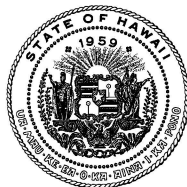


JOSH GREEN, M.D.
GOVERNOR

SYLVIA LUKE
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DEAN MINAKAMI
INTERIM EXECUTIVE DIRECTOR

STATE OF HAWAII

DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

HAWAII HOUSING FINANCE AND DEVELOPMENT CORPORATION

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HONOLULU, HAWAII 96813

PHONE: (808) 587-0620

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IN REPLY REFER TO:

23:DEV/074

July 14, 2023

Ms. Mary Alice Evans, Interim Director
Office of Planning and Sustainable Development
Environmental Review Program
235 South Beretania Street, Suite 702
Honolulu, HI 96813

Dear Ms. Evans:

Re: Draft Environmental Assessment and Anticipated Finding of No Significant Impact,
Waiāhole Valley Water System Improvements (DEA/AFONSI)
Waiāhole, O'ahu, Hawai'i
TMK Plats: 4-8-001 and 4-8-006 through 4-8-013

The Hawai'i Housing Finance and Development Corporation (HHFDC) hereby transmits the subject DEA-AFONSI for the for publication in the next available edition of *The Environmental Notice*.

In addition to this letter, we are submitting the electronic version of the Environmental Review Program Publication Form and a PDF copy of the DEA-AFONSI through the online submission platform.

If there are any questions, please contact Mr. Evahn Beresiwsky, Housing Development Specialist, at (808) 587-0547 or evahn.e.beresiwsky@hawaii.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "Dean Minakami".

for Dean Minakami
Interim Executive Director

From: webmaster@hawaii.gov
To: [DBEDT OPSD Environmental Review Program](#)
Subject: New online submission for The Environmental Notice
Date: Monday, July 17, 2023 3:09:53 PM

Action Name

Waiāhole Valley Water System Improvements Project

Type of Document/Determination

Draft environmental assessment and anticipated finding of no significant impact (DEA-AFNSI)

HRS §343-5(a) Trigger(s)

- (1) Propose the use of state or county lands or the use of state or county funds
- (2) Propose any use within any land classified as a conservation district

Judicial district

Koʻolaupoko, Oʻahu

Tax Map Key(s) (TMK(s))

4-8-001 and 4-8-006 through 4-8-013

Action type

Agency

Other required permits and approvals

HRS §6-E Historic Preservation Review; Water Use Permit (transfer); Well Construction and Pump Installation Permit; Well Abandonment Permit; Conservation District Site Plan Approval; National Pollutant Discharge Elimination System (NPDES) General Permit; Highway Usage Permit; Grading, Grubbing and Stockpiling Permit

Proposing/determining agency

Hawai'i Housing Finance and Development Corporation

Agency contact name

Evahn Beresiwsky

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[Map It](#)

Was this submittal prepared by a consultant?

Yes

Consultant

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[Map It](#)

Action summary

Hawai'i Housing Finance and Development Corporation (HHFDC) owns, operates, and maintains the Waiāhole Valley Water System (WVWS), a private potable water system that serves residential and certain agricultural uses in the valley. The existing WVWS was installed in the late-1980s and certain system components have become unreliable, difficult to access and maintain, and/or have reached the end of their design life. Those characteristics result in water service irregularities and hardship for the WVWS customers. The purpose of the proposed project is to improve the WVWS so that it reliably provides sufficient potable water to all customers in a manner that allows for safe and cost-effective operation and maintenance. The Draft Environmental Assessment addresses several water system improvement alternatives.

Reasons supporting determination

The Hawai'i Housing Finance and Development Corporation is providing an Anticipated Finding of No Significant Impact, based on the analysis of significance criteria provided in Chapter 5 of the DEA/AFONSI.

Attached documents (signed agency letter & EA/EIS)

- [2023-07-14_HHFDCtoERP-DEAforWVWS.pdf](#)
- [DEA-WaiaholeValleyWaterSystemImprove.pdf](#)

Action location map

- [Waiahole-Valley-Lot-50.zip](#)

Authorized individual

Jim Hayes

Authorization

- The above named authorized individual hereby certifies that he/she has the authority to make this submission.

**DRAFT ENVIRONMENTAL ASSESSMENT &
ANTICIPATED FINDING OF NO SIGNIFICANT
IMPACT, WAIĀHOLE VALLEY WATER SYSTEM
IMPROVEMENTS**

PREPARED FOR:



PREPARED BY:



JULY 2023

TABLE OF CONTENTS

1	INTRODUCTION.....	1-1
1.1	BACKGROUND	1-1
1.2	PURPOSE AND NEED	1-7
1.3	ENVIRONMENTAL ASSESSMENT TRIGGER	1-7
1.4	EARLY CONSULTATION	1-8
1.4.1	Scoping Letters	1-8
1.4.2	Kahalu‘u Neighborhood Board.....	1-9
1.4.3	Waiāhole-Waikāne Community Association.....	1-9
1.4.4	State Historic Preservation Division.....	1-10
2	PROPOSED ACTION AND ALTERNATIVES.....	2-1
2.1	DESCRIPTION OF THE PROPOSED ACTION	2-1
2.2	FRAMEWORK FOR CONSIDERATION OF ALTERNATIVES	2-1
2.3	PROJECT SCREENING CRITERIA	2-1
2.3.1	Meeting System Demands	2-1
2.3.2	System Cost Effectiveness.....	2-3
2.3.3	System Reliability.....	2-4
2.3.4	Probability of Adverse Environmental Effect	2-4
2.4	PROJECT ALTERNATIVES	2-5
2.4.1	Water Source Alternatives	2-5
2.4.2	Water Distribution System Alternatives	2-12
2.4.3	Proposed Construction Controls	2-16
2.4.4	No Action	2-16
2.4.5	Permits and Approvals.....	2-17
2.4.6	Preliminary Schedule.....	2-18
2.4.7	Estimated Project Implementation Budget	2-18
2.5	ALTERNATIVE SCREENING	2-19
2.5.1	Meeting Water Demands	2-19
2.5.2	System Cost Effectiveness.....	2-20
2.5.3	System Reliability.....	2-20
2.5.4	Probability of Adverse Environmental Effect	2-21
2.5.5	Alternative Screening Summary	2-23
3	EXISTING ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATION....	3-1
3.1	CLIMATE & PRECIPITATION.....	3-1
3.1.1	Existing Environment	3-1
3.1.2	Potential Impacts	3-1
3.2	GEOLOGY AND SOIL	3-2
3.2.1	Existing Environment	3-2
3.2.2	Potential Impacts	3-5
3.2.3	Avoidance, Minimization, and Mitigation Measures	3-6
3.3	WATER RESOURCES	3-6

3.3.1	Existing Surface Waters (Wetlands).....	3-6
3.3.2	Groundwater	3-11
3.3.3	Potential Impacts	3-14
3.3.4	Avoidance, Minimization, or Mitigation Measures.....	3-18
3.4	BIOLOGICAL RESOURCES AND PROTECTED SPECIES.....	3-19
3.4.1	Existing Conditions	3-19
3.4.2	Potential Impacts	3-23
3.4.3	Avoidance, Minimization, or Mitigation Measures.....	3-25
3.5	ARCHAEOLOGICAL AND CULTURAL RESOURCES.....	3-26
3.5.1	Context.....	3-26
3.5.2	Potential Impacts	3-30
3.5.3	Avoidance, Minimization, or Mitigation Measures.....	3-31
3.5.4	Ka Pa‘akai Assessment.....	3-32
3.5.5	HRS Chapter 6E-8 Proposed Determination	3-33
3.6	NATURAL HAZARDS	3-33
3.6.1	Hurricanes and Tropical Storms	3-33
3.6.2	Earthquakes	3-34
3.6.3	Flooding.....	3-35
3.6.4	Tsunami Inundation.....	3-37
3.6.5	Sea Level Rise	3-38
3.6.6	Potential Impacts	3-39
3.6.7	Avoidance, Minimization, and Mitigation Measures	3-40
3.7	VISUAL AND AESTHETIC RESOURCES.....	3-40
3.7.1	Existing Conditions	3-40
3.7.2	Potential Impacts	3-41
3.8	ROADWAYS AND TRAFFIC	3-43
3.8.1	Existing Conditions	3-43
3.8.2	Potential Impacts	3-44
3.8.3	Avoidance, Minimization, and Mitigation Measures	3-45
3.9	SOCIO-ECONOMIC CONDITIONS.....	3-45
3.9.1	Existing Conditions	3-45
3.9.2	Potential Impacts	3-45
3.10	OTHER RESOURCES AND TOPICS	3-47
3.11	CUMULATIVE IMPACTS.....	3-48
3.12	SECONDARY IMPACTS	3-50
4	CONSISTENCY WITH LAND USE PLANS, POLICIES, AND CONTROLS.....	4-1
4.1	STATE OF HAWAI‘I	4-1
4.1.1	Hawai‘i State Plan, HRS §226.....	4-1
4.1.2	Hawai‘i 2050 Sustainability Plan	4-3
4.1.3	Hawai‘i Land Use Law; HRS §205	4-4
4.1.4	Coastal Zone Management Program, HRS §205A.....	4-5
4.1.5	Hawai‘i Water Plan.....	4-12
4.1.6	O‘ahu General Plan (2021).....	4-13
4.1.7	Ko‘olau Poko Sustainable Communities Plan (2017)	4-15

4.1.8	Land Use Ordinance, ROH §21	4-16
4.1.9	Special Management Area	4-17
4.1.10	Shoreline Setback Ordinance	4-17
5	ANTICIPATED DETERMINATION	5-1
5.1	SIGNIFICANCE CRITERIA	5-1
5.2	FINDINGS	5-1
5.2.1	Irrevocable Loss or Destruction of Valuable Resource	5-2
5.2.2	Curtails Beneficial Uses	5-2
5.2.3	Conflicts with Long-Term Environmental Policies or Goals	5-2
5.2.4	Substantially Affects Economic or Social Welfare	5-2
5.2.5	Public Health Effects	5-2
5.2.6	Produce Substantial Secondary Impacts	5-2
5.2.7	Substantially Degrade the Environment	5-3
5.2.1	Cumulative Effects or Commitment to a Larger Action	5-3
5.2.2	Effects on Rare, Threatened, or Endangered Species	5-3
5.2.3	Affects Air or Water Quality or Ambient Noise Levels	5-3
5.2.4	Environmentally Sensitive Area	5-3
5.2.5	Affects Scenic Vistas and View Planes	5-4
5.2.6	Requires Substantial Energy Consumption	5-4
5.3	ANTICIPATED DETERMINATION	5-4
6	CONSULTATION AND DISTRIBUTION	6-1
6.1	EARLY CONSULTATION	6-1
6.2	DISTRIBUTION OF THE DEA	6-1
7	REFERENCES	7-1

LIST OF APPENDICES

APPENDIX A.	EARLY CONSULTATION LETTERS AND RESPONSES
APPENDIX B.	ASSESSMENT OF THE POTENTIAL IMPACT ON SURFACE WATERS
APPENDIX C.	LOT 50 RUNOFF CALCULATIONS
APPENDIX D.	ARCHAEOLOGICAL LITERATURE REVIEW AND FIELD INSPECTION REPORT
APPENDIX E.	CULTURAL IMPACT ASSESSMENT
APPENDIX F.	BIOLOGICAL SURVEY

LIST OF FIGURES

Figure 1-1: Waiāhole Valley Location	1-2
Figure 1-2: Waiāhole Valley Parcel and Lot Overview.....	1-3
Figure 1-3: County Zoning Map.....	1-4
Figure 1-4: State Land Use District and Existing WVWS Overview.....	1-6
Figure 2-1: Well Water Source Alternative Overview	2-6
Figure 2-2: Tunnel Water Source Alternative Overview.....	2-10
Figure 2-3: Tunnel Access Road Photographs.....	2-11
Figure 2-4: BWS Distribution Alternative Overview	2-13
Figure 2-5: WVWS Distribution Alternative Overview	2-15
Figure 3-1: Simplified Geologic Map of O‘ahu	3-3
Figure 3-2: Waiāhole Valley Soil Map.....	3-4
Figure 3-3: Surface Waters and Wetlands	3-7
Figure 3-4: Photographs of Waianu and Uwao Stream	3-7
Figure 3-5: Waiāhole Stream Gauge 16294100 Records	3-9
Figure 3-6: Conceptual Model of Groundwater Occurrence and Flow in Hawai‘i Developed in the Middle of the 20 th Century	3-11
Figure 3-7: Map of Modes of Groundwater Occurrence and Flow on O‘ahu	3-12
Figure 3-8: Groundwater Hydrologic Units on O‘ahu.....	3-13
Figure 3-9: Storm Water System Discharge and Channel	3-18
Figure 3-10: Photograph Showing Flora near Proposed Wells/Tank Site.....	3-20
Figure 3-11: Photograph Showing Flora near Proposed Wells/Tank Site Access Driveway...	3-21
Figure 3-12: Photograph Showing Conditions at Existing Well Site	3-22
Figure 3-13: Critical Habitat.....	3-23
Figure 3-14: Hurricanes Within 60 Miles of the Main Hawaiian Islands (1982-2022).....	3-34
Figure 3-15: USGS Seismic Hazard Map based on Past Earthquakes	3-35
Figure 3-16: Flood Zones in Waiāhole Valley	3-36
Figure 3-17: Tsunami Evacuation Zones, Kāne‘ohe Bay to Ko‘olau Bay	3-37
Figure 3-18: Sea Level Rise Exposure Area in Project Area under a 3.2-foot Sea Level Rise Scenario	3-38
Figure 3-19: Passive Flooding under a 6-foot Sea Level Rise Scenario.....	3-39
Figure 3-20: Open Space and Significant Views in Ko‘olau Poko	3-41
Figure 3-21: Landward View from Kamehameha Highway toward Lot 50.....	3-42
Figure 3-22: Landward View from Waiāhole Beach Park toward Lot 50.....	3-43
Figure 3-23: 1,000-foot Radius from Proposed Wells.....	3-50

LIST OF TABLES

Table 1-1: Scoping Letter Recipients	1-8
Table 2-1: Water Demand.....	2-2
Table 2-2: Water Utility Minimum Customer Charge.....	2-3
Table 2-3: Water Utility Monthly Quantity Charge	2-3
Table 2-4: Permits and Approvals, Categorized by Potential Action Alternatives	2-17
Table 2-5: Preliminary Schedule for the Wells/BWS Alternative.....	2-18
Table 2-6: Preliminary Schedule for the Wells/WVWS Alternative.....	2-18
Table 2-7: Preliminary Schedule for the Tunnel//BWS Alternative.....	2-18
Table 2-8: Preliminary Schedule for the Tunnel//WVWS Alternative.....	2-18
Table 2-9: Summary of Estimated Construction Cost	2-19
Table 2-10: Summary of Districts and Resources Potentially Affected by Water Source Alternatives	2-22
Table 2-11: Alternative Screening Summary, Water Source Alternatives	2-23
Table 2-12: Alternative Screening Summary, Water Distribution Alternatives.....	2-23
Table 3-1: Summary of Existing and Proposed Groundwater Usage, Ko‘olaupoko Aquifer ..	3-14
Table 3-2: Summary of Lot 50 Runoff	3-17
Table 3-3: Summary of Annual Potable Water Costs for Waiāhole Valley Residents and Farmers (2023).....	3-46
Table 4-1: Summary of LUO Compliance, Lot 50 (TMK 4-8-012:031).....	4-17
Table 6-1: Early Consultation.....	6-1
Table 6-2: DEA Distribution List	6-2

LIST OF ACRONYMS

ADC	Agribusiness Development Corporation
ADD	Average Daily Demand
AFONSI	Anticipated Finding of No Significant Impact
AIS	Archaeology Inventory Survey
AMP	Archaeological Monitoring Plan
AWUDP	Agricultural Water Use and Development Plan
BFE	Base Flood Elevation
BLNR	Board of Land and Natural Resources
BMP	Best Management Practice
BWS	Board of Water Supply
CCH	City and County of Honolulu
CDUP	Conservation District Use Permit

CFS	Cubic Feet Per Second
CIA	Cultural Impact Assessment
CRM	Concrete Reinforced Masonry
CSH	Cultural Surveys Hawai‘i
CWRM	Commission of Water Resource Management
CZM	Coastal Zone Management
DEA	Draft Environmental Assessment
DHHL	Department of Hawaiian Home Lands
DLNR	Department of Land and Natural Resources
DPP	Department of Planning and Permitting
EA	Environmental Assessment
EIS	Environmental Impact Statement
ERP	Environmental Review Program
ESA	Endangered Species Act
ESCP	Erosion and Sediment Control Plan
FEA	Final Environmental Assessment
FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact
GPD	Gallons Per Day
HAR	Hawai‘i Administrative Rules
HCC	Honolulu City Council
HDOH	State of Hawai‘i Department of Health
HDOT	State of Hawai‘i Department of Transportation
HEPA	Hawai‘i Environmental Policy Act
HFD	Honolulu Fire Department
HPD	Honolulu Police Department
HRS	Hawai‘i Revised Statutes
HSLR	Hawai‘i Sea Level Rise Vulnerability and Adaptation Report
HWP	Hawai‘i Water Plan
IBC	International Building Code
IPCC	Intergovernmental Panel on Climate Change
IRC	International Residential Code
IWS	Independent Wastewater System
KPSCP	Ko‘olau Poko Sustainable Communities Plan
LCA	Land Commission Awards
LSB	Land Study Bureau
MBTA	Migratory Bird Treaty Act
MDD	Maximum Daily Demand

MG	Million Gallons
MGD	Million Gallons per Day
MSL	Mean Sea Level
NHO	Native Hawaiian Organizations
NOAA	National Oceanographic and Atmospheric Agency
NPDES	National Pollutant Discharge Elimination System
NSSCP	North Shore Sustainable Community Plan
NWP	Nationwide Permit
O&M	Operating & Maintenance
PGA	Peak Ground Acceleration
PHD	Peak Hour Demand
PRV	Pressure Reducing Valve
PSI	Planning Solutions, Inc.
ROH	Revised Ordinances of Honolulu
ROW	Right-of-Way
SDG	Sustainable Development Goals
SHPD	State Historic Preservation Division
SLR	Sea Level Rise
SLR-XA	Sea Level Rise Exposure Area
SMA	Special Management Area
SMP	Special Management Area Permit
SPA	Site Plan Approval
SWPP	State Water Projects Plan
SWPPP	Storm Water Pollution Prevention Plan
TEN	The Environmental Notice
TMK	Tax Map Key
UBC	Uniform Building Code
USACE	United States Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish & Wildlife Service
USGS	U.S. Geological Survey
WMA	Water Management Area
WMP	Watershed Management Plan
WQP	Water Quality Plan
WRCC	Western Regional Climate Center
WRPP	Water Resources Protection Plan
WUP	Water Use Permit
WVWS	Waiāhole Valley Water System

1 INTRODUCTION

Waiāhole Valley and Ahupua‘a is in the Ko‘olaupoko Moku on the Mokupuni of O‘ahu.¹ The location of the valley is shown in Figure 1-1. In the back of the valley, there are three tributary streams (Waiāhole, Waianu, and Uwao) that merge to form Waiāhole Stream in the developed portion of the valley. Agriculture has been practiced in the valley for hundreds of years and continues today.

