and Nānākuli, Wai‘anae, O‘ahu*. Aki Sinoto Consulting, Honolulu, Hawai‘i.

Ogden Environmental and Energy Services Co.
1997 *Final Report Cultural Resources Overview Survey Naval Magazine Lualualei, Island of O‘ahu, Hawai‘i, in Conjunction with Department of Defense Legacy Resources Management Program: Demonstration Project #70.* Prepared for the Department of the Navy, Pacific Division, Naval Facilities Engineering Command, Pearl Harbor, Hawai‘i. Ogden Environmental and Energy Services Co., Inc., Honolulu, Hawai‘i.
1998 *Final Archaeological Report, Phase I Reconnaissance Survey, Naval Radio Transmitter Facility Lualualei (RTF Lualualei), Oahu, Hawaii.* Ogden Environmental and Energy Services Co., Inc., Honolulu, Hawai‘i.

O’Leary, Owen, and Matt McDermott
2006 *Archaeological Inventory Survey of 200 Acres for the Proposed Nānākuli B Site Materials Recovery Facility and Landfill, Lualualei Ahupua‘a, Wai‘anae District, Island of O‘ahu, Hawai‘i.* Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

Perzinski, David, David W. Shideler, and Hallett H. Hammatt
2002 *An Archaeological and Cultural Impact Evaluation for the Proposed Wai‘anae Community Transit Center, Lualualei Ahupua‘a, Wai‘anae District, O‘ahu (TMK 8-6-1:29).* Cultural Surveys Hawai‘i, Inc, Kailua, Hawai‘i.

Pukui, Mary Kawena, Samuel H. Elbert, and Esther T. Mookini
1974 *Place Names of Hawai‘i*. University of Hawai‘i Press, Honolulu, Hawai‘i.

R. M. Towill Corporation
1977-8 Aerial photograph of Lualualei. R. M. Towill Corporation, Honolulu, Hawai‘i.

Schmitt, Robert C.
1973 *The Missionary Census of Hawaii*. Bernice P. Bishop Museum Press, Honolulu, Hawai‘i.

Sinoto, Aki, and Jeffrey Pantaleo
1990 *Archaeological Surface Assessment, Proposed Village, Poka‘i Bay Subdivision, Lualualei, Wai`anae, O‘ahu Island.* Bernice P. Bishop Museum, Honolulu, Hawai‘i.

Soehren, Lloyd
2009 *Hawaiian Place Names database*. On line at http//ww.ulukau.org. Downloaded June 1, 2009.

Souza, Kēhaulani, and Hallett H. Hammatt
2003 *Archaeological Monitoring Report For The Fiber Optic Cable Line At Pāhe‘ehe‘e Ridge DHHL Sub-Division, Lualualei Ahupua‘a, Wai‘anae District O‘ahu, Hawai‘i TMK: 8-6-003:008, 8-6-19 Por. 016-017, 028-029, 035-039.* Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i

Sterling, Elspeth P., and Catherine C. Summers
1978 *Sites of Oahu.* Bishop Museum Press, Honolulu, Hawai‘i.

Thrum, Thomas G.

1922 Hawaiian Place Names. In Lorrin Andrews, 1922, *A Dictionary of the Hawaiian Language*, pp. 625-674. Board of Commissioners of Public Archives of the Territory of Hawaii, Honolulu, Hawai‘i.

Tulchin, Todd, Constance R. O’Hare, and Hallett Hammatt

2003 *Archaeological Inventory Survey in Support of the Proposed Wai‘anae 242 Reservoir and Access Road Project, Lualualei Ahupua‘a, Wai‘anae District, Island of O‘ahu.* Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

Tulchin, Jon, and Hallett Hammatt

2007 *Archaeological Assessment for the Leeward Coast Emergency Homeless Shelter Project, Lualualei Ahupua‘a, Wai‘anae District, Island of O‘ahu, TMK: [1] 8-7-010:007.* Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

Tulchin, Jon, Kathryn Whitman, and Hallett H. Hammatt

2007 Archaeological Assessment for the Waianae Sustainable Communities Plan Project, Lualualei Ahupua’a, Waianae District, O’ahu Island, TMK [1] 8-7-023:060. Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

U.S. Geological Survey

1998 U.S. Geological Survey 7.5 minute topographic map, Wai‘anae Quad. Available at USGS Information Services, Box 25286, Denver, Colorado.

1928/9 U.S. Geological Survey 7.5 minute topographic map, Wai‘anae and Kaena Quads. Available at USGS Information Services, Box 25286, Denver, Colorado.

2005 U.S. Geological Service Orthoimagery, Wai‘anae Quad (Aerial photograph). Available at USGS Information Services, Box 25286, Denver, Colorado.

U.S. War Department

1919 U.S. War Department 7.5 minute topographic map, Wai‘anae and Nanakuli Quads. Available at USGS Information Services, Box 25286, Denver, Colorado.

1943 U.S. War Department 7.5 minute topographic map, Wai‘anae and Nanakuli Quads. Available at USGS Information Services, Box 25286, Denver, Colorado.

Wall, Walter E.

1914 Lualualei Homesteads. Hawai‘i Territorial Survey Plat Map No. 2026, Walter E. Wall, Surveyor. On file at Hawai‘i Land Survey Division, Department of Accounting and General Services, Honolulu.

Wilkes, Charles

1845 *Narrative of the United States Exploring Expedition, Volume 4.* Lea and Blanchard, Philadelphia, Pennsylvania.

Appendix C

Archaeological Assessment for
Board of Water Supply Fire Dip Tank Project
Honouliuli Ahupuaa, Waianae District, Oahu Island
TMK (1) 9-2-003:088 por.
Cultural Surveys Hawaii, Inc.
June 2011

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

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BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

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HISTORIC PRESERVATION
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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
STATE HISTORIC PRESERVATION DIVISION
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January 9, 2012

Dr. H. Hammatt
Cultural Surveys Hawaii, Inc.
P.O. Box 1114
Kailua, Hawaii 96734

LOG NO: 2011.1608
DOC NO: 1201NN01
Archaeology

Dear Dr. Hammatt:

SUBJECT: Chapter 6E-42 Historic Preservation Review –
Archaeological Assessment Report for the BWS Fire Dip Tank at Pālehua
Honouliuli Ahupua'a, 'Ewa District, Island of O'ahu
TMK: [1] 9-2-003:088 Por.

Thank you for the opportunity to review this draft of an Archaeological Assessment (AA) that was received by our office on June 13, 2011. This report was prepared for Wilson Okamoto Corporation on behalf of the Honolulu Board of Water Supply. The project area is being proposed for a fire dip tank location and improvements would include grading for access and construction of a level slab or pad of approx. 1,500 sq. ft. A temporary buoy tank would be set up on this slab to facilitate rapid replenishment of a helicopter-borne water bucket for fire fighting.

The fieldwork for this project began as a formal Archeological Inventory Survey (AIS). As part of the AIS an extensive pedestrian survey (depicted in figure 3) covered 100% of this 1 acre project area. This survey did not encounter any historic properties and the AIS was changed to an AA pursuant to HAR § 13-13-275-5. In addition, the surrounding area has been thoroughly surveyed. While historic sites have been recorded in the area, these consist mainly of surface features none of which are within .25 miles of the project area. The Pālehua Trail is approximately 465-meters northwest of the project area.

The extensive survey of this project area revealed an existing ranching fence infrastructure, and an aqueduct. Aerial photos of the project area indicate that the land was previously altered by grading for the construction of an existing water tank. Therefore it is unlikely that the proposed project will have an impact on archeological or historic resources in the area and we agree with your recommendation that no further archaeological work is required.

Please submit a copy of this report, marked "**FINAL**," along with a copy of this review letter and a text-searchable PDF version on CD to the attention of the "**SHPD Library**" at the Kapolei SHPD office.

Aloha,

Rua Aiu, PhD
Administrator
Historic Preservation Division

Final Archaeological Assessment for the Board of Water Supply Fire Dip Tank Project at Pālehua, Honouliuli Ahupuaʻa, ʻEwa District, Island of Oʻahu TMK: [1] 9-2-003: 088 por.

Prepared for

Wilson Okamoto Corporation

Prepared by

Hallett H. Hammatt, Ph.D.

And

David W. Shideler, M.A.

Cultural Surveys Hawaiʻi, Inc.

Kailua, Hawaiʻi

(Job Code: HONOULIULI 50)

June 2011

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Management Summary

Reference	Archaeological Assessment for the Board of Water Supply Fire Dip Tank Project at Pālehua, Honouliuli Ahupuaʻa, ʻEwa District, Island of Oʻahu TMK: [1] 9-2-003: 088 por.
Date	June 2011
Project Number (s)	Cultural Surveys Hawaiʻi, Inc. (CSH) Job Code: HONOULIULI 50
Investigation Permit Number	The fieldwork component of the archaeological assessment was carried out under archaeological permit number 11- 17, 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 lies just north and northeast of Pālehua Road, just southeast of a Board of Water Supply water tank on the west ridge of Kaloʻi Gulch in the upper Makakilo/Pālehua area of central Honouliuli Ahupuaʻa, southwest Oʻahu
Land Jurisdiction	The project area is understood as currently owned by the Edmund C. Olson Trust II
Agencies	State of Hawaiʻi Department of Land and Natural Resources/State Historic Preservation Division (DLNR/SHPD), Board of Water Supply (source of project funding)
Project Description	The project area is proposed for the development of a fire dip tank facility to facilitate helicopter transport of water to aid in the fighting of brush fires in the vicinity
Project Area	5,000 square feet
Area of Potential Effect (APE) and Survey Acreage	Based on available information, the proposed Fire Dip Tank Project at Pālehua in Honouliuli Ahupuaʻa will not impose adverse visual, auditory or other environmental impact to any known historic properties, including standing architecture, located outside the project area. Accordingly, the proposed project, based on available information lacks potential to affect historic properties outside the project area. As a result the project's APE is the same as the project area. The survey area for the current investigation included the entire approximately 1-acre APE/project area.

Historic Preservation Regulatory Context	The proposed Fire Dip Tank Project at Pālehua in Honouliuli Ahupua‘a requires compliance with and review under state of Hawai‘i historic preservation legislation [Hawai‘i Revised Statutes (HRS) Chapter 6E-8 and Hawai‘i Administrative Rules (HAR) Chapter 13-13-275]. At the request of Wilson Okamoto Corporation and on behalf of the City & County of Honolulu Board of Water Supply, Cultural Surveys Hawai‘i Inc. began this study as an archaeological inventory survey, per the requirements of HAR Chapter 13-13-276. Because no historic properties were located, this investigation became an archaeological assessment, per the language of HAR Chapter 13-13-275-5. This archaeological assessment report was prepared to support the proposed project’s historic preservation review (under HAR 13-13-275) and any project-related historic preservation consultation.
Fieldwork Effort	The fieldwork effort was carried out by David W. Shideler, M.A. and Jon Tulchin, B.A. under the general supervision of Hallett H. Hammatt, Ph.D. The fieldwork took place on February 4, 2011 and March 3, 2011 taking a total of one person-day to complete.
Number of Historic Properties Identified	None
Effect Recommendation	“No historic properties Affected”
Mitigation Recommendation	No further archaeological field work is recommended. As always, in the unlikely event that previously unidentified subsurface historic properties are encountered by project construction, the project proponents should immediately stop work in the vicinity and contact SHPD’s O‘ahu Office [Tel. (808) 692-8015].

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Section 1 Introduction

1.1 Project Background

On behalf of Wison Okamoto Corporation and for the Honolulu Board of Water Supply, Cultural Surveys Hawaii, Inc. (CSH) conducted an archaeological assessment for a proposed Fire Dip Tank Project on the west ridge of Kalo‘i Gulch Valley in Honouliuli Ahupua‘a, ‘Ewa District, O‘ahu Island, TMK [1] 9-2-003:088 (por.) as shown on a U.S. Geological Survey ‘Ewa and Schofield quad maps (Figure 1) Tax Map Key plat (Figure 2) and aerial photograph (Figure 3). Honouliuli is the westernmost of the *ahupua‘a*, of ‘Ewa District that extend inland from the lochs of Pearl Harbor (Figure 4).

The project area is being proposed for a fire dip tank location. It is understood that improvements would include grading for access and construction of a level slab or pad of approximately 1,500- square feet (total area of disturbance estimated at 5,000 square feet). A temporary buoy wall tank would be set up on this slab to facilitate rapid replenishment of a helicopter-borne water bucket for fire fighting. The slab and tank may be connected to an existing water line understood to run down the middle of the asphalt access road to the water tank. The actual construction area for the slab itself would be quite small. The present study examines a larger, approximately 37,500 square-foot (0.86 acre), project area (see Figure 1 to Figure 3) in order to allow for possible small changes to final slab placement and for directly associated amenities (such as a small adjacent parking area). Based on available information, the proposed Fire Dip Tank Project on the east side of the Board of Water Supply water tank access road would not impose adverse visual, auditory, or other environmental impact to any known historic properties, including standing architecture, located outside the project area. Accordingly, the proposed project lacks potential to affect historic properties outside the project area. As a result the project’s APE is the same as the project area. The survey area for the current investigation included the entire approximately 1-acre APE/project area.

The Fire Dip Tank Project on the east side of the Board of Water Supply water tank access road on lands owned by the Edmund C. Olson Trust II in Honouliuli Ahupua‘a constitutes a project requiring compliance with and review under state of Hawai‘i historic preservation legislation [Hawai‘i Revised Statutes (HRS) Chapter 6E-8 and Hawai‘i Administrative Rules (HAR) Chapter 13-13-275]. At the request of Wilson Okamoto Corporation, CSH completed what began as an archaeological inventory survey investigation of the project area, per the requirements of HAR Chapter 13-13-276. Because no historic properties were located, this investigation became an archaeological assessment, per the language of HAR Chapter 13-13-275-5. This archaeological assessment report was prepared to support the proposed project’s historic preservation review (under HAR 13-13-275) and any other project-related historic preservation consultation.

1.2 Scope of Work

The following archaeological inventory survey scope of work was developed and implemented to satisfy SHPD (State Historic Preservation Division) requirements. The scope of work for this inventory survey (which later became an archaeological assessment because no

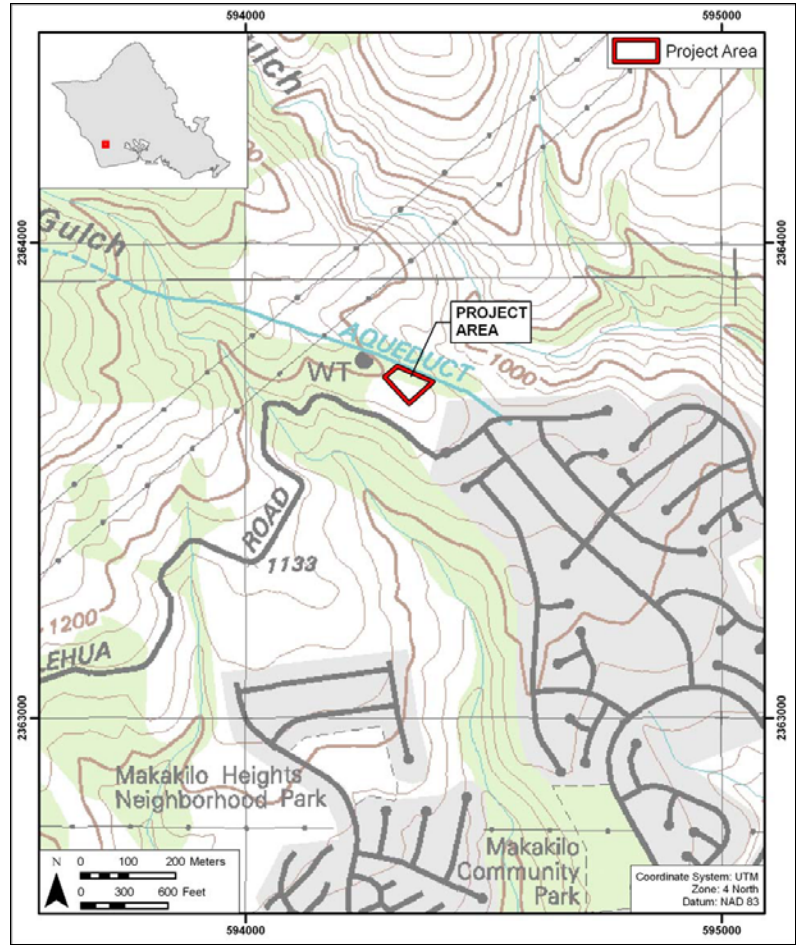

Figure 1. U.S. Geological Survey 7.5 Minute Series Topographic Map, ‘Ewa (1998) and Schofield Barracks (1998) Quadrangles, showing the location of the project area

Figure 3. Aerial Photograph, showing the location of the project area (source: U.S. Geological Survey Orthoimagery 2005)

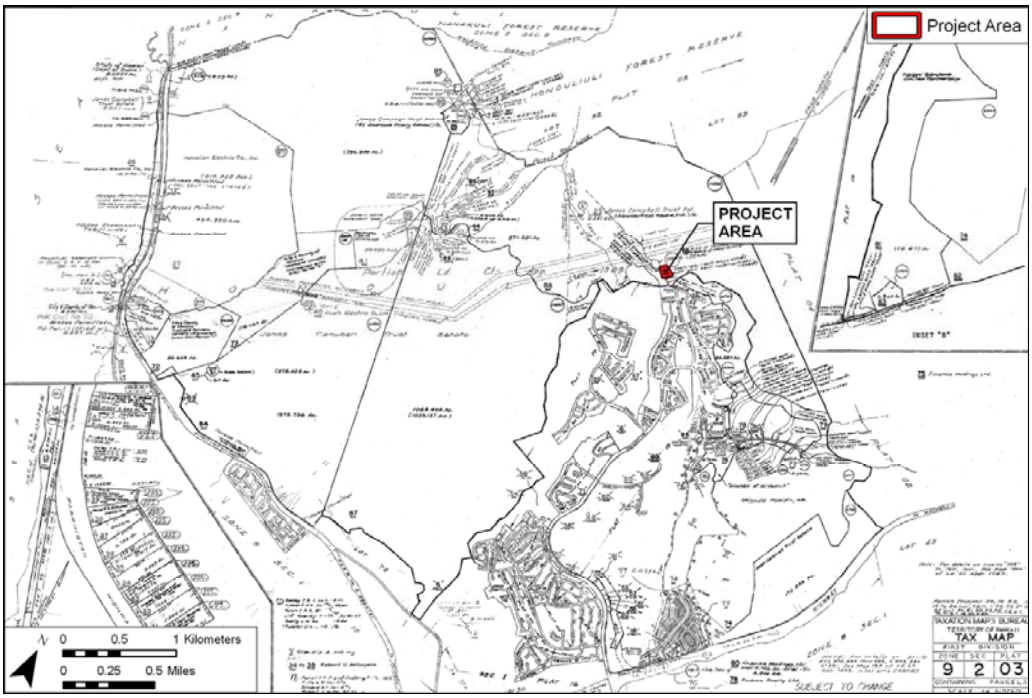

Figure 2. Tax Map Key [1] 9-2-003, showing the location of the project area

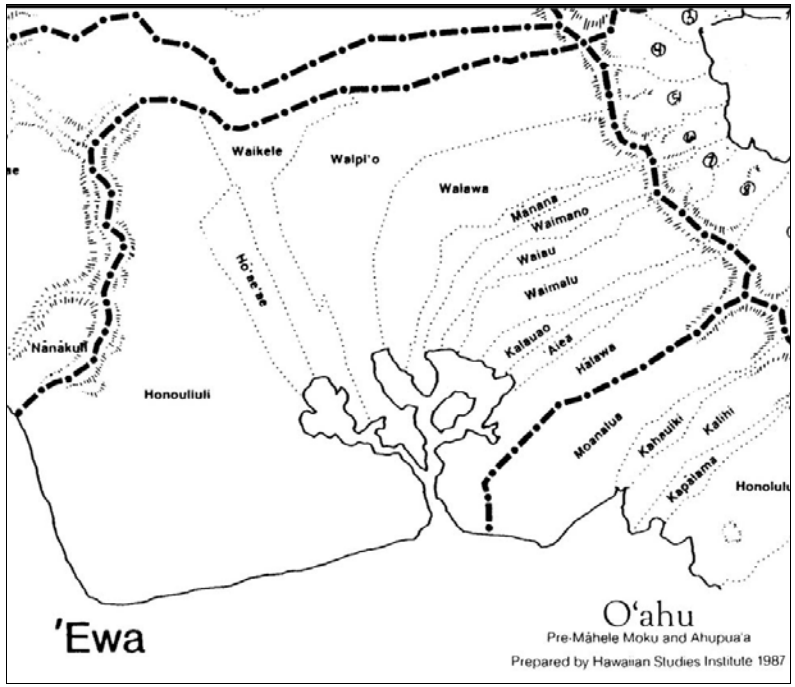

Figure 4. Portion of Hawaiian Studies Institute (1987) Map of O‘ahu, Showing *Moku* (District) and *Ahupua‘a* Boundaries

historic properties were located within the project) was designed in accord with SHPD rules governing standards for archaeological inventory surveys and reports (HAR 13-13-276):

1. A complete ground survey of the entire project area for the purpose of historic property inventory. If historic properties were located the following would be applicable: All historic properties would be located, described, and mapped with evaluation of function, interrelationships, and significance; and documentation in the form of photographs and scale drawings of selected sites and complexes.
2. Appropriate consultation with knowledgeable members of the community, requesting information on historic properties in the study area.
3. Research on historic and archaeological background, including search of historic maps, written records, and Land Commission Award documents. This research focused on the specific area with general background on the *ahupua‘a* (Hawaiian land division) and district and emphasizes settlement patterns.
4. Preparation of this inventory survey report including the following:
   - A project description;
   - A topographic map of the survey area showing all record historic properties;
   - Descriptions of all historic properties, including selected photographs, scale drawings, and discussions of age, function, and significance, per the requirements of HAR Title 13, Subtitle 13, Chapter 276 “Rules Governing Standards for Archaeological Inventory Surveys and Reports.” Cultural resources were assigned State Inventory of Historic Properties (SIHP) numbers;
   - Historical and archaeological background sections summarizing prehistoric and historic land use of the project area and its vicinity;
   - A summary of cultural resource categories and significance based upon the Hawai‘i Register of Historic Places (Hawai‘i Register) criteria;
   - A project effect recommendation; and,
   - Treatment recommendations to mitigate the project’s adverse effect on historic properties recommended eligible to the Hawai‘i Register (i.e. “significant historic properties”).

This scope of work includes full coordination with the State Historic Preservation Division (SHPD), and the City and 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 project area is located in the *ahupua‘a* of Honouliuli, within the ‘Ewa District of Leeward O‘ahu (see Figure 4). Honouliuli Ahupua‘a is the largest traditional land unit on O‘ahu,

extending from the West Loch of Pearl Harbor in the east, to the border of Nānākuli Ahupua‘a at Pili o Kahe in the west. Honouliuli Ahupua‘a includes approximately 19 km (12 mi.) of open coastline from One‘ula westward to Pili o Kahe. The *ahupua‘a* extends *mauka* (almost pie-shaped) from West Loch nearly to Schofield Barracks in Wahiawā; the western boundary is the Wai‘anae Mountain crest running north as far as Pu‘u Hapapa (or to the top of Ka‘ala Mountain according to some).

Located in the dry, leeward area of O‘ahu, the project area receives an average of approximately 32 in. (800 mm) of annual rainfall (Giambelluca et al. 1986). Elevations within the survey area ranged from approximately 1140-1200 ft. (347-366 m) AMSL. The land surface slopes moderately upward to the northwest along the southwest ridge of Kalo‘i Gulch. The land surface slopes moderately to the northeast into Kalo‘i Gulch

Soils within the survey area consist of Mahana silty clay loam, 12 to 20 percent slopes, eroded (McD2) on the southwest (ridge) side and Mahana-Badland complex (MBL) on the northeast Kalo‘i Gulch side, (Foote et al. 1972) (Figure 5). Soils of the Mahana Series are described as “well-drained soils…developed in volcanic ash” (Foote et al. 1972:86). Mahana-Badland Complex consists of Mahana soils and Badland, or “steep or very steep, nearly barren land, ordinarily not stony” (Foote et al. 1972:28).

This area is an open savanna. Trees and bushes include *Koa Haole* (*Leucaena leucocephala*), *Kiawe* (*Prosopis pallida*), Lantana (*Lantana camara*), Christmas Berry (*Schinus terebinthifolius*), and Silk Oak (*Grevillea robusta*). *Uhaloa* (*Waltheria indica*) was the only native plant observed in the project area.

1.3.2 Built Environment

Presently, the project area is being utilized for cattle grazing. Fences used to restrict the movement of cattle are located throughout the project area and vicinity.

The project area is accessed via Makakilo Drive and Kikaha Street. A paved access driveway to a Board of Water Supply water tank extends west of the intersection of Kikaha Street and Umena Street, between private homes, leading up to the water tank. This paved access driveway to the water tank forms the west boundary of the small project area (see Figure 3).

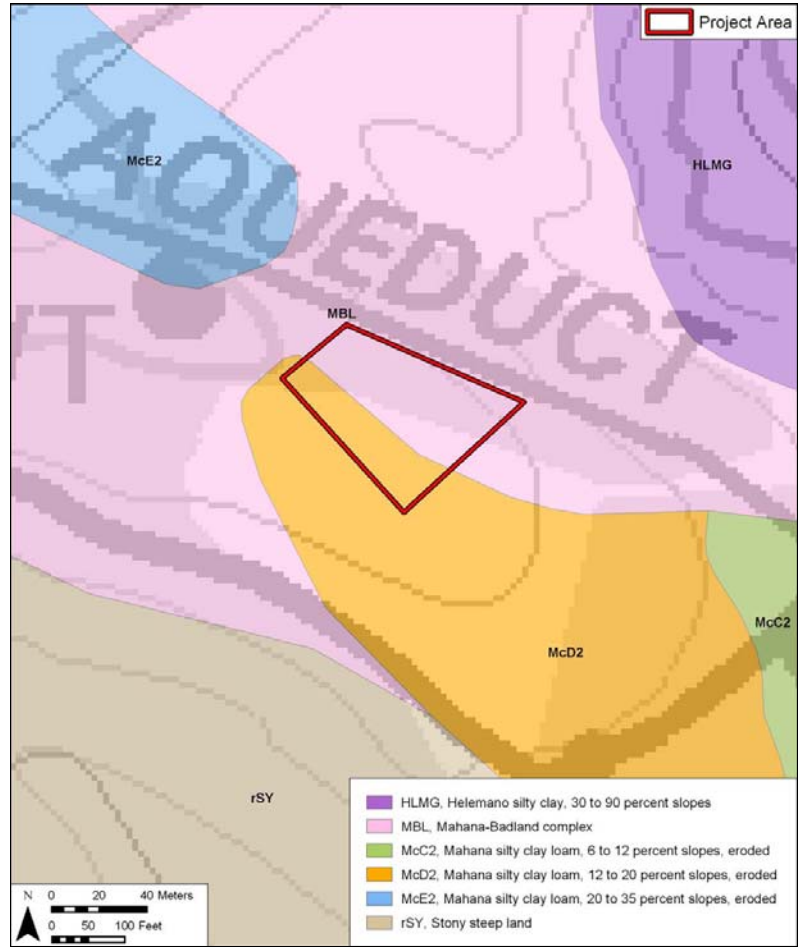

Figure 5. Overlay of the Soil Survey of the State of Hawai‘i (Foote et al. 1972), indicating soil types within the project area

Section 2 Methods

2.1 Field Methods

David W. Shideler, M.A. and Jon Tulchin, B.A. carried out the field effort, which required less than 1 person-day to complete. Fieldwork took place on February 4th and March 3rd 2011 under the general supervision of Hallett H. Hammatt, Ph.D. (principal investigator). Fieldwork in this report has been performed under CSH's annual archaeological research permit, No. 11-17, issued by DLNR/SHPD. No historic properties were observed.