1.1 BACKGROUND

The Hawai‘i Housing Authority, a precursor of the Hawai‘i Housing Finance and Development Corporation (HHFDC), acquired a substantial portion of Waiāhole Valley (the “valley”) on November 30, 1977. HHFDC’s ownership came about because, in the 1970s, the State of Hawai‘i (the “State”) intervened and purchased the land when the former owners, the McCandless-Marks Family, sought to sell the land to a developer that reportedly planned to build approximately 4,000 homes. To retain the character of the valley, the State subdivided the land, made various infrastructure improvements, and preferentially leased the lots to certain residents and farmers of record in 1977. In 1993, an additional 108 acres of Ceded Lands were transferred to a predecessor of HHFDC, and 20 lots were transferred to the Department of Hawaiian Home Lands (DHHL) in 1998.²

Figure 1-2 provides an overview of the valley parcels discussed in this report; Figure 1-3 depicts county zoning districts in the area. Each parcel has a tax map key (TMK) number, which was assigned by the City and County of Honolulu (CCH), and those parcels currently or formerly owned by the State have a lot number (assigned during subdivision by the State in the 1980s). HHFDC owns most of parcels in the developed portion of Waiāhole Valley, most of which are leased, including:

- 46 agricultural lots (roughly 367 acres). Several of the agricultural lots include lo‘i, which are flooded by water diverted from the streams in the valley.
- 62 residential lots (roughly 40 acres).
- 4 commercial and market-rate lots (roughly 9 acres).

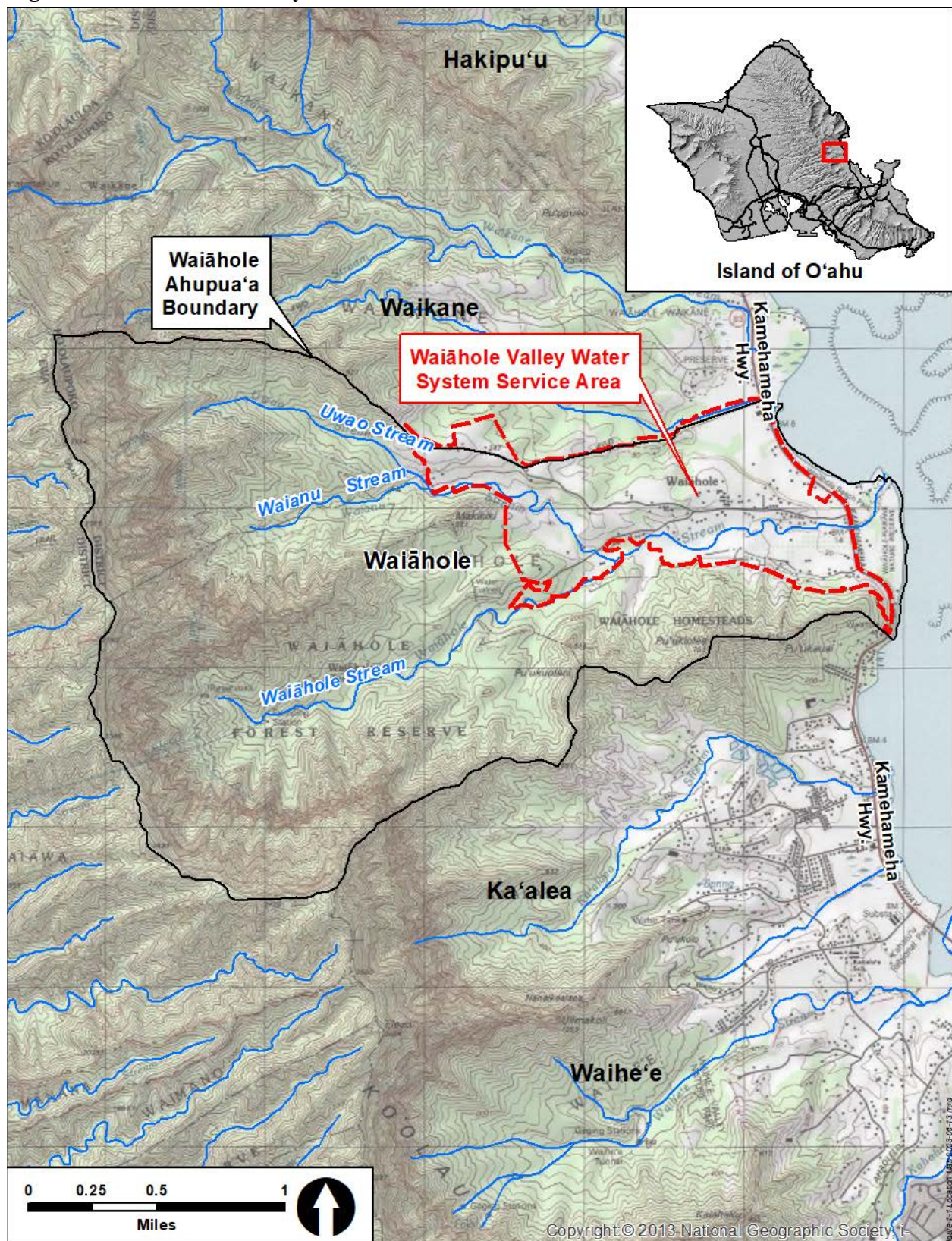
Non-HHFDC owned property in the developed portion of the valley includes:

- 20 DHHL parcels in residential and/or agricultural use.
- 21 privately-owned, fee-simple parcels in residential and/or agricultural use.
- 3 parcels for Waiāhole Elementary School.

¹ Waiāhole is named for the schools of āholehole that populate the location where Waiāhole Stream flows into Kāne‘ohe Bay.

² Upon annexation, the Republic of Hawai‘i transferred approximately 1.8 million acres of Hawaiian Government and Crown Lands to the United States, which are today held by the State of Hawai‘i and commonly referred to as “Ceded Lands”.

Figure 1-1: Waiāhole Valley Location



Source: Planning Solutions, Inc. (PSI).

Figure 1-2: Waiāhole Valley Parcel and Lot Overview

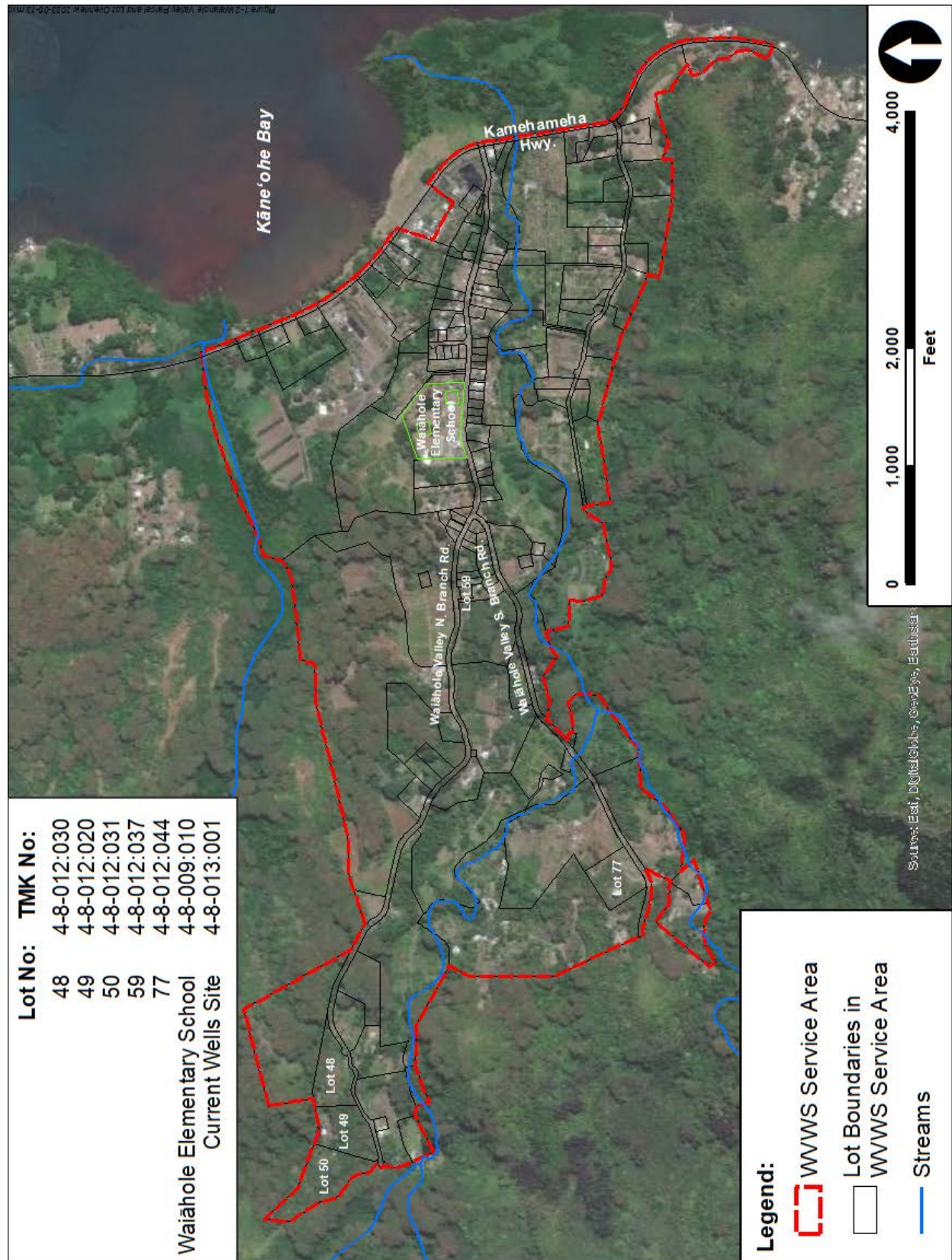


Figure 1-3: County Zoning Map



Source: PSI.

When the State acquired portions of the valley in 1977, it had an antiquated private water system known as the “McCandless system.” In coordination with residents and stakeholders, the State elected to develop a new water system to serve the community. The Waiāhole Valley Water System (WVWS) was designed in the early-1980s, installed in the late-1980s, and provides potable water for both domestic and irrigation purposes, while the McCandless system continues to provide non-potable water for some agricultural uses in the valley. The WVWS system serves most, but not all, of the lots listed above. The WVWS provides about 120,000 gallons per day to its customers. The existing WVWS is depicted in Figure 1-4 and is composed of:

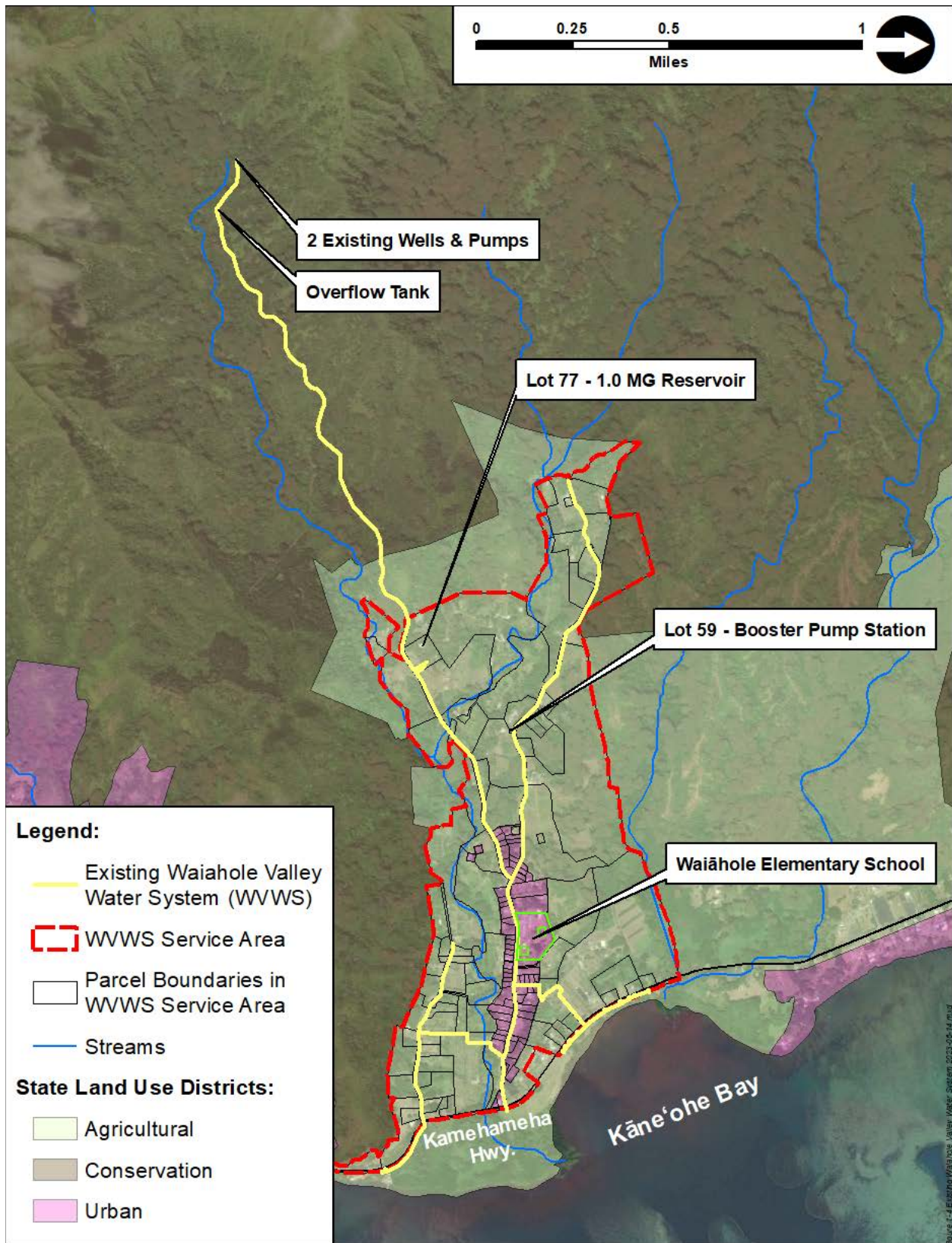
- Two potable-water production wells with pumps at an elevation of 494 feet in Waiāhole Valley. These wells are designated State Well numbers 3-2853-004 and 3-2853-005 by the Commission of Water Resource Management (CWRM). They have been approved to produce 0.075 million gallons per day (MGD) on a 12-month average basis. These wells are in the Conservation District and are accessible only by a 1.3-mile-long unimproved road.
- An 8-inch-diameter water pipeline from the wells to the service area.
- A 2,100-gallon surge tank, located downstream from and near the wells, at an elevation of roughly 540 feet, which is the high point along the water pipeline to the service area.
- A 1,000,000-gallon (1MG) reservoir at an elevation of roughly 240 feet on TMK 4-8-012:044 (Lot 77), which is accessible off Waiāhole Valley Road, South Branch.
- Water distribution pipelines of various diameters throughout the service area, primarily located within roadway right-of-way (ROW).
- A booster pump station at an elevation of roughly 160 feet on TMK 4-8-012:037 (Lot 59), which is accessible off Waiāhole Valley Road, North Branch, and serves the customers above it on the North Branch.

During development of the WVWS and other improvements in the valley in the 1980s, CCH granted development exemptions that require the State to maintain and operate the WVWS. HHFDC does this on behalf of the State. Generally, the existing WVWS provides sufficient volumes of water to its customers, but as it approaches 40 years of service, its aging infrastructure suffers periodic outages and requires increased maintenance.

In 2016, HHFDC began the development of a *Strategic Plan for Waiāhole Valley* (henceforth, “Strategic Plan”). One of HHFDC’s goals when they began working on the Strategic Plan was to “[d]etermine long-term ownership, management, and maintenance of water systems.” During interviews with Waiāhole residents and farmers, one of the primary issues and concerns they identified was “water access challenges for both potable and non-potable water systems.” The Strategic Plan was completed in November, 2022, and includes the following goals:

- WVWS has a reliability comparable to the rest of the island, if not better.
- WVWS is continually being maintained or improved.
- Revenue generation from lease rents and water fees will be sufficient to cover ongoing WVWS operation and maintenance costs.

Figure 1-4: State Land Use District and Existing WVWS Overview



Source: PSI, BEI, and HHFDC.

1.2 PURPOSE AND NEED

The purpose of the proposed project is to improve the WVWS so that it reliably provides sufficient potable water to all customers in a manner that allows for safe and cost-effective operation and maintenance. This purpose is consistent with achieving the WVWS-related goals in the Strategic Plan (2022).

This effort is needed because certain components of the existing WVWS are unreliable, difficult to access and maintain, and/or have reached the end of their design life. Those characteristics result in water service irregularities and hardship for the WVWS customers. Examples of these characteristics include:

1. The well pumps have reached the end of their design life.
2. The booster pump station is approaching the end of its design life.
3. The existing access road to the production wells and associated water pipeline is difficult to access due to rough road conditions and fallen trees, especially in inclement weather. Flooding and fallen trees can damage equipment, including the aboveground power line, causing service outages. It can take days to access and repair the damage. Improving the road and managing the vegetation in a manner that would adequately avoid or minimize these issues would be prohibitively expensive.
4. The 1 MG reservoir is leaking due to corrosion of the metal tank plates embedded in the concrete base. As a result, the reservoir cannot operate at full capacity.
5. A few customers are connected to the WVWS above the 1MG reservoir. The 2,100-gallon surge tank, which is the only storage upgradient of them, is insufficient to buffer their water use. Therefore, the well pumps cycle when those customers draw from the system, resulting in the pumps operating in a manner inconsistent with their optimal use, which results in increased wear and tear on the pumps.

Another component of the project purpose and need is that in 2006, the Hawai‘i State Legislature enacted Senate Concurrent Resolution No. 195, encouraging the transfer of the WVWS to the Board of Water Supply (BWS). Engineering studies and public presentations were made to assess and present the ramifications to HHFDC and the community. The *Waiāhole Valley Water System Assessment* dated October 19, 2007, was completed to satisfy the assessment and presentation requirements of the resolution. The assessment discussed three water system scenarios: (i) a WVWS-BWS interconnected system, (ii) a WVWS stand-alone system, and (iii) an HHFDC-operated system. This document furthers the work initiated by Senate Concurrent Resolution No. 195.

1.3 ENVIRONMENTAL ASSESSMENT TRIGGER

Per Chapter 343, Hawai‘i Revised Statutes (HRS 343), specifically HRS 343-5: “[e]xcept as otherwise provided, an environmental assessment (EA) shall be required for actions that: (a) Propose the use of state or county lands or the use of state or county funds.” The proposed action would result in the use of state lands (HHFDC-owned land) and the expenditure of state funds.

This Draft Environmental Assessment (DEA) is prepared pursuant to the requirements of HRS 343, *Environmental Impact Statement Law* and its implementing regulations contained in Title 11-200.1, Hawai‘i Administrative Rules (HAR 11-200.1), *Environmental Impact Statement Rules*.

1.4 EARLY CONSULTATION

Pursuant to HAR 11-200.1-18(a), HHFDC has sought to:

“conduct early consultation seeking, at the earliest practicable time, the advice and input of the county agency responsible for implementing the county's general plan for each county in which the proposed action is to occur, and consult with other agencies having jurisdiction or expertise as well as those citizen groups and individuals that the proposing agency or approving agency reasonably believes may be affected.”

1.4.1 SCOPING LETTERS

On November 3, 2022, Planning Solutions, Inc. (PSI), acting on behalf of HHFDC, sent scoping letters to the agencies and organizations identified in Table 1-1. All responses received were carefully considered during preparation of the DEA. The early consultation letter and all responses are contained in Appendix A.

Table 1-1: Scoping Letter Recipients

<i>Level</i>	<i>Department</i>	<i>Division</i>	<i>Recipient</i>	<i>Response</i>
Federal	U.S. Dept. of the Interior	Fish and Wildlife Service	Aaron Nadig, Island Team Manager	Yes
Federal	U.S. Army Corps of Engineers	Honolulu District, Regulatory Branch	Linda Speerstra, Chief	Yes
State of Hawai‘i	Dept. of Agriculture		Travis Shimabukuro-Geiser, Chairperson	No
State of Hawai‘i	Dept. of Agriculture	Agribusiness Development Corporation		Yes
State of Hawai‘i	Dept. of Business, Economic Development and Tourism (DBEDT)	Office of Planning and Sustainable Development	Mary Alice Evans, Director	No
State of Hawai‘i	DLNR	Engineering Division	Carty Chang, P.E.	No
State of Hawai‘i	DLNR	Division of Aquatic Resources	Brian Neilson, Administrator	No
State of Hawai‘i	DLNR	Division of Forestry & Wildlife	David G. Smith, Administrator	No
State of Hawai‘i	DLNR	Commission on Water Resource Management	M. Kaleo Manuel, Deputy Director	Yes
State of Hawai‘i	DLNR	Land Division	Russell Tsuji, Administrator	Yes
State of Hawai‘i	DLNR	Office of Conservation and Coastal Lands	Michael Cain, Administrator	No
State of Hawai‘i	Office of Hawaiian Affairs		Sylvia Hussey, CEO	No

Level	Department	Division	Recipient	Response
State of Hawai‘i	Dept. of Transportation	Highways Division	Ed Sniffen, Deputy Director	No
State of Hawai‘i	Department of Health (HDOH)	Safe Drinking Water Branch	Dennis Lopez	No
State of Hawai‘i	HDOH	Clean Air Branch	Marianne Rossio, P.E.	No
State of Hawai‘i	HDOH	Clean Water Branch	Alec Wong, P.E.	No
CCH	Dept. of Planning & Permitting	--	Dawn Takeuchi-Apuna, Director	Yes
CCH	Board of Water Supply		Ernest Lau, P.E.	Yes
CCH	Honolulu Police Dept.		Rade Vanic, Chief	Yes
CCH	Honolulu Fire Dept.		Sheldon Hao, Chief	Yes
CCH	Kahalu‘u Neighborhood Board		Kaanoī Walk, Chairperson	Yes
CCH	City Council, District 2		Councilmember Heidi Tsuneyoshi	No
CCH	Office of Climate Change, Sustainability & Resiliency		Matthew Gonser, Executive Director	No
Private	--	--	Waiāhole-Waikāne Community Association	No

Source: Compiled by Planning Solutions, Inc.

This EA reflects input received during the early consultation period. Its publication in the Office of Planning and Sustainable Development, Environmental Review Program’s (ERP) bi-monthly bulletin, *The Environmental Notice*, initiates a 30-day public review and comment period. After the 30-day public review period is complete, all substantive comments will be considered and addressed in the Final EA (FEA).

1.4.2 KAHALU‘U NEIGHBORHOOD BOARD

In response to the November 3, 2022, scoping letter, the Neighborhood Board unanimously passed a motion that stated “KNB #29 strongly requests that HHFDC and Planning Solutions include in the Pre-Assessment Consultation for the Waiāhole Valley Water System Improvements the WWCA Water Committee Proposal for a gravity flow system as an alternative in the Draft EA.” That gravity flow system, which is referred to as the tunnel alternative in this EA, is discussed in Section 2.4.1.2 and elsewhere.

1.4.3 WAIĀHOLE-WAIKĀNE COMMUNITY ASSOCIATION

Bills Engineering, Inc. presented the project to the Waiāhole Valley Community Association on April 7, 2022. The presentation included the project background, the existing water system, and proposed improvements. This meeting was an opportunity for the association members and the public to ask questions, provide comments, and voice concerns. The association expressed an interest in a gravity flow system. That gravity flow system, which is referred to as the tunnel alternative in this EA, is discussed in Section 2.4.1.2 and elsewhere.

The association also indicated an interest in the gravity flow system being used to generate electricity via hydropower. The generation of electricity is not a purpose or need of the proposed action and is not considered in this EA.

1.4.4 STATE HISTORIC PRESERVATION DIVISION

On December 15, 2022, on behalf of HHFDC, Cultural Surveys Hawai‘i (CSH) submitted their Archaeological Literature Review and Field Inspection report and other project information to the State Historic Preservation Division (SHPD). The submission requested HRS 6E-8, consultation between SHPD and HHFDC. The submission was made via HICRIS (Project No. 2022PR01476). No response has been received. The information submitted to SHPD is summarized in Section 3.5.

2 PROPOSED ACTION AND ALTERNATIVES

2.1 DESCRIPTION OF THE PROPOSED ACTION

The proposed action consists of HHFDC using state land and expending state funds to improve the WVWS and then either approving a transfer of the WVWS to BWS or procuring a third party to operate the WVWS on HHFDC's behalf. WVWS improvement and operation alternatives are discussed in the remainder of this chapter. Alternatives that involve the system being transferred to BWS would also require BWS action to accept the system.

2.2 FRAMEWORK FOR CONSIDERATION OF ALTERNATIVES

HAR 11-200.1 contains the environmental review rules; HAR 11-200.1-8 deals with agency actions. It requires that, for actions not exempt, the agency must consider the environmental factors and available alternatives and disclose those in an EA or Environmental Impact Statement (EIS). HAR 11-200.1-18 establishes the process for the preparation and content of an EA. Among the requirements listed, HAR 11-200.1-18(d)(7) requires the identification and analysis of impacts and alternatives considered.

In accordance with those requirements, HHFDC has and continues to consider several alternatives. The process consisted of formally defining the purpose and need for the project (Section 1.2) and then identifying other ways in which those objectives might be achieved (i.e., alternatives, including those specifically recommended by HRS 343 and HAR 11-200.1). Possible alternatives considered include the no action alternative (Section 2.4.4), alternative locations, alternative configurations, alternative scales, and alternative timing (i.e., delayed action).

Certain types of alternatives were eliminated from consideration by HHFDC because, although their consideration is part of the HRS 343 process, they are not suitable to the proposed action. Those alternatives eliminated from consideration early fell into the alternative scale and alternative timing categories. They were eliminated because (a) the scale is dictated by the WVWS' service area and number of customers; and (b) delaying the action is not in the interest of HHFDC or the WVWS customers.

2.3 PROJECT SCREENING CRITERIA

The criteria outlined in this section were developed to screen viable project alternatives. Some of the criteria are based on the purpose and need (Section 1.2) and other criteria is based on probability of adverse environmental effects. The criteria were developed early in the process to identify the alternatives that should be considered in detail in this EA.

2.3.1 MEETING SYSTEM DEMANDS

To be viable, the proposed WVWS improvements must reliably provide sufficient potable water to meet the demands of the system's customers. Table 2-1 summarizes the projected water demand based on Water System Standards applicable to BWS.

Table 2-1: Water Demand

	<i>Single-Family Residential Demand</i>	<i>Agricultural Demand</i>	<i>System Demand</i>
Number of Units	116 residences	152.5 acres	na
Water Use Demand per Unit	500 GPD/residence	1,275 GPD/acre	na
Average Daily Demand (ADD)	58,000 GPD	194,055 GPD	252,055 GPD
Maximum Daily Demand (MDD) (MDD = 1.5 x ADD)	87,000 GPD	291,083 GPD	378,083 GPD
Peak Hour Demand (PHD) (PHD = 3.0 x ADD)	174,000 GPD	582,165 GPD	756,165 GPD

Notes: There were roughly 116 residences served by WVWS in 2022.

Arable land potentially irrigated by WVWS was estimated based on the past *Agricultural Needs Study* (Scott, 1981), which estimated there was 320 acres of arable land. The past estimate was adjusted by BEI based on existing land use, yielding 305 arable acres. Because half of the arable land is irrigated by other sources (e.g., the McCandless irrigation system), it is estimated that 152.5 arable acres will potentially be irrigated with water obtained from the WVWS.

The ADD, MDD, and PHD calculations are based on Water System Standards applicable to BWS (2002).

Source: HHFDC and Water System Standards.

The water demand summarized in Table 2-1 is what any WVWS improvement project needs to address to comply with BWS guidelines. However, the following should be kept in mind regarding the actual water demand in the valley:

- WVWS meter readings between 2009 and 2022 show that total (domestic and agricultural) water consumption varied between 28,634,000 gallons-per-year and 39,189,000 gallons-per-year, and averaged 33,549,000 gallons-per-year. This means that, based on the annual use, WVWS customers used roughly 78,449 to 107,367 gallons per day (GPD) over that period. The month with the maximum water use during the period was August 2019, with 5,001,000 gallons, which is 161,323 GPD.
- The actual average daily use, 91,916 GPD (based on the average annual use of 33,549,300 gallons), has been only 36 percent of the System's calculated Average Daily Demand (ADD) using on BWS standards, 262,055 GPD (the right most column in Table 2-1). The highest daily use, 161,323 GPD (based on the highest monthly use of 5,001,000 gallons), was 64 percent of the System's calculated ADD.
- Water usage is not anticipated to increase substantially over the next 50 years because zoning and land use in the valley are not anticipated to change over that time. The agricultural lands that are irrigated by other methods are anticipated to continue their current practices. Therefore, the number of WVWS customers and their water usage is projected to remain steady.

All water systems have leakage. Due to the issues outlined in Section 1.2, the WVWS may have more than the typical leakage. That leakage occurs upstream of the metered usage discussed above. To account for the leakage, WVWS also meters the volume of water pumped from the two wells. From 2019 through 2022, the volume of water pumped from the wells each year has averaged roughly 52,400,000 gallons. That means, on average, roughly 15.5 million gallons leaked from the system each year and roughly 143,560 GPD was pumped from the wells, which is roughly 50 percent of the ADD in Table 2-1.

In terms of addressing the WVWS demands vis-à-vis potential project alternatives, a water system alternative that cannot provide for the Maximum Daily Demand (MDD) is not viable and should not be considered further; a water system that can provide for the MDD may be considered.

2.3.2 SYSTEM COST EFFECTIVENESS

The principal consideration in cost effectiveness is the cost to the consumer. For WVWS operations to remain viable over the long term, HHFDC or BWS must recover the costs of providing the water to the customer. Table 2-2 and Table 2-3 summarize the current customer charges for BWS and WVWS customers, the latter as approved by the HHFDC Board of Directors (the “Board”) and the Governor, and subsequently codified in HAR 15-319. While similar for residential customers, the WVWS rates for agricultural customers are substantially lower than the BWS agricultural rates. The lower agricultural rates reflect the fact that HHFDC did not increase rates from the time that the WVWS was placed in service until administrative rules were promulgated in 2022.

Table 2-2: Water Utility Minimum Customer Charge

<i>Meter Size</i>	<i>BWS as of July 1, 2022</i>	<i>WVWS as of 2022</i>
5/8" or 3/4"	\$12.09	\$13.30
1"	\$15.28	\$13.30
1.5"	\$17.41	\$13.30
2"	\$43.45	\$13.30
3"	\$53.55	\$13.30
4"	\$101.92	\$13.30
6"	\$181.64	\$13.30
8"	\$276.78	\$13.30
12"	\$598.53	\$13.30

Source: BWS and HHFDC.

Table 2-3: Water Utility Monthly Quantity Charge

	<i>BWS Rate as of July 1, 2023</i>	<i>WVWS as of 2023</i>
Minimum Charge (Service Charge)	\$12.09 (for 5/8" or 3/4" Meter)	\$13.30
Single-Family Residential		
Tier 1 (Essential Needs): first 2,000 gallons	\$4.46/2,000 gallons	\$4.91/2,000 gallons
Tier 2: 2,001 - 6,000 gallons	\$5.25/1,000 gallons	\$5.78/1,000 gallons
Tier 3: 6,001 - 30,000 gallons	\$5.85/1,000 gallons	\$6.44/1,000 gallons
Tier 4: Over 30,000 gallons	\$9.25/1,000 gallons	\$10.18/1,000 gallons
Mixed Residential & Agricultural		
Tier 1 (Essential Needs): First 2,000 gallons	N/A	\$4.91/1,000 gallons
Tier 2: 2,001 - 6,000 gallons	N/A	\$5.78/1,000 gallons
Tier 3: 6,001 - 13,000 gallons	N/A	\$6.44/1,000 gallons
Block 2 Over 13,000 gallons	N/A	0.70/1,000 gallons
Non-Residential		
All Usage	\$5.27/1,000 gallons	
Agricultural		
Tier 1 (Essential Needs): first 2,000 gallons	\$4.46/2,000 gallons	\$0.70/2,000 gallons
Tier 2: 2,001 - 6,000 gallons	\$5.25/1,000 gallons	\$0.70/1,000 gallons
Tier 3: Over 6,000 gallons	\$2.12/1,000 gallons	\$0.70/1,000 gallons

Source: BWS and HHFDC.

A system that can be built, operated, and maintained at lower cost would be preferable.

2.3.3 SYSTEM RELIABILITY

Reliability, generally measured as a percentage of time during which a system is not experiencing an outage, is an important consideration for any utility. As discussed in Section 1.2, the reliability of the WVWS is one of the current community concerns. Consequently, system designs that provide for greater reliability are preferred. For any alternative to be considered, it must be considered capable of providing domestic, agricultural, and fire-fighting water at least as reliably as the existing WVWS. Beyond that level, greater reliability can come with some additional cost, but it is important to note that, at least in this case, cost is a more important factor than incremental reliability improvements over the baseline target.

2.3.4 PROBABILITY OF ADVERSE ENVIRONMENTAL EFFECT

The probability that an alternative would adversely affect the natural and/or human environment is another important screening criteria. At the initial screening level, the likelihood of an adverse environmental effect does not require detailed site-specific surveys, information from previous projects in the region and information easily obtained from governmental records regarding the environment are sufficient. For instance, the likelihood of an impact can be assessed by whether an alternative involves a use of a certain district or known resource. If two alternatives both use the district or resource, then the intensity of that use can differentiate them.

The districts and resources of interest in this situation include:

- *State Land Use District.* The resources potentially present in the Conservation District (e.g., native species, rare species, threatened species, and endangered species), are more likely to be adversely affected by a use than the resources likely present in the Agricultural District (e.g., agricultural crops, pasture, and domesticated animals). Similarly, should a resource potentially be impacted, there are typically more options to avoid, minimize, or mitigate the impact in the Agricultural District than the Conservation District.
- *Critical Habitat.* Areas designated as critical habitat are those areas deemed necessary to support recovery of “listed” (e.g., threatened or endangered) species. Although this designation does not mean no further development can occur, it does indicate that listed species are more likely to be present and, thus, more likely to be adversely affected.
- *Historic Sites.* District or property on the State or National Register of Historic Places.
- *Permits Required.* Many permits are used to manage potential environmental effects. The number of “environmental” permits triggered by an action can be a proxy for the potential for that action to have an adverse effect on the resource or district that the permit is concerned with. Examples of environmental permits include Clean Water Act permits (e.g., Section 404 Department of the Army permits), Conservation District Use Permit (CDUP), and Special Management Area (SMA) permit.

2.4 PROJECT ALTERNATIVES

Through early consultation with the community and other stakeholders, HHFDC identified several WVWS improvement alternatives that it deemed sufficiently capable of potentially meeting the purpose and need (Section 1.2) and warranted screening per the criteria in Section 2.3. There are two water source alternatives: wells (Section 2.4.1.1) or tunnel (Section 2.4.1.2); and there are two distribution system alternatives: BWS (Section 2.4.2.1) and WVWS (Section 2.4.2.2). The WVWS improvement alternatives require one of the water source alternatives and one of the distribution system alternatives, for a total of four possible improvement alternatives: (i) wells/BWS; (ii) wells/WVWS; (iii) tunnel/BWS; and (iv) tunnel/WVWS.

The description of the alternatives in the following sections focuses on the initial construction of new potable water infrastructure and the decommissioning of existing infrastructure rendered obsolete. In addition to the initial construction, the installed infrastructure would need to be operated and maintained. The operation and maintenance of any of the alternatives would require staff and support facilities; the number, scope, scale, and location of those staff and facilities would be like those necessary for the existing WVWS. Similarly, the periodic activities, such as excavations to repair leaks or perform preventative maintenance, would be like those necessary for the existing WVWS. This document does not provide details regarding operation and maintenance activities or needs, except where there may be important distinctions among the alternatives and their potential impacts.

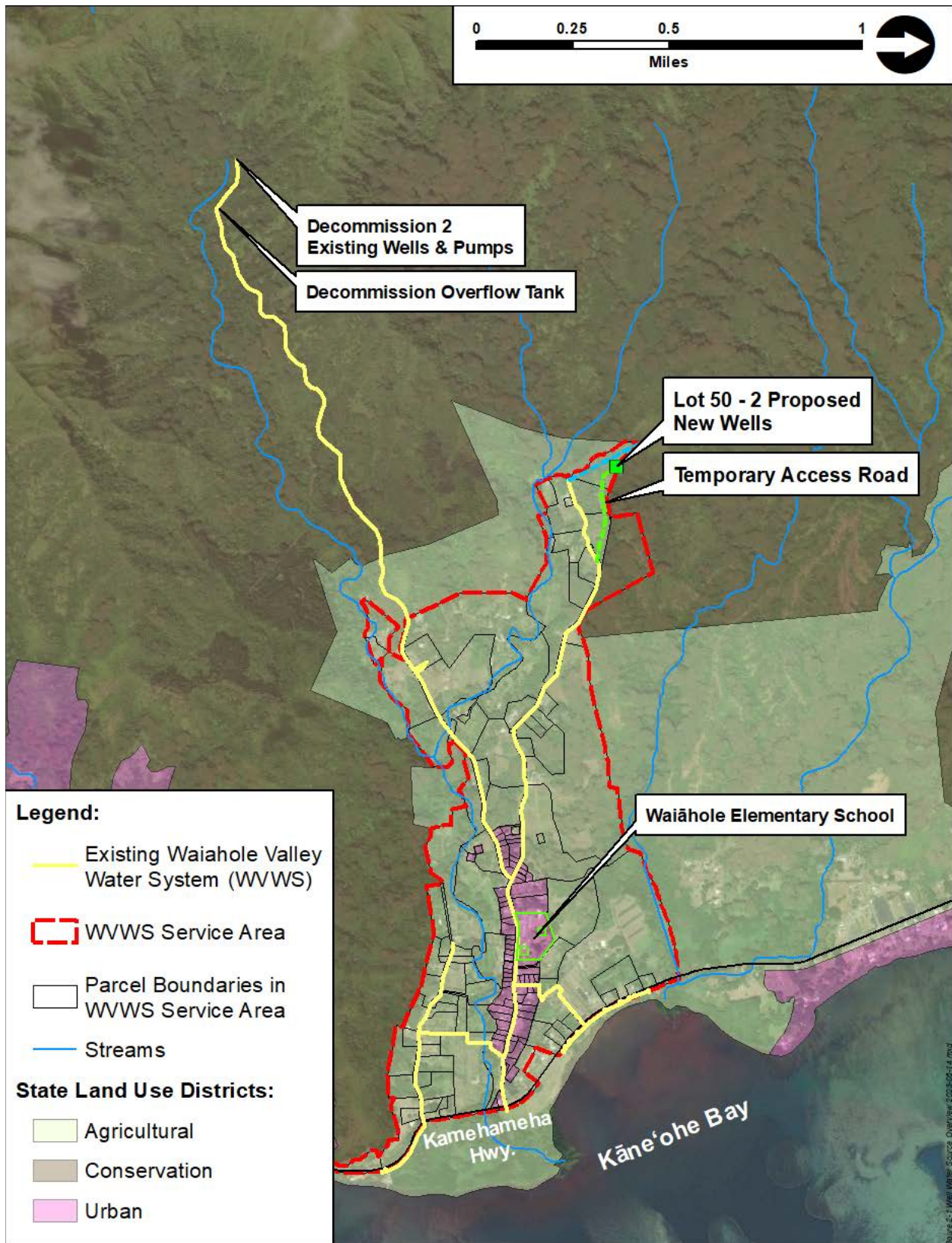
2.4.1 WATER SOURCE ALTERNATIVES

2.4.1.1 Wells

New wells would be sited on TMK (1) 4-8-012:031 (Lot 50), which is at the end of Waiāhole Valley Road, North Branch (Figure 2-1). The parcel is owned by HHFDC and is in the State's Agricultural District. This parcel is considered well suited for this use because its elevation allows for adequate water service to the entire system's service area with limited infrastructure. Furthermore, the parcel is not well suited to other uses. The wells would be sited in the northern/highest portion of the parcel, at an elevation of roughly 365 feet. The wells would tap into the Ko'olaupoko Aquifer System, which CWRM estimates has a sustainable yield of 28 MGD. The total current permitted water use within the aquifer system is 10.3 MGD.³

³ The new well would replace the existing wells. They would withdraw a similar quantity of the water from the same aquifer system. Thus, the permitted water use within the aquifer would change nominally, if at all.