One hundred percent of the project area was subjected to pedestrian inspection. The project boundaries were loaded into a hand-held GPS unit (Garmin GPS Map 60 CSX). The GPS unit's tracking feature was used to record the extent of the pedestrian inspection within the project area and its vicinity. Because no historic properties were observed in the project area, field recordation was limited to photographs and general observations of past land disturbance. The second day of fieldwork was undertaken to clarify the relationship of the present project area to the Pālehua Trail and a pipeline/aqueduct shown on topographic maps.

2.2 Laboratory Methods

No materials were collected during the inventory survey and thus, no laboratory methods were applied.

2.3 Document Review

Background research included: a review of previous archaeological studies on file at the State Historic Preservation Division (SHPD) of the Department of Land and Natural Resources (DLNR); a review of geology and cultural history documents at Hamilton Library of the University of Hawai‘i, the Hawai‘i State Archives, the Mission Houses Museum Library, the Hawai‘i Public Library, and the Archives of the Bishop Museum; a study of historic photographs at the Hawai‘i State Archives and the Archives of the Bishop Museum; and, a study of historic maps at the Survey Office of the DLNR. Information on Land Commission Awards (LCA) was accessed through Waihona ‘Āina Corporation's Māhele Data Base (<www.waihona.com>).

This research provided the environmental, cultural, historic, and archaeological background for the project area. The sources studied were used to formulate a predictive model regarding the expected type and location of sub-surface pre and post-contact historic properties in the project area.

Section 3 Background Research

3.1 Traditional and Historical Background

3.1.1 Historical Setting

Honouliuli Ahupua‘a, as a traditional land unit, had tremendous and varied resources available for exploitation by early Hawaiians. Within Honouliuli Ahupua‘a, not only is there a long coastline fronting the normally calm waters of leeward O‘ahu, but there are also four miles of waterfront along the west side of the West Loch of Pearl Harbor. The "karstic desert" and marginal characterization of the limestone plain, which is the most readily visible terrain, does not do justice to the *ahupua‘a* as a whole. The richness of this land unit is marked by the following available resources:

1. 12 miles of coastline with continuous shallow fringing reef, which offered rich marine resources.
2. Four miles of frontage on the waters of West Loch that offered extensive fisheries (mullet, *awa*, shellfish) as well as frontage suitable for development of fishponds (for example, Laulaunui).
3. The lower portion of Honouliuli Valley in the ‘Ewa plain offered rich level alluvial soils with plentiful water for irrigation from the stream as well as abundant springs. This irrigable land would have stretched well up the valley.
4. A broad limestone plain which, because of innumerable limestone sinkholes, offered a nesting home for a large population of avifauna. This resource may have been one of the early attractions to human settlement.
5. An extensive upland forest zone extending as much as 12 miles inland from the edge of the coastal plain. As Handy and Handy (1972:469) have pointed out, the forest was much more distant from the lowlands here than on the windward coast, but it was much more extensive. Much of the upper reaches of the *ahupua‘a* would have had species-diverse forest with *kukui*, *‘ōhia*, *‘iliahi* (sandalwood), *hau*, *ti*, banana, etc.

The political and cultural center of the *ahupua‘a* is understood to have been the relatively dense settlement and rich lands for irrigated taro cultivation at the *‘ili* of Honouliuli located where Honouliuli Stream empties into the north portion of West Loch (east of the present study area). The name of the *ahupua‘a*, translated as "dark bay" (Pukui et al. 1974:51) may refer to the nature of the waters of West Loch at the mouth of Honouliuli Stream. Early accounts and maps indicate a large settlement at the *‘ili* of Honouliuli and it may well be that the political power of this village was so great that it was able to extend its jurisdiction well to the northwest into an area which might have been anticipated to fall under the dominion of the Wai‘anae ruling chiefs.

3.1.2 Mythological and Traditional Accounts

The traditions of Honouliuli Ahupua‘a have been complied and summarized numerous times, in studies by Sterling and Summers (1978), Hammatt and Folk (1981), Kelly (1991), Charvet-

Pond and Davis (1992), Maly et al. (1993), and Tuggle & Tuggle (1997). Some of the themes of these traditions, include connections with Kahiki (the traditional homeland of Hawaiians, probably in reference to central Polynesia) and the special character and relationship of the places known as Pu‘uokapolei and Kualaka‘i.

Connections with Kahiki are found in numerous place names, traditional events, and with the beings associated with Honouliuli. There are several versions of Kaha‘i leaving from Kalaeloa for a trip to Kahiki to bring breadfruit back to ‘Ewa (e.g. Kamakau 1991:110). There are several stories that associate places in the region with Kamapua‘a and the Hina family, as well as with Pele’s sisters, all of whom have strong connections with Kahiki (cf. Kamakau 1961:111; Pukui et al. 1974:200).

Pu‘uokapolei was one of the most sacred places in Honouliuli (cf Sterling and Summers 1978:33). Pu‘uokapolei’s connections with Kahiki are emphasized when it is noted that the hill was the home of Kamapua‘a’s grandmother, Kamaunuaniho, the Kahiki ancestor to the people of O‘ahu (Fornander 1916-20, V:318; Kahiolo 1978:81, 107). By name, Kapolei is associated with the goddess Kapo, another connection with the Pele and Kamapua‘a stories (Kamakau 1976:14).

McAllister (1933:108) records that a *heiau*, or temple, was located on Pu‘uokapolei, but was destroyed before his survey of the early 1930s. The *heiau* may have been associated with the sun (Fornander 1916-20, III:292). The hill was used as a point of solar reference or as a place where such observations were made. Pu‘uokapolei might have been understood as the gate of the setting sun. It is notable that the rising sun at the eastern gate of Kumukahi in Puna is associated with the Hawaiian goddess Kapo (Emerson 1978:41). There is little specific information for Pu‘uokapolei, but the place name itself (“hill of beloved Kapo”) is hard to ignore. It is mentioned in some cosmologies that Kū was the god of the rising sun, and Hina should be associated with the setting sun (Hina is the mother of Kamapua‘a). Fornander (1916-20, III; 292) states, Pu‘uokapolei may have been a jumping off place (also connected with the setting sun) and associated with the dead who roamed the adjacent Plain of Kaupe‘a.

Pu‘uokapolei was also the primary landmark for travelers between Pearl Harbor and the west O‘ahu coast, with a main trail running just inland of it (‘Ī‘ī 1959:27, 29; Figure 7). Pu‘uokapolei was probably the most common name used as a reference for the area of the ‘Ewa Plain in traditional Hawai‘i (cf. Nakuina 1992:54; Fornander 1916-20, II: 318; E.M. Nakuina 1904, in Sterling and Summers 1978:34).

3.1.3 Pre-Contact and Early History

Various Hawaiian legends and early historical accounts indicate that the *ahupua‘a* of Honouliuli was once widely inhabited by pre-contact Hawaiian populations, including the Hawaiian *ali‘i*. This substantial population is attributable for the most part to the plentiful marine and estuarine resources available at the coast, along which several sites interpreted as permanent habitations were located. Other attractive subsistence-related features of the *ahupua‘a* included irrigated lowlands suitable for wet land taro cultivation (Hammatt and Shideler 1990), as well as the lower forest area of the mountain slopes for the procurement of forest goods.

Exploitation of the forest resources along the slopes of the Wai‘anae Range - as suggested by E. S. and E.G. Handy - probably acted as a viable subsistence alternative during times of famine:

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

These upper valley slopes may have also been a significant resource for opportunistic quarrying of basalt for the manufacturing of stone tools. This is evidenced in part by the existence of a probable quarrying site (50-80-12-4322) in Makaīwa Gulch at 152 m (500 ft.) A.M.S.L., west of the current study area (Hammatt et al. 1991).

The Hawaiian *ali‘i* were also attracted to the region. One historical account of particular interest refers to an *ali‘i* residing in Ko Olina, southwest of the current study area:

> Ko Olina is in Waimānalo near the boundary of ‘Ewa and Wai‘anae. This was a vacationing place for chief Kākuhihewa and the priest Napuaikamao was the caretaker of the place. Remember reader, this Ko Olina is not situated in the Waimānalo on the Ko‘olau side of the island but the Waimānalo in ‘Ewa. It is a lovely and delightful place and the chief, Kākuhihewa loved this home of his (Sterling and Summers 1978:41).

John Papa ‘Ī‘ī describes a network of Leeward O‘ahu trails (Figure 6) which in later historic times encircled and crossed the Wai‘anae Range, allowing passage from West Loch to the Honouliuli lowlands, past Pu‘u Kapolei and Waimānalo Gulch to the Wai‘anae coast and onward circumscribing the shoreline of O‘ahu (‘Ī‘ī 1959:96-98).

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

Subsequent to western contact in the area, the landscape of the ‘Ewa plains and Wai‘anae slopes was adversely affected by the removal of the sandalwood forest, and the introduction of domesticated animals and new vegetation species. Domesticated animals including goats, sheep and cattle were brought to the Hawaiian Islands by Vancouver in the early 1790s, and allowed to graze freely about the land for some time after. L.A. Henke reports the existence of a longhorn cattle ranch in Wai‘anae by at least 1840 (in Frierson 1972:10). During this same time, perhaps as early as 1790, exotic vegetation species were introduced to the area. These typically included vegetation best suited to a terrain disturbed by the logging of sandalwood forest and eroded by animal grazing. The following dates of specific vegetation introduced to Hawai‘i are given by R. Smith and outlined by Frierson (1972:10-11):

1. “early,” c. 1790:

   Prickly pear cactus, *Opuntia tuna*
   Haole koa, *Leucaena leucocephala*
   Guava, *Psidium guajava*

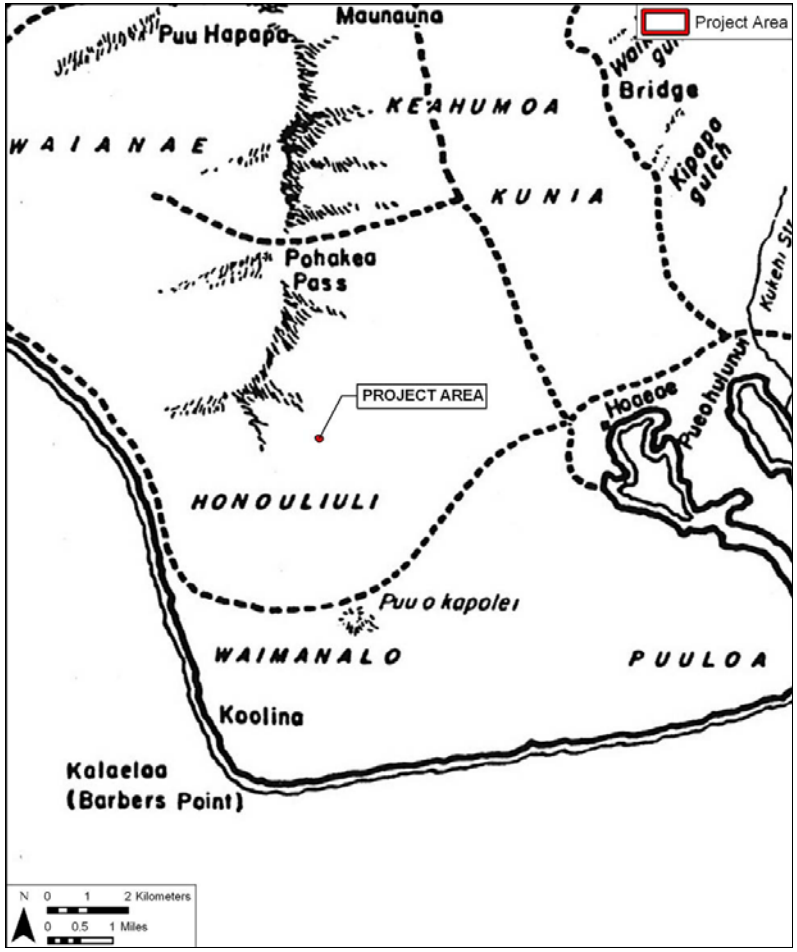

Figure 6. Trails of Leeward O‘ahu as Described by John Papa ‘Ī‘ī; Map by Paul Rockwood (‘Ī‘ī 1983:96)

2. 1835-1840:

   Burmuda [sic] grass, *Cynodon dactylon*
   Wire grass, *Eleusine indica*

3. 1858:

   Lantana, *Lantana camara*

The *kiawe* tree (*Prosopis pallida*) was also introduced during this period, either in 1828 or 1837 (Frierson 1972:11).

3.1.4 Mid to late 19th Century

During the Māhele of 1848, 99 individual land claims in the *ahupua‘a* of Honouliuli were registered and awarded by King Kamehameha III. No claims were made for land within the current study area or vicinity. The vast majority of the Land Commission Awards (LCA) were located near the Pu‘uloa Salt Works and the taro lands of the *‘ili* of Honouliuli. The largest award (Royal Patent 6071, LCA 11216, *‘Āpana* 8) granted in Honouliuli Ahupua‘a was to Miriam Ke‘ahi-Kuni Kekau‘onohi on January 1848 (Native Register). Kekau‘onohi acquired a deed to all unclaimed land within the *ahupua‘a*, including a total of 43,250 acres.

Samuel Kamakau relates the following about Kekau‘onohi as a child:

> Kamehameha's granddaughter, Ke-ahi-Kuni Kekau-‘onohi...was also a tabu chiefess in whose presence the other chiefesses had to prostrate and uncover themselves, and Kamehameha would lie face upward while she sat on his chest. (Kamakau 1961:208-209).

Kekau‘onohi was one of Liholiho’s (Kamehameha II’s) wives, and after his death, she lived with her half-brother, Luanu‘u Kahala‘i‘a, who was governor of Kaua‘i (Kamakau 1961:20). Subsequently, Kekau‘onohi ran away with Queen Ka‘ahumanu’s stepson, Keli‘i-ahonui, and then became the wife of Chief Levi Ha‘alelea. Upon her death on June 2, 1851, all her property was passed on to her husband and his heirs. When Levi Ha‘alelea died, the property went to his surviving wife, who in turn leased it to James Dowsett and John Meek in 1871 for stock running and grazing.

In 1877, James Campbell purchased most of Honouliuli Ahupua‘a for a total of $95,000. He then drove off 32,347 head of cattle belonging to Dowsett, Meek and James Robinson and constructed a fence around the outer boundary of his property (Bordner and Silva 1983:C-12). In 1879, Campbell brought in a well-driller from California to search the ‘Ewa plains for water, and a “vast pure water reserve” was discovered (Armstrong and Bier 1983). Following this discovery, plantation developers and ranchers drilled numerous wells in search of the valuable resource. By 1881, the Campbell property of Honouliuli prospered as a cattle ranch with “abundant pasturage of various kinds” (Briggs in Haun and Kelly 1984:45). Within 10 years of the first drilled well in ‘Ewa, the addition of a series of artesian wells throughout the island was supplying most of Honolulu’s water needs (Armstrong and Bier 1983).

In 1889, Campbell leased his property to Benjamin Dillingham, who subsequently formed the O‘ahu Railway & Land Co. (O.R. & L) in 1890. To attract business to his new railroad system,

Dillingham subleased all land below 200 feet elevation to William Castle who in turn sublet the area to the 'Ewa Plantation Company for sugar cane cultivation (Figure 7) (Frierson 1972:15). Dillingham's Honouliuli lands above 200 feet elevation that were suitable for sugar cane cultivation were sublet to the O'ahu Sugar Co. (Figure 8).

'Ewa Plantation Co. was incorporated in 1890 and continued in full operation up into modern times. The plantation grew quickly with the abundant artesian water. As a means to generate soil deposition on the coral plain and increase arable land in the lowlands, the 'Ewa Plantation Co. installed ditches running from the lower slopes of the mountain range to the lowlands and then plowed the slopes vertically just before the rainy season to induce erosion (Frierson 1972:17).

The O'ahu Sugar Co. was incorporated in 1897, and included lands in the foothills above the 'Ewa plain and Pearl Harbor. Prior to commercial sugar cultivation, the lands occupied by the O'ahu Sugar Co. were described as being "of near desert proportion until water was supplied from drilled artesian wells and the Waiāhole Water project" (Conde and Best 1973:313). The O'ahu Sugar Co. took control over the 'Ewa Plantation lands in 1970 and continued operations into the 1990s.

Dillingham's *mauka* lands in western Honouliuli that were unsuitable for commercial sugar production remained pasture for grazing livestock. From 1890 to 1892 the Ranch Department of the O.R. & L. Co. desperately sought water for their herds of cattle by tapping plantation flumes and searching for alternative sources of water. Ida von Holt leaves this account of her husband Harry's (Superintendent of the O.R. & L Ranch Dept.) search for water in the foothills of the Wai'anae Range:

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

It is believed that the spring depicted in this account may have been located during an inventory survey of the neighboring Pālehua East B project area (Tulchin and Hammatt 2005). The spring was located along the upper slopes of the southern face of Kalo'i Gulch. A second account is given of the discovery of spring water on the north side of Kalo'i Gulch:

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

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

> Finally he [Harry von Holt] got them to explain that the spring, called "Waihuna" (Hidden Spring) had been one of the principal sources of water for all that country, which was quite heavily populated before the smallpox epidemic of 1840…A powerful Kahuna living at the spring had hidden it before he died of the smallpox, and had put a curse on the one who disturbed the stone, that he or she would surely die before a year was out. (Von Holt 1985:138-140)

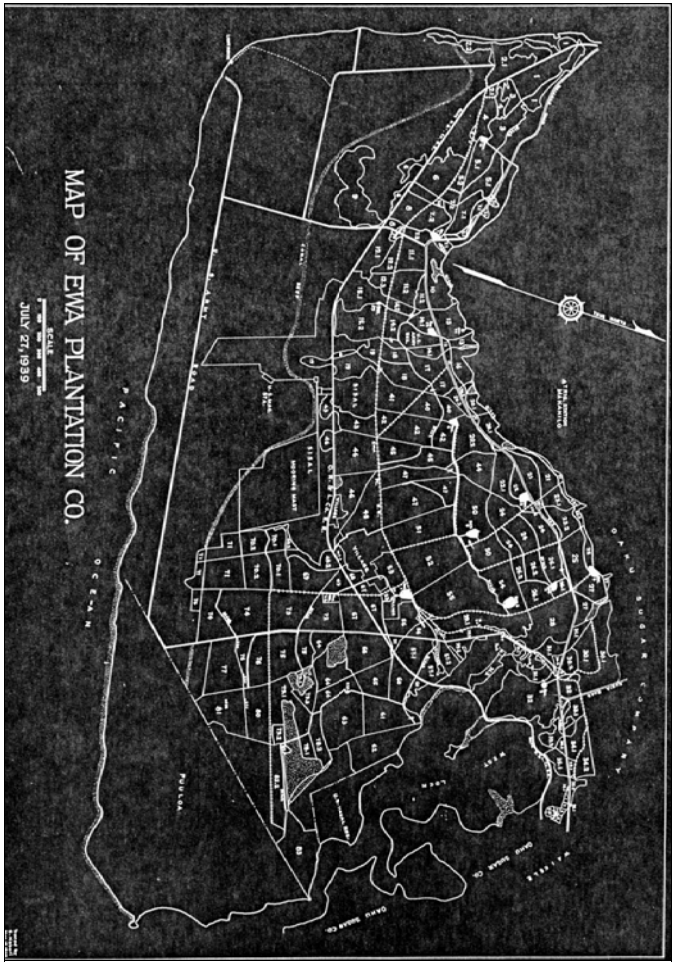

Figure 7. Map showing the extent of the 'Ewa Plantation Co. field system (Conde and Best 1973:285) (the Ewa Plantation sugar planting was restricted to the lowlands)

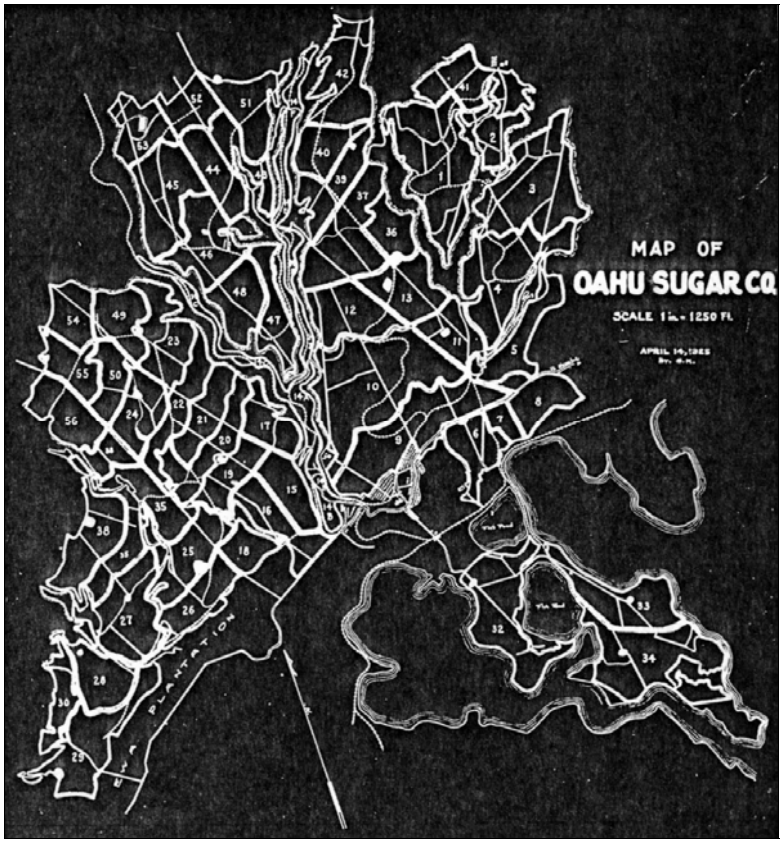

Figure 8. Map showing the extent of the O‘ahu Sugar Co. field system that was upslope of the Ewa Plantation holdings (Conde and Best 1973:317).

3.1.5 Early 1900s to Present

By 1920, the lands of Honouliuli were used primarily for commercial sugar cane cultivation and ranching (Frierson 1972:18). Much of the *mauka* lands in western Honouliuli, including ridges and deep gulches, were unsuitable for commercial sugar cultivation and remained pasture land for grazing livestock. Historic maps of the Makakilo area indicate a lack of any significant development in the area into the 1940s (Figures 9 to 11). Development in the area is limited to Pālehua Road, allowing access to the uplands of western Honouliuli. Also of note is a trail running roughly northwest by southeast through the middle of the project area leading to tunnels and a tank well upslope of the project area. This trail is likely the Pālehua Trail along which Von Holt located and tapped various springs to supply water to his herds of cattle. The tunnels located along the northern end of this trail are likely water tunnels excavated into the hillside in order to secure water.

In the late 1920s, the main residential communities were at the northeast edge of the ‘Ewa Plain. The largest community was still at Honouliuli village. ‘Ewa was primarily a plantation town, focused around the sugar mill, with a public school as well as a Japanese School. Additional settlement was in Waipahu, centered around the Waipahu sugar mill, operated by the O‘ahu Sugar Company.

Major land use changes came to western Honouliuli when the U.S. Military began development in the area. Military installations were constructed both near the coast, as well as in the foothills and upland areas. Barbers Point Military Reservation (a.k.a. Battery Barbers Point from 1937-1944), located at Barbers Point Beach, was used beginning in 1921 as a training area for firing 155 mm guns (Payette 2003). Also in the vicinity were Camp Malakole Military Reservation (a.k.a. Honouliuli Military Reservation), used from 1939, and Gilbert Military Reservation, used from 1922-1944. Barbers Point NAS, in operation from 1942 into the 1990s, was the largest and most significant base built in the area. It housed numerous naval and defense organizations, including maritime surveillance and anti-submarine warfare aircraft squadrons, a U.S. Coast Guard Air Station, and the U.S. Pacific Fleet.

Fort Barrette (a.k.a. Kapolei Military Reservation and Battery Hatch), located atop Pu‘u Kapolei, was in use from 1931 to 1948 for housing four 3-inch anti-aircraft batteries (Payette 2003). In the 1950s, the site was used as a NIKE missile base. Palailai Military Reservation, located atop Pu‘u Palailai in Makakilo, was in service from 1921, housing Battery Palailai and Fire Control Station B (Payette 2003). Fire Control Station A, was located atop Pu‘u Makakilo. From 1942 to 1945 the Pu‘u Makakilo Training Area, including lands in and around Pu‘u Makakilo, was used for military training during WWII (Environment Hawai‘i 1992).

Historic U.S. Geological Survey maps of the area indicated the presence of an industrial quarry located within Kalo‘i Gulch. The quarry first appears on the 1953 U.S. Geological Survey topographic map (Figure 12). The exact date in which the quarry was initially constructed could not be determined, though research of historic maps indicated construction between 1943 and 1952. In 2004, CSH conducted an archaeological inventory survey of a property adjacent to the east of the current study area, during this survey the quarry was observed and documented and assigned State Inventory of Historic Properties (SHIP) No. 50-80-12-6680.

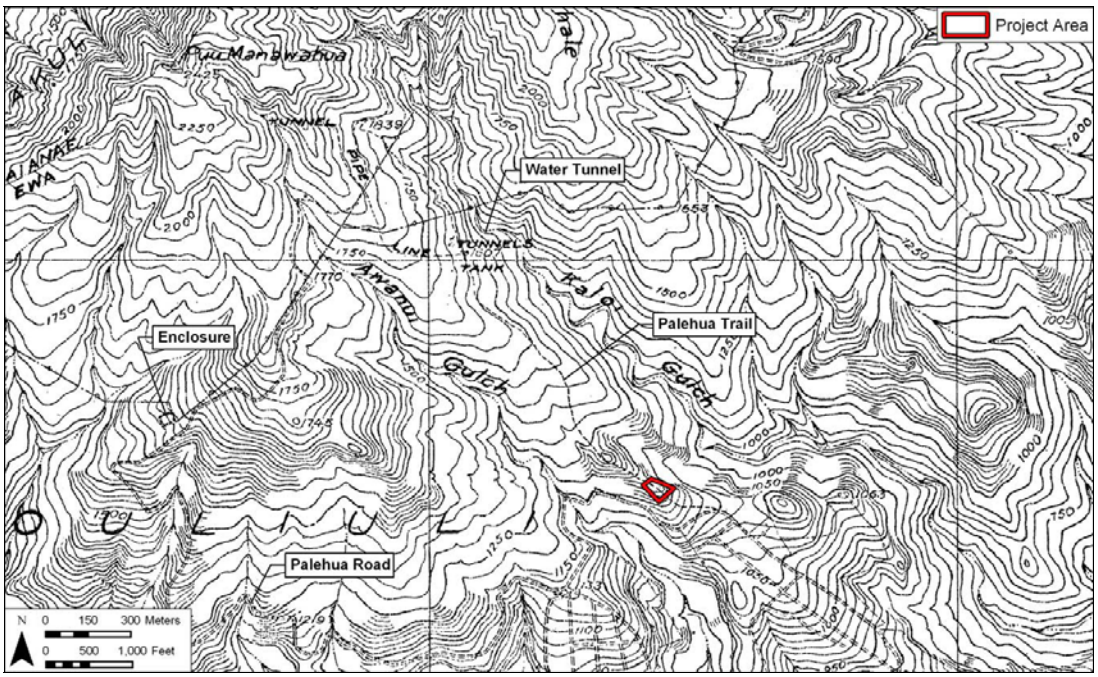

Figure 10. 1928 U.S. Geological Survey Topographic map, Wai‘anae Quad, showing the location of the study area.