Figure 2-1: Well Water Source Alternative Overview



Source: HHFDC, PSI, BEI, and State of Hawai'i GIS layers.

The appropriate permits and approvals would be obtained (Section 2.4.5), and then the following project elements would be built:

1. A temporary gravel access road to the well site and graded pad for the two proposed wells. The access road would go through TMKs (1) 4-8-012:020 and 030 (Lots 48 and 49, respectively) and be roughly 1,000 feet long by 10 feet wide.⁴ This temporary road would be used because this route has already been disturbed and would require limited resources to establish. A long-term access driveway is not warranted until the wells are confirmed to be productive. The flat, graded portion of the well site would be roughly 0.2 acre. A roughly half acre area would be disturbed by the temporary access road and well site work. The temporary access road would be removed once no longer needed.
2. Two new wells would be developed within the graded well site. Installation of each well would follow this sequence:
 - a. Drill, log, and test the borings to confirm yield and quality. It is anticipated that the borings would reach a depth of roughly 600 feet below ground (an elevation of roughly -250 feet). Assuming yield and quality are confirmed, this sequence would continue. There is no reason to suspect that yield and quality would be insufficient. Should yield and/or quality be insufficient, then an alternative well site or an alternative water source would need to be identified.
 - b. Complete the wells, which are anticipated to be 21-inches in diameter.
 - c. Conduct additional tests and take water samples for analysis and certification.
3. A permanent road for access, operation, and maintenance of the wells and other equipment near the wells site. The road would be roughly 900 feet long, 12 feet wide, and have an asphalt surface. Within the road corridor, the following utilities would be installed underground:
 - a. 3-phase electrical lines and communications lines. Currently, 3-phase electrical power and communications lines do not extend up Waiāhole Valley Road, North Branch, to where the access driveway would connect to it. 3-phase power would have to be extended from its current terminus; the extension along the Waiāhole Valley Road, North Branch would be aboveground.⁵
 - b. A storm drain line with inlets. The drain line would collect storm water from the well site and the access driveway. The drain line would extend beyond TMK 4-8-012:031 (Lot 50) on TMK 4-8-012:005 (Lot 52) for roughly 150 feet where it would discharge to an existing swale.⁶

⁴ Equipment accessing the well site during this phase would also use a roughly 330-foot-long portion of the existing driveway on TMK 4-8-012:030 (Lot 48). A temporary access easement would be obtained for the access road on TMKs 4-8-012:020 and 030.

⁵ The current terminus is at TMK 4-8-012:037 (Lot 59) where the existing WVWS booster pump is located. Therefore, the extension would be roughly 0.75 miles long and require that existing utility poles be replaced with poles roughly 10 feet taller.

⁶ The storm drain system on Waiāhole Valley Road and a culvert under a road on 4-8-012:005 (Lot 52) currently discharge to the same swale. The swale, which is roughly 100 feet long, flows into Waianu Stream.

- c. An 8-inch diameter water pipeline to connect the new system to the existing system. Section 2.4.2 discusses the water distribution system alternatives in detail.

The access driveway corridor would also require some walls, curbs, and ditches/swales. It is estimated that the disturbance area on TMK 4-8-012:031 (Lot 50) would be 0.41 acre and the disturbance area on TMK 4-8-012:005 (Lot 52), for the drain line extension, would be 0.1 acre.

4. The wells would be outfitted with pumps and become production wells. It is anticipated that the wells would be permitted and capable of producing approximately 0.2 MGD each.
5. A generator, fuel tank, and associated infrastructure to provide standby power in the event of Hawaiian Electric outages.
6. Security fencing (without barbed wire), lighting (wildlife acceptable per <https://dlnr.hawaii.gov/wildlife/files/2016/03/DOC439.pdf>), gates, bollards, and other security/safety equipment would be installed around and within the improvements outlined above.

These project elements would provide water from the wells to the WVWS distribution system, which is discussed in Section 2.4.2.

During the operation phase, the wells and pumps would require periodic preventative maintenance. As similar pumps and wells are prevalent throughout the Hawaiian Islands, these needs are well understood, and services/equipment is readily available. The operation and maintenance of the proposed Lot 50 wells would be similar to, but easier, than the maintenance of the existing wells. It would be easier because access to the proposed Lot 50 wells would be more reliable and not require maintenance of a long, unimproved access road through dense forest.

The existing WVWS wells, which are in the Ko‘olaupoko Aquifer System, would be decommissioned once the new wells were operational. The other existing WVWS infrastructure in the Conservation District would be removed or abandoned in place if it is not being used by other parties or providing service to customers,⁷ parallel with Waiāhole Stream. That infrastructure includes water pipelines, electrical lines, the road and bridge to the well site, and an surge tank.⁸ These facilities are located on TMK 4-8-013:001.

2.4.1.2 Tunnel

This alternative requires construction and operation of an approximately 6,000-foot-long (1.1-mile-long access road and water pipeline from roughly the end of Waiāhole Valley Road, North Branch, to Uwao Tunnel (Figure 2-2). It would also require modification of the tunnel, which is part of the Waiāhole Ditch System, was built in the early 1900s, and is at an elevation of roughly

⁷ Certain infrastructure, like much of the access road to the existing wells, is used by other parties, such as ADC.

⁸ This would result in only a short section of road being abandoned because others use most of the road to access the Waiāhole Ditch and Tunnel further mauka. It would be expected that the road would not be maintained at the level it is today because those parties do not use large vehicles. It is possible that a substantial length of Hawaiian Electric power line could be abandoned because the WVWS wells are the only facilities that require 3-phase power in the back of Waiāhole Valley and that circuit originates in Ka‘alaia Valley.

920 feet. The tunnel is, and most of the road and pipeline would be, on TMK (1) 4-8-014:003, which is owned by the State of Hawai‘i, Department of Agriculture, Agribusiness Development Corporation (ADC) and is in the State’s Conservation District. A short portion of the access road and pipeline would be on TMK (1) 4-8-014:003, which is owned by HHFDC and is in the State’s Agricultural District. Water in the tunnel primarily comes from the Ko‘olaupoko Aquifer System, which CWRM estimates has a sustainable yield of 28 MGD. The total current permitted water use within the aquifer system is 10.3 MGD.

The appropriate permits and approvals would be obtained (Section 2.4.5) and then the following project elements would be built:

1. A permanent road for access, operation, and maintenance of the equipment in and near the tunnel site. The road would use the existing unimproved road alignment; Figure 2-3 shows typical road conditions in March 2023.⁹ The road would be roughly 1 mile long, 12 feet wide, have pull outs and turn arounds, and have a gravel surface. Other improvements needed near the tunnel site include vehicle turnaround and construction equipment staging areas, which will require clearing of vegetation and grading in a roughly 0.5-acre area. A roughly 0.5-acre staging area would also be necessary for construction staging near the start of the road. Within the road corridor an 8-inch diameter water pipeline would be installed underground to connect the new water source to the distribution system. Section 2.4.2 discusses the water distribution system alternatives in detail.
2. The addition of new infrastructure, such as a perforate pipe, in the tunnel and modifications to the existing tunnel infrastructure to allow for the extraction of water from the tunnel for WVWS use.
3. A water filtration system could be necessary, depending on water quality.

These project elements would carry water from the tunnel to the WVWS distribution system, which is discussed in Section 2.4.2.

HDOH currently considers Uwao Tunnel water a non-potable water source because a record of historical water quality has not been established. For a period, the water extracted from the tunnel would need to be tested daily to monitor water quality. The water would have to meet HDOH, Safe Drinking Water Branch criteria before the Uwao Tunnel water could be considered potable. The testing would be done following the HDOH’s Groundwater Under the Direct Influence of a Surface Water (GWUDI) determination protocol. Should the water not consistently meet the required quality, a water treatment plant would need to be installed. It is anticipated that the water quality would be such HDOH would agree it meets potable water requirements and a water treatment plant would not be needed.

⁹ The existing unimproved road is used by ADC personnel to access Uwao Tunnel, which is a component of the Waiāhole Ditch and Tunnel system that ADC owns and maintains. ADC reports that the existing road is frequently blocked by fallen trees and impacted by floods and landslides. When HHFDC walked the unimproved road in March 2023, several large trees were observed blocking the road and ADC personnel reported that they had not been able to drive their all-terrain vehicle to the tunnel for over a year. Figure 2-3 shows typical road conditions in March 2023.

Figure 2-2: Tunnel Water Source Alternative Overview

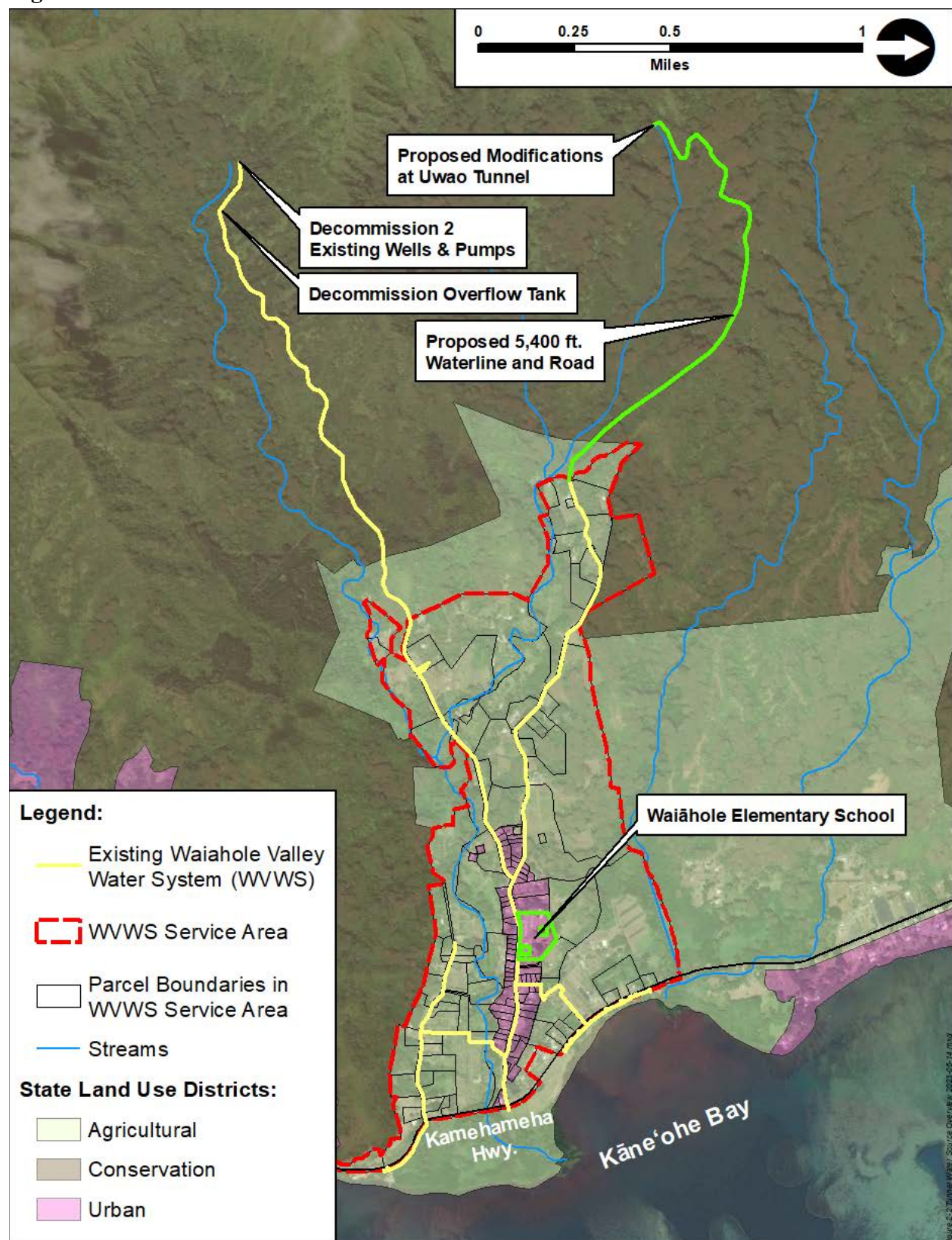


Figure 2-3: Tunnel Access Road Photographs



Open area in lower section of the road.



Tree fall across road in lower section.



One of several small stream crossings.

Source: PSI, photos taken March 24, 2023.



One of many tree falls in upper section.

In addition, operation of the tunnel water source would require maintenance of the long access road and water pipeline through rough terrain to periodically conduct maintenance/repair of the improvements made. Some of those maintenance requirements potentially could be shared with ADC.

The existing WVWS wells, which are in the Ko‘olaupoko Aquifer System, would be decommissioned once the tunnel source was operational. Also decommissioned or abandoned in place would be other WVWS infrastructure in the Conservation District parallel with Waiāhole Stream as discussed at the end of Section 2.4.1.1.

2.4.2 WATER DISTRIBUTION SYSTEM ALTERNATIVES

2.4.2.1 Board of Water Supply Compliant and Operated Distribution System

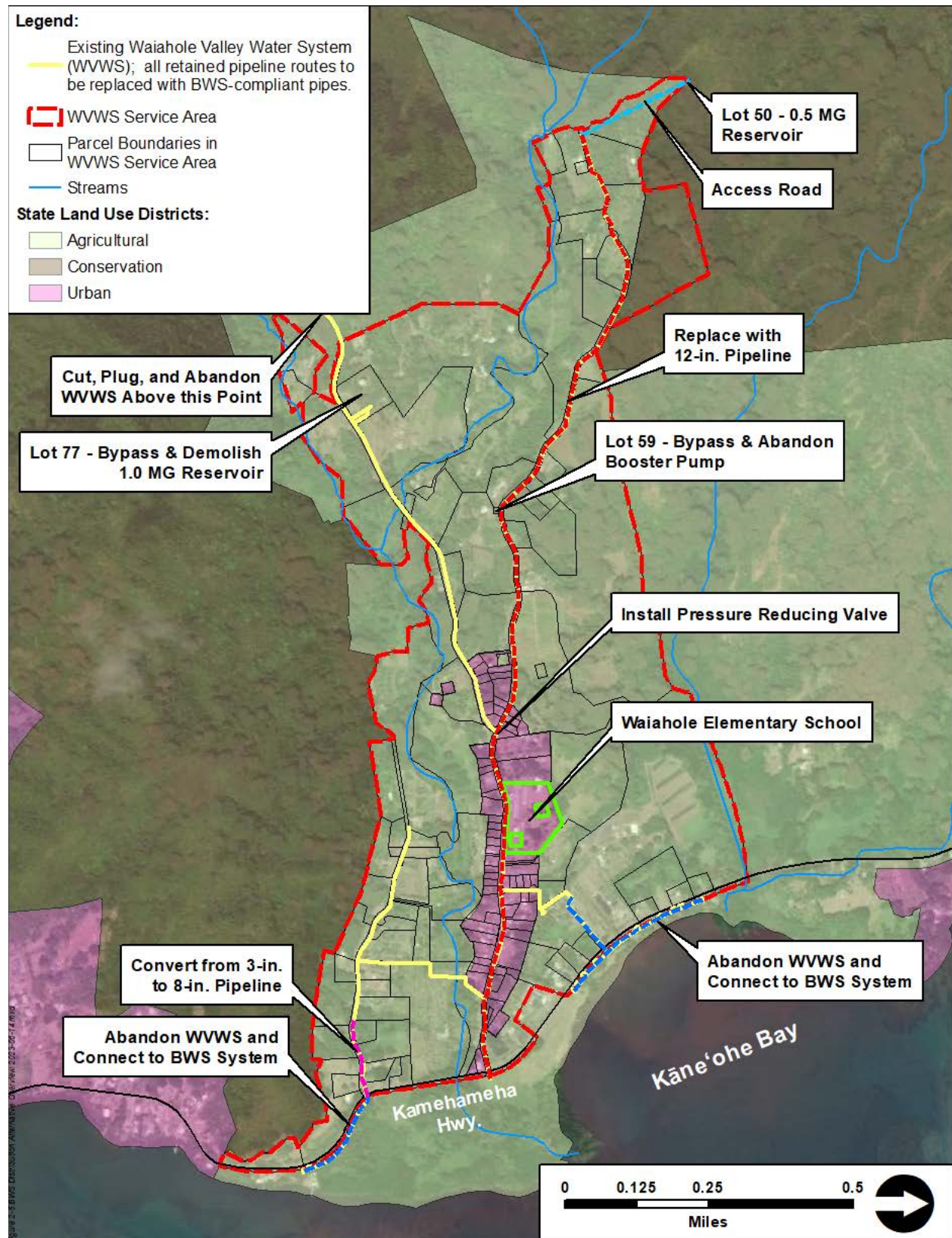
This alternative involves HHFDC improving the WVWS distribution system so that it is compliant with BWS standards, connected to the new water source (Section 2.4.1), and integrated with the BWS system. HHFDC would also turn the system over to BWS to maintain and operate. Under this alternative, the WVWS customers would become BWS customers. Figure 2-4 provides an overview of this alternative's components and layout.

This alternative would include the following project elements, all of which would be built to BWS standards:¹⁰

1. A 0.5 MG reservoir on TMK (1) 4-8-012:031 (Lot 50). This is the same site as the well site discussed in Section 2.4.1.1. If the well water source alternative is selected, there would be an additional 0.45 acres of disturbance on the parcel to install the reservoir near the wells. If the tunnel water source alternative is selected, an access road and water pipeline would also need to be installed on the lot, similar to the road discussed in Section 2.4.1.1, item 3; together the driveway and reservoir would disturb a roughly 0.75-acre portion of the parcel.
2. Water pipelines under both North and South Branches of Waiāhole Valley Road. The new pipelines would consist of ductile iron pipe class 53 and replace the existing piping, which would be abandoned in place. The pipelines would vary in diameter and would include:
 - a. A 12-inch diameter water pipeline from Kamehameha Highway to the Waiāhole Elementary School parcel (TMK (1) 4-8-009:010) to provide the requisite water pressure to meet the fire code requirements at the school.
 - b. Connections to the BWS 265 water pipeline under Kamehameha Highway.
 - c. The new water pipeline would bypass the booster pump station on TMK (1) 4-8-012:037 (Lot 59), which is located along Waiāhole Valley Road, North Branch, and bypass the 1.0 MG reservoir on TMK (1) 4-8-012:044 (Lot 77), which is located near the end of Waiāhole Valley Road, South Branch.
 - d. A pressure reducing valve (PRV) would be installed in the water pipeline near where Waiāhole Valley Road branches.
3. New service connections, water meters, backflow preventors, and shutoff valves for each customer, including those fronting Kamehameha Highway. The connections would comply with BWS' Cross-Connection Control and Backflow Prevention requirements. These improvements would extend slightly into each customer's lot. When this is done, each customer would be connected, and potable water would flow into their private water infrastructure as it does today. Any improvements downstream of the water meter, backflow preventor, and shutoff valve would be the responsibility of the customer.

¹⁰ It is anticipated that final water distribution system design may diverge slightly from those listed here to ensure current BWS standards are met. Such changes are anticipated to be minor.

Figure 2-4: BWS Distribution Alternative Overview



Source: HHFDC, PSI, BEI, and State of Hawai'i GIS layers.

In addition to these and other minor improvements, the booster pump station on TMK (1) 4-8-012:037 (Lot 59) and the 1.0 MG reservoir on TMK (1) 4-8-012:044 (Lot 77), would be decommissioned.

HHFDC would transfer the WVWS to the BWS once the improvements outlined above had been made. The WVWS customers would then become BWS customers and be charged the same rates as other BWS customers.