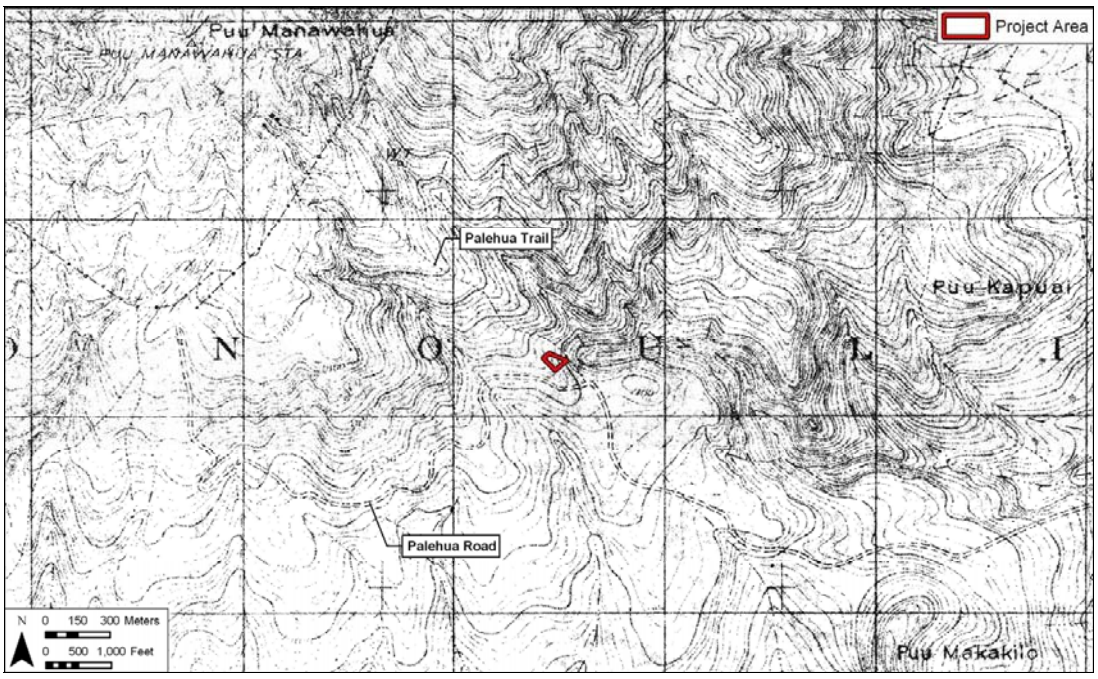

Figure 9. 1918 Fire Control Map, showing the location of the study area.

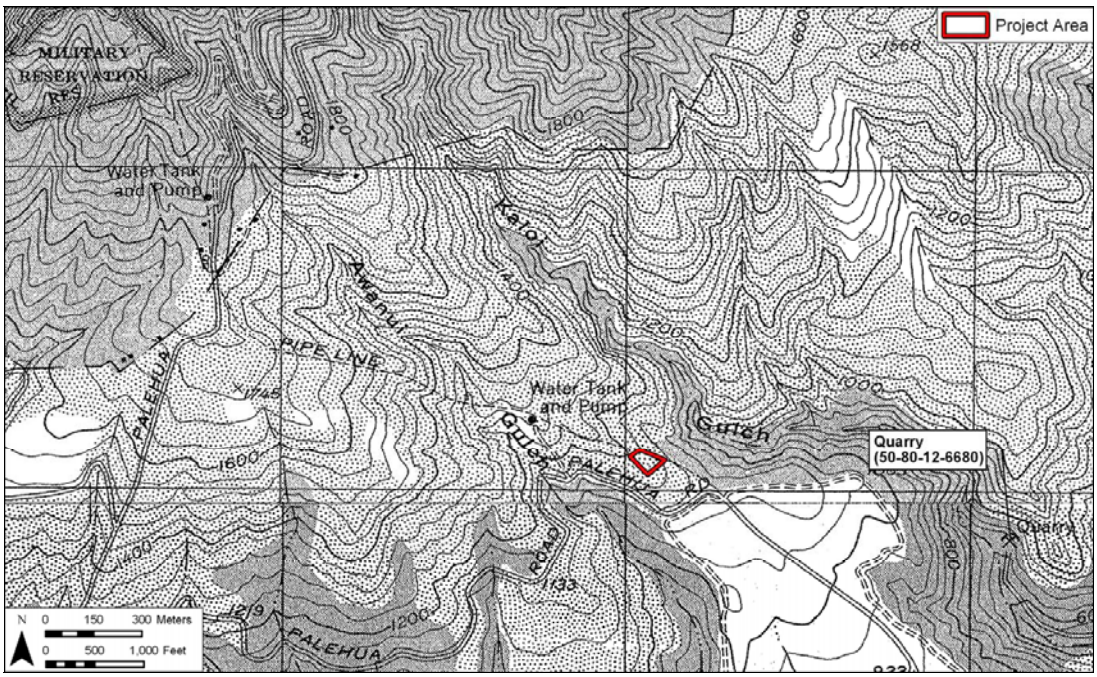

Figure 12. 1953 U.S. Geological Survey Topographic Map, showing the location of the study area. Note the location of the quarry within Kalo‘i Gulch.

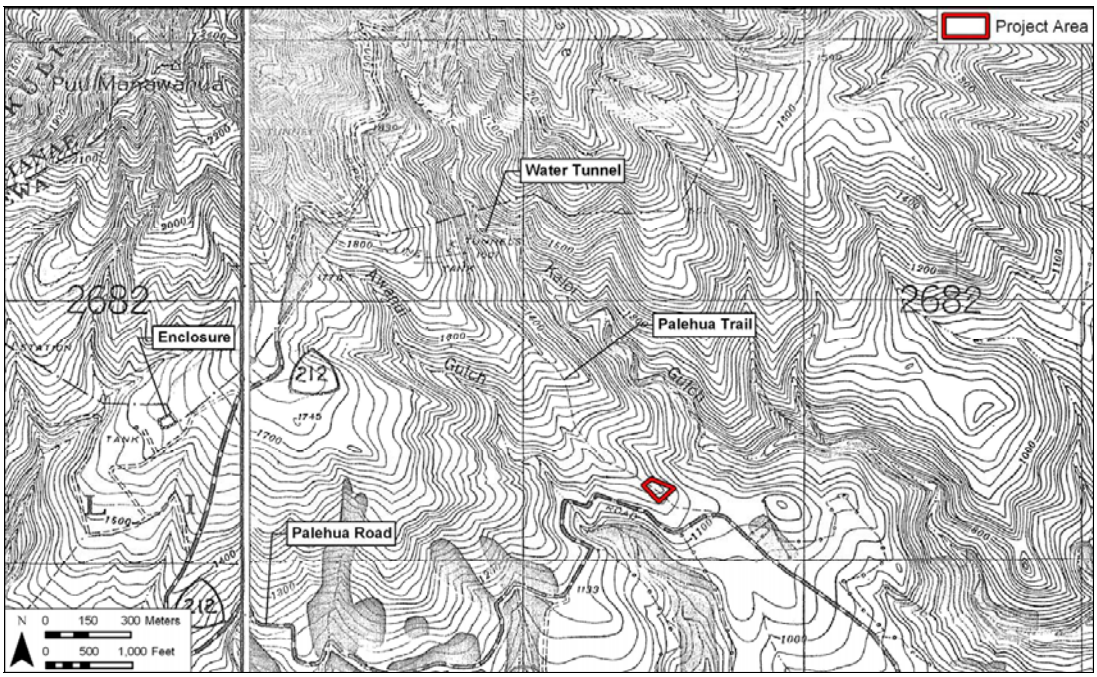

Figure 11. 1943 War Department map, Waipahu Quad, showing the location of the study area.

In response to increased demand for housing, spurred by the increased development at Barbers Point NAS, the Estate of James Campbell set aside land in the foothills of the southern Wai‘anae Range in 1960 for the development of the residential community of Makakilo. Development began just *mauka* of the H-1 Freeway and continued *mauka*, with ranch lands being incrementally replaced by subdivision construction. At present, former ranching pasture lands are continually being replaced by residential house lots.

Development in the uplands of western Honouliuli has generally been limited to ranch related housing and infrastructure, military training and NIKE missile stations, as well as the construction of military and commercial communication and atmospheric observation stations on the ridges near Pālehua. In 1975, the U.S. Air Force constructed the Pālehua Solar Observatory with five solar optical telescopes.

3.2 Honouliuli Settlement Patterns

Archaeological and traditional sources show a general pattern of three main areas of settlement within Honouliuli Ahupua‘a: a coastal zone, the Honouliuli taro lands, and inland settlement at Pu‘u Ku‘ua.

3.2.1 The Coastal Zone - Kalaeloa (Barber's Point), Ko‘olina (West Beach)

3.2.1.1 Kalaeloa (Barber's Point)

Archaeological research at Barber's Point has focused on the areas in and around the Deep Draft Harbor (Barrera 1975; Davis and Griffin 1978; Hammatt and Folk 1981; McDermott et al. 2000). Series of small clustered shelters, enclosures and platforms show limited but recurrent use at the shoreline zone for marine oriented exploitation. This settlement covers much of the shoreline, with more concentrated features around small marshes and wet sinks. Immediately behind the shoreline, under a linear dune deposit is a buried cultural layer believed to contain some of the earliest habitation evidence in the area.

The attraction of the area to early Hawaiians was the plentiful and easily exploited bird population. Particular evidence for taking of petrel occurs at Site -2763 (Hammatt and Folk 1981 197:213). Initial heavy exploitation of nesting seabirds and other species, in conjunction with habitat destruction, probably led to early extinction.

There is some indication of limited agriculture in mulched sinkholes and limited soil areas. Considering rainfall, this activity would have been limited, but probably involved tree crops and roots (sweet potatoes). The archaeological content of the sites indicates a major focus on marine resources.

Davis and Griffin (1978) distinguish functional classes of sites based on surface area size, and argue that the Barber's Point settlement consists of functionally integrated, multi-household residence groups. Density contours of midden (by weight) and artifacts (by numbers) plotted for residence sites by Hammatt and Folk (1981) generally indicate narrowly defined spatial foci of discard, possibly indicating continuous use, or at least with no refurbishing or additions to the structures over time (Hammatt and Folk 1981). The focus is small habitation sites, typically

lacking the full range of features found in large permanent residence complexes such as high platforms, complex enclosures, and ceremonial sites.

3.2.1.2 Ko‘Olina (West Beach)

There are three available studies on the Ko‘Olina project area (Davis et al. 1986a; Davis et al. 1986b; and Davis and Haun 1987).

Davis documents approximately 180 component features at 48 sites and site complexes consisting of habitation sites, gardening areas, and human burials. Chronologically, the occupation covers the entire span of Hawaiian settlement in what Davis and Haun describe as “one of the longest local sequences in Hawaiian prehistory” (Davis and Haun 1987:37). The earliest part of the sequence relates to the discovery of an inland marsh and early dates were also obtained for the beachfront site and an inland rock shelter.

3.2.2 Honouliuli Taro Lands

Centered around the west side of Pearl Harbor at Honouliuli Stream and its broad outlet into the West Loch are the rich irrigated lands of the *‘ili* of Honouliuli, which give the *ahupua‘a* its name. The major archaeological reference to this area is Dicks, Haun and Rosendahl (1987) who documented remnants of a once widespread wetland system (*lo‘i* and fishponds), as well as dry-land cultivation of the adjacent slopes.

Carol Silva has conducted “Historic Research Relative to the Land of Honouliuli” (Dicks et al. 1987) and the reader is referred to this work for an overview of the history of Honouliuli.

The area bordering West Loch was clearly a major focus of population within the Hawaiian Islands and this was a logical response to the abundance of fish and shellfish resources in close proximity to a wide expanse of well-irrigated bottomland suitable for wetland taro cultivation. The earliest detailed map (Malden 1825) shows all the roads of southwest O‘ahu coalescing and descending the *pali* as they funnel into the locality (i.e. Honouliuli Village) which gave the *ahupua‘a* of Honouliuli its name. Dicks et al. (1987:78-79) conclude, on the basis of 19 carbon isotope dates and 3 volcanic glass dates, that “agricultural use of the area spans over 1,000 years.” Undoubtedly, Honouliuli was a locus of habitation for thousands of Hawaiians. Prehistoric population estimates are a matter of some debate but it is worth pointing out that in the earliest mission census (Schmitt 1973:19) in 1831-1832, the land (*‘āina*) of Honouliuli contained 1026 men, women, and children. It is not clear whether this population relates to Honouliuli Village or Honouliuli Ahupua‘a, but the village probably contained the vast majority of the district’s population. The nature of the reported population structure for Honouliuli (less than 20% children under 12 years of age) and the fact that the population decreased more than 15% in the next 4 years (Schmitt 1973:22) suggests that the prehistoric population of Honouliuli Village may well have been significantly greater than it was in 1831-1832. A conservative estimate would be that tens of thousands of Hawaiians lived and died at Honouliuli Village.

3.2.3 Pu‘u Ku‘ua: Inland Settlement

Documentation of inland settlement in Honouliuli Ahupua‘a is more problematic in that there are relatively few documented archaeological sources. However, it is probable that the area

around Pu‘u Ku‘ua, on the east side of the Wai‘anae Ridge, seven miles inland of the coast, was a Hawaiian place of some importance.

In 1899, the Hawaiian Newspaper "*Ka Loea Kalaiaina*" relates a story of Pu‘u Ku‘ua as "a place where chiefs lived in ancient times" and a "battle field," "thickly populated." The article summarizes:

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

McAllister recorded three sites in this area, two *heiau* (134 - Pu‘u Kuina and 137 -Pu‘u Ku‘ua, both destroyed) and a series of enclosures in Kukuilua which he calls "*kuleana* sites" (McAllister 1933). On the opposite side of the Wai‘anae range, along the trail to Pōhākea Pass, Cordy (2002) states "Kākuihihewa was said to have built (or rebuilt) Nīoi‘ula, a *po‘okanaka heiau* (1,300 sq. m.) in Hālona in upper Lualualei, along the trail to Pōhākea Pass leading into ‘Ewa, ca. A.D. 1640-1660" (Cordy 2002:36). There is no direct archaeological evidence available to the authors' knowledge that intensive Hawaiian settlement occurred here, but it is considered as a place of high probability, based on the above indications. John Papa ‘Ī‘ī (1959) described a journey that Liholiho took which led him and an entourage through inland Honouliuli and over Pōhākea Pass. Geographically, the area receives sufficient quantities of water and would have had abundant locally available forest resources.

3.2.4 Summary

Based on the above summary of areas of Honouliuli settlement, the following general considerations are made to place the study area in the context of the *ahupua‘a* pattern.

1. There are three areas of Hawaiian settlement in the *ahupua‘a*; two are well documented and the inland settlement in the vicinity of Pu‘u Ku‘ua is problematic.
   b. The extensive limestone plain with recurrent use habitations for fishermen and gatherers, and sometime gardeners;
   c. The rich cultivated lands of Honouliuli *‘ili* for extensive wetland taro and clearly the *ahupua‘a* population center;
   d. The uplands around Pu‘u Ku‘ua for probable agriculture and forest resource utilization.
2. Honouliuli is designed as a unit to contain all the geographic elements of a typical Hawaiian valley *ahupua‘a*, except they are arranged geomorphically in an atypical relationship. The *ahupua‘a* is not organized around a single drainage network but shares the west portions of Waikele drainage in its upper reaches. A typical and highly advantageous characteristic for human subsistence is included in a vast coastline and fringing reef, an extensive limestone plain which would support only limited agriculture, but would be excellent for bird catching in early times. The richest forest land for foraging for wood, birds, feathers, etc. would have been the east slope of the Wai‘anae Range. The *mauka/makai* route would have been up Honouliuli Gulch or up the Makakilo ridge, paralleling the coast from Honouliuli Gulch to Kahe. The most convenient route to *mauka* lands, even from the western end of the coast near Kahe Point, would have been *mauka* only to the base of the hills and then either up the Makakilo Ridge or northeast to a trail to Pu‘u Ku‘ua and Pōhākea Pass. The *makai* slope is the dry side of the ridgeline. Here, streams would respond to rainfall quickly but drain quickly leaving little available water for even short-term use. However, abundant springs may have provided adequate water for localized dry land cultivation.
3. The *makai* slope of the Wai‘anae Range (i.e. *mauka* of Ko‘Olina) was not a major thoroughfare. We can see some very limited evidence of part-time agriculture in and around gulches and 2 foci of sparse habitation with the first limited to *makai* portions of gulches and lava flats. This habitation is considered a *mauka* component or continuation of the Ko‘Olina coastal settlement rather than an independent focus. The second focus, separated from the first by a barren zone, is generally above the 800-foot elevation. This *mauka* habitat, which could have been supported by seasonal dry land planting and forest foraging, may be the lower portion of a thinly scattered but widespread zone of settlement. This zone stretches eastward and northeast along the east Wai‘anae Range slopes and may increase in intensity along the more watered lands forming the *mauka* western boundary of Honouliuli.
4. The central place of the *ahupua‘a* of Honouliuli in terms of population, as well as cultivated foods, was the *‘ili* of Honouliuli. There is good reason to assume, given the lack of intensive agricultural resources in other locations during prehistoric times, that all other habitation zones were economically and socially co-dependent.
5. There is to date no archaeological evidence of high status residence in Honouliuli. Large residential structures are not present along the Pacific shoreline where they would be expected. The late prehistoric occurrence of chiefs' houses is not apparent, perhaps because the ocean shoreline, although rich in marine resources, is uninviting for sport and unsuitable for fishponds. The chiefly focus of ‘Ewa District was Waipi‘o. Whatever activities of this class occurred in Honouliuli would have been in or near the rich lands fronting West Loch (the ‘ili of Honouliuli) but to date there is no direct archaeological evidence of this. Concerning status associations with Honouliuli it is interesting to note the connection of the Pu‘u Ku‘ua settlement with pariah (*kauwā*), the lowest class of Hawaiians (Sterling and Summers 1978:33).

3.3 Previous Archaeological Research

The coral plains of ‘Ewa have been the focus of more than 50 archaeological studies over the last two decades, largely as the result of required compliance with county, state, and federal legislation. The Kalaeloa (Barber's Point) area is one of the most studied places in Polynesia. However, relatively little research has been conducted along the southern slopes of the Wai‘anae Range.

The earliest attempt to record archaeological remains in Honouliuli Ahupua‘a was made by Thrum (1906). He reports the existence of a *heiau* located on Pu‘u Kapolei, approximately 2.6 miles (4 km) southeast of the current study area. Pu‘u Kapolei Heiau is described as "Ewa-size and class unknown. Its walls thrown down for fencing" (Thrum 1906:46).

In his surface survey of 1930, archaeologist J. Gilbert McAllister recorded the specific locations of important sites, and the general locations of less important sites (at least at Honouliuli). Archaeological investigations by McAllister along the southern slopes of the Wai‘anae Range identified a number of sites which are of interest (Figure 13).

McAllister documents Pu‘u Kapolei Heiau as Site 138 and notes:

> The stones from the heiau supplied the rock crusher which was located on the side of this elevation, which is about 100 feet away on the sea side. There was formerly a large rock shelter on the sea side where Kamapuaa (the pig-god) is said to have lived with his grandmother (Kamaunuahihio). (McAllister 1933:108)

McAllister's Site 136 is located near Mauna Kapu, well north of the current study area, and is described as a small platform on the ridge dividing the ‘Ewa and Wai‘anae districts. The 4 to 6 square foot platform was constructed of coral and basalt stones, and was believed to be an altar (McAllister 1933:107). It is noted to have been destroyed by the time of Sterling and Summers' work in the late 1950's (Sterling and Summers 1978:32).

McAllister's Site 137 is at Pu‘u Ku‘ua, a prominent landmark 1.2 miles (1.9 km) northeast of the current study area. Pu‘u Ku‘ua Heiau is described by McAllister as:

> (Destroyed) The heiau was located on the ridge overlooking Nanakuli as well as Honouliuli at the approximate height of 1800 feet. Most of the stones of the heiau were used for a cattle pen located on the sea side of the site. The portion of the heiau which has not been cleared for pineapple has been planted in ironwoods. (McAllister 1933:32)

The presence of Pu‘u Ku‘ua *heiau*, provides some archaeological evidence of the Pu‘u Ku‘ua settlement described in the Hawaiian Newspaper "*Ka Loea Kalaiaina*" (see Section 3.2: Honouliuli Settlement Patterns).

None of these sites are in the immediate vicinity of the current study area. However, the presence of extant or former archaeological remains demonstrates Hawaiian use of these *mauka* lands.

Recent archaeological investigations in the southern Wai‘anae Range have generally been focused on deep gulch areas for potential landfill locations, lower slopes for residential development, and mountain peaks for antennae or satellite tracking infrastructure (Table 1).

3.3.1 Archaeological Research in the Vicinity of the Study Area

The locations of archaeological studies conducted in the vicinity of the current study area are illustrated in Figure 14, while Figure 15 shows the locations of archaeological sites in the vicinity and Table 2 lists and describes these sites. The following is a summary of these archaeological studies.

In 1959, the Bishop Museum was notified of a *kū‘ula* stone (stone god used to attract fish) located along Pālehua Road. The *kū‘ula* stone was briefly documented and assigned as SIHP No. 50-80-08-2316 (Kelly 1959). SIHP No. 50-80-08-2316 is located a mile west of the current study area, along the western edge of Pālehua Road (see Figure 15).

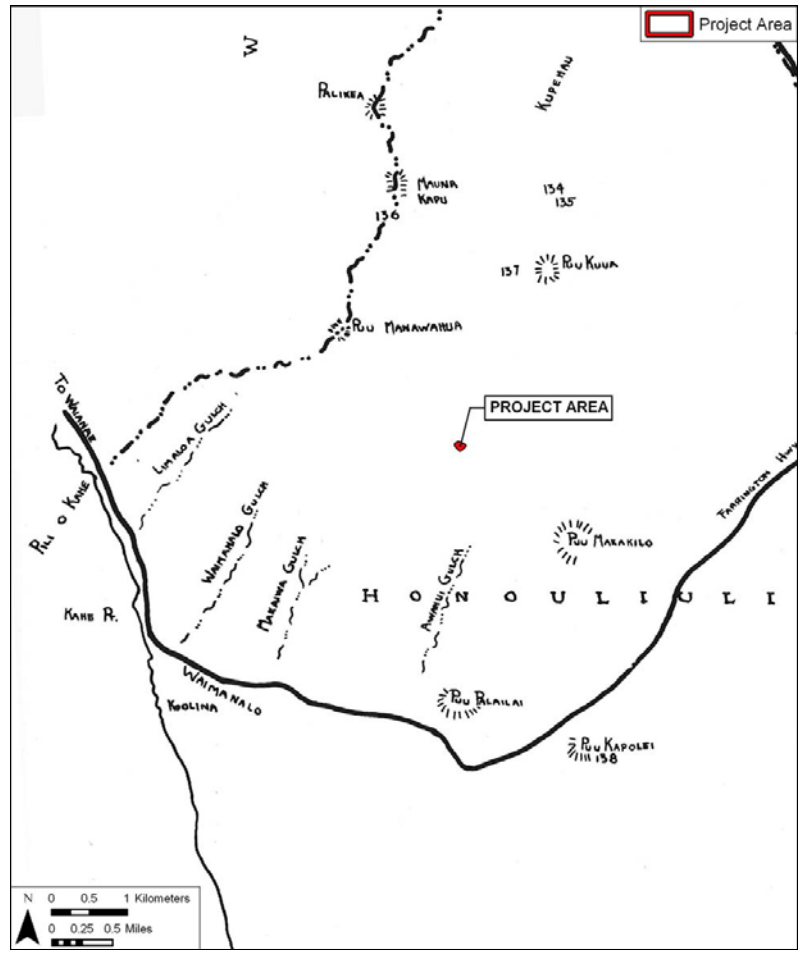

Figure 13. Portion of map by Sterling and Summers (1978), showing the location of the study area in relation to sites identified by McAllister

Table 1. Previous Archaeological Investigations in the Uplands of Honouliuli Ahupua‘a

Reference	Type of Investigation	General Location	Findings
Kelly 1959	Ku‘ula stone documentation	Along Pālehua Rd., TMK [1] 9-2-003: 002	One Ku‘ula stone documented (SIHP No. 50-80-08-2316)
Bordner 1977a	Archaeological Reconnaissance	Proposed Makaīwa Gulch Landfill Site	No archaeological sites identified
Bordner 1977b	Archaeological Reconnaissance	Proposed Kalo‘i Gulch Landfill Site	3 sites (-2600, -2601, -2602), low stacked boulder walls
Bordner and Silva 1983	Archaeological Reconnaissance and Historical Documentation	Proposed Waimānalo Gulch Landfill Site	No archaeological sites identified
Sinoto 1988	Archaeological Reconnaissance	Makakilo Golf Course	low stacked boulder wall (-1975)
Bath 1989	Petroglyph Documentation	Waimānalo Gulch	3 petroglyphs (-4110)
Hammatt et al. 1991	Archaeological Inventory Survey	Makaīwa Hills Project Site, TMK: [1] 9-1-015: 005 & 017; 9-2-003: 002, 005, and 084.	34 sites, including prehistoric habitation and agricultural features, rock shelters, petroglyphs, *ahu*, and various sugar cane cultivation infrastructure
Hammatt 1992	Archaeological Inventory Survey	KAIM Radio Tower, Pālehua, TMK [1] 9-2-005: 013	No archaeological sites identified
Nakamura et al. 1993	Archaeological Inventory Survey	Makakilo D and D-1 Development Parcels	Cement irrigation flume (-4664)
Borthwick 1997	Archaeological Assessment	Satellite Multi-Ranging Station, Pālehua, TMK: TMK: [1] 9-2-003: 002	No archaeological sites identified

Reference	Type of Investigation	General Location	Findings
Dega et al. 1998	Archaeological Inventory Survey	UH West O‘ahu, TMK: [1] 9-2-002: 001 & [1] 9-2-002: 001	Two historic site complexes, (50-80-08-5593 historic irrigation system and 50-80-09-2268 Waiāhole Ditch System)
Hammatt and Shideler 1999	Archaeological Inventory Survey and Assessment	Waimānalo Gulch Sanitary Landfill Project Site	Battery Arizona Complex and modern “shrine” site
Monahan 2004	Archaeological Inventory Survey	TMK: 9-2-03: 002	4 historic properties associated with19th or 20th century commercial agriculture identified: SIHP No. 50-80-12-4341, water flume that is a component of the previously identified site by Hammatt et al. 1991; SIHP No. 50-80-12-6654, a stone ranch wall; SIHP No. 50-80-12-6655, a pair of concrete bridge supports; and SIHP No. 50-80-12-6656, low rock walls and rock stacking.
Tulchin, J and Hammatt 2004	Archaeological Field Inspection	Proposed HECO Meteorological Observation Stations	Three small stone features identified: an *ahu*, a stone terrace, and a small C-shape.
Tulchin, T. and Hammatt 2004	Archaeological Inventory Survey	86-Acre Proposed Pālehua Community Association (PCA) Common Areas Parcels, Makakilo (TMK: 9-2-03: 78 por. and 79)	4 historic properties identified: a complex of concrete and iron structures associated with industrial rock quarry operations (Site 50-80-12-6680); three boulder mounds believed to be related to land clearing or ditch construction by the O‘ahu Sugar Co. (Site 50-80-12-6681); a small terrace believed to function as a historic water diversion feature (Site 50-80-12-6682); and a remnant portion of the Waiāhole Ditch (Site 50-80-09-2268).