2.4.2.2 Continued WVWS Operated Water Distribution System

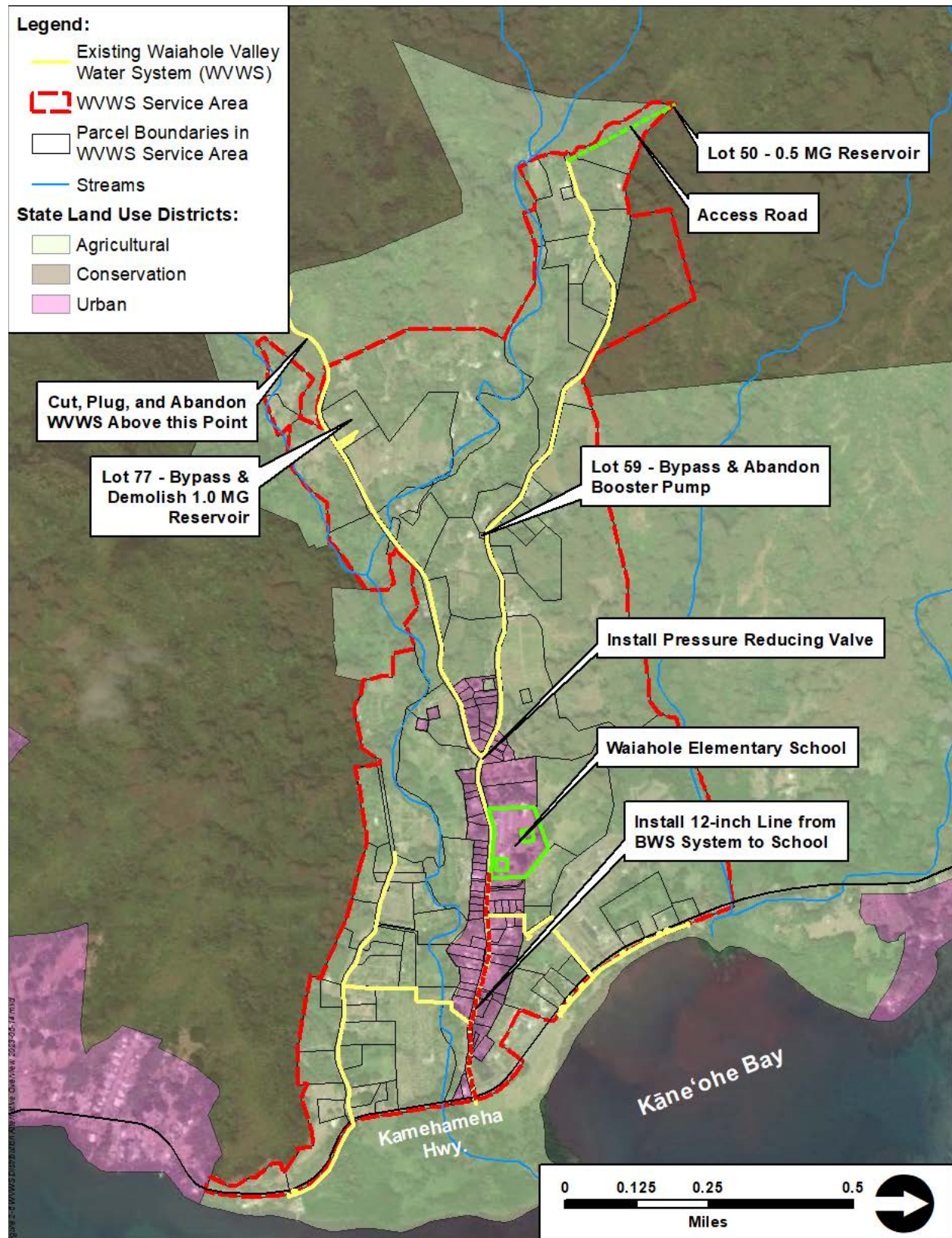
This alternative involves HHFDC improving the WVWS distribution system so that it is connected to the new water source and other improvements and modifications are made. Under this alternative, WVWS customers would continue to be WVWS customers for the foreseeable future; however, HHFDC may seek to procure a third-party entity to operate the water system. Figure 2-5 provides an overview of this alternative's components and layout.

Under this alternative, the bulk of the existing WVWS distribution network would remain as it is. However, this alternative would include the following improvements and modifications:

1. A 0.5 MG reservoir on TMK (1) 4-8-012:031 (Lot 50). This is the same site as the well site discussed in Section 2.4.1.1. If the well water source alternative is selected, there would be an additional 0.45 acres of disturbance on the parcel to install the reservoir near the wells. If the tunnel water source alternative is selected, an access driveway and water pipeline would need to be installed on the lot, similar to the road discussed in Section 2.4.1.1, item 3; together the road and reservoir would disturb a roughly 0.75 acre portion of the parcel.
2. Water pipelines to bypass the booster pump station on TMK (1) 4-8-012:037 (Lot 59), which is located along Waiāhole Valley Road North Branch. The existing booster pump station would be abandoned.
3. Water pipelines to bypass the 1.0 MG reservoir on TMK (1) 4-8-012:044 (Lot 77), which is located near the end of Waiāhole Valley Road South Branch.
4. A PRV near where Waiāhole Valley Road branches.
5. A 12-inch-diameter water pipeline would be extended from BWS's main under Kamehameha Highway to the Waiāhole Elementary School parcel (TMK (1) 4-8-009:010). This water pipeline would not be part of the WVWS; it would be owned by BWS. This is necessary to provide the requisite water pressure to meet the fire code requirements at the Waiāhole Elementary School parcel.
6. Water meters, backflow preventors, and shutoff valves for each customer. These improvements would extend slightly into each customer's lot. When this is done, each customer would be connected, and potable water would flow into their private water infrastructure as it does today. Any improvements downstream of the water meter, backflow preventor, and shutoff valve would be the responsibility of the customer.

In addition to these and other minor improvements, the booster pump station on Lot 59 and the 1.0 MG reservoir on Lot 77, would be decommissioned.

Figure 2-5: WVWS Distribution Alternative Overview



Source: HHFDC, PSI, BEI, and State of Hawai'i GIS layers.

2.4.3 PROPOSED CONSTRUCTION CONTROLS

Construction characteristics will be like that of a typical water system installation. Regardless of the alternatives selected, the following general controls and Best Management Practices (BMPs) would be employed:

- BMPs related to storm water would be implemented, including measures related to ground disturbance, perimeter control, dust control, construction site ingress and egress, storm drain inlet protection, waste management, fueling and maintenance practices, material staging, and soil stockpiles. The BMPs are discussed further in Section 3.2.3.
- Traffic control plans would be developed and implemented, per Hawai‘i Department of Transportation, Highways Division (HDOT) guidelines, for work in Kamehameha Highway’s right-of-way. Traffic control plans would also be developed for work in valley road rights-of-way.
- There are no plans to work at night. Night work would only occur if HDOT requires it when work occurs on Kamehameha Highway. If night work is necessary, night work would not be conducted during seabird fledgling season (September 15 to December 15).
- No trees taller than 15 feet would be removed or trimmed between June 1 and September 15 to protect Hawaiian Hoary bat.
- Cutting by torch or welding, or any “hot work,” would only be performed when adequate fire protection is available.
- All vehicles, except fuel trucks, would be equipped with an ABC triple class, dry chemical fire extinguisher of not less than 2.5-pound capacity.
- Ground disturbances beyond roadway ROW and customer’s lots would be monitored by an archaeologist per a SHPD-approved Archaeological Monitoring Plan (AMP).
- If necessary, potable water would be delivered to WVWS customers during water system change-over.
- Residents along the roads affected and the community association would be notified prior to commencing construction activities. Worker travel and parking will also be coordinated to either occur on-site (e.g., Lot 50) or in appropriate nearby areas.

2.4.4 NO ACTION

The no action alternative would maintain the existing water system in its current configuration and condition with no improvement. The current operation and maintenance challenges would continue, and the system would remain vulnerable to storm damage and intermittent outages that negatively impact the businesses and residents of the area.

2.4.5 PERMITS AND APPROVALS

The permits and approvals required to implement the range of action alternatives are identified in Table 2-4. The no action alternative would not trigger any permits or approvals.

Table 2-4: Permits and Approvals, Categorized by Potential Action Alternatives

<i>Permit or Approval</i>	<i>Alternative:</i>	<i>Wells/ BWS</i>	<i>Wells/ WVWS</i>	<i>Tunnel/ BWS</i>	<i>Tunnel/ WVWS</i>
Well/Pump Permit, issued by Commission on Water Resource Management (CWRM)		X	X		
Site Plan Approval (SPA), issued by Office of Conservation and Coastal Lands (OCCL)		X (for demo of existing wells)	X (for demo of existing wells)		
Conservation District Use Permit (CDUP), issued by Board of Land and Natural Resources (BLNR)				X	X
Board of Water Supply (BWS) Plan Approval		X		X	
Hawai'i Department of Health (HDOH) Plan Approval			X		X
Department of the Army, Clean Water Act Section 404 Nationwide Permit (NWP), issued by United States Army Corps of Engineers (USACE)				X	X
Easements/Agreements, from Agribusiness Development Corporation (ADC)				X	X
Water Use Permit (transfer), issued by Commission on Water Resource Management (CWRM)		X	X	X	X
Well Abandonment Permit (CWRM)		X	X	X	X
National Pollutant Discharge Elimination System (NPDES), General Construction, issued by Hawai'i Department of Health (HDOH) Clean Water Branch		X	X	X	X
Grubbing, Grading, Stockpiling, and/or Building, issued by Department of Planning and Permitting (DPP)		X	X	X	X
Highway Usage Permit, issued by Hawai'i Department of Transportation, Highways Division (HDOT)		X	X	X	X
HRS 6E Historic Preservation Review, by State Historic Preservation Division (SHPD)		X	X	X	X

Source: Planning Solutions, Inc.

The CDUP is the only discretionary permit that would be triggered by any of the alternatives. Only the tunnel alternative would require the discretionary CDUP, which is issued by the Board of Land and Natural Resources (BLNR), because it represents a public purpose use (a not-for-profit utility) in the Conservation District. It is considered discretionary because the BLNR could vote to deny the permit even if the applicant complies with application instructions and all rules, statutes, ordinances, or other requirements. The other permits are considered ministerial, meaning that the issuing agency cannot deny the permit or approval if the applicant demonstrates that its plans comply with applicable rules, statutes, ordinances, or other requirements.

The well/pump permit is required for any potable water production well; it is only triggered by the wells alternatives. The Site Plan Approval (SPA) is triggered when the only activity in the Conservation District is the demolition/removal of existing structures, facilities, or equipment; under the wells alternatives, the only activity in the district will be the decommissioning of existing WVWS facilities. A Nationwide Permit (NWP) per Clean Water Act Section 404 would be triggered by improving the access road where it crosses streams and installing a water line under

the streams; these permits are issued by the US Army Corps of Engineers (USACE). Plan approval would be required from BWS if the system is to be turned over to them; HDOH Safe Drinking Water Branch plan approval would be required if the WVWS would remain private.

The water use permit is required for the use of any State water; it is required for all alternatives because both the well and tunnel alternatives would use State water. The NPDES permit is triggered when a project disturbs more than 1 acre of land; all alternatives would exceed an acre of disturbance. An HDOT Highways Use and Occupancy Permit would be needed for the portion of the selected alternative that occurs within Kamehameha Highway ROW.

2.4.6 PRELIMINARY SCHEDULE

The anticipated project schedules for the action alternatives are presented in the tables below.

Table 2-5: Preliminary Schedule for the Wells/BWS Alternative

<i>Task</i>	<i>Estimated Duration</i>	<i>Estimated Completion Date</i>
EA process	12 months	October 2023
Permits and Approvals	24 months	October 2025
Construction	36 months	October 2028
Entire Project	6 years	NA

Source: PSI and BEI.

Table 2-6: Preliminary Schedule for the Wells/WVWS Alternative

<i>Task</i>	<i>Estimated Duration</i>	<i>Estimated Completion Date</i>
EA process	12 months	October 2023
Permits and Approvals	18 months	April 2025
Construction	18 months	October 2026
Entire Project	4 years	NA

Source: PSI and BEI.

Table 2-7: Preliminary Schedule for the Tunnel//BWS Alternative

<i>Task</i>	<i>Estimated Duration</i>	<i>Estimated Completion Date</i>
EA process	12 months	October 2023
Permits and Approvals	30 months	April 2026
Construction	36 months	April 2029
Entire Project	6.5 years	NA

Source: PSI and BEI.

Table 2-8: Preliminary Schedule for the Tunnel//WVWS Alternative

<i>Task</i>	<i>Estimated Duration</i>	<i>Estimated Completion Date</i>
EA process	12 months	October 2023
Permits and Approvals	30 months	April 2026
Construction	36 months	April 2029
Entire Project	6.5 years	NA

Source: PSI and BEI.

2.4.7 ESTIMATED PROJECT IMPLEMENTATION BUDGET

The anticipated construction costs for the alternatives is presented in Table 2-9. These costs encompass the construction of the alternatives to the point that they are ready for operation.

Table 2-9: Summary of Estimated Construction Cost

<i>Proposed Action Description</i>	<i>Estimated Cost (2023 M\$)</i>
Wells/BWS	\$27.4
Wells/WVWS	\$14.8
Tunnel/BWS	\$46.2
Tunnel/WVWS	\$34.2

Source: BEI and HHFDC

The construction costs in Table 2-9 do not include annual operating and maintenance (O&M) costs. Under the BWS alternatives, current WVWS customers would become BWS customers, be charged the same rates as other BWS customers, and BWS would cover all O&M costs. Under the WVWS alternatives, current WVWS customers would continue to be WVWS customers, be charged per the established WVWS rate structure, and HHFDC would cover all O&M costs.

Overall, the O&M costs of the wells water source alternatives are anticipated to be less than, or similar to, the O&M costs of the tunnel water source alternatives. This is because the tunnel alternatives would require: (a) maintenance of a long road through rough terrain that is susceptible to flooding and has large, invasive vegetation along it; and (b) for an unknown period, water from the tunnel will require more frequent testing, and perhaps treatment. Those costs would likely be greater than the energy costs to operate the well pumps. The difference in O&M costs between the BWS and WVWS distribution systems is anticipated to nominal over the long term; however, in the short term, the BWS distribution would likely have lower O&M costs because new piping would be present throughout the service area.

The no action alternative would result in a continuation of the O&M costs for the existing system. The O&M costs would likely increase over time because the facilities would need replacement or more frequent repair as system components reach the end of their design life.

2.5 ALTERNATIVE SCREENING

2.5.1 MEETING WATER DEMANDS

Both water source alternatives, wells (Section 2.4.1.1) and tunnel (Section 2.4.1.2), are anticipated to easily supply sufficient potable water to meet the demands of the WVWS customers. Both sources would draw water from the same aquifer system, the Ko‘olaupoko Aquifer System, which CWRM estimates has a sustainable yield of 28 MGD. The two existing wells demonstrate that two wells can satisfy the demand. It is anticipated that the proposed Lot 50 wells would produce a similar quantity and quality of water as the existing wells.

The quantity of water produced by the tunnel has been monitored for over 100 years. It typically produces between 12 and 14 MGD and there is no reason to believe that production will change dramatically in the future. The tunnel’s production is the subject of a CWRM ruling related to operation of the Waiāhole Ditch and Tunnel System. Given that the tunnel’s production is over 40 times the WVWS’ ADD (Table 2-1), it is reasoned that it could easily meet the WVWS’ needs. However, as ADC states in their scoping response (Appendix A), there would need to be consideration of how water is withdrawn from the tunnel. The water withdrawal could affect ADC’s ability to provide sufficient water to their customers and comply with permit conditions that include releases to streams.

The two water distribution alternatives are not substantially different when it comes to meeting water demand.

2.5.2 SYSTEM COST EFFECTIVENESS

HHFDC would be responsible for the initial capital costs (Table 2-9) under all alternatives. The difference in capital cost between the well and tunnel water source alternatives is primarily due to the tunnel alternative requiring a roughly mile long access road and 8-inch diameter water pipeline. The safety of the work environment is another concern associated with the effectiveness criteria for the tunnel alternative. Work in the remote, heavily forested area beyond the end of Waiāhole Valley Road can present safety hazards and other risks that would not be present (or present at a lesser degree) at the well site on Lot 50. Those hazards and risks could drive up project costs in ways not accounted for in the cost estimate, such as personal injury and weather delays. Therefore, the wells alternative is preferred in the cost effectiveness criteria.

The difference in capital cost between the WVWS and BWS water distribution alternatives is substantial (Table 2-9). Therefore, from purely a capital cost perspective, the WVWS would be preferable under this criterion. However, as discussed below, it would not address certain goals, plus the existing WVWS is aging and continuing to maintain it would drive up the O&M cost.

Should the water system remain private, O&M costs would be higher under the WVWS alternative because the existing distribution pipelines are now over 40 years old and would require more frequent preventative maintenance and more frequent leak/failure response than a completely new system built to BWS specifications would.

Under the BWS alternative, the WVWS customers would become BWS customers and the BWS rates would apply to them. There is no reason to anticipate that the BWS rates would change due to BWS' absorption of the WVWS, because the WVWS would represent a small fraction of the BWS' infrastructure and the improved WVWS would be built to BWS specifications.

Although the BWS distribution system alternative has a substantial cost, it fully addresses the Hawai'i State Legislature Senate Concurrent Resolution No. 195, which was approved in 2006. That resolution is an important aspect of the action's purpose and need (Section 1.2) and encouraged the transfer of the WVWS to BWS. Thus, despite the higher cost, the BWS alternative is considered cost-effective because it fully addresses the purpose and need of the proposed project. The WVWS distribution system is also considered cost-effective because, although it does not fully address the purpose and need, its cost is roughly half of the BWS alternative. Nevertheless, HHFDC would prefer to implement the BWS alternative so that it could comply with the legislative resolution and fully meet the purpose and need.

2.5.3 SYSTEM RELIABILITY

The primary issues that decrease the current system's reliability are the remoteness of the wells and the difficulty of restoring access and power to the wells after a flood, tree fall, or another similar event. Both water source alternatives address these issues, but to different degrees.

- *Well source alternative.* This alternative eliminates the remoteness issue and substantially reduces the restoring power issue by placing the wells in the developed portion of the valley and near existing power lines that are maintained for other

- customers. Power to the wells would only be lost when an incident along the main road results in power being lost to other uses in the valley. Because the main road is well maintained and the number of trees and other threats to the power lines are substantially less than the threats associated with the existing well site, system reliability would be increased, and the duration of outages would be reduced.
- *Tunnel source alternative.* This alternative requires infrastructure in a remote area, similar to the existing wells, but does not require electrical service in the remote area. The infrastructure in the remote area would be prone to damage associated with floods and landslides and obtaining access to the system and failures that require repair could delay restoration of service. The remote infrastructure would not be as complex as the current remote infrastructure. Because power would not be required in the remote area, it is likely that the frequency and duration of outages would be reduced relative to the existing system.

Given these considerations, HHFDC has assessed that both water source alternatives would be more reliable than the existing system (i.e., the no action alternative), but the added reliability associated with the wells alternatives is preferred.

The difference in reliability between the WVWS and BWS distribution systems would likely not be great. The portions of the existing water distribution pipelines that would be retained under the WVWS alternative are now over 40 years old and likely require more frequent leak/failure response than a completely new system built to BWS specifications. The leaks and failures that did occur under the WVWS alternative would not affect the entire system and could be addressed quickly and, therefore, the reduction in reliability would be limited.

The primary reliability difference between the distribution alternatives is that the BWS alternative would have a built-in backup water source. Because the valley would be part of the BWS water system, should the water source in the valley become unavailable for any reason, water from other BWS sources would be available to meet the valley's water demand. This redundancy provides a greater level of reliability and greater flexibility for in-valley water source maintenance.

Given the importance of potable and irrigation water, HHFDC would prefer the added reliability that the BWS distribution system would provide.

2.5.4 PROBABILITY OF ADVERSE ENVIRONMENTAL EFFECT

As discussed in Section 2.3.4, during initial screening the likelihood of an impact can be assessed by whether an alternative involves a use of a certain district or known resource. Table 2-10 summarizes the two water source alternatives' likely use of certain districts and resources.

Table 2-10: Summary of Districts and Resources Potentially Affected by Water Source Alternatives

<i>Topic</i>	<i>Wells Alternative (new construction)</i>	<i>Tunnel Alternative (new construction)</i>
State land use district	All in Agricultural District	<ul style="list-style-type: none"> Improvements to a roughly 1-mile-long road, a new 1-mile-long pipeline, and modification of tunnel in Conservation District. Improvements to a roughly 500-foot-long road and a new roughly 1,300-foot-long pipeline in Agricultural District.
Designated critical habitat	None	Roughly 1-mile-long road, 1-mile-long pipeline, and modification of tunnel in Critical Habitat for the O‘ahu ‘Elepaio and/or 47 other species.
Documented historic places	None	Modification of Uwao Tunnel, which is believed to be eligible for listing on the State and National Historic Place Registries.
Permits required	<ul style="list-style-type: none"> Permits triggered by both water source alternatives. Well/Pump Permit. Water Use Permit would be a relatively straightforward transfer from existing wells to new wells. 	<ul style="list-style-type: none"> Permits triggered by both water source alternatives. Water Use Permit could be complicated by need to revisit the Waiāhole Ditch Water Use Permit, including the volume of water released. Conservation District Use Permit (CDUP), issued by Board of Land and Natural Resources (BLNR), for the road improvement, new water pipeline, and tunnel modifications. Clean Water Action Section 404 Nationwide Permit (NWP), issued by United States Army Corps of Engineers (USACE), for stream crossings in the Conservation District by the improved road and new pipeline.

The district and resource information in Table 2-10 indicate that the potential for adverse environmental effects under the tunnel alternative is greater than the wells alternative. This is primarily due to the use of the Conservation District, most of which is designated critical habitat and requires a CDUP. Long-term impacts to the district can accumulate as the access road is maintained, more vehicles travel the road, and more people access the area using the road. These uses and activities can introduce invasive species and expose resources to other hazards. The work in the Conservation District would also involve modification of a historic place and probably trigger permits associated with the road and water pipeline crossing streams. Furthermore, using water from the tunnel for a new purpose would likely trigger modification of the Water Use Permit for the ditch system, which was developed through a long process that involved contested cases and court orders. The cumulative impacts associated with modifications to that permit and the resulting change in flow to other ditch uses or discharges could be extensive. For these reasons, when considering the environmental effect criteria, HHFDC strongly prefers the wells alternative over the tunnel alternative.

The difference in environmental impacts between the two water distribution alternatives is considered negligible over the long term. Under the BWS alternative, there would be more ground disturbance in the short term as a BWS-compliant system is installed. This would temporarily affect traffic flow in the valley but would not have a significant impact on area roadways or traffic. Over the long term, both alternatives would result in an entity (i.e., BWS or a private entity) operating water utility infrastructure in the same locations and that infrastructure would require periodic maintenance. Thus, the difference between the two alternatives is negligible.

2.5.5 ALTERNATIVE SCREENING SUMMARY

The screening of the alternatives is summarized in Table 2-11 and Table 2-12.

Table 2-11: Alternative Screening Summary, Water Source Alternatives

<i>Topic</i>	<i>Wells Alternative</i>	<i>Tunnel Alternative</i>
Meeting water demand	No issue.	No issue.
Cost effectiveness	Preferred due to lower capitol cost and limit risk of unforeseen cost increases.	Not preferred due to higher capitol cost and greater risk of unforeseen cost increases.
Reliability	Preferred due to greater reliability due to accessibility of all components.	Not preferred due to lower reliability associated with remoteness of water source and long connecting pipeline.
Adverse environmental effects	Preferred due to low potential for adverse environmental effects, associated with small footprint within the Agricultural District.	Not preferred due to long, linear use within the Conservation District and Critical Habitat, among other potential effects.

Based on the screening, HHFDC has identified the wells alternative as the safer, more cost-effective, and more reliable water source alternative. HHFDC has assessed that the tunnel alternative has a greater likelihood of causing adverse environmental effects and of having permitting challenges, and does not have any countervailing cost or reliability advantages. Therefore, HHFDC has determined that the wells alternative will continue to be considered and the tunnel alternative does not warrant further consideration or detailed analysis in this EA.

Table 2-12: Alternative Screening Summary, Water Distribution Alternatives

<i>Topic</i>	<i>Preferred Alternative</i>
Achieving purpose and filling the need	BWS because it addresses the resolution encouraging the transfer of the WVWS to the BWS.
Meeting water demand	Not applicable.
Cost effectiveness	WVWS due to lower capitol cost and lower agricultural water rates.
Reliability	BWS because an entirely new system built to BWS standards would be more reliable than continuing to mainting water mains that were installed over 40 years ago.
Adverse environmental effects	No preference, neither distribution alternative is anticipated to cause substantial adverse effects.

Based on the screening, HHFDC has determined that it prefers the BWS water distribution system alternative, primarily because it would satisfy the legislative resolution that calls for the system to be transferred to BWS. HHFDC also recognizes that the screening criteria do not reveal other substantial differences between the BWS and WVWS water distribution system alternatives. Both distribution system alternatives will continue to be considered in this EA.

Based on the screening, the two alternatives that will be analyzed in the remainder of this EA are: (i) wells/BWS and (ii) wells/WVWS.

3 EXISTING ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATION

This chapter describes the potential environmental effects of the project alternatives and the no action alternative, as described in Chapter 2. This chapter is organized by resource category (e.g., coastal hazards, archaeological and cultural resources, etc.). The discussion under each topic includes: (i) an overview of existing conditions at the site, valley, or region; (ii) the potential environmental impacts that may occur as a result of implementation of the alternatives considered in this EA; and, where appropriate, (iii) any measures that the HHFDC will take to avoid, minimize, or mitigate potential adverse effects. The scale of the discussion is commensurate with the potential for impacts and public interest as informed by scoping input received. Where appropriate, the larger environmental context (e.g., the Ko‘olaupoko region) is discussed, and in other cases the focus is narrower (e.g., the valley or well site). The discussion of impacts also distinguishes between short-term (i.e., those occurring when construction equipment and personnel are actively implementing demolition and construction processes) and long-term (i.e., those that may occur during the operational phase of the project) for the action alternatives.

3.1 CLIMATE & PRECIPITATION

3.1.1 EXISTING ENVIRONMENT

Tradewinds have a significant effect on Windward O‘ahu’s climate patterns. Tradewinds blow from the northeast most of the year and bring warm moist air from the ocean onto the land. As the air is forced upwards over the Ko‘olau Mountains, a phenomenon known as orographic lift, the air cools, forms clouds and creates precipitation. As a result, the mountainous regions of Windward O‘ahu experience frequent rainfall and are often cloudy. Fog drip at higher elevations also contributes to precipitation.

The highest annual average rainfall on O‘ahu (roughly 240 inches) occurs in the mountains behind Kahana Valley. In Waiāhole Valley, the highest annual rainfall is roughly 180 inches at the back of the valley; rainfall declines rapidly toward the coast where annual rainfall is roughly 60 inches. Annual rainfall at Lot 50 is roughly 105 inches.

Data from the Western Regional Climate Center (WRCC) indicate that average temperatures in the vicinity of Waiāhole Valley (temperatures recorded in Kāne‘ohe mauka) vary minimally throughout the year with the warmest temperatures averaging 79.8° F in the summer months and the coolest temperatures averaging 68.8° F in the winter months. The average annual wind speed recorded at the Marine Corps Base in Kāne‘ohe between 1996 and 2006 was 8.4 miles per hour. The average wind speed in 2017 was 9 miles per hour.

Climate variability and climate change can exacerbate and facilitate impacts from other hazards such as hurricanes, tropical storms, flooding, sea level change, and drought.

3.1.2 POTENTIAL IMPACTS

The action alternatives do not include short-term or long-term uses or activities on a scale that have the potential to adversely affect local climate conditions.

Similarly, the no action alternative would not affect local climate conditions.

3.2 GEOLOGY AND SOIL

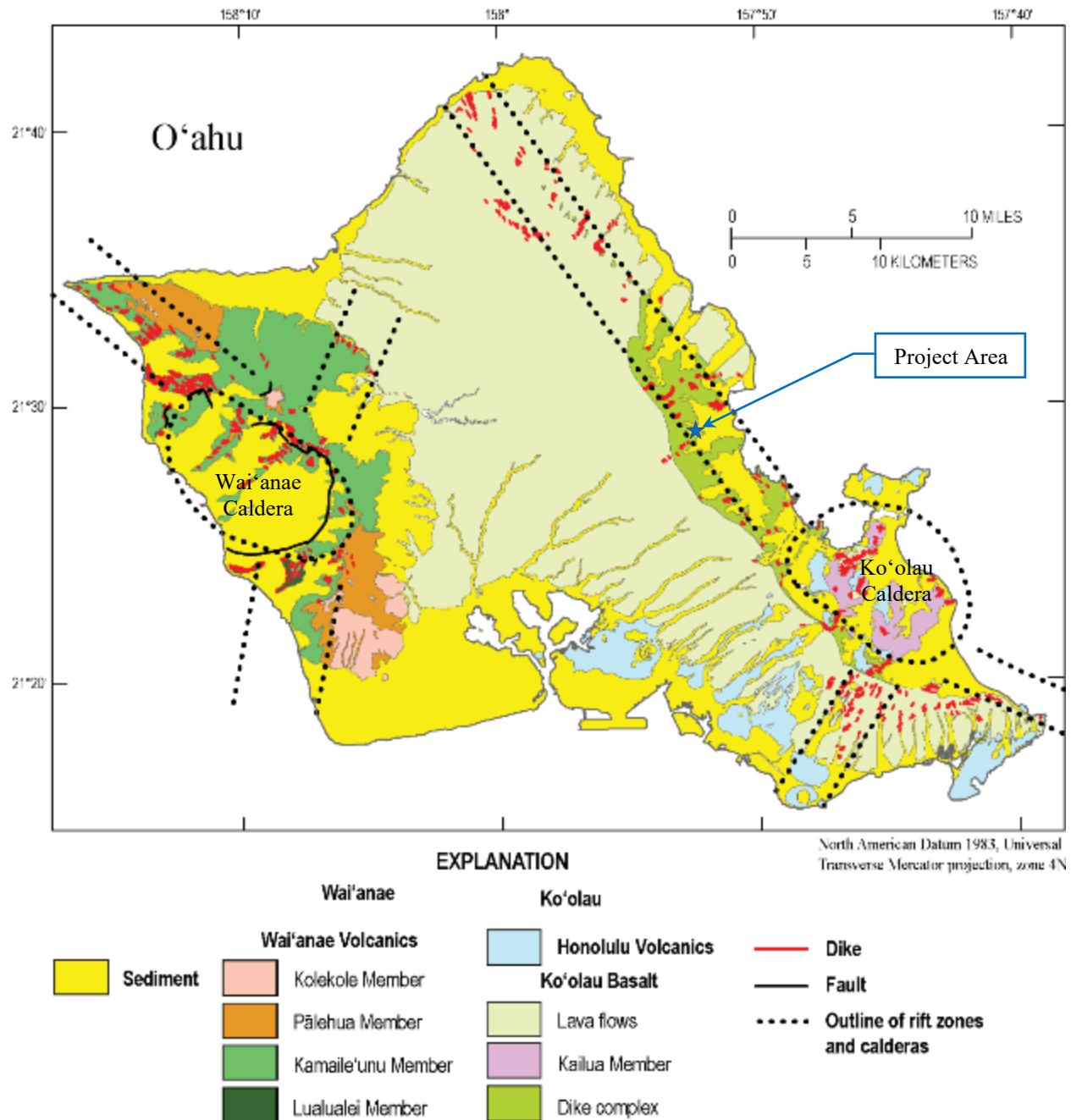
3.2.1 EXISTING ENVIRONMENT

O‘ahu consists of the eroded remnants of two elongated shield volcanoes; the older, western Wai‘anae Volcano (main shield-building stage approximately 3.8-2.95 million years ago) and the younger, eastern Ko‘olau Volcano (shield-building stage approximately 2.5-1.7 million years ago). The rift zone and caldera locations are interpreted based on the location of dikes and other evidence. Dikes are fractures through which magma rose to the surface when the volcano was active. When magma cools in the fractures, it forms dense, near vertical sheet-like bodies of intrusive rock which are referred to as dikes. The approximate area of the Ko‘olau caldera would have encompassed the areas where the towns of Kāne‘ohe and Kailua are now located (Figure 3-1).

Waiāhole Valley is in the rift zone trending northwest from the Ko‘olau caldera; there are known to be several dikes in the area. Often, the dikes are where waterfalls occur because the dikes do not erode as readily as the rocks around them and hold back groundwater, as discussed in Section 3.3.2.

The eruptive period of the volcano was followed by a long period of erosion, leading to the amphitheater-shaped valleys of windward O‘ahu. The mauka portions of the valley have narrow ridges and very steep to precipitous slopes, which become gradually less steep in the center and makai portions of the valley. The lower portions of the valleys are filled with sediment that derive from and overlay the volcanic bedrock. The thickness of these sediments varies from thin in the back and on the margins of the valley to roughly 500 feet thick at the coastline. The surface and near surface portion of the sediment consists of the soils described below.

Figure 3-1: Simplified Geologic Map of O‘ahu



Source: USGS, 2018, Figure 31.

Figure 3-2 is a soils map of the Waiāhole Valley area; it is from surveys done by the Hawai‘i Department of Agriculture in the 1970s. In the very steep mauka portions of the valley, the Ko‘olau Basalt is exposed (rRO on Figure 3-2). Below the mauka cliffs, a thin layer of weathered alluvium and rock overlays the Ko‘olau Basalt in the upper reaches of the valley (WpF, WpE, and WpC on Figure 3-2). In the middle and lower reaches of the valley, the layer of weathered alluvium becomes thicker and is locally overlain with younger alluvium; these are the rich alluvial soils of the Waikāne silty clay series (WpB on Figure 3-2), the Hanalei silty clay series (HnA on

Figure 3-2), with the Pearl Harbor series (Ph on Figure 3-2) that soils are the ones most commonly used for agriculture in Waiāhole Valley.

Figure 3-2: Waiāhole Valley Soil Map



Source: Natural Resource Conservation Service (2023)

The following provides details concerning the soils mapped in the project area:

- WpF, WpE, WpC, and WpB. The Waikāne Series consists of well-drained soils on alluvial fans and terraces. They develop in alluvium and colluvium derived from basic igneous rock. These soils make up the bulk of Waiāhole Valley, except for the low, flat, river bottom areas where most of the taro lo‘i are located. Generally moving from steeper to flatter and from mauka to makai, these soils include the following:
 - WpF is Waikāne silty clay with 40 to 70 percent slopes where runoff is rapid to very rapid and the erosion hazard is severe. This soil is used for pasture and woodland (Capability Class [CC] VIIe, Pasture Group [PG] 8, Woodland Group [WG] 14).
 - WpE is Waikāne silty clay with 25 to 40 percent slopes, which has a moderately rapid permeability, medium to rapid runoff, moderate to severe erosion hazard, and is used for pasture (CC VIe, PG 8, PG 7).
 - WpC is Waikāne silty clay with 8 to 15 percent slopes that has slow to medium runoff and slight to moderate erosion hazard; truck crops, pasture, and homesites are typical uses (CC IIIe, PG 8, WG 7).
 - WpB is Waikāne silty clay with 3 to 8 percent slopes where runoff is slow, erosion hazard is slight, and truck crops, pasture, and homesites are common (CC IIe, PG 8, WG 7).

- HnA. Hanalei silty clay with 0 to 2 percent slopes that derive from basic igneous rock and have moderate permeability, very slow runoff, and no more than slight erosion hazard. This soil is used for taro, pasture, and sugarcane (CC IIw, PG 7, WG 4). In Waiāhole Valley, these soils are primarily used for taro lo‘i.
- Ph. Pearl Harbor clay soil is very poorly drained soil that is nearly level on the coastal plain. Permeability is very slow, runoff is very slow with ponding, and the erosion hazard is no more than slight. This soil is used for taro, bananas, and pasture (CC IVw, PG 7, WG 4).

Lot 50 is mapped as WpF and WpC, depending on the slope. Generally, where the slope is low (WpC), the soil can be used for truck crop agriculture. Lot 50 is currently woodland. Throughout Waiāhole Valley the WpF and WpC soils are not utilized for agriculture; they are typically used for woodlands and homesites.

3.2.2 POTENTIAL IMPACTS

The potential impacts of the two action alternatives on geologic and soil resources would not be substantially different because the impacts would primarily occur on Lot 50, and the scope of activity on Lot 50 is the same under both alternatives. Beyond Lot 50, the installation and maintenance of new water infrastructure (BWS alternative) or the maintenance of the existing distribution system (WVWS alternative) within the roadway network does not have the potential to affect these resources in a substantial manner.

The action alternatives would include short-term vegetation clearing, grading and excavation (cut and fill), and general construction at the new well and reservoir site (Lot 50). The action alternatives would also involve decommissioning and/or abandonment of certain existing WVWS infrastructure, which would also involve short-term clearing and ground disturbance, but not mass grading. Ground disturbance associated with project construction and decommissioning activities would temporarily increase the potential for erosion and sediment discharge when compared to the existing condition. Those short-term activities do not have the capacity to adversely affect geology or soil in a significant way; the impacts would have a limited extent, be temporary, and not affect soils that are important for farming.

Over the long-term soil cover (e.g., vegetation and stabilized roads) would be maintained and the project would not result in permanent changes to soil or geological characteristics beyond the limited extent of improvements within Lot 50. Maintenance of the water system would periodically require ground disturbance, but those disturbances would be of limited duration and occur in previously disturbed areas where infrastructure already exists and, thus, geological and soil resources would not be adversely impacted.

The two action alternatives would not have substantially different impacts on geologic and soil resources and those impacts would be less than significant.

The no action alternative would not involve construction or ground-disturbing activities that have the capacity to affect soils or geologic conditions beyond ongoing maintenance of the existing system. The access road to the existing wells is not paved and is in WpF and WpE soils; that access road does show evidence of erosion due to use and surface water runoff. Repairs and maintenance of the road would continue on an as needed basis. If WVWS improvements are not

made, it would be reasonable to assume that maintenance and repairs on the existing water system would increase in frequency and magnitude.

3.2.3 AVOIDANCE, MINIMIZATION, AND MITIGATION MEASURES

Required permits, such as CCH Grading and Grubbing Permits and NPDES permit, would be obtained prior to performing work and staff/contractors would be required to comply with permit conditions. The project shall comply with the City and County of Honolulu's "Storm Drainage Standards" and the "Rules Relating to Water Quality," which address issues related to soil erosion.

Whether required by permit conditions or not, temporary BMPs would be implemented during ground-disturbing activities to avoid and minimize soil erosion. Those BMPs are likely to include perimeter controls like silt fences and silt socks, check dams and/or erosion blankets in steep areas, stabilized construction access areas, designated fueling and storage areas, soil stockpile protections, dust control measures, and site stabilization measures.

Additionally, the following avoidance and minimization measures would be employed:

- Stopping work and stabilizing the site during periods of heavy rainfall. Stabilization methods would include straw mulch cover, erosion blankets with anchors, 6-milimeter plastic sheets, and other measures.
- Phasing the project to reduce the disturbed/exposed areas at any one time.
- Existing vegetation would be preserved to the maximum practicable extent.
- Clearing and grubbing along steep slopes and prior to rain events would be avoided.
- Stabilizing disturbed areas as soon as possible.
- Maintaining temporary BMPs until permanent stabilization has been achieved.