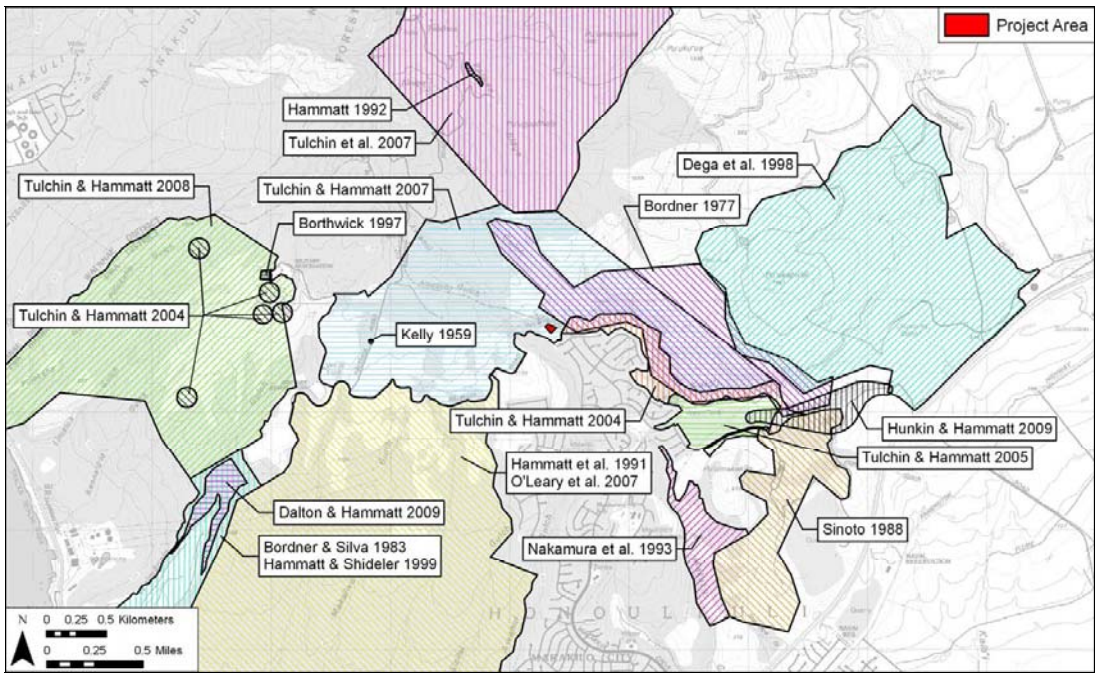

Figure 14. U.S. Geological Survey 7.5 Minute Series Topographic Map, 'Ewa (1998) and Schofield Barracks (1998) Quadrangles, showing the location of archaeological studies conducted in the vicinity of the study area

Reference	Type of Investigation	General Location	Findings
Tulchin, T. and Hammatt 2005	Archaeological Inventory Survey	71-Acre Proposed Pālehua East B Project, Makakilo, (TMK: 9-2-03: 76 and 78)	Three historic properties identified: SIHP No. 50-80-12-6666 (pre-contact agricultural alignment and mound), SIHP No. -6667 (plantation-era stacked basalt boulder walls and a ditch), and SIHP No. -6668 (single alignment of upright basalt boulders and a small, low terrace).
O'Leary et al. 2007	Archaeological Inventory Survey Addendum	Makaīwa Hills Project Site, TMK: [1] 9-1-015: 005 & 017; 9-2-003: 002, 005, and 084.	Two historic properties identified: SIHP No. 50-80-12-6870, a terrace, three springs, and a small rock shelter; SIHP No. -6871, a paved area situated on a ridge top.
Tulchin J. and Hammatt 2007	Archaeological Literature Review and Field Inspection	Approximately 790-Acre Parcel at Palehua, Honouliuli (TMK: [1] 9-2-003:002 por. and 005 por.)	Because the lands within their project area were almost exclusively used for ranching purposes from historic times until the present, much of the pre-Contact landscape remains intact and relatively undisturbed. Archaeological features representing distinct periods of land use were observed, including: pre-Contact indigenous Hawaiian habitation and associated agricultural and ceremonial features; historic ranching and related features; and historic quarrying and related features. A total of 26 archaeological sites were identified of which 22 were new identifications.

Table 2. Archaeological Sites in the Vicinity of the Project Area

SIHP No.	Description	Reference
50-80-08-2316	*Kū'ula* stone originally collapsed but moved and made upright by Mr. Philpotts	Kelly 1959; J. Tulchin & Hammatt 2007
50-80-08-5593	Historic irrigation system	Dega et al. 1998
50-80-09-2268	Historic Waiāhole Ditch System	Dega et al. 1998, T. Tulchin & Hammatt 2004
50-80-12-1975	Historic wall segment of undetermined function, constructed of stacked boulders.	Sinoto 1988
50-80-12-2600	Possible pre-Contact wall constructed of poorly stacked boulders. Undetermined function.	Bordner 1977b; J. Tulchin & Hammatt 2007
50-80-12-2601	Possible pre-Contact wall, constructed of stacked boulders, utilized as a water control feature.	Bordner 1977b; J. Tulchin & Hammatt 2007
50-80-12-2602	Possible pre-Contact wall, constructed of stacked boulders. Undetermined function.	Bordner 1977b
50-80-12-4310	Historic temporary habitation consisting of a circular enclosure constructed of stacked boulders.	Hammatt et al. 1991
50-80-12-4313	Pre-Contact agricultural feature consisting of an L-shaped terrace wall constructed of stacked boulders.	Hammatt et al. 1991
50-80-12-4316	Historic cattle wall constructed of stacked boulders.	Hammatt et al. 1991
50-80-12-4317	Pre-Contact habitation consisting of a U-shaped enclosure and platform constructed of stacked boulders.	Hammatt et al. 1991
50-80-12-4320	Historic road consisting of several wall alignments retaining an existing dirt road.	Hammatt et al. 1991
50-80-12-4332	Pre-Contact temporary habitation consisting of a circular enclosure constructed of stacked boulders.	Hammatt et al. 1991
50-80-12-4334	Pre-Contact temporary habitation consisting of a circular enclosure constructed of stacked boulders.	Hammatt et al. 1991
50-80-12-4335	Pre-Contact clearing mound constructed of piled cobbles and small boulders.	Hammatt et al. 1991
50-80-12-4336	Pre-Contact habitation consisting of a triangular enclosure constructed of stacked boulders and cobbles.	Hammatt et al. 1991
50-80-12-4337	Pre-Contact habitation consisting of a rectangular enclosure constructed of stacked boulders and cobbles.	Hammatt et al. 1991

Figure 15. U.S. Geological Survey 7.5 Minute Series Topographic Map, 'Ewa (1998) and Schofield Barracks (1998) Quadrangles, showing the location of archaeological sites identified in the vicinity of the project area

SIHP No.	Description	Reference
50-80-12-6666	Pre-contact agricultural alignment and mound.	T. Tulchin & Hammatt 2005
50-80-12-6667	Plantation-era stacked basalt boulder walls and a ditch.	T. Tulchin & Hammatt 2005
50-80-12-6668	Pre-Contact agricultural features consisting of a single alignment of upright basalt boulders and a small, low terrace.	T. Tulchin & Hammatt 2005
50-80-12-6680	Historic rock quarry (concrete and iron structures)	T. Tulchin & Hammatt 2004; J. Tulchin & Hammatt 2007
50-80-12-6681	Historic boulder mounds believed to be related to land clearing or ditch construction by the O‘ahu Sugar Co.	T. Tulchin & Hammatt 2004
50-80-12-6682	Historic terrace believed to function as a historic water diversion feature.	T. Tulchin & Hammatt 2004
50-80-12-6870	Pre-contact and historic archaeological site consisting of a terrace, three springs, and a small rock shelter utilized for animal husbandry	O’Leary et al. 2007
50-80-12-6871	Pre-contact paved area situated on a ridge top of undetermined function.	O’Leary et al. 2007
CSH 1	Ranching Wall	J. Tulchin & Hammatt 2007
CSH 2	Mounds (Possible trail markers)	J. Tulchin & Hammatt 2007
CSH 3	Large enclosure (Possible habitation or ceremonial)	J. Tulchin & Hammatt 2007
CSH 4	Pre-Contact Habitation Platform	J. Tulchin & Hammatt 2007
CSH 5	Mounds (Agriculture or possible burials)	J. Tulchin & Hammatt 2007
CSH 6	Adze (Pre-Contact Stone tool)	J. Tulchin & Hammatt 2007
CSH 7	Pre-Contact Habitation or ceremonial Platform	J. Tulchin & Hammatt 2007
CSH 8	Terraces (Possible Pre-Contact agricultural or habitation features)	J. Tulchin & Hammatt 2007
CSH 9	Pre-Contact Enclosure and two small caves	J. Tulchin & Hammatt 2007

SIHP No.	Description	Reference
CSH 10	Pre-Contact Habitation Enclosure	J. Tulchin & Hammatt 2007
CSH 11	Mound	J. Tulchin & Hammatt 2007
CSH 12	Pre-Contact Habitation or ceremonial Platform	J. Tulchin & Hammatt 2007
CSH 13	Pre-Contact Possible habitation Enclosure	J. Tulchin & Hammatt 2007
CSH 14	Pre-Contact Possible agricultural or habitation Terrace	J. Tulchin & Hammatt 2007
CSH 15	Wall remnant, hearth, and military “fox-hole” Pre-Contact and historic Pre-contact site modified by historic military activity	J. Tulchin & Hammatt 2007
CSH 16	Pre-Contact Agricultural Terrace and *hau* thicket	J. Tulchin & Hammatt 2007
CSH 17	Level soil area along ridge (Possible Pre-Contact habitation)	J. Tulchin & Hammatt 2007
CSH 18	Enclosure (post-Contact Water prospecting?)	J. Tulchin & Hammatt 2007
CSH 19	Historic Pālehua Trail	J. Tulchin & Hammatt 2007
CSH 20	Water tunnel (Post-Contact Water prospecting)	J. Tulchin & Hammatt 2007
CSH 21	Large boulder with historic petroglyphs	J. Tulchin & Hammatt 2007
CSH 22	Pre-Contact Ceremonial Enclosure with uprights	J. Tulchin & Hammatt 2007

Kalo‘i Gulch, east of the current study area, was surveyed as a potential landfill location (Bordner 1977b). The archaeological reconnaissance survey included lands within Kalo‘i Gulch and its smaller tributaries from the *makai* end of the gulch up to the 1,400 ft elevation. It was noted that lands at the base of the gulch, *makai* of a historic quarry (SIHP No. 50-80-12-6680), were extensively modified by bulldozing. In the *mauka* portion of that study area, north of the present study area, three sites, possibly prehistoric, were identified (see Figure 15). The three sites (SIHP No. 50-80-12-2600, -2601, -2602) consisted of low stacked basalt boulder walls located along the north side of the Kalo‘i Stream channel.

An archaeological inventory survey of the “Makaīwa Hills” development project, a half mile southwest of the current study area, located several traditional as well as post-contact archaeological sites (Hammatt et al. 1991). That project area included a 1,915 acre parcel in Honouliuli Ahupua‘a, located between the town of Makakilo and Waimanalo Gulch, and bounded to the south by Farrington Highway and to the north by Pālehua Road. A total of 34 historic properties were located, including prehistoric habitation structures (temporary and permanent), agricultural features (terrace and mounds), rock shelters, petroglyphs, *ahu*, and various sugar cane cultivation infrastructure.

Within the “Makaīwa Hills” project area, habitation sites were found to be clustered in higher elevations above 1000 ft., and in lower elevations below 500 ft (Hammatt et al. 1991). The higher elevations would contain ample forest subsistence resources for gathering on both a continual basis, as well as during times of famine and drought. The lower elevations would be in close proximity to the shoreline and bountiful coastal resources.

An archaeological inventory survey for the proposed UH West O‘ahu campus was conducted by Dega et al. (1998). That survey included 991 acres in the vicinity of Pu‘u Kapu‘ai. No pre-Contact Hawaiian sites were located. Their project area was noted to have undergone extensive land modification associated with commercial agriculture. Two historic site complexes (SIHP No. 50-80-08-5593: historic irrigation system, SIHP No. 50-80-09-2268: Waiāhole Ditch System) were documented (see Figure 15). Identified features included flumes, aqueducts, ditches, pumps, and other irrigation infrastructure. It was noted that the Waiāhole Ditch crossed through the project area and “exits the property to the west near Kaloi Gulch” (Dega et al. 1998:17).

T. Tulchin and Hammatt (2004) conducted an inventory survey of the approximately 86-acre proposed Pālehua Community Association (PCA) Common Areas on the northwestern side of Makakilo a half mile southeast of the current study area. Historic sites located during the inventory survey included: a complex of concrete and iron structures associated with industrial rock quarry operations (SIHP # 50-80-12-6680); three boulder mounds believed to be related to land clearing or ditch construction by the O‘ahu Sugar Co. (SIHP # 50-80-12-6681); a small terrace believed to function as an historic water diversion feature (SIHP # 50-80-12-6682); and a remnant portion of the Waiāhole Ditch (SIHP # 50-80-09-2268). No pre-Contact historic properties were identified.

J. Tulchin and Hammatt (2004) undertook a field inspection of four locations just west of the current study area. Three small stone features were identified: an *ahu*, a stone terrace, and a small C-shape. An archaeological inventory survey was recommended should any construction activities be proposed for those parcels of land.

T. Tulchin and Hammatt (2005) conducted an inventory of a 71-acre parcel located a kilometer southeast of the current study area. Three historic properties were identified: SIHP No. 50-80-12-6666, an pre-Contact agricultural alignment and mound; SIHP No. 50-80-12-6667, Plantation-era stacked basalt boulder walls and a ditch; and SIHP # 50-80-12-6668, two pre-Contact agricultural features consisting of a single alignment of upright basalt boulders and a small, low terrace.

In 2007, O’Leary conducted an addendum to the archaeological inventory survey conducted for the “Makaīwa Hills” development project, originally surveyed by Hammatt et al in 1991 (see above). Because 15 years had passed since the last archaeological inspection of that project area CSH field personnel conducted a reconnaissance of the project area to relocate the 17 historic properties. During this fieldwork two additional historic properties were identified in the *mauka*/west corner of the project area. SIHP No. 50-80-12-6870 consists of a historic ranching-era terrace constructed to create a large level soil area in front of three natural springs. The second site, SIHP # 50-80-12-6871, consists of a paved area comprised of large basalt boulders prominently positioned on a ridge top overlooking the western half of the ‘Ewa Plain, possibly functioning as a resting place, a trail marker, or possibly had a religious role. The excavation of test units at both sites did not reveal any further information regarding site function.

J. Tulchin and Hammatt (2007) conducted an Archaeological Literature Review and Field Inspection of an Approximately 790-Acre Parcel at Palehua, Honouliuli (TMK: [1] 9-2-003:002 por. and 005 por.) that included the present study area (see Figure 14). Pedestrian inspection of the study area confirmed the area to be rich in archaeological remains. Because the lands within the project area were almost exclusively used for ranching purposes from historic times until the present, much of the pre-Contact landscape remains intact and relatively undisturbed. Archaeological features representing distinct periods of land use were observed, including: pre-Contact indigenous Hawaiian habitation and associated agricultural and ceremonial features; historic ranching and related features; and historic quarrying and related features. Archaeological sites observed within their 790-Acre study area predominantly consist of pre-Contact indigenous Hawaiian habitation and associated agricultural features.

The J. Tulchin and Hammatt (2007) identified one site (their temporary site designation CSH 19) in the vicinity of the present project area described as follows:

> CSH 19 consists of the historic Pālehua Trail which runs roughly northwest by southeast through the middle of the[ir] study area. The trail is approximately 3 m wide and is cut into the slope of the hill side. A stacked basalt boulder retaining wall has been constructed along the down slope edge of the trail. Currently the trail is overgrown with exotic grasses.
>
> CSH 19 is in fair condition, and has a probable age of historic. The site functioned as a transportation route. (Tulchin and Hammatt (2007:75)

3.4 Background Summary and Predictive Model

Historical background research of Honouliuli Ahupua‘a indicated that pre-Contact settlement of the *ahupua‘a* would have been centered around the rich cultivated lands of Honouliuli ‘Ili for extensive wetland taro cultivation and abundant coastal resources. The extensive limestone plain would also include recurrent use habitations for fishermen and gatherers, and sometimes gardeners. The upland dry forest areas would be used for hunting and gathering of forest resources, but likely not for widespread permanent settlement. In the intermediate area between the limestone plain and the upland forests, in the vicinity of the current study area, indigenous Hawaiian activities would have been limited to dry land agriculture within gulches or near springs, and *mauka*/*makai* transportation routes (i.e. trails) and associated temporary shelters.

Within the “Makaīwa Hills” project area, located to the southwest of the current study area, pre-Contact habitation sites were found to be clustered in higher elevations above 1000 ft., and in lower elevations below 500 ft (Hammatt et al. 1991). The higher elevations, similar to the elevation of the current study area, would contain ample forest subsistence resources for gathering on both a continual basis, as well as during times of famine and drought.

In Von Holt’s (1985) accounts of discovering spring water near the present study area, it is noted that Kalo‘i had “been a place of which the Hawaiians had known” and the area “had been quite heavily populated before the smallpox epidemic of 1840” (Von Holt 1985:138-140).

By 1920, the lands of Honouliuli were used primarily for commercial sugar cane cultivation and ranching (Frierson 1972:18). Much of the *mauka* lands in western Honouliuli, including ridges and deep gulches, were unsuitable for commercial sugar cultivation and remained pasture land for grazing livestock. Historic maps indicate a general lack of any significant development within the vicinity of the present project area into the 1940s suggesting that the lands were unsuitable for commercial sugar cane cultivation and were utilized as pasture land for grazing livestock. Modest constructions in the vicinity included Pālehua Road, allowing access to the uplands of western Honouliuli, as well as plantation irrigation infrastructure. Of note is the presence of a trail running roughly northwest by southeast through the middle of the study area leading to tunnels and a tank well upslope of the project area. This trail is likely the Pālehua Trail along which Von Holt located and tapped various springs to supply water to his herds of cattle. The tunnels located along the northern end of this trail are likely water tunnels excavated into the hillside in order to secure water.

Previous archaeological research in the vicinity of the study area has identified numerous pre-Contact sites including: habitation structures (temporary and permanent) and agricultural features (terrace and mounds). Of particular interest are three pre-Contact sites (SIHP No. -2600, -2601, & -2602) located within Kalo‘i Gulch. All three sites were determined to related to erosion control and water management and suggest that in the past water was fairly abundant within the study area. This coincides with Von Holt’s (1985) accounts of discovering spring water and that Kalo‘i had “been a place of which the Hawaiians had known”.

Historic archaeological sites identified in the vicinity of the study area include Plantation Era infrastructure (ditches, flumes, clearing mounds, etc.) related to the ‘Ewa Plantation Co. and O‘ahu Sugar Co., walls and fences attributed to the Campbell Ranch, and industrial quarry infrastructure (rock crusher, concrete platforms and structures, etc.).

Based on background research expected finds in the vicinity of the project area are likely to include both pre-Contact and historic archaeological sites. Pre-Contact archaeological sites may include: dry land agricultural sites, including planting mounds and terraces in the vicinity of springs or drainage gulches; habitation sites, including enclosures and platforms; trail markers (*ahu)*; religious sites (*heiau*), including enclosures, terraces, platforms, and/or upright stones located on prominent hills or other significant locations. Historic archaeological sites may include: ranch related structures, including walls, fences, maintained springs, and water tunnels; irrigation infrastructure, including ditches and flumes related to the ‘Ewa Plantation Co. and O‘ahu Sugar Co.; or industrial quarry infrastructure.

Section 4 Results of Fieldwork

4.1 Results of Fieldwork With-in the Project Area Per Se

A 100 percent pedestrian inspection of the project area’s surface confirmed that there were no surface historic properties within the project area (Figure 16 & Figure 17). The project area (Figure 18 to Figure 21) is a relatively open savannah-like landscape of short exotic grasses with scattered *kiawe* (*Prosopis pallida*) trees, and *koa haole (Leucaena glauca)*, *klu* (*Acacia farnesiana*), and *‘uhaloa* (*Waltheria americana*) brush. Ground visibility was generally very good to excellent. Particular attention was directed toward any areas of exposed rocks including in particular an area of the “Mahana-Badland complex” present in the northeast portion of the project area (Figure 21).

No indications of traditional Hawaiian occupation were observed. Remnants of ranching infrastructure were observed including fences (Figure 22 to Figure 24) and a remnant of a former water storage tank (Figure 25).

Some of the ranching infrastructure appears quite new (see Figure 23). Some of the ranching infrastructure appears to be a mixture of older and newer fence posts (see Figure 24) with what appears to be adaptive re-use of older fence posts through re-location. Some of the ranching infrastructure appears to be in remnant condition lacking integrity of function. None of the ranching infrastructure seems likely to be pre-twentieth century and while some of the posts were certainly quite weathered it is not clear they are more than fifty years old. With the uncertainty regarding the antiquity of the ranching infrastructure and the apparent lack of integrity, and given that the assemblage observed represents a very, very small portion of the ranching infrastructure believed to be present in the southern Wai‘anae Range it was thought to be inappropriate to give a formal site designation.

The piece of steel in the study area believed to have been part of a former water tank associated primarily with ranching (Figure 25). Given the lack of geographic context and remnant nature of this out-of-context fragment of water tank no formal site designation was deemed appropriate.

4.2 Pālehua Trail

Topographic maps from 1918 (see Figure 9), 1928 (see Figure 10), and 1943 (see Figure 11) indicate the presence of a trail running roughly northwest by southeast through the middle of the project area. This trail is shown to lead towards “tunnels” and a “tank” situated along the western side of Kalo‘i Gulch, located approximately 1 km northwest of the project area. This trail is likely the Pālehua Trail along which Harry Von Holt located and tapped various springs in early 1890’s to supply water to his herds of cattle (Von Holt 1985).

The current investigation identified a 794 m long segment of what is believed to be the historic Pālehua Trail. This trail segment is located approximately 465 m northwest of the project area (Figure 26 and Figure 27). The identified trail segment is approximately 1 to 3 m wide and consists of a cut into the slope of the hillside on the southwest side of Kalo‘i Gulch. The down

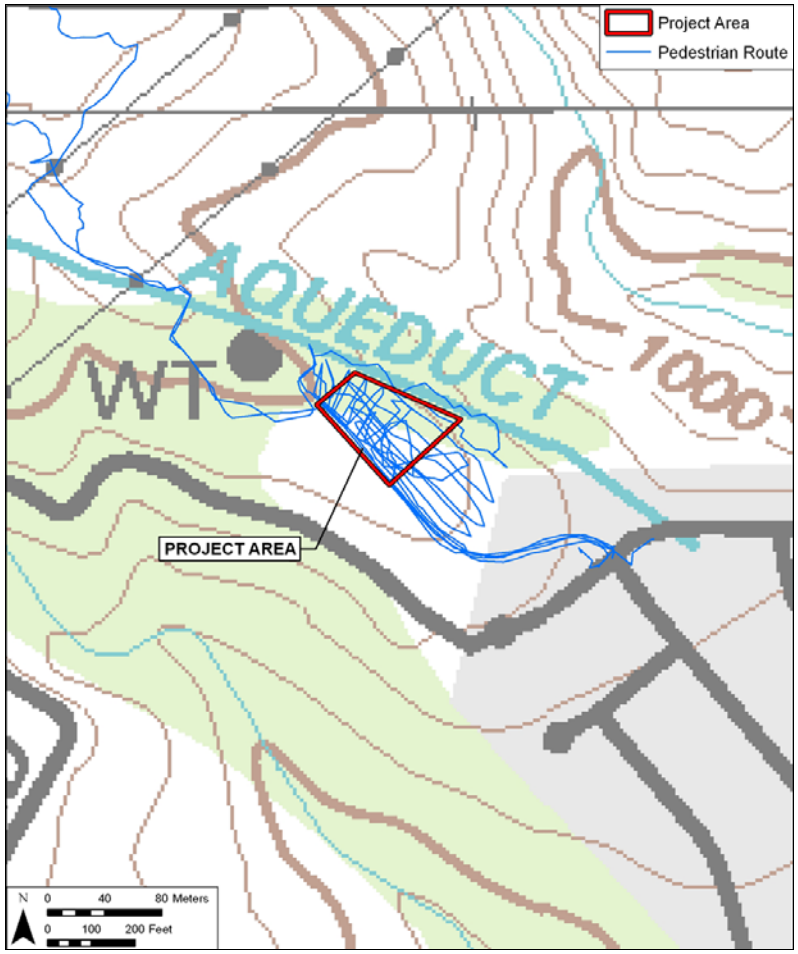

Figure 16. Pedestrian survey route overlay on U.S. Geological Survey map with project area

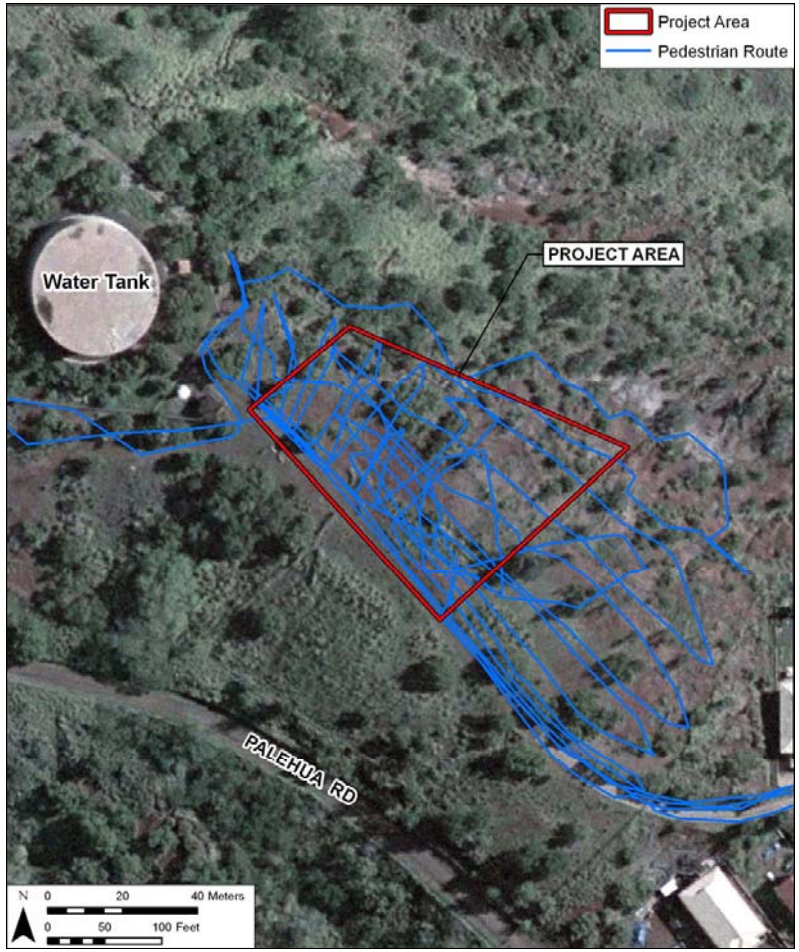

Figure 17. Pedestrian survey route overlay on aerial photograph with project area

Figure 18. General view of north portion of project area from northeast corner, view to southwest (paved water tank access road in background)

Figure 19. General view of north portion of project area from northeast corner, view to southeast (edge of Kalo‘i Gulch at left)

Figure 20. General view of the central portion of project area, view to northwest (paved water tank access road at left, water tank at upper left)

Figure 21. General view of soils of the Mahana-Badland complex in the east corner of the project area

Figure 22. General view of ranching fence infrastructure in north portion of project area, view to east, Kalo‘i Gulch in background)

Figure 23. General view of ranching fence infrastructure showing modern placement of boulders to support barbed wire fence

Figure 24. General view of ranching fence infrastructure in central portion of project area (water tank at upper left), view to northwest