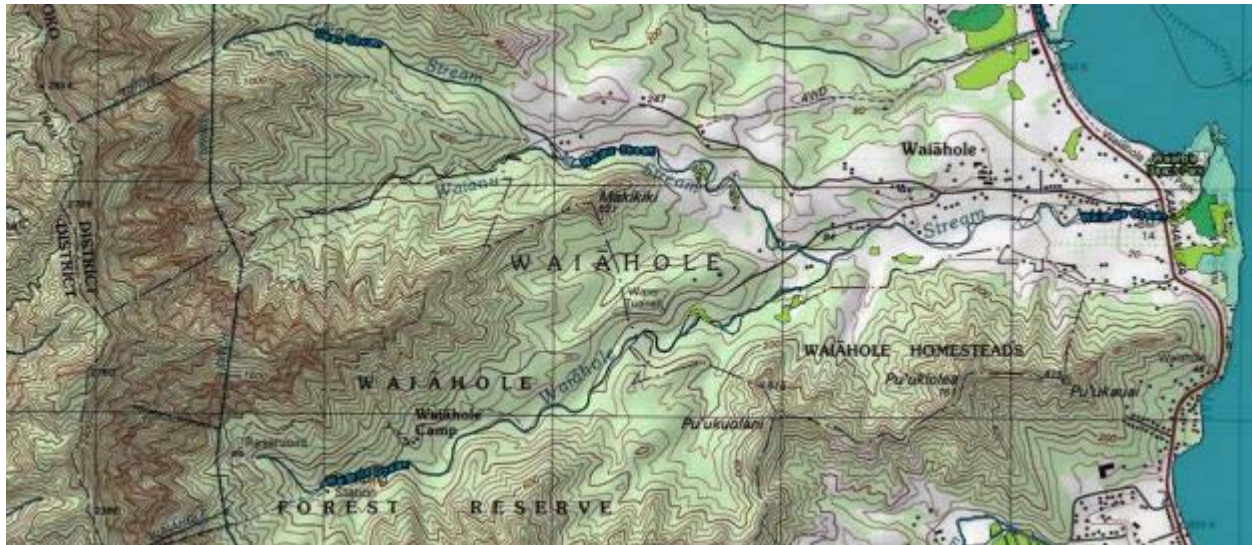
3.3 WATER RESOURCES

The Climate & Precipitation section (Section 3.1) and Geology and Soil section (Section 3.2) above provide context for this section. The climate, principally precipitation, contributes to and affects the water resources discussed here. The relatively high annual precipitation results in abundant water resources in the valley. It is important to understand the geologic and soil conditions because they are the media through which the groundwater flows.

3.3.1 EXISTING SURFACE WATERS (WETLANDS)

Wetlands include surface waters like stream and the ocean. They also include wetlands like taro lo'i and other features. Figure 3-3 illustrates the surface waters and wetlands in the project area as mapped in the National Wetlands Inventory by the U.S. Fish and Wildlife Service.

Figure 3-3: Surface Waters and Wetlands



Source: <https://www.fws.gov/wetlands/data/mapper.html>, accessed April 19, 2023.

The streams in Waiāhole Valley are the wetlands that people are most familiar with. From south to north in the mauka portion of the valley the streams include Waiāhole, Waianu, and Uwao Streams; Uwao is a tributary of Waianu and Waianu is a tributary of Waiāhole Stream, which flows to Kāneʻohe Bay. The watershed is roughly 4 square miles (2,560 acres) and includes the entire Waiāhole ahupuaʻa except for the low coastal area along Kamehameha Highway north of the Waiāhole Nursery & Garden Center.

The streams nearest Lot 50 are Waianu and Uwao Streams. Figure 3-4 shows the condition of those streams in a relatively dry time near the end of Waiāhole Valley Road North Branch, near the boundary between the Agricultural District and Conservation District, and at an elevation of roughly 200 feet. At this location these two streams join. The higher flow in Waianu Stream is primarily due to the release of roughly 3 MGD from the Waiāhole Ditch System into the stream; the Waianu Stream watershed is also larger than the Uwao Stream watershed.

Figure 3-4: Photographs of Waianu and Uwao Stream



Waianu Stream

Uwao Stream

Note: Photographs taken near the confluence of these two streams at an elevation of roughly 200 feet.
Source: Planning Solutions, Inc., photographs taken on November 29, 2023

The U.S. Fish and Wildlife Service (USFWS) classifies the streams as follows:

- Upper reaches of the streams, roughly the extent of the streams in the Conservation District, are considered freshwater forested/shrub wetland habitat classified as PFO3C.¹¹
- Lower reaches of the streams, roughly from the Conservation District to the alluvial fan near the river mouth, are considered riverine habitat classified as R3UBH.¹²

A USGS stream gauge monitors Waiāhole Stream near (above) the Kamehameha Highway bridge. That gauge has been in service since October 1, 2001. The streamflow (discharge in cubic feet per second) and gauge height (in feet) recorded since then are shown in Figure 3-5. As those records show, the stream has a base flow that changes with the season and responds quickly to storm events. The maximum discharge (8,600 cubic feet per second (cfs)) and height (15.4 feet) occurred during a storm on March 9, 2021. That storm caused flooding in the valley; however, it did not reach major flood stage (16.4 feet). As can be seen from Figure 3-5, high discharge rates are not rare; the previous highest discharge rate was 6,000 cfs in 2014 and there are typically discharges exceeding 4,000 cfs a few times per year. The daily average discharge is 43 cfs (27.8 MGD).

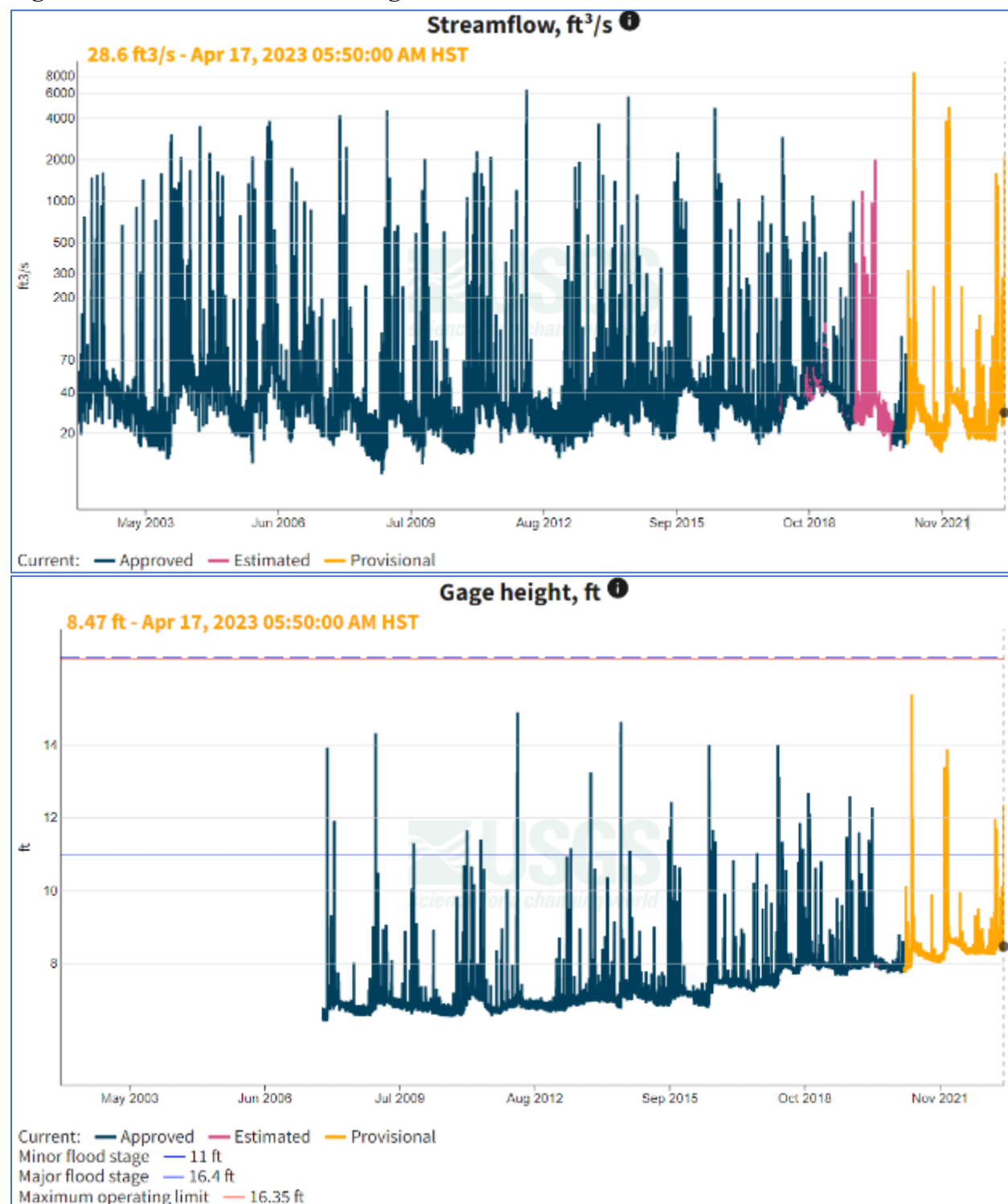
Water from the Waiāhole Ditch System has been added to certain windward streams since at least early 1995. The ongoing additions to Waiāhole and Waianu Streams have been in place since roughly early 2002. Those additions involve at least 4.8 MGD¹³ being added to Waiāhole Stream (at about 800-foot elevation) and 3 MGD being added to Waianu Stream (at about 830-foot elevation). Water from the ditch is added to other streams too, but those streams are not within Waiāhole Valley. These additions substantially contribute to the flow in the valley's streams. However, the continuing operation of the ditch system likely results in a decrease in Waiāhole, Waianu, and Uwao stream flows relative to the natural, pre-ditch flows.

¹¹ The PFO3C classifications stands for: **Palustrine (P) System** includes all nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 ppt. It also includes wetlands lacking such vegetation, but with all of the following four characteristics: (1) area less than 8 ha (20 acres); (2) active wave-formed or bedrock shoreline features lacking; (3) water depth in the deepest part of basin less than 2.5 m (8.2 ft) at low water; and (4) salinity due to ocean-derived salts less than 0.5 ppt. **Forested (FO) Class** is characterized by woody vegetation that is 6 m tall or taller. **Broad-Leaved Evergreen (3) Subclass** indicates woody angiosperms (trees or shrubs) with relatively wide, flat leaves that generally remain green and are usually persistent for a year or more; e.g. red mangrove (*Rhizophora mangle*). **Seasonally Flooded (C) Water Regime** means surface water is present for extended periods especially early in the growing season, but is absent by the end of the growing season in most years. The water table after flooding ceases is variable, extending from saturated to the surface to a water table well below the ground surface.

¹² R3UBH stands for: **Riverine (R) System** includes all wetlands and deepwater habitats contained within a channel, with two exceptions: (1) wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens, and (2) habitats with water containing ocean-derived salts of 0.5 ppt or greater. A channel is an open conduit either naturally or artificially created which periodically or continuously contains moving water, or which forms a connecting link between two bodies of standing water. **Upper Perennial (3) Subsystem** is characterized by a high gradient. There is no tidal influence, and some water flows all year, except during years of extreme drought. The substrate consists of rock, cobbles, or gravel with occasional patches of sand. The natural dissolved oxygen concentration is normally near saturation. The fauna is characteristic of running water, and there are few or no planktonic forms. The gradient is high compared with that of the Lower Perennial Subsystem, and there is very little floodplain development. **Unconsolidated Bottom (UB) Class** includes all wetlands and deepwater habitats with at least 25% cover of particles smaller than stones (less than 6-7 cm), and a vegetative cover less than 30%. **Permanently Flooded (H) Water Regime** means water covers the substrate throughout the year in all years.

¹³ Additional water is released to Waiāhole Stream when the allotted offstream use in Central O'ahu is not fully subscribed and/or the Central O'ahu uses do not require their full allotment due to their operations or site conditions.

Figure 3-5: Waiāhole Stream Gauge 16294100 Records



Source: <https://waterdata.usgs.gov/monitoring-location/16294100> accessed April 19, 2023.

As discussed in the report prepared by Tom Nance Water Resource Engineering (Appendix B), the operation of the existing HHFDC wells potentially reduces the flow of Waiāhole Stream. The two existing HHFDC wells are at about 490-foot elevation, are roughly 20 feet from Waiāhole

Stream, have a static water level higher than the nearby stream bed, and are near the back of the valley where there is no alluvial deposit over the Ko‘olau Basalts. The groundwater level in the two wells is higher than the stream channel bottom and both are in the Ko‘olau Basalts. As such, pumping water from the wells has the potential to reduce streamflow on up to a 1:1 basis and may have been doing so since pumping began in 1989. The reduction, up to 0.144 MGD, is minor relative to the water added to the stream (at least 4.8 MGD) and the flow of the stream measured near Kamehameha Highway (27.8 MGD).

Other wetlands in the project area (the valley mauka of Kamehameha Highway) include the following:

- Numerous taro lo‘i that USFWS considers freshwater emergent wetland habitat classified as PEM1Fh.¹⁴
- Other lo‘i along the stream are identified by USFWS as freshwater emergent wetland habitat classified as PEM1Ch. The difference between these lo‘i and the others is that USFWS considered these seasonally flooded (C) instead of semipermanently flooded (F).
- There are three areas considered freshwater emergent wetland habitat classified as PEM1C by USFWS along Kamehameha Highway north of Waiāhole Stream. These are similar to the seasonally flooded taro lo‘i but are not hand dug. They are the areas that are most prone to passive flooding as sea level rises (Section 3.6.5).
- A small freshwater pond is present on a lot south of Lot 50, near Waianu Stream. This pond is considered a freshwater pond habitat classified as PUBHx¹⁵ by USFWS.

On Lot 50, in 2018, AECOS noticed that there was a small potential wetland feature located near the proposed access driveway and drainline alignment between the wells/tank site and Waiāhole Valley Road North Branch. They reported that the feature is not adjacent to a traditionally navigable water but could be an isolated wetland. The storm described above on March 9, 2021, occurred a few years after the AECOS study and when project personnel returned to the area in 2022 the feature could not be located. It is possible that the storm, or other events, modified the topography in a manner that eliminated this small feature.

¹⁴ **Palustrine (P) System** includes all nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 ppt. It also includes wetlands lacking such vegetation, but with all of the following four characteristics: (1) area less than 8 ha (20 acres); (2) active wave-formed or bedrock shoreline features lacking; (3) water depth in the deepest part of basin less than 2.5 m (8.2 ft) at low water; and (4) salinity due to ocean-derived salts less than 0.5 ppt. **Emergent (EM) Class** is characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. These wetlands are usually dominated by perennial plants. **Persistent (I) Subclass** is dominated by species that normally remain standing at least until the beginning of the next growing season. This subclass is found only in the Estuarine and Palustrine systems. **Semipermanently Flooded (F) Water Regime** means surface water persists throughout the growing season in most years. When surface water is absent, the water table is usually at or very near the land surface. The **Diked/Impounded (h) Special Modifier** indicates these wetlands have been created or modified by a man-made barrier or dam that obstructs the inflow or outflow of water.

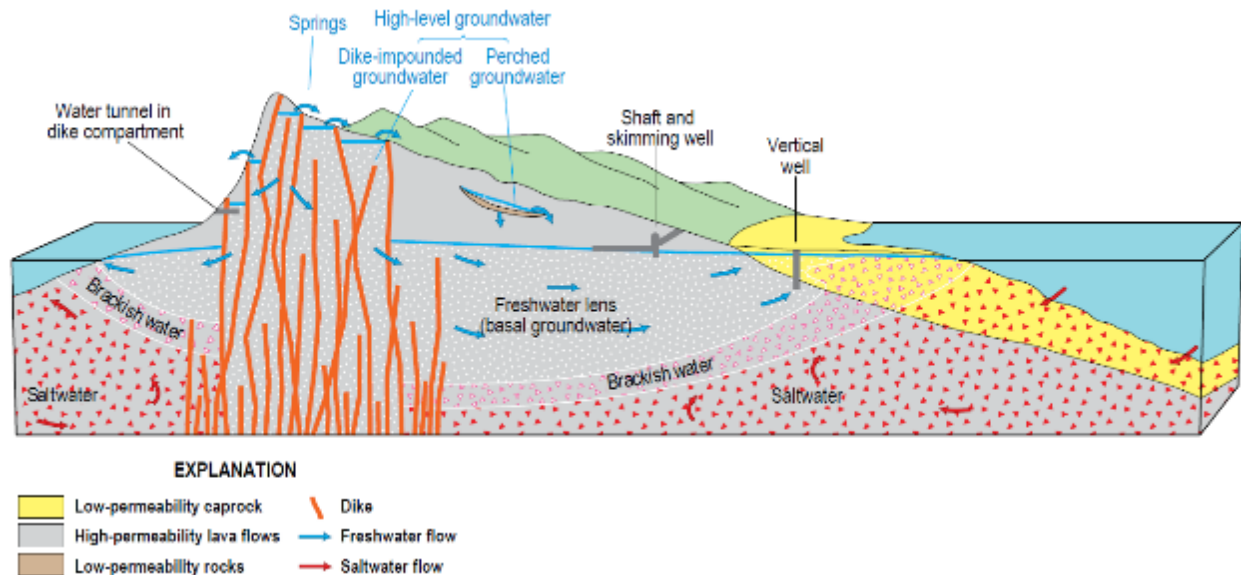
¹⁵ The **Palustrine (P) System** includes all nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 ppt. It also includes wetlands lacking such vegetation, but with all of the following four characteristics: (1) area less than 8 ha (20 acres); (2) active wave-formed or bedrock shoreline features lacking; (3) water depth in the deepest part of basin less than 2.5 m (8.2 ft) at low water; and (4) salinity due to ocean-derived salts less than 0.5 ppt. **Unconsolidated Bottom (UB) Class** includes all wetlands and deepwater habitats with at least 25% cover of particles smaller than stones (less than 6-7 cm), and a vegetative cover less than 30%. **Permanently Flooded (H) Water Regime** means water covers the substrate throughout the year in all years. The **Excavated (x) Special Modifier** is used to identify wetland basins or channels that were excavated by humans.

There are also several wetland areas makai of Kamehameha Highway. These include some freshwater emergent wetlands similar to those listed above, estuarine and marine wetlands with mangrove that make up the stream's delta into Kāneʻohe Bay, and estuarine and marine deepwater wetlands that are the open waters of Kāneʻohe Bay.

3.3.2 GROUNDWATER

In Hawaiʻi, fresh groundwater occurs primarily either as dike-impounded groundwater or as a freshwater lens (basal groundwater) floating on saltwater. Figure 3-6 shows a conceptual model for these occurrences of fresh groundwater. This simplified model, developed in about the middle of the 20th century, remains useful. The left side of the figure represents the windward side and the right side of the figure the leeward (town) side of Oʻahu. The “water tunnel in dike compartment” on the windward side is a representation of the Uwao Tunnel and other production tunnels associated with the Waiāhole Ditch System and elsewhere.