Figure 25. Portion of former water storage tank

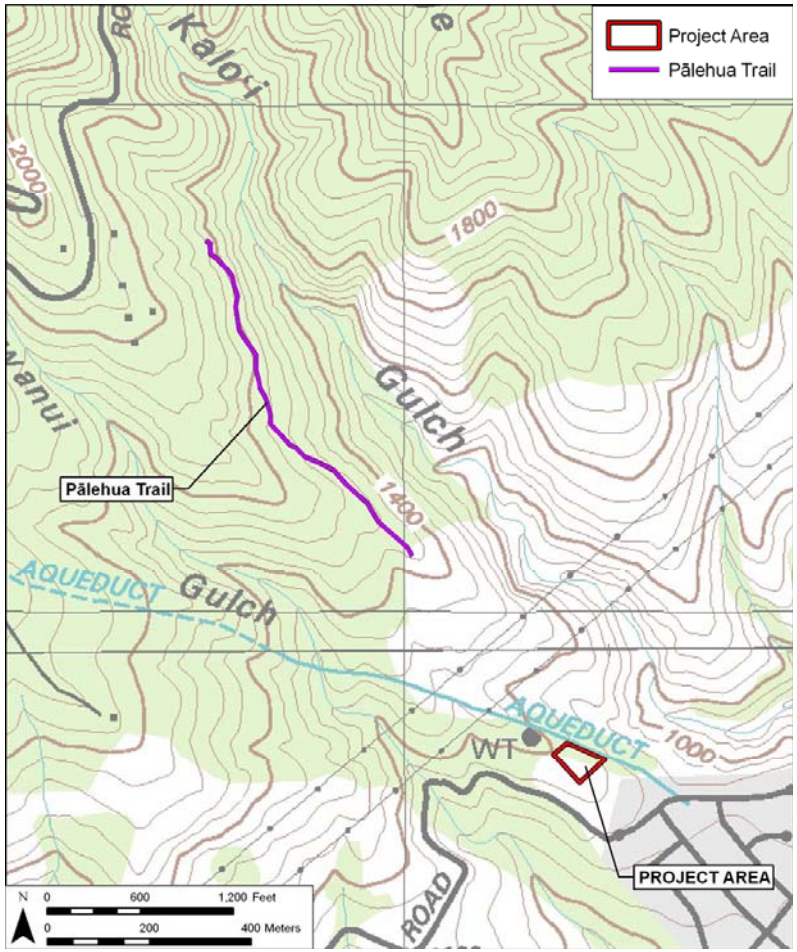

Figure 26. U.S. Geological Survey 7.5 Minute Series Topographic Map, ‘Ewa (1998) and Schofield Barracks (1998) Quadrangles, showing the location of Pālehua Trail in relation to the project area

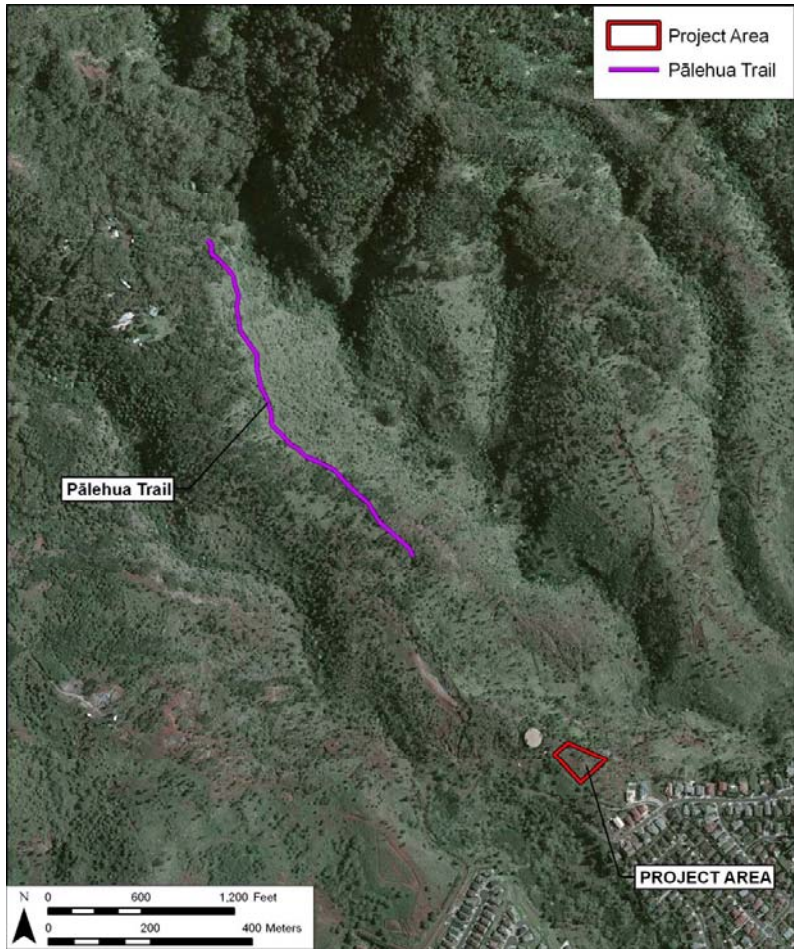

Figure 27. Aerial Photograph, showing the location Pālehua Trail in relation to the project area (source: Google Earth 2011)

slope edge of the trail is effectively terraced with an alignment of basalt boulders one to three courses high, abutting the down slope edge of the trail (Figure 28). These modifications serve to delineate the trail's path and act as a retaining wall, stabilizing the down slope edge of the trail.

Once the trail stops running cross-slope and begins to head down the summit of the ridgeline, formal trail modifications (i.e., soil cuts, stone curbing, retaining walls, etc.) begin to become sparse until they disappear completely. There is no clear indication on the ground of the trail within 450 m of the present project area. The trail may always have been minimally demarcated on the lower portion of the ridge and appears likely to have been cut by construction of a rough road servicing power poles, the construction of the large reservoir just upslope and perhaps by pasturage improvements as well.

There is no trace of the Pālehua Trail within or in the immediate vicinity of the project area due to extensive land modifications associated with power line installations, Board of Water Supply infrastructure (i.e., water tank, roads, etc.), and ranching.

A pipeline or aqueduct is noted on a 1953 U.S. Geological Survey map (see Figure 12) and subsequent maps (see Figure 26). A PVC water pipe line on modern supports was observed upslope to the northwest of the project area (Figure 29) but no evidence of former pipelines was observed in the present project area.

No archaeological features were observed or are believed to be present in the vicinity of the proposed fire dip tank and this proposed development is concluded to have "no affect" on cultural resources.

Figure 28. Photograph of the down slope edge of Pālehua Trail, view to west

Figure 29. View of pipeline

Section 5 Project Effect and Mitigation Recommendations

5.1 Project Effect

Based on the current investigation, there are no historic properties within the project's APE. This corroborates the results of a prior study by Cultural Surveys Hawai‘i (Tulchin and Hammatt 2004) that appears to have included the present project area (see Figure 17) that identified no historic properties (other than the historic Pālehua Trail which runs through Awanui Gulch and is cut into the slope of the hill side). Accordingly CSH recommends a project-specific effect determination of "no historic properties affected."

5.2 Mitigation

No further historic preservation work is recommended for the proposed fire dip tank project at the indicated Pālehua, Honouliuli location.

It is recommended that, where commensurate with the proposed construction that the modest existing ranching infrastructure and aqueduct section be left where they are as part of the legacy of land-use.

As always, in the unlikely event that previously unidentified subsurface historic properties are encountered by project construction, the project proponents should immediately stop work in the vicinity and contact SHPD's O‘ahu Office [Tel. (808) 692-8015].

5.3 Disposition of Materials

No cultural materials (midden, artifacts, etc.) were observed or collected during the fieldwork effort for this project.

Section 6 References Cited

Anonymous

1992 Training Areas and Camps: 1942 to 1945. Environment Hawai‘i, Inc. (Accessed 4/29/2004) http://www.environment-hawaii.org/892map.htm

Barrera, William M., Jr.

1975 *A Report on the Archaeological Reconnaissance Survey of the Proposed Barbers Point Harbor Area, TMK:9-1-14*, Prepared for U.S. Army Corps of Engineers, Pacific Ocean Division by BPBM Department of Anthropology, Honolulu, HI.

Bath, Joyce

1989 *Waimanalo Gulch Petroglyphs*, SHPD, DLNR, State of Hawaii, Honolulu, HI.

Bordner, Richard M.

1977a Archaeological Reconnaissance of the Proposed Makaiwa Gulch Landfill Site, ‘Ewa, O‘ahu, Archaeological Research Center Hawai‘i, Inc.

1977b Archaeological Reconnaissance of the Proposed Kaloì Gulch Landfill Site, ‘Ewa, O‘ahu Island, Archaeological Research Center Hawai‘i, Inc.

Bordner, Richard M. and Carol Silva

1983 Archaeological Reconnaissance and Historical Documentation: Waimanalo Gulch, Oahu, TMK:9-2-03:2,40,13 (por).

Borthwick, Douglas

1997 Archaeological Assessment for the proposed Ministry of Transportation Satellite Multi-Ranging Station (MTSAT-MRS) project site, Palehua, Honouliuli, Ewa, Oahu Island, Hawaii (TMK 9-2-3: por 2), Cultural Surveys Hawai‘i, Kailua, HI.

Bouthillier, Katie

1995 *"Artillery Batteries of Oahu"* in Hawaii Pacific Architecture, April 1995, pp.10-12.

Charvet-Pond, Ann and Bertel D. Davis

1992 West Beach Data Recovery Program Phase 4, Archaeology and Paleontological Excavations, PHRI Hilo

Condé, Jesse C. and Gerald M. Best

1973 Sugar Trains, Narrow Gauge Rails of Hawaii, Glenwood Publishers, Felton, CA.

Cordy, Ross

2002 *Rise and Fall of the O'ahu Kingdom*, Mutual Publishing, Honolulu, HI

Davis, Bertel D. and P. Bion Griffin (eds.)

1978 "Interim Report I: Present Environment and Archaeological Survey of the Proposed Deep-Draft Harbor Area, Honouliuli, ‘Ewa, O‘ahu, Hawaii," in *Studies in Natural History and Human Settlement at Barbers Point, O‘ahu*, Prepared for U.S. Army Corps of Engineers by Archaeological Research Center Hawaii (ARCH), Lawai, Kauai, HI.

Davis, Bertell D. and Alan E. Haun
1987 Phase 2. Intensive Survey and Test Excavations, West Beach Data Recovery Program, West Beach Resort, Honouliuli, Ewa, Island of Oahu, PHRI Inc., Hilo, HI.

Davis, Bertell D., Alan E. Haun and Paul H. Rosendahl
1986a Phase 1. Research Design for Intensive Survey and Test Excavations, West Beach Data Recovery Program, West Beach Resort, Honouliuli, ‘Ewa, O‘ahu, PHRI, Hilo, HI

1986b Phase 3. Data Recovery Plan for Archaeological and Paleontological Excavations, West Beach Data Recovery Program, West Beach Resort, Honouliuli, 'Ewa, O'ahu, PHRI, Hilo, HI.

Dega, Michael F., Randy Ogg, Michael T. Carson, and Leina‘ala Benson
1998 An Archaeological Inventory Survey of the University of Hawai‘i West O‘ahu Campus, District of ‘Ewa, Island of O‘ahu, Hawai‘i (TMK 9-2-02:01, 9-2-02:03, 9-2-02:05), Scientific Consultant Services, Honolulu, HI.

Dicks, A. Merrill, Alan E. Haun and Paul H. Rosendahl
1987 Archaeological Reconnaissance Survey for Environmental Impact Statement, West Loch Estates Golf Course and Parks, Honouliuli, ‘Ewa, O‘ahu, Paul H. Rosendahl, Ph.D., Inc.

Emerson, Nathaniel B.
1915 *Pele and Hi‘iaka*, Copyright 1993 by ‘Ai Pōhaku Press, Honolulu, HI.

Foote, Donald E., E.L. Hill, S. Nakamura and F. Stephens
1972 *Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii*, U.S. Dept. of Agriculture, U.S. Government Printing Office, Washington, D.C.

Fornander, Abraham
1916 *Fornander Collection of Hawaiian Antiquities and Folk-Lore*, with translations edited and illustrated with notes by Thomas G. Thrum, Volume 4, First series, 1916 - l917 notes by Thomas G. Thrum, Memoirs of the Bernice P. Bishop Museum, Vols. 4, 5, 6, Honolulu, HI.

Frierson, Barbara
1972 *A Study of Land Use and Vegetation Change: Honouliuli, 1790-1925*, Manuscript prepared for Graduate Seminar in Geography (750), University of Hawaii, Honolulu.

Giambelluca, Thomas W., Michael A. Nullet and Thomas A. Schroeder
1986 *Rainfall Atlas of Hawai‘i*, Department of Land and Natural Resources, Honolulu, HI.

Hammatt, Hallett H.
1992 Archaeological Inventory Survey of Proposed K-A-I-M Radio Tower, Palikea, Honouliuli, ‘Ewa, O‘ahu (TMK 9-2-005:013 Portion), Cultural Surveys Hawai‘i, Kailua, HI.

Hammatt, Hallett H. and William H. Folk
1981 Archaeological and Paleontological Investigation at Kalaeloa (Barber's Point), Honouliuli, ‘Ewa, O‘ahu, Federal Study Areas 1a and 1b, and State of Hawai'i Optional Area 1, ARCH 14-115.

Hammatt, Hallett H., Jennifer Robins, Mark Stride and Matthew McDermott
1991 An Archaeological Inventory Survey for the Makaiwa Hills Project Site, Honouliuli, ‘Ewa, O‘ahu, Cultural Surveys Hawaii, Kailua.

Hammatt, Hallett H. and David W. Shideler
1999 An Archaeological Inventory Survey and Assessment for the Waimanalo Gulch Sanitary Landfill Project Site, Honouliuli, `Ewa, O`ahu, Draft, Cultural Surveys Hawaii, Kailua, HI.

Handy, E.S. Craighill and Elizabeth G. Handy
1972 Native Planters in Old Hawaii: Their Life, Lore, and Environment, Bishop Museum Bulletin 233, Honolulu.

Haun, Alan E. and Marion Kelly
1984 Research Design for an Archaeological Survey of Naval Communication Area Radio Transmission Facility, Lualualei; and Naval Air Station, Barbers Point, Oahu, Hawaii, Dept. of Anthropology, Bishop Museum, Honolulu.

‘Ī‘ī, John Papa
1959 *Fragments of Hawaiian History*, Revised, Bishop Museum Press, Honolulu, HI.

Kahiolo, G. W.
1978 *He Moolelo No Kamapuaa, The Story of Kamapuaa*, translated by Esther T. Mookini and Erin C. Neizmen with the assistance of David Tom, Hawaiian Studies Program, University of Hawaii, Mānoa, HI. (see Also Ka Leo O Ka Lāhui)

Kamakau, Samuel M.
1961 *Ruling Chiefs of Hawaii*, The Kamehameha Schools Press, Honolulu, HI. (2 vols.).

1976 *The Works of the People of Old, Na Hana a ka Po‘e Kahiko*, Bishop Museum Special Publication, No. 61, Honolulu, HI.

Kelly, Marion
1959 Palehua Ku`ula Stone, `Ewa, O`ahu. B.P. Bishop Museum, Honolulu, HI.

1991 “Notes on the History of Honouliuli,” IN: *An Archaeological Survey of the Naval Air Station, Barber's Point, O`ahu, Hawai`i*, B.P. Bishop Museum, Honolulu, HI.

Kirchner, D.P. and E. R. Lewis
1967 *“The Oahu Turrets*” in The Military Engineer, Nov.-Dec. 1967, pp.430-433.

Maly, Kepa and Paul H. Rosendahl
1993 ‘Ewa Marine Community Project, Memorandum of Agreement, Items 2.a,b Compliance Plans, Land of Honouliuli, `Ewa District, Island of Oahu (TMK 9-1-001-001,2,3,4,5,6,7; 9-1-012:2,3,5-17,23), PHRI, Hilo, HI.

McAllister, J. Gilbert
1933 *Archaeology of Oahu*. Bulletin 104. Bishop Museum: Honolulu.

McDermott, Matthew, David Shideler, John Winieski and Hallett H. Hammatt
2000 Archaeological Data Recovery Report for the Archaeological sites in the Proposed Barber's Point Harbor Expansion Area, Kalaeloa, Ahupua`a of Honouliuli, District of `Ewa, Island of O`ahu (TMK 9-1-14:2), Cultural Surveys Hawaii, Kailua, HI.

Monahan, Christopher M.
2004 Archaeological Inventory Survey of 2 Acres of Land Located in the Ahupua‘a of Honouliuli, District of ‘Ewa, O‘ahu Island, Hawai‘i {TMK: 9-1-015: Portion of 005 and TMK 9-2-03: Portion of 002] Scientific Consultant Services.

Nakamura, Barry S., Jeffery Pantaleo, and Aki Sinoto
1993 Archaeological Inventory Survey of Proposed Development Parcels D and D-1 Makakilo, Honouliuli, ‘Ewa, O‘ahu Island (TMK 9-2-3:18 por.; 75 por.; 81 por.), Aki Sinoto Consulting, Honolulu, HI.

Nakuina, Emma M.
1904 Hawaii - Its People and Their Legends, Honolulu, HI.

Nakuina, Moses K.
1992 The Wind Gourd of La‘amaomao, The Hawaiian Story of Pāka‘a and Kūapāka‘a, Personal Attendants of Keawenuia‘umi, Ruling Chief of Hawaii and Descendants of La‘amaomao, Collected, edited, and expanded by Moses K. Nakuina, translated by Esther T. Mookini and Sarah Nākoa, Kalamakū Press, Honolulu, HI.

O'Leary, Owen, David Shideler, and Hallett Hammett
2007 Archaeological Inventory Survey Addendum for the Makaīwa Hills Project, Honouliuli Ahupua‘a, ‘Ewa District, O‘ahu, TMK: [1] 9-1-015:005 por. and 017; 9-2-003:002 por., 005 por., and 084 por. Cultural Surveys Hawai‘i, Kailua, HI.

Payette, Pete
2003 American Forts: Hawai‘i (Accessed 4/29/2004)
http://www.geocities.com/naforts/hi.html

Pukui, Mary Kawena
1983 *‘Ōlelo No‘eau: Hawaiian Proverbs and Poetical Sayings*, Bishop Museum Special Publication No.71, Bishop Museum Press, Honolulu, HI.

Pukui, Mary K., Samuel H. Elbert and Esther Mookini
1974 *Place Names of Hawaii*, University of Hawaii Press, Honolulu, HI.

Schmitt, Robert C.
1973 *The Missionary Censuses of Hawaii*, Pacific Anthropological Records, 20, Honolulu.

Sinoto, Aki
1988 Surface Survey of the Proposed Makakilo Golf Course, ‘Ewa, O‘ahu, Bishop Museum, Honolulu, HI.

Sterling, Elspeth P. and Catherine C. Summers (comp.)
1978 *Sites of O`ahu*, Dept. of Anthropology, B.P. Bishop Museum, Honolulu.

Thrum, Thomas G.
1886 *"Honouliuli Ranch".* Hawaiian Almanac and Annual. Honolulu: T. G. Thrum.
1906 "Heiaus and Heiau Sites Throughout the Hawaiian Islands, in Thos. G. Thrum, compiler, *Hawaiian Almanac and Annual* for 1907, pp. 38-47, Honolulu, HI.
1907 *Hawaiian Folk Tales*, A Collection of Native Legends A.C. McClurg & Co., Chicago, IL.
1923 *More Hawaiian Folk Ta*les, A.C. McClurg & Co., Chicago, IL.

Tuggle, H. David and M.J. Tomonari-Tuggle
1997 Synthesis of Cultural Resource Studies of the `Ewa Plain, Task 1a: Archaeological Research Services for the Proposed Cleanup, Disposal and Reuse of Naval Air Station Barbers Point, O'ahu, Hawai`i, IARII, Honolulu, HI.

Tulchin, Jon and Hallett H. Hammatt
2004 Archaeological Field Inspection for the Proposed HECO Meteorological Observation Stations, Honouliuli Ahupua‘a, ‘Ewa District, Island Of O‘ahu. Cultural Surveys Hawai‘i, Kailua
2007 Archaeological Literature Review and Field Inspection of an Approximately 790-Acre Parcel at Palehua, Honouliuli Ahupua‘a, ‘Ewa District, Island of O‘ahu (TMK: [1] 9-2-003:002 por. and 005 por.) Cultural Surveys Hawai‘i, Kailua

Tulchin, Todd and Hallett H. Hammatt
2005 Archaeological Inventory Survey of the Approximately 71-Acre Proposed Pālehua East B Project, Makakilo, Honouliuli Ahupua‘a, ‘Ewa District, Island Of O‘ahu (TMK: 9-2-03: 76 and 78), Cultural Surveys Hawai‘i, Kailua
2004 Archaeological Inventory Survey Of The Approximately 86-Acre Proposed Pālehua Community Association (PCA) Common Areas Parcels, Makakilo, Honouliuli Ahupua‘a, ‘Ewa District, Island Of O‘ahu (TMK: 9-2-03: 78 por. and 79), Cultural Surveys Hawai‘i, Kailua, HI.

Von Holt, Ida Elizabeth Knudsen
1985 *Stories of Long Ago Niihau, Kauai, Oahu*, Daughters of Hawaii, Honolulu, HI.

Appendix D

Office of Conservation and Coastal Lands
Determination Letter, OA-11-121, December 1, 2010

101107

WR/IT

LINDA LINGLE
GOVERNOR OF HAWAII

RECEIVED
BOARD OF WATER SUPPLY
2010 DEC -2 P 1:27

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

PAUL J. CONRY
ACTING FIRST DEPUTY

LENORE N. OHYE
ACTING DEPUTY DIRECTOR - WATER

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

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

REF:OCCL:AB

Correspondence: OA-11-121

DEC - 1 2010

Wayne Hashiro
Board of Water Supply
City & County of Honolulu
630 South Beretania Street
Honolulu, Hawai'i 96843

SUBJECT: Proposed Wildland Fire Fighting Dip Tank Project, Located at the Makaha 242 Reservoirs, Booster No. 1 and Shaft Site, Makaha, O'ahu, TMK: (1) 8-4-002:011

Dear Mr. Hashiro:

The Department of Land and Natural Resources (DLNR) Office of Conservation and Coastal Lands (OCCL) has reviewed the information you provided regarding the proposed Wildland Fire Fighting Dip Tank Project, located at the Makaha 242 Reservoirs, Booster No. 1 and Shaft Site, Makaha, O'ahu, TMK: (1) 8-4-002:011.

According to your information, the Board of Water Supply is proposing to install 3,000-gallon portable buoy water tanks for Honolulu Fire Department helicopter use in fighting wildland fires. The site will consist of a 20' x 20' grassed, asphalt, or concrete pad and a 190-foot access road adjacent to an existing booster pump building. A water connection will be installed for filling the tank.

ANALYSIS:

According to OCCL records, the project site is located in the State Conservation District, Resource subzone. There is an existing Conservation District Use Permit (CDUP) OA-2839, approved on May 9, 1997, for a storage tank and transmission lines.

The proposed project of a 20' x 20' pad and access road is an identified land use in the Conservation District pursuant to Hawai'i Administrative Rules (HAR) §13-5-24 Identified Land Uses in the Limited Subzone, L-7, STRUCTURES, ACCESSORY, (B-1) *Construction or placement of structures accessory to an existing structure, building, or facility under an existing conservation district use permit. Accessory uses shall be allowed only if they are consistent with the purpose of the conservation district.* **This action would require a Site Plan Approval (SPA).**

A SPA application submitted to our office should include site plan that includes construction, grading, site restoration, and landscaping, if applicable, in addition to existing site photographs and a statement describing the project in detail. The SPA application fee is $50.00 and a check or money order should be made out to the State of Hawai'i and included with the application.

Should you have any questions regarding this correspondence, please contact the OCCL at 587-0377.

Sincerely,

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

c: Chairperson
ODLO/CWRM/DOFAW
DPP

Appendix E

Pre-Assessment Consultation Letters

PRE-ASSESSMENT COMMENT LETTERS

Agency/Organization/Individual	Date of Comment
Federal	
U.S. Army Corps of Engineers	
U.S. Fish and Wildlife Service	May 6, 2011
State	
Department of Agricultural	
Department of Business, Economic Development and Tourism	
Department of Hawaiian Home Lands	April 21, 2011
Department of Health Environmental Planning Office	 April 15, 2011
Department of Land and Natural Resources (DLNR) Division of Forestry & Wildlife Land Division, Oahu District Office of Conservation & Coastal Lands	 April 27, 2011 April 27, 2011 April 27, 2011
State Historic Preservation Division (SHPD)	
Department of Transportation	May 24, 2011
Office of Hawaiian Affairs	April 26, 2011
City & County of Honolulu	
Department of Planning and Permitting	
Department of Transportation Services	April 20, 2011
Fire Department	April 25, 2011
Police Department	April 18, 2011
Makakilo/Kapolei Neighborhood Board No. 34	
Waianae Neighborhood Board No. 24	
Elected Officials	
Representative Jo Jordan	
Representative Karen L. Awana	
Representative Sharon E. Har	
Senator Maile S.L. Shimabukuro	
Senator Mike Gabbard	
Councilmember Nestor Garcia	
Councilmember Tom Berg	
Other	
Verizon Hawaii	
Hawaiian Electric Company, Inc.	
Hawaiian Telcom	
Edmund C. Olson Trust	
Makaha Valley Towers	
Makaha Valley Plantation	
Makaha Resort and Golf Club	No date. Received on April 19, 2011
Shad Kane	April 24, 2011

TF

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

TAKE PRIDE IN AMERICA

In Reply Refer To:
2011-TA-0243

MAY 0 6 2011

RECEIVED
MAY 1 0 2011
WILSON OKAMOTO CORPORATION

Ms. Tracy Fukuda
Wilson Okamoto Corporation
1907 South Beretania Street, Suite 400
Honolulu, Hawaii 96826

Subject: Technical Assistance on the Pre-Draft Environmental Assessment for the Wildland Fire Fighting Portable Dip Tank Project, Oahu

Dear Ms. Fukuda:

Thank you for your letter dated May 3, 2011, offering the U.S. Fish and Wildlife Service an opportunity to comment on your proposed project. The City and County of Honolulu, Board of Water Supply, is proposing to develop three portable dip tank sites for use by the Honolulu Fire Department. The portable tanks would be located in Makaha, Lualualei and Makakilo on Oahu. Helicopters can fill hanging buckets with water from the tanks in order to fight wildland fires.

We have reviewed the information you provided and pertinent information in our files, including data compiled by the Hawaii Biodiversity and Mapping Program and the Hawaii GAP Program. There are no threatened or endangered species or critical habitat in or near the proposed project locations.

We hope this information assists you in the development of your Draft Environmental Assessment. If you have questions regarding this response, please contact Jodi Charrier, Fish and Wildlife Biologist, (phone: 808-792-9400, email: jodi_charrier@fws.gov).

Sincerely,

for Loyal Mehrhoff
Field Supervisor

WILSON OKAMOTO CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS

1907 South Beretania Street
Artesian Plaza, Suite 400
Honolulu, Hawaii, 96826 USA
Phone: 808-946-2277
FAX: 808-946-2253
www.wilsonokamoto.com

7978-01
September 12, 2011

Dr. Loyal Mehrhoff, Field Supervisor
Fish and Wildlife Service
United States Department of the Interior
300 Ala Moana Boulevard, Room 3-122
Honolulu, HI 96850

Attention: Ms. Jodi Charrier

Subject: Draft Environmental Assessment (EA) Pre-Assessment Consultation
Wildland Fire Fighting Portable Dip Tank Project
Tax Map Key: Various Parcels
Makaha, Lualualei, and Makakilo, Oahu, Hawaii

Dear Dr. Mehrhoff:

Thank you for your letter dated May 6, 2011 (2011-TA-0243) on the Draft EA Pre-Assessment Consultation. We acknowledge that there are no threatened or endangered species or critical habitat in or near the proposed project locations.

Your comment, along with this response, will be included in the forthcoming Draft EA. Should you have any questions, please contact me at 947-2277. We appreciate your participation in the environmental review process.

Sincerely,

Tracy Fukuda
Project Manager

cc: Mr. Rian Adachi, BWS

NEIL ABERCROMBIE
GOVERNOR
STATE OF HAWAI'I

ALBERT "ALAPAKI" NAHALE-A
CHAIRMAN
HAWAIIAN HOMES COMMISSION

ROBERT J. HALL
DEPUTY TO THE CHAIRMAN

STATE OF HAWAI'I
DEPARTMENT OF HAWAIIAN HOME LANDS
P.O. BOX 1879
HONOLULU, HAWAI'I 96805

April 21, 2011

RECEIVED
APR 29 2011
WILSON OKAMOTO CORPORATION

Ms. Tracy Fukuda
Project Manager
Wilson Okamoto Corporation
1907 South Beretania Street, Suite 400
Honolulu, Hawaii 96826

Aloha Ms. Fukuda:

Subject: ENVIRONMENTAL ASSESSMENT, PRE-ASSESSMENT CONSULTATION, WILDLAND FIRE FIGHTING PORTABLE DIP TANK PROJECT, MAKAHA, LUALUALEI, AND MAKAKILO, OAHU, HAWAII

Thank you for the opportunity to review and provide comments on the subject matter. The Department of Hawaiian Home Lands is a major landowner in Waianae, Lualualei, and Nanakuli. We are reviewing the potential for a joint development with the Kamehameha Schools in Makaha. The proposed Dip Tank Project will provide much-needed support for the Honolulu Fire Department and other agencies involved in fighting wildland fires in this area.

The positive environmental impacts are substantial to protect residential and farming communities, conservation and endangered species habitat, and cultural resources along the Waianae Coast.

If you have any questions, please call our Planning Office at 620-9519.

Me ke aloha,

Albert "Alapaki" Nahale-a, Chairman
Department of Hawaiian Home Lands

WILSON OKAMOTO
CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS

1907 South Beretania Street
Artesian Plaza, Suite 400
Honolulu, Hawaii, 96826 USA
Phone: 808-946-2277
FAX: 808-946-2253
www.wilsonokamoto.com

7978-01
September 12, 2011

Mr. Alapaki Nahale-a, Chairman
State of Hawaii
Department of Hawaiian Home Lands
P.O. Box 1879
Honolulu, HI 96805

Subject: Draft Environmental Assessment (EA) Pre-Assessment Consultation
Wildland Fire Fighting Portable Dip Tank Project
Tax Map Key: Various Parcels
Makaha, Lualualei, and Makakilo, Oahu, Hawaii

Dear Mr. Nahale-a:

Thank you for your letter dated April 21, 2011 on the Draft EA Pre-Assessment Consultation. We acknowledge your support for the proposed project.

Your comment, along with this response, will be included in the forthcoming Draft EA. Should you have any questions, please contact me at 947-2277. We appreciate your participation in the environmental review process.

Sincerely,

Tracy Fukuda
Project Manager

cc: Mr. Rian Adachi, BWS

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

LORETTA J. FUDDY, A.C.S.W., M.P.H.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
File:
EPO-11-068

April 15, 2011

TF

RECEIVED
APR 20 2011
WILSON OKAMOTO CORPORATION

Ms. Tracy Fukuda
Wilson Okamoto Corporation
1907 South Beretania Street Suite 400
Honolulu, Hawaii 96826

Dear Ms. Fukuda:

SUBJECT: Environmental Assessment (EA) Pre-Assessment Consultation Wildland Fire Fighting Portable Dip Tank Project, Makaha, Lualualei and Makakilo, Oahu, Hawaii
TMK: Various parcels

Thank you for allowing us to review and comment on the subject document. The document was routed to the various branches of the Environmental Health Administration. We have no comments at this time, but reserve the right to future comments. We strongly recommend that you review all of the Standard Comments on our website: www.hawaii.gov/health/environmental/env-planning/landuse/landuse.html. Any comments specifically applicable to this application should be adhered to.

The same website also features a Healthy Community Design Smart Growth Checklist (Checklist). The Hawaii State Department of Health, Built Environment Working Group, recommends that State and county planning departments, developers, planners, engineers and other interested parties apply the healthy built environment principles in the Checklist whenever they plan or review new developments or redevelopments projects. We also ask you to share this list with others to increase community awareness on healthy community design.

If there are any questions about these comments please contact the Environmental Planning Office at 586-4337.

Sincerely,

Genevieve Salmonson

GENEVIEVE SALMONSON, Acting Manager
Environmental Planning Office

WILSON OKAMOTO CORPORATION
ENGINEERS / PLANNERS / CONSULTANTS

1907 South Beretania Street
Artesian Plaza, Suite 400
Honolulu, Hawaii, 96826 USA
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www.wilsonokamoto.com

7978-01
September 12, 2011

Ms. Genevieve Salmonson, Acting Manager
State of Hawaii
Department of Health
Environmental Planning Office
P.O. Box 3378
Honolulu, HI 96801-3378

Subject: Draft Environmental Assessment (EA) Pre-Assessment Consultation
Wildland Fire Fighting Portable Dip Tank Project
Tax Map Key: Various Parcels
Makaha, Lualualei, and Makakilo, Oahu, Hawaii

Dear Ms. Salmonson:

Thank you for your letter dated April 15, 2011 (EPO-11-068) on the Draft EA Pre-Assessment Consultation. We offer the following responses in the order of your comments:

1. We acknowledge that you have no comments to offer at this time, but reserve the right to future comments.

2. The proposed project will comply with HAR, Chapters 11-54 and 11-55, as applicable. The proposed project will also apply Healthy Community Design Smart Growth Principles, as appropriate.

Your comment, along with this response, will be included in the forthcoming Draft EA. Should you have any questions, please contact me at 947-2277. We appreciate your participation in the environmental review process.

Sincerely,

Tracy Fukuda
Project Manager

cc: Mr. Rian Adachi, BWS

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

TF

April 27, 2011

RECEIVED
APR 28 2011
WILSON OKAMOTO CORPORATION

Wilson Okamoto Corporation
1907 South Beretania Street
Honolulu, Hawaii 96826

Attention: Ms. Tracy Fukuda, Project Manager

Ladies and Gentlemen:

Subject: Pre-Assessment Consultation for Environmental Assessment for Wildland Fire Fighting Portable Dip Tank Project

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, Office of Conservation & Coastal Lands, 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 587-0414. Thank you.

Sincerely,

Charlene E. Unoki

for Russell Y. Tsuji
Administrator

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

April 13, 2011

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: Charlene Unoki, Assistant Administrator
SUBJECT: Pre-Assessment Consultation for Environmental Assessment for Wildland Fire Fighting Portable Dip Tank Project
LOCATION: Island of Oahu
APPLICANT: Wilson Okamoto Corporation on behalf of Board of Water Supply

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by April 27, 2011.

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: _____
Date: 4/4/11

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

Wayne C
review - comments

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

RECEIVED
LAND DIVISION
2011 APR 19 P 2:57
DEPT OF LAND & NATURAL RESOURCES
STATE OF HAWAII

April 13, 2011

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

Charlene

FROM: Charlene Unoki, Assistant Administrator
SUBJECT: Pre-Assessment Consultation for Environmental Assessment for Wildland Fire Fighting Portable Dip Tank Project
LOCATION: Island of Oahu
APPLICANT: Wilson Okamoto Corporation on behalf of Board of Water Supply

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by April 27, 2011.

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

(X) We have no objections.
( ) We have no comments.
( ) Comments are attached.

Signed: Paul J Conry
Date: 4/18/11

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

6A-11-201

RECEIVED
LAND DIVISION
2011 APR 15 P 2:54

RECEIVED
OFFICE OF CONSERVATION
AND COASTAL LANDS
2011 APR 14 A 10:21

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

April 13, 2011

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

Charlene

FROM: Charlene Unoki, Assistant Administrator
SUBJECT: Pre-Assessment Consultation for Environmental Assessment for Wildland Fire Fighting Portable Dip Tank Project
LOCATION: Island of Oahu
APPLICANT: Wilson Okamoto Corporation on behalf of Board of Water Supply

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by April 27, 2011.

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.
(X) Comments are attached.

Signed: Dawn Hegger
Date: 4/15/2011

(1) 8-6-3:015
(1) 8-4-2:011 ← get Boundary Interpretation from Land Use Commission to determine boundary Conservation District and other District. If no construction proposed in CD area then no further comments.

WILSON OKAMOTO CORPORATION
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FAX: 808-946-2253
www.wilsonokamoto.com

7978-01
September 12, 2011

Mr. William Aila, Director
State of Hawaii
Department of Land and Natural Resources
Land Division
P.O. Box 621
Honolulu, HI 96813

Subject: Draft Environmental Assessment (EA) Pre-Assessment Consultation
Wildland Fire Fighting Portable Dip Tank Project
Tax Map Key: Various Parcels
Makaha, Lualualei, and Makakilo, Oahu, Hawaii

Dear Mr. Aila:

Thank you for your letter dated April 27, 2011 on the Draft EA Pre-Assessment Consultation. We offer the following responses in the order of your comments:

Land Division – Oahu District
We acknowledge that the Division has no comments to offer at this time.

Office of Conservation and Coastal Lands

1. We acknowledge that the Makaha site, TMK (1) 8-4-2:011 is within the State Conservation District. The project site is located within the Resource (R) subzone. Installation of the proposed facility is an identified land use in the Conservation District and will require a Site Plan Approval, as determined by your Department (see Attachment).

2. We acknowledge TMK (1) 8-6-3:075 is within the State Conservation and Agricultural Districts. However, the project site is located within a portion of parcel 075 which is designated Agricultural. State Land Use Map showing project sites will be included in the forthcoming Draft EA.

Division of Forestry and Wildlife
We acknowledge that the Division has no objections to the proposed project.

Your comment, along with this response, will be included in the forthcoming Draft EA. Should you have any questions, please contact me at 947-2277. We appreciate your participation in the environmental review process.

Sincerely,

Tracy Fukuda
Project Manager

cc: Mr. Rian Adachi, BWS

NEIL ABERCROMBIE
GOVERNOR

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
FORD N. FUCHIGAMI
JAN S. GOUVEIA
RANDY GRUNE
JADINE URASAKI

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:

STP 8.0440

May 24, 2011

TF

Ms. Tracy Fukuda
Project Manager
Wilson Okamoto Corporation
1907 South Beretania Street, Suite 400
Honolulu, Hawaii 96826

RECEIVED
JUN 02 2011
WILSON OKAMOTO CORPORATION

Dear Ms. Fukuda:

Subject: Wildland Fire Fighting Portable Dip Tank Project
Pre-Assessment for Environmental Assessment (EA)

Thank you for requesting the State Department of Transportation's (DOT) review of the subject project.

DOT understands the City and County of Honolulu, Board of Water Supply proposes to develop three wildland fire fighting portable dip tank sites for use by the Honolulu Fire Department. The sites are proposed in Makaha, Lualualei and Makakilo.

Given the location of the subject project, DOT does not anticipate any significant, adverse impacts to its transportation facilities.

DOT appreciates the opportunity to provide comments. If there are any other questions, please contact Mr. David Shimokawa of the DOT Statewide Transportation Planning Office at telephone number (808) 831-7976.

Very truly yours,

GLENN M. OKIMOTO, Ph.D.
Director of Transportation

WILSON OKAMOTO CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS

1907 South Beretania Street
Artesian Plaza, Suite 400
Honolulu, Hawaii, 96826 USA
Phone: 808-946-2277
FAX: 808-946-2253
www.wilsonokamoto.com

7978-01
September 12, 2011

Mr. Glenn M. Okimoto, Director
State of Hawaii
Department of Transportation
869 Punchbowl Street
Honolulu, HI 96813-5097

Subject: Draft Environmental Assessment (EA) Pre-Assessment Consultation
Wildland Fire Fighting Portable Dip Tank Project
Tax Map Key: Various Parcels
Makaha, Lualualei, and Makakilo, Oahu, Hawaii

Dear Mr. Okimoto:

Thank you for your letter dated May 24, 2011 (STP 8.0440) on the Draft EA Pre-Assessment Consultation. We acknowledge that the Department of Transportation does not anticipate any significant, adverse impacts to its transportation facilities.

Your comment, along with this response, will be included in the forthcoming Draft EA. Should you have any questions, please contact me at 947-2277. We appreciate your participation in the environmental review process.

Sincerely,

Tracy Fukuda
Project Manager

cc: Mr. Rian Adachi, BWS

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

TF

HRD11/5682

April 26, 2011

Tracy Fukuda, Project Manager
Wilson Okamoto Corporation
1907 South Beretania Street
Artesian Plaza, Suite 400
Honolulu, Hawai'i 96826

RECEIVED
MAY 06 2011
WILSON OKAMOTO CORPORATION

Re: Pre-Draft Environmental Assessment Consultation
Wildland Fire Fighting Portable Dip Tank Project
Island of O'ahu

Aloha e Tracy Fukuda,

The Office of Hawaiian Affairs (OHA) is in receipt of your April 5, 2011 letter requesting comments ahead of a draft environmental assessment to support the development of three wildland fire fighting portable dip tank sites (sites) proposed by the City and County of Honolulu-Department of Water Supply (DWS). The sites will be developed in Makaha, Lualualei and Makakilo. Upon completion, the sites will be used by the Honolulu Fire Department to deploy temporary tanks to hold water during fire fighting operations.

OHA recognizes the importance of this project and has no substantive comments at this time. We look forward to reviewing the DEA and providing additional comments at that time. Please send one CD and one hardcopy of the DEA to OHA attn: Compliance Monitoring Program when it becomes available. Should you have any questions or concerns, please contact Keola Lindsey at 594-0244 or keolal@oha.org.

'O wau iho nō me ka 'oia'i'o,

Clyde W. Nāmu'o
Chief Executive Officer

WILSON OKAMOTO CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS
1907 South Beretania Street
Artesian Plaza, Suite 400
Honolulu, Hawaii, 96826 USA
Phone: 808-946-2277
FAX: 808-946-2253
www.wilsonokamoto.com

7978-01
September 12, 2011

Mr. Clyde Namuo, Chief Executive Officer
State of Hawaii
Office of Hawaiian Affairs
711 Kapiolani Boulevard, Suite 500
Honolulu, HI 96813

Attention: Mr. Keola Lindsey

Subject: Draft Environmental Assessment (EA) Pre-Assessment Consultation
Wildland Fire Fighting Portable Dip Tank Project
Tax Map Key: Various Parcels
Makaha, Lualualei, and Makakilo, Oahu, Hawaii

Dear Mr. Namuo:

Thank you for your letter dated April 26, 2011 (HRD11/5682) on the Draft EA Pre-Assessment Consultation. We acknowledge that you have no comments to offer at this time. A CD with PDF file and one hard copy will be mailed to you.

Your comment, along with this response, will be included in the forthcoming Draft EA. Should you have any questions, please contact me at 947-2277. We appreciate your participation in the environmental review process.

Sincerely,

Tracy Fukuda
Project Manager

cc: Mr. Rian Adachi, BWS

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

PETER B. CARLISLE
MAYOR

WAYNE Y. YOSHIOKA
DIRECTOR

KAI NANI KRAUT, P.E.
DEPUTY DIRECTOR

KENNETH TORU HAMAYASU, P.E.
DEPUTY DIRECTOR

TP4/11-411521R

April 20, 2011

Ms. Tracy Fukuda, Project Manager
Wilson Okamoto Corporation
1907 South Beretania Street, Suite 400
Honolulu, Hawaii 96826

RECEIVED
APR 22 2011
WILSON OKAMOTO CORPORATION

TF

Dear Ms. Fukuda:

Subject: Pre-Consultation for Draft Environmental Assessment (DEA) Wildland Fire Fighting Portable Dip Tank Project; Tax Map Key (TMK): Various Parcels; Makaha, Lualualei, and Makakilo; Oahu, Hawaii

This responds to your letter of April 5, 2011, requesting our comments concerning this proposed project.

We have the following comment. The short-term traffic impacts and possible mitigation measures during construction should be discussed. Should any proposed construction activities require the temporary closure of a traffic lane, parking, etc., on a local street, a street usage permit from the Department of Transportation Services will be required.

Thank you for the opportunity to review this matter. Should you have any further questions, please contact Michael Murphy of my staff at 768-8359.

Very truly yours,

WAYNE Y. YOSHIOKA
Director

WILSON OKAMOTO CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS
1907 South Beretania Street
Artesian Plaza, Suite 400
Honolulu, Hawaii, 96826 USA
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FAX: 808-946-2253
www.wilsonokamoto.com

7978-01
September 12, 2011

Mr. Wayne Y. Yoshioka, Director
City and County of Honolulu
Department of Transportation Services
650 South King Street, 3rd Floor
Honolulu, HI 96813

Attention: Mr. Michael Murphy

Subject: Draft Environmental Assessment (EA) Pre-Assessment Consultation
Wildland Fire Fighting Portable Dip Tank Project
Tax Map Key: Various Parcels
Makaha, Lualualei, and Makakilo, Oahu, Hawaii

Dear Mr. Yoshioka:

Thank you for your letter dated April 20, 2011 (TP4/11-411521R) on the Draft EA Pre-Assessment Consultation. We offer the following responses in the order of your comments:

1. The Draft EA will include a discussion on potential short-term traffic impacts resulting from construction activities, as well as potential mitigation measures.

2. We acknowledge that a Street Usage Permit from your department will be required for work that may temporarily close any traffic lane, parking, etc. It will be cited as a potential permit requirement.

Your comment, along with this response, will be included in the forthcoming Draft EA. Should you have any questions, please contact me at 947-2277. We appreciate your participation in the environmental review process.

Sincerely,

Tracy Fukuda
Project Manager

cc: Mr. Rian Adachi, BWS

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

PETER B. CARLISLE
MAYOR

KENNETH G. SILVA
FIRE CHIEF

ROLLAND J. HARVEST
DEPUTY FIRE CHIEF

April 25, 2011

RECEIVED
APR 27 2011
WILSON OKAMOTO CORPORATION

Ms. Tracy Fukuda
Project Manager
Wilson Okamoto Corporation
1907 South Beretania Street, Suite 400
Honolulu, Hawaii 96826

Dear Ms. Fukuda:

Subject: Environmental Assessment/Preassessment Consultation
Wildland Fire Fighting Portable Dip Tank Project
Makaha, Lualualei, and Makakilo, Oahu, Hawaii
Tax Map Key: Various Parcels

In response to your letter of April 5, 2011, regarding the above-mentioned subject, the Honolulu Fire Department reviewed the material provided and has no objections to the proposed project.

Should you have any questions, please call Acting Battalion Chief Gary Lum of our Fire Prevention Bureau at 723-7152.

Sincerely,

KENNETH G. SILVA
Fire Chief

KGS/GL:bh

WILSON OKAMOTO CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS

1907 South Beretania Street
Artesian Plaza, Suite 400
Honolulu, Hawaii, 96826 USA
Phone: 808-946-2277
FAX: 808-946-2253
www.wilsonokamoto.com

7978-01
September 12, 2011

Mr. Kenneth G. Silva, Fire Chief
City & County of Honolulu
Fire Department
636 South Street
Honolulu, HI 96813

Subject: Draft Environmental Assessment (EA) Pre-Assessment Consultation
Wildland Fire Fighting Portable Dip Tank Project
Tax Map Key: Various Parcels
Makaha, Lualualei, and Makakilo, Oahu, Hawaii

Dear Mr. Silva:

Thank you for your letter dated April 25, 2011 on the Draft EA Pre-Assessment Consultation. We acknowledge that you have no objections to the proposed project.

Your comment, along with this response, will be included in the forthcoming Draft EA. Should you have any questions, please contact me at 947-2277. We appreciate your participation in the environmental review process.

Sincerely,

Tracy Fukuda
Project Manager

cc: Mr. Rian Adachi, BWS

POLICE DEPARTMENT

CITY AND COUNTY OF HONOLULU

801 SOUTH BERETANIA STREET · HONOLULU, HAWAII 96813
TELEPHONE: (808) 529-3111 · INTERNET: www.honolulupd.org

PETER B. CARLISLE
MAYOR

LOUIS M. KEALOHA
CHIEF

DELBERT T. TATSUYAMA
RANDAL K. MACADANGDANG
DEPUTY CHIEFS

OUR REFERENCE BSW-LS

TF

April 18, 2011

Ms. Tracy Fukuda, Project Manager
Wilson Okamoto Corporation
1907 South Beretania Street, Suite 400
Honolulu, Hawaii 96826

RECEIVED
APR 20 2011
WILSON OKAMOTO CORPORATION

Dear Ms. Fukuda:

This is in response to your letter of April 5, 2011, requesting comments on a Pre-Assessment Consultation, Environmental Assessment, for the Wildland Fire Fighting Portable Dip Tank project.

The Honolulu Police Department has no concerns to offer at this time.

If there are any questions, please call Major Raymond Ancheta of District 8 (Kapolei) at 723-8488.

Sincerely,

LOUIS M. KEALOHA
Chief of Police

By

JOHN THOMPSON
Acting Assistant Chief of Police
Support Services Bureau

WILSON OKAMOTO
CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS

1907 South Beretania Street
Artesian Plaza, Suite 400
Honolulu, Hawaii, 96826 USA
Phone: 808-946-2277
FAX: 808-946-2253
www.wilsonokamoto.com

7978-01
September 12, 2011

Mr. Louis M. Kealoha, Police Chief
City & County of Honolulu
Police Department
801 South Beretania Street
Honolulu, HI 96813

Subject: Draft Environmental Assessment (EA) Pre-Assessment Consultation
Wildland Fire Fighting Portable Dip Tank Project
Tax Map Key: Various Parcels
Makaha, Lualualei, and Makakilo, Oahu, Hawaii

Dear Mr. Kealoha:

Thank you for your letter dated April 18, 2011 (BSW-LS) on the Draft EA Pre-Assessment Consultation. We acknowledge that you have no concerns to offer at this time.

Your comment, along with this response, will be included in the forthcoming Draft EA. Should you have any questions, please contact me at 947-2277. We appreciate your participation in the environmental review process.

Sincerely,

Tracy Fukuda
Project Manager

cc: Mr. Rian Adachi, BWS

84 - 626 Makaha Valley Road
Waianae, Hawaii 96792
www.makaharesort.net

Makaha Resort & GOLF CLUB

T (808) 695-9544
F (808) 695-7558
Toll Free (866) 576-6447

Tracy Fukuda

Project Manager

Wilson Okamoto Corporation

1907 South Beretania Street

Artesian Plaza, Suite 400

Honolulu, Hawaii, 96826

RECEIVED
APR 19 2011
WILSON OKAMOTO CORPORATION

TF

Dear Tracy Fukuda:

Makaha Resort and Golf Club is concerned about the aesthetic nature of the proposed Dip Tank Project. The proposed site is visible from our restaurants and golf course. Will you provide a narrative on what this structure looks like and how you plan to blend it into the environment? The natural environment is very important to our business.

Sincerely,

Kelly Cuff

General Manager

Makaha Resort and Golf Club

WILSON OKAMOTO CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS

1907 South Beretania Street
Artesian Plaza, Suite 400
Honolulu, Hawaii, 96826 USA
Phone: 808-946-2277
FAX: 808-946-2253
www.wilsonokamoto.com

7978-01
September 12, 2011

Ms. Kelly Cuff, General Manager
Makaha Resort and Golf Club
84-626 Makaha Valley Road
Waianae, HI 96792

Subject: Draft Environmental Assessment (EA) Pre-Assessment Consultation
Wildland Fire Fighting Portable Dip Tank Project
Tax Map Key: Various Parcels
Makaha, Lualualei, and Makakilo, Oahu, Hawaii

Dear Ms. Cuff:

Thank you for your letter regarding the Draft EA Pre-Assessment Consultation. We offer the following responses in the order of your comments:

1. We appreciate your concern regarding the visual impacts of the proposed project. The proposed project will not obstruct existing view planes. The proposed fire dip tank site will be located near the Board of Water Supply (BWS) booster station and below the BWS reservoirs off of Kili Drive.

2. BWS proposes to construct an approximately 400 square foot concrete pad behind the booster station to allow the Honolulu Fire Department (HFD) to temporarily place the 15-foot diameter, 5-foot tall inflatable polypropylene buoywall dip tank to fight wildland fires when they occur. The buoywall dip tank is not a permanent fixture. When the dip tank is not in use, it will be collapsed and stored off-site at a HFD facility.

   A discussion on visual impact will be included in the Draft EA.

Your comment, along with this response, will be included in the forthcoming Draft EA. Should you have any questions, please contact me at 947-2277. We appreciate your participation in the environmental review process.

Sincerely,

Tracy Fukuda
Project Manager

cc: Mr. Rian Adachi, BWS

TF

April 24, 2011

RECEIVED
APR 26 2011
WILSON OKAMOTO CORPORATION

Ms. Tracy Fukuda
Wilson Okamoto Corporation
1907 South Beretania Street, Suite 400
Honolulu, Hawaii 96826

Dear Ms. Fukuda:

I am resident just below the proposed project and want to make it clear that I am opposed to this project. Perhaps the biggest reason for my opposition is the risk it poses to all of us who live just below the location of this project. I am familiar with the location as I assisted the previous leasee prior to Buddy Gibson who had kept cattle in that area and requested assistance checking the fence line to make sure his cattle did not get out. The footprint of your proposed project sits on a narrow knoll with Kaloi Gulch on the east and Awanui Gulch on the west. There are 2 very serious safety concerns. One, it will sit directly above a number of homes including mine. The other is a concern for the helicopters that will have to deal with the updraft of these 2 valleys on both sides of the project.

In the past the HFD and military helicopters used to get their water from a hydrant adjacent to the Makakilo District Park which was large enough to land and distant from updraft of Awanui. The hydrant used to provide water to the dip buckets very fast which makes me wonder why we are considering this very hazardous alternative.

The risk the project poses to our homes also raises concerns to the impact it will have on value and resale of our homes directly below this reservoir. I would like this letter to be considered a matter of record regarding my opposition to your project.

Sincerely,

Shad Kane, Resident
92-1309 Uahanai Street
Kapolei, Hawaii 96707

Cc : Representative Jo Jordan

WILSON OKAMOTO CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS

1907 South Beretania Street
Artesian Plaza, Suite 400
Honolulu, Hawaii, 96826 USA
Phone: 808-946-2277
FAX: 808-946-2253
www.wilsonokamoto.com

7978-01
September 12, 2011

Mr. Shad Kane
92-1309 Uahanai Street
Kapolei, HI 96707

Subject: Draft Environmental Assessment (EA) Pre-Assessment Consultation
Wildland Fire Fighting Portable Dip Tank Project
Tax Map Key: Various Parcels
Makaha, Lualualei, and Makakilo, Oahu, Hawaii

Dear Mr. Kane:

Thank you for your letter dated April 24, 2011 on the Draft EA Pre-Assessment Consultation. The Board of Water Supply (BWS), in consultation with the Honolulu Fire Department (HFD), is proposing to develop three dip tank pad sites in Makaha, Lualualei and Makakilo, areas prone to wildland fires. The purpose of the project is to facilitate a quicker response time and more effective fire fighting capability in the event of a wildland fire. The HFD visited all three sites and determined these sites met their operational and safety requirements. Furthermore, the design for the small concrete pad on which the dip tank will sit will meet all appropriate geologic and structural requirements. The dip tank is a portable unit that will be deployed only during operations. It will be removed once operations are over and will be stored at a HFD facility.

HFD would continue to use nearby parks if additional dip tank sites are needed to fight wildland fires. However, the Palehua site would be a permanent new dip tank site closer to mauka areas prone to wildland fires and would therefore reduce HFD's response time.

We acknowledge your opposition to the proposed Palehua site and your concern regarding the impact this proposed site may have on the resale value of homes located nearby. However, as previously mentioned, the mauka area is prone to wildland fires and this location would decrease the possibility of wildland fires reaching homes along Palehua/Makakilo Ridge due to the faster response time. In addition, noise impacts would be temporary and less than the use of the current location since the flight path will be mainly over the mountains and not the surrounding residential area.

Your comment, along with this response, will be included in the forthcoming Draft EA. Should you have any questions, please contact me at 947-2277. We appreciate your participation in the environmental review process.

Sincerely,

Tracy Fukuda
Project Manager

cc: Mr. Rian Adachi, BWS

Appendix F

Draft Environmental Assessment Consultation Letters

DRAFT ENVIRONMENTAL ASSESSMENT COMMENT LETTERS

Agency/Organization/Individual	Date of Comment
Federal	
U.S. Army Corps of Engineers	
U.S. Fish and Wildlife Service	
State	
Department of Accounting & General Services	October 4, 2011
Department of Agricultural	
Department of Business, Economic Development and Tourism (DBEDT) Office of State Planning, DBEDT	
Department of Hawaiian Home Lands	
Department of Health Clean Water Branch Indoor & Radiological Health Branch Environmental Planning Office	 November 9, 2011 October 6 & 17, 2011 October 17, 2011
Department of Land and Natural Resources (DLNR) Division of Forestry & Wildlife Land Division, Oahu District Engineering Division Division of State Parks Office of Conservation & Coastal Lands	 November 2, 2011 November 2, 2011 November 4, 2011 November 4, 2011 November 4, 2011
State Historic Preservation Division (SHPD)	
Department of Transportation	October 28, 2011
Office of Hawaiian Affairs	September 28, 2011
University of Hawaii Environmental Center	
City & County of Honolulu	
Department of Design & Construction	October 25, 2011
Department of Facility Maintenance	October 10, 2011
Department of Parks & Recreation	October 11, 2011
Department of Planning and Permitting	October 6, 2011
Department of Transportation Services	
Fire Department	October 31, 2011
Police Department	October 3, 2011
Makakilo/Kapolei Neighborhood Board No. 34	
Waianae Neighborhood Board No. 24	
Elected Officials	
Representative Jo Jordan	
Representative Karen L. Awana	
Representative Sharon E. Har	
Senator Maile S.L. Shimabukuro	
Senator Mike Gabbard	
Councilmember Nestor Garcia	
Councilmember Tom Berg	

Agency/Organization/Individual	Date of Comment
Other	
Verizon Hawaii	
Hawaiian Electric Company, Inc.	
Hawaiian Telcom	October 3, 2011
Edmund C. Olson Trust	
Makaha Valley Towers	
Makaha Valley Plantation	
Makaha Resort and Golf Club	
Libraries	
Hawaii State Library	
Waianae Library	
Kapolei Library	

NEIL ABERCROMBIE
GOVERNOR

BRUCE A. COPPA
COMPTROLLER

JAN S. GOUVEIA
DEPUTY COMPTROLLER

STATE OF HAWAI'I
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P.O. BOX 119, HONOLULU, HAWAI'I 96810-0119

(P)1237.1

TF

OCT - 4 2011

RECEIVED
OCT 05 2011
WILSON OKAMOTO CORPORATION

Mr. Rian Adachi
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Adachi:

Subject: Draft Environmental Assessment (DEA)
Portable Dip Tanks for Wildland Firefighting Project
Various Locations, Island of Oahu, Hawaii
TMK: 8-4-002:011, 8-6-003:075, and 9-2-003:088

This is in response to a September 19, 2011 letter we received from Wilson Okamoto Corporation requesting comments on the subject Draft Environmental Assessment. The project does not impact any of the Department of Accounting and General Services' projects or existing facilities in the affected areas, and we have no comments to offer at this time.

If you have any questions, please call me at 586-0400 or have your staff call Mr. Alva Nakamura of the Public Works Division at 586-0488.

Sincerely,

BRUCE A. COPPA
State Comptroller

c: Ms. Tracy Fukuda Project Manager

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

PETER B. CARLISLE, MAYOR

RANDALL Y. S. CHUNG, Chairman
DENISE M. C. DE COSTA, Vice Chair
THERESIA C. McMURDO
DUANE R. MIYASHIRO
ADAM C. WONG

WESTLEY K.C. CHUN, Ex-Officio
GLENN M. OKIMOTO, Ex-Officio

DEAN A. NAKANO
Acting Manager

January 23, 2012

Ms. Jan Gouveia, Acting State Comptroller
Department of Accounting and General Services
State of Hawaii
P. O. Box 119
Honolulu, Hawaii 96810-0119

Dear Ms. Gouveia:

Subject: Your Letter of October 4, 2011 Regarding the Draft Environmental Assessment Portable Dip Tanks for Wildland Firefighting Project at Various Locations on the Island of Oahu, Hawaii, TMK: 8-4-002: 001; 8-6-003: 075; and 9-2-003: 088

Thank you for your letter dated October 4, 2011 regarding the subject Draft Environmental Assessment. We acknowledge that the project does not impact any of the Department of Accounting and General Services' projects or existing facilities in the affected areas.

If you have any questions, please contact Rian Adachi at 748-5943.

Sincerely,

DEAN A. NAKANO
Acting Manager

cc: Tracy Fukuda, Wilson Okamoto Corporation

TF

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

LORETTA J. FUDDY, A.C.S.W., M.P.H.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
EMD/CWB

11010PJF.11

November 9, 2011

RECEIVED
NOV 15 2011
WILSON OKAMOTO CORPORATION

Mr. Rian Adachi
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Adachi:

SUBJECT: Draft Environmental Assessment (DEA) for Portable Dip Tanks for Wildland Firefighting Project Island of Oahu, Hawaii TMKs: (1) 8-4-002:011, (1) 8-6-003:075 and (1) 9-2-003:088

The Department of Health, Clean Water Branch (CWB), has reviewed the subject document and offers these comments on your project. Please note that our review is based solely on the information provided in the subject document and its compliance with the Hawaii Administrative Rules (HAR), Chapters 11-54 and 11-55. You may be responsible for fulfilling additional requirements related to our program. We recommend that you also read our standard comments on our website at: http://www.hawaii.gov/health/environmental/env-planning/landuse/CWB-standardcomment.pdf.

1. Any project and its potential impacts to State waters must meet the following criteria:

   a. Antidegradation policy (HAR, Section 11-54-1.1), which requires that the existing uses and the level of water quality necessary to protect the existing uses of the receiving State water be maintained and protected.

   b. Designated uses (HAR, Section 11-54-3), as determined by the classification of the receiving State waters.

   c. Water quality criteria (HAR, Sections 11-54-4 through 11-54-8).

2. You may be required to obtain a National Pollutant Discharge Elimination System (NPDES) permit for discharges of wastewater, including storm water runoff, into State surface waters (HAR, Chapter 11-55). For the following types of discharges into Class A or Class 2 State waters, you may apply for an NPDES general permit coverage by submitting a Notice of Intent (NOI) form:

a. Storm water associated with construction activities, including clearing, grading, and excavation, that result in the disturbance of equal to or greater than one (1) acre of total land area. The total land area includes a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under a larger common plan of development or sale. This includes areas used for a construction base yard and the storage of any construction related equipment, material, and waste products. An NPDES permit is required before the start of the construction activities.

b. Hydrotesting water.

c. Construction dewatering effluent.

You must submit a separate NOI form for each type of discharge at least 30 calendar days prior to the start of the discharge activity, except when applying for coverage for discharges of storm water associated with construction activity. For this type of discharge, the NOI must be submitted 30 calendar days before to the start of construction activities. The NOI forms may be picked up at our office or downloaded from our website at: http://www.hawaii.gov/health/environmental/water/cleanwater/forms/genl-index.html.

3. For other types of wastewater not listed in Item No. 2 above or wastewater discharging into Class 1 or Class AA waters, an NPDES individual permit will need to be obtained. An application for an NPDES individual permit must be submitted at least 180 calendar days before the commencement of the discharge. The NPDES application forms may be picked up at our office or downloaded from our website at http://hawaii.gov/health/environmental/water/cleanwater/forms/environmental/water/cleanwater/forms/indiv-index.html.

4. Please note that all discharges related to the project construction or operation activities, whether or not NPDES permit coverage and/or a Section 401 Water Quality Certification are required, must comply with the State's Water Quality Standards. Noncompliance with water quality requirements contained in HAR, Chapter 11-54, and/or permitting requirements, specified in HAR, Chapter 11-55, may be subject to penalties of $25,000 per day per violation.

If you have any questions, please visit our website at: http://www.hawaii.gov/health/environmental/water/cleanwater/index.html, or contact the Engineering Section, CWB, at (808) 586-4309.

Sincerely,

ALEC WONG, P.E., CHIEF
Clean Water Branch

JF:ml

c: Ms. Tracy Fukuda, Wilson Okamoto Corporation
DOH-EPO #11-196 [via email only]

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

PETER B. CARLISLE, MAYOR

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ADAM C. WONG

WESTLEY K.C. CHUN, Ex-Officio
GLENN M. OKIMOTO, Ex-Officio

DEAN A. NAKANO
Acting Manager

January 24, 2012

Mr. Alec Wong, Chief
Clean Water Branch
Department of Health
State of Hawaii
P. O. Box 3378
Honolulu, Hawaii 96801-3378

Dear Mr. Wong:

Subject: Your Letter of November 9, 2011 Regarding the Draft Environmental Assessment Portable Dip Tanks for Wildland Firefighting Project at Various Locations on the Island of Oahu, Hawaii, TMK: 8-4-002: 001; 8-6-003: 075; and 9-2-003: 088

Thank you for your letter dated November 9, 2011 (Reference No: 11010PJF.11) on the subject Draft Environmental Assessment. We have the following responses to your comments:

1. The proposed project will comply with Hawaii Administrative Rules, Chapters 11-54 and 11-55, as applicable.

2. The proposed project does not require a National Pollutant Discharge Elimination System (NPDES) Permit for Storm Water Associated with Construction Activities. Dewatering is not anticipated and hydrotesting waters will be minimal and contained on site or in tanker trucks. There should be no discharges to State receiving waters. However, if one is needed, separate Notice of Intent forms for each type of discharge will be submitted at least 30 calendar days prior to the start of discharge activity.

3. An Individual NPDES Permit is not anticipated. The coastal waters along the Waianae Coast from Makua Beach to Ewa Beach are designated Class "A" marine waters. The project sites are within designated Class 2 Inland waters.

4. We acknowledge discharges related to the project construction or operation activities, whether or not NPDES permit coverage and/or Section 401 Water Quality Certification are required, must comply with the State's Water Quality Standards.

If you have any questions, please contact Rian Adachi at 748-5943.

Sincerely,

DEAN A. NAKANO
Acting Manager

cc: Tracy Fukuda, Wilson Okamoto Corporation

TF

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

LORETTA J. FUDDY, A.C.S.W., M.P.H.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
File:

October 06, 2011

RECEIVED
OCT 11 2011
WILSON OKAMOTO CORPORATION

Mr. Rian Adachi
Board of Water Supply
City & County of Honolulu
630 South Beretania Street
Honolulu, HI 96843

Dear Mr. Adachi:

This correspondence is in response to your request for comments to the Draft Environmental Assessment (DEA) for Portable Dip Tanks Wildland Firefighting Project at various locations on the Island of Oahu, Hawaii.

Based on our review, we have no comments at this time.

Should you have any questions, please contact me at (808) 586-4701.

Sincerely,

Jeffrey M. Eckerd
Acting Program Manager
Indoor and Radiological Health Branch

C: Tracy Fukuda, Wilson Okamoto Corporation

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

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DENISE M. C. DE COSTA, Vice Chair
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DUANE R. MIYASHIRO
ADAM C. WONG

WESTLEY K.C. CHUN, Ex-Officio
GLENN M. OKIMOTO, Ex-Officio

DEAN A. NAKANO
Acting Manager

January 23, 2012

Mr. Jeffrey M. Eckerd, Acting Program Manager
Indoor and Radiological Health Branch
Department of Health
State of Hawaii
P. O. Box 3378
Honolulu, Hawaii 96801-3378

Dear Mr. Eckerd:

Subject: Your Letter of October 6, 2011 Regarding the Draft Environmental Assessment Portable Dip Tanks for Wildland Firefighting Project at Various Locations on the Island of Oahu, Hawaii, TMK: 8-4-002: 001; 8-6-003: 075; and 9-2-003: 088

Thank you for your letter dated October 6 2011 regarding the subject Draft Environmental Assessment. We acknowledge that you have no comments to offer at this time.

If you have any questions, please contact Rian Adachi at 748-5943.

Sincerely,

DEAN A. NAKANO
Acting Manager

cc: Tracy Fukuda, Wilson Okamoto Corporation

TF

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

LORETTA J. FUDDY, A.C.S.W., M.P.H.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
File:
EPO-11-196

October 17, 2011

Ms. Tracy Fukuda, Project Manager
Wilson Okamoto Corporation
1907 South Beretania Street
Artesian Plaza, Suite 400
Honolulu, Hawaii 96826

RECEIVED
OCT 20 2011
WILSON OKAMOTO CORPORATION

Dear Ms. Fukuda:

SUBJECT: Draft Environmental Assessment (DEA)
Portable Dip Tanks for Wildland Firefighting Project
Various Locations, Island of Oahu, Hawaii
TMKs: 8-4-002:011; 8-6-003:075; and 9-2-003:088

Thank you for allowing us to review and comment on the subject document. The document was routed to the various branches of the Environmental Health Administration. We have the following Indoor and Radiological Health Branch and General Comments.

Indoor and Radiological Health Branch Standard Comments

"Project activities shall comply with the Administrative Rules of the Department of Health:

- Chapter 11-39 Air Conditioning and Ventilating
- Chapter 11-45 Radiation Control
- Chapter 11-46 Community Noise Control
- Chapter 11-501 Asbestos Requirements
- Chapter 11-502 Asbestos- Containing Materials in Schools
- Chapter 11-503 Fees for Asbestos Removal and Certification
- Chapter 11-504 Asbestos Abatement Certification Program

Should there be any questions, please contact the Indoor and Radiological Health Branch at 586-4701."

General

We strongly recommend that you review all of the Standard Comments on our website: www.hawaii.gov/health/environmental/env-planning/landuse/landuse.html. Any comments specifically applicable to this application should be adhered to.

The same website also features a Healthy Community Design Smart Growth Checklist (Checklist). The Hawaii State Department of Health, Built Environment Working Group, recommends that State and county planning departments, developers, planners, engineers and other interested parties apply the healthy built environment principles in the Checklist whenever they plan or review new developments or redevelopments projects. We also ask you to share this list with others to increase community awareness on healthy community design.

If there are any questions about these comments please contact the Environmental Planning Office at 586-4337.

Sincerely,

Genevieve Salmonson

GENEVIEVE SALMONSON, Acting Manager
Environmental Planning Office

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

PETER B. CARLISLE, MAYOR

RANDALL Y. S. CHUNG, Chairman
DENISE M. C. DE COSTA, Vice Chair
THERESIA C. McMURDO
DUANE R. MIYASHIRO
ADAM C. WONG

WESTLEY K.C. CHUN, Ex-Officio
GLENN M. OKIMOTO, Ex-Officio

DEAN A. NAKANO
Acting Manager

January 23, 2012

Ms. Genevieve Salmonson, Acting Manager
Environmental Planning Office
Department of Health
State of Hawaii
P. O. Box 3378
Honolulu, Hawaii 96801-3378

Dear Ms. Salmonson:

Subject: Your Letter of October 17, 2011 Regarding the Draft Environmental Assessment Portable Dip Tanks for Wildland Firefighting Project at Various Locations on the Island of Oahu, Hawaii, TMK: 8-4-002: 001; 8-6-003: 075; and 9-2-003: 088

Thank you for your letter dated October 17, 2011 (EPO-11-196) on the subject Draft Environmental Assessment. We have the following responses to your comments:

1. The proposed project will comply with the applicable Administrative Rules of the Department of Health (DOH).

2. We will review all standard comments found on the State DOH Environmental Planning website. All comments applicable to this project will be adhered to.

3. We will also review and consider the Healthy Community Design Smart Growth Checklist, as well as share it with others as requested.

If you have any questions, please contact Rian Adachi at 748-5943.

Sincerely,

DEAN A. NAKANO
Acting Manager

cc: Tracy Fukuda, Wilson Okamoto Corporation

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

November 2, 2011

Board of Water Supply
Attention: Mr. Rian Adachi
City and County of Honolulu
630 S. Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Adachi:

SUBJECT: Draft of Environmental Assessment (DEA) for Portable Dip Tanks for Wildland Firefighting Project - Various Locations - Island of Oahu

Thank you for the opportunity to review and comment on the subject matter. The Department of Land and Natural Resources' (DLNR) Land Division distributed or made available a copy of your report pertaining to the subject matter to DLNR Divisions for their review and comments.

At this time, enclosed are comments from (a) Division of Forestry & Wildlife; and (b) Land Division – Oahu District on the subject matter. Should you have any questions, please feel free to call Darlene Nakamura at 587-0417. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosures
cc: Wilson Okamoto Corporation (w/copies)
Ms. Tracy Fukuda (sent via fax no. (808) 946-2253)

No. of Pages: 3

→ Wayne C.

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

October 24, 2011

MEMORANDUM

TO: **DLNR Agencies:**
X Div. of Aquatic Resources
__ Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
X Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Draft of Environmental Assessment (DEA) for Portable Dip Tanks for Wildland Firefighting Project
LOCATION: Various Locations - Island of Oahu
APPLICANT: Wilson Okamoto Corporation on behalf of Board of Water Supply

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by October 31, 2011.

Only one (1) copy of the document is available for your review in Land Division office, Room 220.

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 Darlene Nakamura at 587-0417. Thank you.

Attachments

(X) We have no objections. OK
( ) We have no comments.
( ) Comments are attached.

Signed: Paul J. Gruy
Date: 10/31/11

RECEIVED
LAND DIVISION
2011 NOV -1 P 12:01
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

cc: Central Files

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

October 24, 2011

MEMORANDUM

TO: TR

DLNR Agencies:
X Div. of Aquatic Resources
__ Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
X Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Draft of Environmental Assessment (DEA) for Portable Dip Tanks for Wildland Firefighting Project
LOCATION: Various Locations - Island of Oahu
APPLICANT: Wilson Okamoto Corporation on behalf of Board of Water Supply

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Only one (1) copy of the document is available for your review in Land Division office, Room 220.

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 Darlene Nakamura at 587-0417. Thank you.

Attachments

( ) We have no objections.
(✓) We have no comments.
( ) Comments are attached.

Signed: TCN
Date: 10/27/2011

cc: Central Files

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

November 4, 2011

Board of Water Supply
Attention: Mr. Rian Adachi
City and County of Honolulu
630 S. Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Adachi:

SUBJECT: Draft of Environmental Assessment (DEA) for Portable Dip Tanks for Wildland Firefighting Project - Various Locations - Island of Oahu

Thank you for the opportunity to review and comment on the subject matter. In addition to the comments previously sent you on November 2, 2011, enclosed are comments from the (a) Engineering Division; (b) Division of State Parks; and (c) Office of Conservation & Coastal Lands on the subject matter. Should you have any questions, please feel free to call Darlene Nakamura at 587-0417. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosures
cc: Wilson Okamoto Corporation (w/copies)
Ms. Tracy Fukuda (sent via fax no. (808) 946-2253)

No. of Pages: 6

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

October 24, 2011

RECEIVED
LAND DIVISION
2011 NOV -3 A 10: 22
DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII
'11 OCT 28 AM 10:18 ENGINEERING

MEMORANDUM

TO: **DLNR Agencies:**
X Div. of Aquatic Resources
__ Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
X Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Draft of Environmental Assessment (DEA) for Portable Dip Tanks for Wildland Firefighting Project
LOCATION: Various Locations - Island of Oahu
APPLICANT: Wilson Okamoto Corporation on behalf of Board of Water Supply

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Attachments

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed: [signature]
Date: 11/2/11

cc: Central Files

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

DL/DarleneNakamura
REF.:DEAPortableDipTanksWildlifeFirefightingProject
Oahu.865

COMMENTS

(X) **We confirm that the project site for Makaha is located in Zone X, while the project sites for Lualualei and Palehua are located in Zone D, according to the Flood Insurance Rate Map (FIRM). The National Flood Insurance Program does not have any regulations for developments within Zones X and D.**

( ) Please take note that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Zone____.

( ) 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 Sumitomo at (808) 768-8097 or Mr. Mario Siu Li at (808) 768-8098 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.

( ) Ms. Wynne Ushigome at (808) 241-4890 of the County of Kauai, Department of Public Works.

( ) The applicant should include water demands and infrastructure required to meet project needs. Please note that projects within State lands requiring water service from the Honolulu Board of Water Supply system will be required to pay a resource development charge, in addition to Water Facilities Charges for transmission and daily storage.

( ) he 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 Ms. Suzie S. Agraan of the Planning Branch at 587-0258.

Signed: _____
CARTY S. CHANG, CHIEF ENGINEER

Date: 11/2/11

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

October 24, 2011

MEMORANDUM

TO: **DLNR Agencies:**
X Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
X Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

RECEIVED
STATE PARKS DIV
'11 OCT 27 P3:22
DEPT OF LAND & NATURAL RESOURCES

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Draft of Environmental Assessment (DEA) for Portable Dip Tanks for Wildland Firefighting Project
LOCATION: Various Locations - Island of Oahu
APPLICANT: Wilson Okamoto Corporation on behalf of Board of Water Supply

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by October 31, 2011.

Only one (1) copy of the document is available for your review in Land Division office, Room 220.

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 Darlene Nakamura at 587-0417. Thank you.

RECEIVED
LAND DIVISION
2011 NOV -3 P 3:12
DEPT OF LAND & NATURAL RESOURCES STATE OF HAWAII

Attachments

( ) We have no objections.
(✓) We have no comments.
( ) Comments are attached.

Signed: [signature]
Date: 11/1/11

cc: Central Files

COWR OA-12-106

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RECEIVED
LAND DIVISION
2011 NOV -3 P 3:10
DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

October 24, 2011

RECEIVED
OFFICE OF CONSERVATION
AND COASTAL LANDS
2011 OCT 27 A 10:08
DEPT. OF LAND & NATURAL RESOURCES
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
X Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Draft of Environmental Assessment (DEA) for Portable Dip Tanks for Wildland Firefighting Project
LOCATION: Various Locations - Island of Oahu
APPLICANT: Wilson Okamoto Corporation on behalf of Board of Water Supply

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by October 31, 2011.

Only one (1) copy of the document is available for your review in Land Division office, Room 220.

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 Darlene Nakamura at 587-0417. Thank you.

Attachments

( ) We have no objections.
( ) We have no comments.
(X) Comments are attached.

Signed: [signature]
Date: 2 Nov 11

cc: Central Files

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

GUY H. KAULUKUKUI
FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

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

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

REF: OCCL: AJR

COR: OA-12-106

MEMORANDUM

NOV - 3 2011

TO: Russell Y. Tsuji, Administrator
Land Division

FROM: Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

SUBJECT: *Comments for Draft Environmental Assessment (DEA) for portable dip-tanks*
TMK: (1) 8-4-002:011
Makaha Ahupuaa, Waianae District, Honolulu County, Oahu

Dear Mr. Tsuji,

The Department of Land and Natural Resources (DLNR), Office of Conservation and Coastal Lands (OCCL) is in receipt of your memorandum regarding the subject parcel which is located within the Conservation District Resource Subzone.

The OCCL has reviewed the DEA and requests that additional concerns be addressed in the Final Environmental Assessment:

The draft EA proposed that "PHOS-CHEK WD 881 Class A" *fire retardant foam may be added if necessary* and *after fire operations the excess from the dip-tank will be disposed of on site*. Research into the use of "fire fighting foams" reveals that there may be a significant potential for damage to terrestrial vegetation and aquatic ecosystems from their continued use. Please provide an evaluation of potential impacts and best management practices for the use and disposal of the "fire fighting foams" for this site.

Should you have any further questions, please contact Alex J. Roy of the Office of Conservation and Coastal Lands at 808-587-0316

CC: ODLO
City and County of Honolulu

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

PETER B. CARLISLE, MAYOR

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DEAN A. NAKANO
Acting Manager

January 24, 2012

Mr. William J. Aila, Jr., Chairperson
Commission on Water Resource Management
Department of Land and Natural Resources
State of Hawaii
P.O. Box 621
Honolulu, Hawaii 96809

Attention: Russell Y. Tsuji, Land Administrator, Land Division

Dear Mr. Aila:

Subject: Your Letters of November 2 and 4, 2011 Regarding the Draft Environmental Assessment Portable Dip Tanks for Wildland Firefighting Project at Various Locations on the Island of Oahu, Hawaii, TMK: 8-4-002: 001; 8-6-003: 075; and 9-2-003: 088

Thank you for your letters dated November 2 and 4, 2011 on the subject Draft Environmental Assessment. We have the following responses to your comments:

1. Division of Forestry and Wildlife
   We acknowledge that the Division has no objections to the proposed project.

2. Land Division – Oahu District
   We acknowledge that the Division has no comments.

3. Engineering Division
   We acknowledge that the Makaha project site is located in Zone X, the Lualualei and Palehua project sites are located in Zone D, and the National Flood Insurance Program does not have any regulations for developments in these zones.

4. Division of State Parks
   We acknowledge that the Division has no comments.

5. Office of Conservation and Coastal Lands
Depending on fire conditions, the Honolulu Fire Department (HFD) may add to the dip tank water PHOS-CHEK® WD 881 Class A Foam (Class A fire retardant), a foam forming additive designed to fight fires. This type of additive contains surfactant or wetting agent commonly used in shampoos and other cleaning compounds. The purpose of foam fire retardant is to reduce the surface tension of water so that it will more continuously cover and penetrate or soak into porous materials (such as wood) on which it is being applied. The additive is mixed with water at very low concentrations (approximately 0.1 percent by volume). The dip tank can hold up to 3,000 gallons of water, and HFD will generally add 3 gallons of additive to the dip tank. This mixture is then used to fight wildland fires. The additive is non-toxic and biodegradable.

The acute toxicity of PHOS-CHEK® WD 881 concentrate and its solutions has been extensively tested, using Environmental Protection Agency protocols under the auspices of the U.S. Department of Agriculture, Forest Service. Acute toxicity refers to the effect of short-term exposure such as a single contact or ingestion. Tests revealed that the concentrated product is non-toxic at even the highest anticipated levels of exposure. No significant adverse health effects would be expected to develop if small amounts are ingested by mouth. The long-term exposure of workers to the additive has also been tested. Tests found that the additive did not pose a significant health hazard to human health during its manufacture or subsequent use. Furthermore, all ingredients in PHOS-CHEK® WD 881 have been studied by the U.S. Food and Drug Administration and approved for use in various types of indirect food additives.

PHOS-CHEK® WD 881 contains biodegradable organic compounds that after use are converted by bacteria to carbon dioxide. Biodegradation, in effect, removed product residues from the environment, eliminating potential accumulation in nature. PHOS-CHEK® WD 881 has been extensively tested and has met the recognized criteria for being classified as biodegradable in water systems.

PHOS-CHEK® WD 881 solutions containing 0.3 to 0.6 percent of the concentrate, which is 3 times higher than what HFD uses, have been applied by both aerial and ground application on wildland fires throughout the world during the past 11 years with no report of vegetative mortality.

Data indicates that the concentrate is slightly to moderately toxic to fish – more so to fingerlings than to larger species. However, a study of water quality in the situation where concentrate was released failed to find any detectable quantities the day after the release. It is therefore unlikely the diluted use solution would have any significant impact should it come in contact with water bodies containing fish. Furthermore, there are no bodies of water or streams in the project sites' vicinity that would be affected by accidental spillage of the concentrate. We therefore do not anticipate any impacts, especially at the low concentration levels that HFD uses.

With the highly dilute concentrations, groundwater concerns would not be expected from the application of PHOS-CHEK® WD 881 solutions.

If you have any questions, please contact Rian Adachi at 748-5943.

Sincerely,

DEAN A. NAKANO
Acting Manager

cc: Tracy Fukuda, Wilson Okamoto Corporation

NEIL ABERCROMBIE
GOVERNOR

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
JADE T. BUTAY
FORD N. FUCHIGAMI
RANDY GRUNE
JADINE URASAKI

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:
STP 8.0620

October 28, 2011

TF

RECEIVED
NOV 09 2011
WILSON OKAMOTO CORPORATION

Mr. Rian Adachi
City and County of Honolulu
Board of Water Supply
Honolulu, Hawaii 96843

Dear Mr. Adachi:

Subject: Portable Dip Tanks for Wildlife Firefighting Project
Draft Environmental Assessment (DEA)

Thank you for requesting the State Department of Transportation's (DOT) review of the subject project.

DOT previously commented on the subject case during the Pre-Consultation for Draft Environmental Assessment (DEA) in its letter STP 8.0440 dated May 24, 2010, (Appendix E of the DEA) and now offers the following supplemental comments provided by the DOT Airports Division staff regarding the three (3) locations proposed for the wildland fire fighting portable dip tanks pads.

1. The developer should file a Federal Aviation Administration (FAA) Form 7480-1, Notice of Landing Area Proposal, for each of the proposed emergency helicopter landing areas. The form can be found at the following website: http://www.faa.gov/documentLibrary/media/form/faa7480-1.pdf

   The developer should send a copy of the FAA Form 7480-1 to the DOT Aiports Division, Planning Branch.

2. The DOT Highways Division is concluding its review of the subject project for impacts to DOT highway facilities. Upon completion of this review, DOT will provide additional comments as necessary.

DOT appreciates the opportunity to provide these supplemental comments. If there are any questions, including the need to meet with DOT Airports Division or Highways Division staffs, please contact Mr. David Shimokawa of the DOT Statewide Transportation Planning Office at telephone number (808) 831-7976.

Very truly yours,

GLENN M. OKIMOTO, Ph.D.
Director of Transportation

c: Tracy Fukuda, Wilson Okamoto Corporation

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

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GLENN M. OKIMOTO, Ex-Officio

DEAN A. NAKANO
Acting Manager

January 24, 2012

Glenn M. Okimoto, Ph.D., Director of Transportation
Department of Transportation
State of Hawaii
869 Punchbowl Street
Honolulu, Hawaii 96813-5097

Dear Dr. Okimoto:

Subject: Your Letter of October 28, 2011 Regarding the Draft Environmental Assessment Portable Dip Tanks for Wildland Firefighting Project at Various Locations on the Island of Oahu, Hawaii, TMK: 8-4-002: 001; 8-6-003: 075; and 9-2-003: 088

Thank you for your letter dated October 28, 2011 (Reference No: STP 8.0620) on the subject Draft Environmental Assessment. We have the following responses to your comments:

1. According to FAA Form 7480-1, FAA "requires all persons to notify the FAA at least 90 days before any construction, alteration, activation, deactivation, or change in the status or use of a civil or joint-use (civil-military) airport." The form further states "notice also is not required for the intermittent use of a site that is not an established airport, which is used for less than one year and at which flight operations will be conducted only under visual flight rules."

   The purpose of the proposed project is to provide the Honolulu Fire Department (HFD) three permanent sites to set up portable dip tanks to be used when needed during wildland firefighting events. We do not anticipate HFD landing helicopters at the proposed project sites; however, the sites will be able to accommodate an emergency landing, if necessary. The proposed usage is not any different than the current practices of HFD at schools and parks.

   The proposed project sites are not located at existing airports. The proposed sites are located on the Board of Water Supply, the Department of Hawaiian Home Lands (DHHL) and private property. Required easements from DHHL and private landowner will be obtained. These sites will be used by HFD only during wildland fire events.

Therefore, the proposed project does not require the preparation of FAA Form 7480-1.

2. We acknowledge that the Department of Transportation (DOT) Highways Division is concluding its review of the proposed project and that DOT will provide additional comments as necessary.

If you have any questions, please contact Rian Adachi at 748-5943.

Sincerely,

DEAN A. NAKANO
Acting Manager

cc: Tracy Fukuda, Wilson Okamoto Corporation

PHONE (808) 594-1888
FAX (808) 594-1865

TF

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

HRD11/5682B

September 28, 2011

Rian Adachi
City and County of Honolulu
Board of Water Supply
630 South Beretania Street
Honolulu, Hawai'i 96843

RECEIVED
OCT 17 2011
WILSON OKAMOTO CORPORATION

Re: Draft Environmental Assessment
Wildland Fire Fighting Dip Tank Project
Island of O'ahu

Aloha e Rian Adachi,

The Office of Hawaiian Affairs (OHA) is in receipt an September 19, 2011 request for comments on a draft environmental assessment (DEA) prepared to support the development of three permanent dip tank pad sites (sites) proposed by the City and County of Honolulu-Board of Water Supply (BWS) on the Island of O'ahu. Sites will be developed in three areas prone to wildfires: Makaha (on BWS land), Lualualei (on Department of Hawaiian Home Lands) and Palehua (on lands owned by the Edmund C. Olsen Trust). Development of the sites will include construction of a hard surface pad where a portable dip tank can be assembled, a helicopter emergency landing area, access roads and other accessory improvements. Upon completion, the sites will be utilized by the Honolulu Fire Department (HFD) for operations in the event of wildfires in these areas.

OHA has no objections to the anticipated "finding of no significant impact" determination in the DEA. We recognize that this project will improve the response times and effectiveness of the HFD and other agencies in the event of wildfires and we look forward to seeing it completed. Thank you for the opportunity to provide comments. Should you have any questions or concerns, please contact Keola Lindsey at 594-0244 or keolal@oha.org.

'O wau iho nō me ka 'oia'i'o,

Clyde W. Nāmu'o
Chief Executive Officer

CWN:kl

C: Tracy Fukuda, Wilson Okamoto Corporation

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

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WESTLEY K.C. CHUN, Ex-Officio
GLENN M. OKIMOTO, Ex-Officio

DEAN A. NAKANO
Acting Manager

January 23, 2012

Mr. Richard Pezzulo, Interim Chief Executive Officer
Office of Hawaiian Affairs
State of Hawaii
711 Kapiolani Boulevard, Suite 500
Honolulu, Hawaii 96813

Dear Mr. Namuo:

Subject: Your Letter of September 28, 2011 Regarding the Draft Environmental Assessment Portable Dip Tanks for Wildland Firefighting Project at Various Locations on the Island of Oahu, Hawaii, TMK: 8-4-002: 001; 8-6-003: 075; and 9-2-003: 088

Thank you for your letter dated September 28, 2011 (HRD11/5682B) regarding the subject Draft Environmental Assessment (EA).

We acknowledge that the Office of Hawaiian Affairs (OHA) has no objections to the anticipated "finding of no significant impact" determination in the Draft EA. We note that OHA recognizes that this project will improve the response times and effectiveness of the Honolulu Fire Department and other agencies in the event of wildfires.

If you have any questions, please contact Rian Adachi at 748-5943.

Sincerely,

DEAN A. NAKANO
Acting Manager

cc: Tracy Fukuda, Wilson Okamoto Corporation

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

PETER B. CARLISLE
MAYOR

COLLINS D. LAM, P.E.
DIRECTOR

LORI M. K. KAHIKINA, P.E.
DEPUTY DIRECTOR

TF

October 25, 2011

RECEIVED
OCT 31 2011
WILSON OKAMOTO CORPORATION

Ms. Tracy Fukuda
Wilson Okamoto Corporation
1907 South Beretania Street, Suite 400
Honolulu, Hawaii 96826

Dear Ms. Fukuda:

Subject: Draft Environmental Assessment (DEA)
Portable Dip Tanks for Wildland Firefighting Project
Various Locations, Island of Oahu, Hawaii
TMK Map Keys: 8-4-002:011, -6-003:075, and 9-2-003:008

The Department of Design and Construction has reviewed the subject project. We have no comments.

Should there be any questions, please contact me at 768-8480.

Sincerely,

for Collins D. Lam, P.E.
Director

CDL:pg(434590)

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

January 23, 2012

PETER B. CARLISLE, MAYOR

RANDALL Y. S. CHUNG, Chairman
DENISE M. C. DE COSTA, Vice Chair
THERESIA C. McMURDO
DUANE R. MIYASHIRO
ADAM C. WONG

WESTLEY K.C. CHUN, Ex-Officio
GLENN M. OKIMOTO, Ex-Officio

DEAN A. NAKANO
Acting Manager

TO: LORI KAHIKINA, P.E., DIRECTOR
DEPARTMENT OF DESIGN & CONSTRUCTION

FROM: DEAN A. NAKANO, ACTING MANAGER

SUBJECT: YOUR LETTER OF OCTOBER 25, 2011 REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT FOR PORTABLE DIP TANKS FOR WILDLAND FIREFIGHTING PROJECT AT VARIOUS LOCATIONS ON THE ISLAND OF OAHU, HAWAII, TMK: 8-4-002: 001; 8-6-003: 075; AND 9-2-003: 088

Thank you for your letter dated October 25, 2011 on the subject Draft Environmental Assessment. We acknowledge that you have no comments.

If you have any questions, please contact Rian Adachi at 748-5943.

cc: Tracy Fukuda, Wilson Okamoto Corporation

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

PETER B. CARLISLE
MAYOR

WESTLEY K.C. CHUN, Ph.D., P.E., BCEE
DIRECTOR AND CHIEF ENGINEER

KENNETH A. SHIMIZU
DEPUTY DIRECTOR

IN REPLY REFER TO:
DRM 11-806

October 10, 2011

TF

RECEIVED
OCT 12 2011
WILSON OKAMOTO CORPORATION

Ms. Tracy Fukuda
Wilson Okamoto Corporation
1907 S. Beretania Street
Artesian Plaza, Suite 400
Honolulu, Hawaii 96826

Dear Ms. Fukuda:

Subject: Draft Environmental Impact Statement (DEIS)
Portable Dip Tanks for Wildland Firefighting Project
Various Locations, Oahu
TMK's: 8-4-002:011, 8-6-003:075 and 9-2-003:088

Thank you for the opportunity to review and comment on the DEIS dated September 19, 2011.

The majority of proposed improvements is in either BWS property or private property and will have negligible impact on our facilities and operations.

It is our understanding that the proposed on-site project roadways, drainage system, detention basins and other roadway improvements will be BWS owned and maintained and will not be for the Department of Facility Maintenance to maintain.

Should you have any questions, please call Lan Yoneda of the Division of Road Maintenance at 768-3600.

Sincerely,

Westley K.C. Chun

Westley K.C. Chun, Ph.D., P.E., BCEE
Director and Chief Engineer

cc: Board of Water Supply – Rian Adachi

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

January 26, 2012

PETER B. CARLISLE, MAYOR

RANDALL Y. S. CHUNG, Chairman
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ADAM C. WONG

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GLENN M. OKIMOTO, Ex-Officio

DEAN A. NAKANO
Acting Manager

TO: WESTLEY K.C. CHUN, Ph.D., P.E., BCEE
DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF FACILITY MAINTENANCE

FROM: DEAN A. NAKANO, ACTING MANAGER

SUBJECT: YOUR LETTER OF OCTOBER 10, 2011 REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT FOR PORTABLE DIP TANKS FOR WILDLAND FIREFIGHTING PROJECT AT VARIOUS LOCATIONS ON THE ISLAND OF OAHU, HAWAII, TMK: 8-4-002: 001; 8-6-003: 075; AND 9-2-003: 088

Thank you for your letter dated October 10, 2011 (DRM 11-806) on the subject Draft Environmental Assessment. We acknowledge that the majority of proposed improvements is in either Board of Water Supply or private property and will have negligible impact on the Department of Facility Maintenance's facilities and operations. Maintenance of the proposed improvements will be determined during the easement acquisitions.

If you have any questions, please contact Rian Adachi at 748-5943.

cc: Tracy Fukuda, Wilson Okamoto Corporation

TF

DEPARTMENT OF PARKS & RECREATION

CITY AND COUNTY OF HONOLULU

1000 Uluohia Street, Suite 309, Kapolei, Hawaii 96707
Phone: (808) 768-3003 • Fax: (808) 768-3053
Website: www.honolulu.gov

PETER B. CARLISLE
MAYOR

GARY B. CABATO
DIRECTOR

ALBERT TUFONO
DEPUTY DIRECTOR

October 11, 2011

RECEIVED
OCT 13 2011
WILSON OKAMOTO CORPORATION

Mr. Rian Adachi
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Adachi:

Subject: Draft Environmental Assessment
Portable Dip Tanks for Wildland Firefighting Project
Various Location, Island of Oahu, Hawaii
Tax Map Keys: 8-4-002:011, 8-6-003:075, and 9-2-003:088

Wilson Okamoto Corporation requested our review and comment on the Board of Water Supply's Draft Environmental Assessment for the proposed Portable Dip Tanks for Wildland Firefighting Project.

The Department of Parks and Recreation has no comment, as the proposed project will not impact any program or facility of the department. You may remove us as a consulted party to the balance of the EIS process.

Should you have any questions, please contact Mr. John Reid, Planner, at 768-3017.

Sincerely,

GARY B. CABATO
Director

GBC:jr
(434626)

cc: Ms. Tracy Fukuda, Wilson Okamoto Corporation

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

January 23, 2012

PETER B. CARLISLE, MAYOR

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ADAM C. WONG

WESTLEY K.C. CHUN, Ex-Officio
GLENN M. OKIMOTO, Ex-Officio

DEAN A. NAKANO
Acting Manager

TO: GARY B. CABATO, DIRECTOR
DEPARTMENT OF PARKS & RECREATION

FROM: DEAN A. NAKANO, ACTING MANAGER

SUBJECT: YOUR LETTER OF OCTOBER 11, 2011 REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT FOR PORTABLE DIP TANKS FOR WILDLAND FIREFIGHTING PROJECT AT VARIOUS LOCATIONS ON THE ISLAND OF OAHU, HAWAII, TMK: 8-4-002: 001; 8-6-003: 075; AND 9-2-003: 088

Thank you for your letter dated October 11, 2011 on the subject Draft Environmental Assessment. We acknowledge that the Department of Parks and Recreation (DPR) has no comments. As requested, DPR will be removed as a consulted party.

If you have any questions, please contact Rian Adachi at 748-5943.

cc: Tracy Fukuda, Wilson Okamoto Corporation

DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 7TH FLOOR • HONOLULU, HAWAII 96813
PHONE: (808) 768-8000 • FAX: (808) 768-6041
DEPT. WEB SITE: www.honoluludpp.org • CITY WEB SITE: www.honolulu.gov

PETER B. CARLISLE
MAYOR

DAVID K. TANOUE
DIRECTOR

JIRO A. SUMADA
DEPUTY DIRECTOR

October 6, 2011

2011/ELOG-2111 (df)

RECEIVED
OCT 12 2011
WILSON OKAMOTO CORPORATION

TF

Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96813

Attention: Mr. Rian Adachi

Dear Mr. Adachi:

Subject: September 2011 Draft Environmental Assessment – Portable Dip Tanks For Wildland Firefighting Project, TMK: 8-4-002: 011, 8-6-003: 075 and 9-2-003: 088

This is in response to your September 19, 2011 letter requesting review and comments to the subject document. Our comments are as follows:

1) Figure 1-13: BWS should obtain an easement from the owner of TMK parcel 8-4-002: 062, as it appears that improvements will be constructed within the adjacent property.

2) Figures 1-14A and 1-14B: State the jurisdiction of Paheehee and Kuwale Roads (i.e., State, City, Private, etc.). If the roadways are City owned or maintained, then a trenching permit will be required. Otherwise, BWS should obtain the necessary authorization/permit from the owner(s) of the roadways.

3) A subdivision application will need to be filed with our department to establish any easements for the project.

If there are any questions, please contact Don Fujii of the Site Development Division at 768-8107.

Very truly yours,

David K. Tanoue, Director
Department of Planning and Permitting

DKT:ky
[883098]

cc: Wilson Okamoto Corporation
Subdivision Branch
CEB-PIS

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

January 24, 2012

PETER B. CARLISLE, MAYOR

RANDALL Y. S. CHUNG, Chairman
DENISE M. C. DE COSTA, Vice Chair
THERESIA C. McMURDO
DUANE R. MIYASHIRO
ADAM C. WONG

WESTLEY K.C. CHUN, Ex-Officio
GLENN M. OKIMOTO, Ex-Officio

DEAN A. NAKANO
Acting Manager

TO: DAVID K. TANOUE, DIRECTOR
DEPARTMENT OF PLANNING AND PERMITTING

FROM: DEAN A. NAKANO, ACTING MANAGER

SUBJECT: YOUR LETTER OF OCTOBER 6, 2011 REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT FOR PORTABLE DIP TANKS FOR WILDLAND FIREFIGHTING PROJECT AT VARIOUS LOCATIONS ON THE ISLAND OF OAHU, HAWAII, TMK: 8-4-002: 001; 8-6-003: 075; AND 9-2-003: 088

Thank you for your letter dated October 6, 2011 (2011/ELOG-2111 (df)) on the subject Draft Environmental Assessment. We have the following responses to your comments:

1. No easement will be required for TMK: 8-4-002: 062 as all improvements are currently being proposed only for the Board of Water Supply (BWS) property. Figure 1-13 was preliminary only, subject to change. The final construction plans for this project will reflect this revision.

2. Paheehee Road is under the jurisdiction of the State Department of Land and Natural Resources (DLNR), and Kuwale Road is under the jurisdiction of the City and County of Honolulu. The Final Environmental Assessment will reflect these jurisdictions. If trenching is required, a trenching permit will be applied for. The BWS will obtain permission from DLNR with regard to Paheehee Road.

3. A subdivision application will be filed with the Department of Planning and Permitting to establish easements required for the project.

If you have any questions, please contact Rian Adachi at 748-5943.

cc: Tracy Fukuda, Wilson Okamoto Corporation

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

PETER B. CARLISLE
MAYOR

KENNETH G. SILVA
FIRE CHIEF

EMMIT A. KANE
DEPUTY FIRE CHIEF

October 31, 2011

TO: DEAN NAKANO, ACTING MANAGER
BOARD OF WATER SUPPLY

ATTN: RIAN ADACHI, CIVIL ENGINEER

FROM: KENNETH G. SILVA, FIRE CHIEF

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT
PORTABLE DIP TANKS FOR WILDLAND FIREFIGHTING PROJECT
VARIOUS LOCATIONS, ISLAND OF OAHU, HAWAII
TAX MAP KEYS: 8-4-002: 011, 8-6-003: 075, and 9-2-003: 088

In response to a letter dated September 19, 2011, from Tracy Fukuda of Wilson Okamoto Corporation regarding the above-mentioned subject, the Honolulu Fire Department is in favor of the Makaha, Lualualei, and Palehua Dip Tank pad sites. These sites will make water drops to wildland urban interface homes quicker and offer an added safety component to our fire fighting efforts.

Should you have any questions, please contact Battalion Chief Dave Takehara of our Fire Operations at 723-7181 or dtakehara@honolulu.gov.

KENNETH G. SILVA
Fire Chief

EAK/DT:ag

✓cc: Tracy Fukuda, Project Manager
Wilson Okamoto Corporation

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

January 23, 2012

PETER B. CARLISLE, MAYOR

RANDALL Y. S. CHUNG, Chairman
DENISE M. C. DE COSTA, Vice Chair
THERESIA C. McMURDO
DUANE R. MIYASHIRO
ADAM C. WONG

WESTLEY K.C. CHUN, Ex-Officio
GLENN M. OKIMOTO, Ex-Officio

DEAN A. NAKANO
Acting Manager

TO: KENNETH G. SILVA, FIRE CHIEF
HONOLULU FIRE DEPARTMENT

FROM: DEAN A. NAKANO, ACTING MANAGER

SUBJECT: YOUR LETTER OF OCTOBER 31, 2011 REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT FOR PORTABLE DIP TANKS FOR WILDLAND FIREFIGHTING PROJECT AT VARIOUS LOCATIONS ON THE ISLAND OF OAHU, HAWAII, TMK: 8-4-002: 001; 8-6-003: 075; AND 9-2-003: 088

Thank you for your letter dated October 31, 2011 on the subject Draft Environmental Assessment. We acknowledge your support of the proposed project.

If you have any questions, please contact Rian Adachi at 748-5943.

cc: Tracy Fukuda, Wilson Okamoto Corporation

POLICE DEPARTMENT

CITY AND COUNTY OF HONOLULU

801 SOUTH BERETANIA STREET · HONOLULU, HAWAII 96813
TELEPHONE: (808) 529-3111 · INTERNET: www.honolulupd.org

TF

PETER B. CARLISLE
MAYOR

LOUIS M. KEALOHA
CHIEF

DAVE M. KAJIHIRO
MARIE A. McCAULEY
DEPUTY CHIEFS

OUR REFERENCE DAT-LS

October 3, 2011

RECEIVED
OCT 05 2011
WILSON OKAMOTO CORPORATION

TO: DEAN A. NAKANO, ACTING MANAGER
BOARD OF WATER SUPPLY

ATTENTION: RIAN ADACHI

FROM: LOUIS M. KEALOHA, CHIEF OF POLICE
HONOLULU POLICE DEPARTMENT

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT; PORTABLE DIP TANKS FOR WILDLAND FIREFIGHTING PROJECT; VARIOUS LOCATIONS; ISLAND OF OAHU, HAWAII; TAX MAP KEYS: 8-4-002:011, 8-6-003:075, AND 9-2-003:088

This is in response to a letter from the Wilson Okamoto Corporation, dated September 19, 2011, regarding the subject above.

This project should have no significant impact on the facilities or services of the Honolulu Police Department.

If there are any questions, please have a member of your staff call Major Raymond Ancheta of District 8 (Kapolei) at 723-8488.

LOUIS M. KEALOHA
Chief of Police

J. THOMPSON, ACTING
By ASSISTANT CHIEF, FOR
DEBORA A. TANDAL
Assistant Chief of Police
Support Services Bureau

cc: Ms. Tracy Fukuda, Wilson
Okamoto Corporation

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

January 23, 2012

PETER B. CARLISLE, MAYOR

RANDALL Y. S. CHUNG, Chairman
DENISE M. C. DE COSTA, Vice Chair
THERESIA C. McMURDO
DUANE R. MIYASHIRO
ADAM C. WONG

WESTLEY K.C. CHUN, Ex-Officio
GLENN M. OKIMOTO, Ex-Officio

DEAN A. NAKANO
Acting Manager

TO: LOUIS M. KEALOHA, CHIEF OF POLICE
HONOLULU POLICE DEPARTMENT

ATTN: DEBORA A. TANDAL, ASSISTANT CHIEF OF POLICE
SUPPORT SERVICES BUREAU

FROM: DEAN A. NAKANO, ACTING MANAGER

SUBJECT: YOUR LETTER OF OCTOBER 3, 2011 REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT FOR PORTABLE DIP TANKS FOR WILDLAND FIREFIGHTING PROJECT AT VARIOUS LOCATIONS ON THE ISLAND OF OAHU, HAWAII, TMK: 8-4-002: 001; 8-6-003: 075; AND 9-2-003: 088

Thank you for your letter dated October 3, 2011 on the subject Draft Environmental Assessment. We acknowledge that the proposed project should have no significant impact on the facilities or services of the Honolulu Police Department.

If you have any questions, please contact Rian Adachi at 748-5943.

cc: Tracy Fukuda, Wilson Okamoto Corporation

Hawaiian Telcom

October 3, 2011

Board of Water Supply
City & County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843
Attention: Mr. Rian Adachi

Dear Mr. Adachi:

Subject: **Draft Environmental Assessment (DEA)**
Portable Dip Tanks for Wildland Firefighting Project
Various Locations, Island of Oahu, Hawaii
Tax Map Keys: 8-4-002:011, 8-6-003:075, and 9-2-003:088

Thank you for the opportunity to review and comment on the draft environmental assessment phase for the subject project.

Hawaiian Telcom is currently working with Wilson Okamoto Corporation regarding a potential conflict with our aerial facilities at the proposed Palehua site.

If you have any questions or require assistance in the future on this project, please call me at 546-7761.

Sincerely,

Les Loo
Network Engineer – Outside Plant Engineering
Network Engineering & Planning

cc: T. Fukuda – Wilson Okamoto Corporation
File

WILSON OKAMOTO CORPORATION

1907 South Beretania Street
Artesian Plaza, Suite 400
Honolulu, Hawaii, 96826 USA
Phone: 808-946-2277
FAX: 808-946-2253
www.wilsonokamoto.com

7978-01
September 19, 2011

Ms. Lynette Yoshida, Senior Manager
Hawaiian Telcom
P.O. Box 2200
Honolulu, HI 96841

SEP 20 2011

Subject: Draft Environmental Assessment (DEA)
Portable Dip Tanks for Wildland Firefighting Project
Various Locations, Island of Oahu, Hawaii
Tax Map Keys: 8-4-002:011, 8-6-003:075, and 9-2-003:088

Dear Ms. Yoshida:

On behalf of the City and County of Honolulu Board of Water Supply, Wilson Okamoto Corporation has enclosed for your review a CD of the Draft Environmental Assessment (DEA) for the Portable Dip Tanks for Wildland Firefighting Project. This DEA has been prepared pursuant to Chapter 343, Hawaii Revised Statutes and Chapter 11-200-2, Hawaii Administrative Rules.

The DEA will be published in the September 23, 2011 issue of the State Office of Environmental Quality Control's (OEQC) *The Environmental Notice*. Please send your original comments to:

Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843
Attention: Mr. Rian Adachi

Copies of your comments should be sent to:

Wilson Okamoto Corporation
1907 South Beretania Street, Suite 400
Honolulu, Hawaii 96826
Facsimile: (808) 946-2253
Attention: Ms. Tracy Fukuda

In order for your comments to be considered in the forthcoming Final EA, they must be received or postmarked by October 22, 2011. Your input regarding the DEA is appreciated.

Sincerely,

Tracy Fukuda
Project Manager

TF/kt

Enclosure: CD

cc: Rian Adachi, Board of Water Supply

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

PETER B. CARLISLE, MAYOR

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ADAM C. WONG

WESTLEY K.C. CHUN, Ex-Officio
GLENN M. OKIMOTO, Ex-Officio

DEAN A. NAKANO
Acting Manager

January 23, 2012

Mr. Les Loo, Network Engineer
Hawaiian Telcom
P. O. Box 2200
Honolulu, Hawaii 96841

Dear Mr. Loo:

Subject: Your Letter of October 3, 2011 Regarding the Draft Environmental Assessment Portable Dip Tanks for Wildland Firefighting Project at Various Locations on the Island of Oahu, Hawaii, TMK: 8-4-002: 001; 8-6-003: 075; and 9-2-003: 088

Thank you for your letter dated October 3, 2011 on the subject Draft Environmental Assessment. We acknowledge that Hawaiian Telcom is currently working with Glenn Kuwaye of Wilson Okamoto Corporation regarding a potential conflict with its aerial facilities at the proposed Palehua site.

If you have any questions, please contact Rian Adachi at 748-5943.

Sincerely,

DEAN A. NAKANO
Acting Manager

cc: Tracy Fukuda, Wilson Okamoto Corporation

WILSON OKAMOTO
CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS
1907 South Beretania Street Suite 400 www.wilsonokamoto.com
Honolulu, Hawaii, U.S.A. 96826 PH 808-946-2277 FX 808-946-2253