Figure 3-6: Conceptual Model of Groundwater Occurrence and Flow in Hawaiʻi Developed in the Middle of the 20th Century



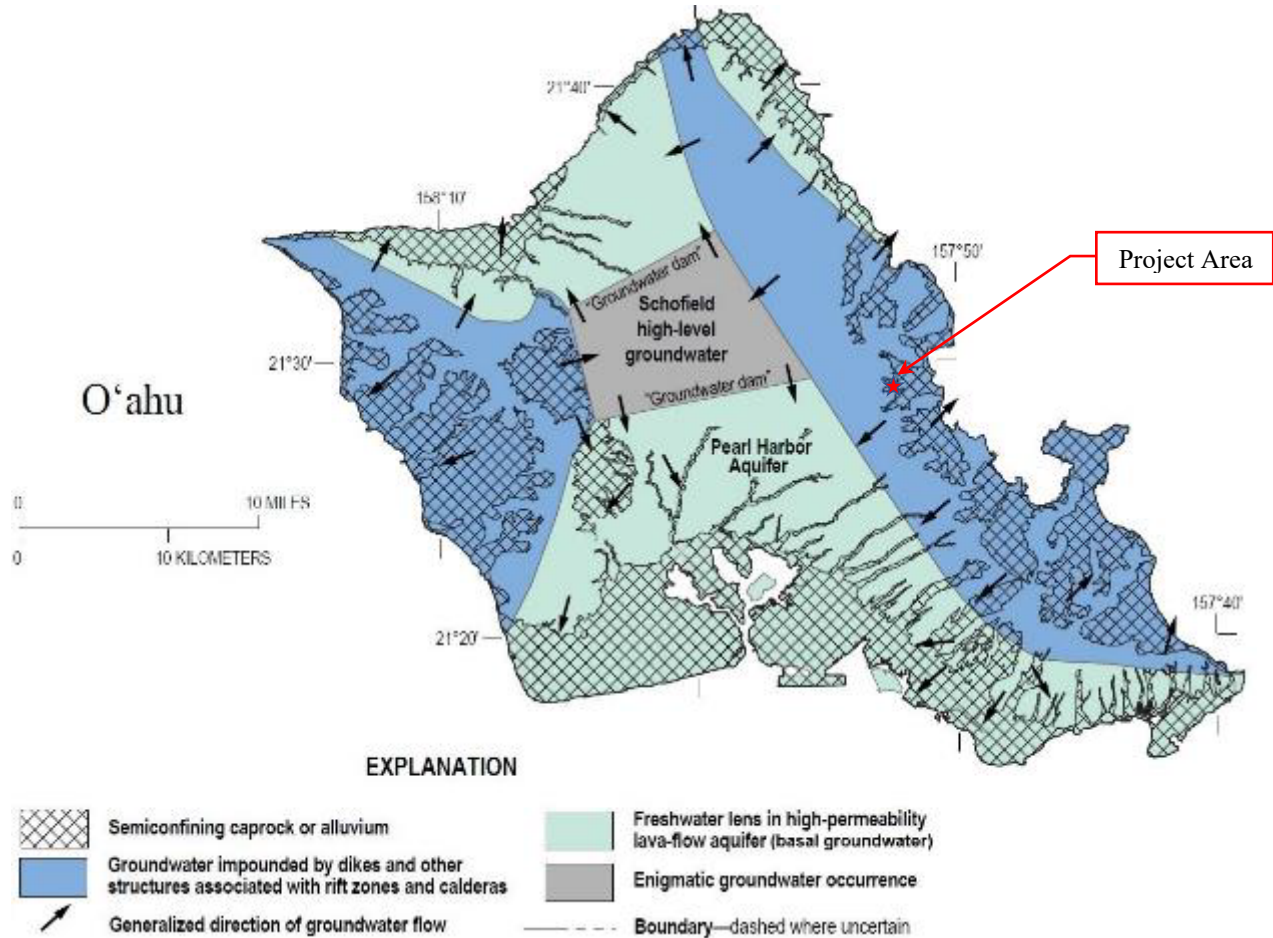
Source: USGS, 2018, Figure 21.

Based on continued study and observations of the groundwater in Hawaiʻi, this conceptual model continues to be refined. Figure 3-7 illustrates some of the refinements associated with groundwater occurrence and flow on Oʻahu. This shows that throughout the Koʻolaupoko Aquifer System groundwater is impounded by dikes and other structures associated with rift zones and calderas (refer to Section 3.2.1 regarding geology for discussion of dikes). This means that, unlike what is illustrated on the left side of Figure 3-6, all the groundwater in the aquifer under Waiāhole Valley is impounded and there is no basal groundwater.

Furthermore, there is semiconfining alluvium in the central portion of the valley. The thickness of the alluvium (sediment) varies from thin in the back and on the margins of the valley to roughly 500 feet thick at the coastline. Those sediments are primarily derived from Koʻolau Basalt that has been weathered into gravel, sand, silt, and clay. The soils at and near the surface are characterized as the WpC, WpB, HnA, and Ph soils discussed in Section 3.2.1. Relative to the

underlying volcanics, this semiconfining alluvium is not a good conductor of groundwater. Therefore, precipitation that occurs where the sediment exists and surface water that flows onto this sediment has a muted connection to the groundwater in the underlying volcanics.

Figure 3-7: Map of Modes of Groundwater Occurrence and Flow on O‘ahu



Source: USGS, 2018, Figure 61, modified by PSI.

Waiāhole Valley is in the Ko‘olaupoko Aquifer System, which is in the Windward Sector according to DLNR maps (Figure 3-8). The entire Windward Sector is a designated Water Management Area (WMA), which means there are additional regulations that owners of water sources, such as wells, must comply with. The Ko‘olaupoko Aquifer System stretches from Waikāne in the north to Kāne‘ohe in the south and from the ridge of the Ko‘olau mountains to the west to Kāne‘ohe Bay to the east. Based on Figure 3-7, the entire Ko‘olaupoko Aquifer System is impounded by dikes and other structures associated with rift zones and calderas. The 2019 *Water Resources Protect Plan* (WRPP), the Ko‘olaupoko Aquifer’s sustainable yield is 28 MGD, the existing permit allocation is 10.312 MGD, the existing water use is 10.38 MGD, and, therefore, the existing water use is 37.1 percent of the sustainable yield.

[illegible]

The only known withdrawals of groundwater in Waiāhole Valley, which is a subset of the Ko‘olaupoko Aquifer System, are (i) the two wells operated by HHFDC that supply the potable water for the existing WVWS, and (ii) the production tunnels associated with the Waiāhole Ditch System. The two existing HHFDC wells are at about 490-foot elevation, are roughly 20 feet from Waiāhole Stream, have a static water level higher than the nearby stream bed, and are near the back of the valley where there is no alluvial deposit over the Ko‘olau Basalts. The wells are identified as State Nos. 2853-004 and 2853-005. When the wells were drilled in the mid-1980s they immediately encountered Ko‘olau Basalt and groundwater was encountered at a depth of 12 and 3 feet below ground, respectively. The water level in the first well stayed at a level of seven feet below ground throughout the drilling, which continued to a depth of 493 feet below ground.

The Waiāhole Ditch System produces roughly 27 MGD but not all of that water is produced in Waiāhole Valley. Per amended agreements regarding the ditch system, WUPs associated with it

cannot exceed 15 MGD. Roughly 12 MGD of the water is added to windward streams per the agreements; that includes 4.8 MGD added to Waiāhole Stream and 3.0 MGD added to Waianu Stream, both of which are in Waiāhole Valley. Additional water may be added to Waiāhole Valley depending on the water demand of permitted offstream uses in central O‘ahu.

3.3.3 POTENTIAL IMPACTS

The no action alternative does not have the potential to impact wetlands, including stream, and groundwater in a manner substantially different than the existing WVWS has been affecting them since pumping from the existing wells began in 1989.

The following sections discuss the potential impacts of the action alternatives. The potential impacts of the two action alternatives on water resources would not be substantially different because the replacement and/or maintenance of the distribution system (BWS vs. WVWS distribution alternatives) does not have the potential to affect water resources in a substantial manner.

3.3.3.1 Ko‘olaupoko Aquifer System

Over the long-term, the action alternatives would not result in more groundwater being extracted from the Ko‘olaupoko Aquifer System than what is extracted by the existing WVWS. That is because both the existing wells and the proposed wells are within that aquifer system and the customers served by the existing and proposed wells would be identical. It is anticipated that by eliminating known or potentially leaky components of the existing WVWS, such as the 1MG tank and long pipeline to the existing well site, that the volume of water extracted from the aquifer would decrease slightly relative to the recent average of 0.144 MGD.

The WUP for the existing WVWS wells would be transferred from the existing wells to the proposed wells and modified to provide for the current and projected water use within the existing WVWS service area. Water use in the service area is not projected to increase substantially because land uses and their intensity are not expected to change. The current WUP is for 0.075 MGD but the actual amount of water pumped from the existing wells has averaged roughly 0.144 MGD since 2019. Therefore, HHFDC will seek a modification to the WUP so that it specifies 0.15 MGD. As summarized in Table 3-1, the total actual water usage from the aquifer will remain roughly the same as it is today and represent only 37 percent of the aquifer’s sustainable yield.

Table 3-1: Summary of Existing and Proposed Groundwater Usage, Ko‘olaupoko Aquifer

	<i>Existing Condition</i>	<i>Proposed Condition</i>
Sustainable Yield (MGD)	28	28
Water Use Permits		
Non-WVWS WUPs (MGD)	10.237	10.237
WVWS WUP (MGD)	0.075	0.15
Total WUPs	10.312	10.387
Actual Water Usage		
Non-WVWS actual usage (MGD)	10.236	10.236
WVWS actual usage (MGD)	0.144	0.14
Total actual water usage (MGD)	10.38	10.376

Source: CWRM and HHFDC.

Based on this analysis, the action alternatives would have a less than significant impact on groundwater resources.

3.3.3.2 Stream Flow

The primary concern regarding the action alternatives' potential to impact surface water resources is its potential to affect long-term stream flows. This concern was raised by CWRM in their scoping letter (Appendix A), which says:

ground-water withdrawals may affect streamflows. Impacts to ground water dependent ecosystems are becoming an emerging issue as impacts to these are related to impacts to traditional & customary practices of sustenance from these ecosystems.” Similar, the WRPP (Section H.6.3.4 regarding the Ko‘olaupoko Watershed Management Plan) states that “There are 13 perennial streams in Ko‘olau Poko. The major portion of baseflow derives from dike-impounded ground water that originates in the upland areas in the back of the valleys. There is interaction between ground and surface waters, and in general, withdrawal of ground water will impact streamflow. Therefore, all of the estimated sustainable yield may not be readily available as impacts to established instream flow standards must first be considered.

Concern regarding stream flow was also raised by participants in the Cultural Impact Assessment (CIA) process, which is discussed in Section 3.5.1.7.

The stream flow concern is addressed in the report in Appendix B and summarized here. The proposed wells in the Agricultural District would replace the existing wells in the Conservation District in the back of Waiāhole Valley. As described in Section 3.3.2, the two existing HHFDC wells are at about 490-foot elevation, are roughly 20 feet from Waiāhole Stream, have a static water level higher than the nearby stream bed, and are near the back of the valley where there is no alluvial deposit over the Ko‘olau Basalts.

two existing HHFDC wells are at about 490-foot elevation, are roughly 20 feet from Waiāhole Stream, have a static water level higher than the nearby stream bed, and are near the back of the valley where there is no alluvial deposit over the Ko‘olau Basalts. The proposed wells would be at about 340-foot elevation, roughly 400 feet from the confluence of Waianu and Owao Streams, and in a portion of the valley where the streams flow over alluvium (specifically, soil classified as HnA, Section 3.2.1). The groundwater level at the proposed well site is not known; it may be relatively high because the alluvium covering the volcanics between the well site and ocean is likely to impede groundwater movement. The Waianu and Owao Stream bed elevation nearest the well is about 80 feet lower than the well site.

Given these characteristics, the existing wells are more likely to be reducing stream flow than the proposed wells would be to reduce stream flows. Pumping the existing wells has the potential to reduce the flow in Waiāhole Stream on a 1:1 basis. The potential for the proposed wells to reduce stream flow is substantially less than the existing wells. This is because the proposed wells are more distant from any stream and are at a lower elevation in the valley where alluvium provides a physical barrier between the groundwater in the Ko‘olau Basalts that the wells would pump and the surface water in the stream that is flowing over alluvium. As such, a reduction in stream flow due to using the proposed wells is considered highly unlikely. In fact, decommissioning the

existing wells and using the proposed wells would likely result in an increase in stream flow, particularly in Waiāhole Stream above its confluence with Waianu Stream, but also below that. However, the change would likely be imperceptible because the volume of water pumped from the wells is small relative to the stream flow.

An additional consideration is that the proposed wells would be located at a lower elevation than the Waianu Stream diversion for the offstream uses (e.g., taro lo'i) within Waiāhole Valley (e.g., the McCandless System). The McCandless System diversion is at an elevation of roughly 500 feet and the proposed well site is at 340 feet. Therefore, any (unlikely) reduction in stream flow would occur downstream of the existing Waianu Stream diversion.

Finally, even a long-term 1:1 reduction in stream flow would be a minor reduction in the context of the stream flows in the valley. Such a reduction has possibly been occurring since 1989 and has not been noticeable because it represents less than a 0.5 percent reduction in stream flow at the gauge just mauka of Kamehameha Highway and began prior to the water releases from the ditch system to the river. Using an estimate of Waianu Stream flow at an elevation of 200 feet (just above the Waianu and Uwao stream confluence) of 3.4 MGD, a 1:1 reduction would be a 4 percent reduction in stream flow where Waianu Stream is nearest the proposed well site. This is an extremely conservative (high) estimate of possible stream flow reduction because, as discussed above, the potential for the proposed wells to reduce stream flow is considered highly unlikely.

Given the factors presented above, the action alternatives' potential to adversely impact stream flows is very low and any impact to stream flows would be less than significant.

3.3.3.3 Storm Water Runoff

The action alternatives would add impervious surfaces on Lot 50, would not change impervious surfaces along roadways where water distribution pipelines are located, and would reduce impervious surface where existing system components would be decommissioned. The reduction in impervious surface at the existing well site and existing 1 MG tank would reduce runoff from those sites, which is considered a beneficial effect.

The increase in impervious surface on Lot 50 would slightly increase the volume of storm water from that parcel. The potential impact associated with adding these impervious surfaces would be minimized by (i) installing a storm water collection system, and (ii) using grass swales along the access driveway to collect and manage storm water. The lot is 5.544 acres and currently has no impervious surfaces. New impervious surfaces on Lot 50 would total roughly half an acre and include the tank, the paved portion of the wells/tank pad, the control building, and the paved access driveway. Appendix C contains a hydrologic analysis of Lot 50 in its current state (undeveloped) and after implementation of the action alternatives (developed). The calculations show that the undeveloped lot generates 8.1 cubic feet per second per acre (cfs/A) and 9.9 cfs/A during 10-year and 50-year frequency storms, respectively. After development Lot 50 would generate 8.4 cfs/A and 10.2 cfs/A for 10-year and 50-year frequency storms, respectively (Table 3-2).

Table 3-2: Summary of Lot 50 Runoff

<i>Storm</i>	<i>Undeveloped Lot 50 Runoff (cfs/A)</i>	<i>Developed Lot 50 Runoff (cfs/A)</i>
10-year	8.1	8.4
50-year	9.9	10.2

Source: Appendix C.

The total runoff from Lot 50 before development is 44.55 cfs during a 10-year storm. Currently this runoff is concentrated in a few small gulches or sheetflows across Lot 50 until it encounters Waiāhole Valley Road North Branch and then flows to Uwao Stream. After development, total runoff from Lot 50 would be no larger than 47.00 cfs and a portion of that runoff would flow into the proposed storm water system prior to it encountering the North Branch Road. During a 10-year storm the runoff from Lot 50 that enters Uwao Stream would be roughly 2.45 cfs higher. During such a storm, the flow in Uwao Stream would likely exceed 2,000 cfs. The slight increase in runoff would be somewhat offset by the reduction in impervious surface elsewhere in the valley and would not have a significant adverse effect on the environment.

3.3.3.4 Potential for Wetland Fill

As pointed out in the Army Corps of Engineers' scoping response (Appendix A), if the project requires the placement of fill in a wetland (e.g., a structure in, under, or over navigable waters), then it would have an impact on the wetland and require a permit. The only action alternative components that would occur near a wetland are the outlet of the Lot 50 storm water system and where the water distribution system crosses streams.

The proposed Lot 50 storm water system would convey the water it collects to a channel where water from the Waiāhole Valley Road North Branch storm water system is currently discharged. Figure 3-9 shows the road's storm water system discharge to the channel; the proposed Lot 50 storm water system would discharge into the channel adjacent to that pipe. Water discharged to the channel flows down slope roughly 100 feet, where it flows into Waianu Stream just downstream from where the photographs in Figure 3-4 were taken. The channel is a man-made upland feature that was likely built when the road was built; there is no evidence that there was a stream in the location prior to the channel being built. Therefore, the channel is not a wetland and the storm drain system outlet would not require the placement of fill in a wetland.

The BWS action alternative would require the replacement of the water pipeline that crosses Uwao Stream at Waiāhole Valley Road South Branch. An existing water distribution pipeline is suspended from the bridge at that location. Both action alternatives would require the long-term periodic maintenance of water pipelines where they cross streams today. Any maintenance or replacement of those water pipelines would result in the pipeline continuing to be suspended from a bridge and would be completed in a manner that avoided impacts to the stream below. Because these pipelines are collocated with roadway bridges and their replacement and/or maintenance would not result in fill be placed in a wetland, no permits would be needed from the Army Corps of Engineers and no impacts to wetlands would occur.

Figure 3-9: Storm Water System Discharge and Channel



The road's storm water system discharge.

Source: Planning Solutions, Inc., photographs taken December 24, 2022.



The channel, view toward Waianu Stream.

3.3.3.5 Other Considerations

The action alternatives would not have any impact on the Waiāhole Ditch System. Operation of the proposed wells on Lot 50 would not decrease the water flow in the ditch system because (i) the same or greater volume of water is being pumped from the existing wells, which are much closer to the ditch system, and that pumpage would cease; and (ii) the ditch system is hydrologically isolated from the existing and proposed wells by dikes.

Ground disturbance associated with action alternatives would temporarily increase the potential for erosion and sediment discharge when compared to the existing condition. Those discharges could adversely affect water quality in wetlands, such as the valley's streams. The Wells/BWS action alternative would involve a greater area of ground disturbance in the short-term because it would involve the installation of new water pipelines throughout the valley. With the implementation of the BMPs discussed below, the impacts associated with both action alternatives would be less than significant.

3.3.4 AVOIDANCE, MINIMIZATION, OR MITIGATION MEASURES

To reduce the potential for adverse impacts to wetlands during construction, BMPs related to storm water would be implemented, including measures related to ground disturbance, perimeter control, dust control, construction site ingress and egress, storm drain inlet protection, waste management, fueling and maintenance practices, material staging, and soil stockpiles. The BMPs are discussed further in Section 3.2.3. In addition, the following measures would be employed:

- The project shall comply with the City and County of Honolulu's "Storm Drainage Standards" and the "Rules Relating to Water Quality."
- The new system shall implement a water audit program. If the system is turned over to the BWS, then BWS' annual water audit program would apply.
- The entity that operates the water system and manages compliance with the WUP would comply with conditions and report actual water use to CWRM.

- The existing wells would be closed using methods approved by CWRM and consistent with guidance from the HDOH Safe Drinking Water Branch.
- Per HAR 11-62-32, no new Individual Wastewater System (IWS) that utilize cesspools, seepage pits, or leach fields would be allowed within 1,000 feet of the proposed wells. Existing IWS that include cesspools, seepage pits, or leach fields within 1,000 feet of the proposed wells would be allowed to remain (be “grandfathered”), but if those existing IWS fail or bedrooms are added to the associated residence, then the owner would be required to (i) apply for a variance and upgrade to an Advanced Treatment Unit (ATU) class of IWS, or (ii) relocate their IWS so that it was more than 1,000 feet from the wells.¹⁶

3.4 BIOLOGICAL RESOURCES AND PROTECTED SPECIES

A biological survey of Lot 50 was completed by AECOS in October 2018. The sections below draw from that report and other observations made by project personnel.

3.4.1 EXISTING CONDITIONS

Figure 3-10 shows conditions near the proposed wells/tank site on Lot 50 and Figure 3-11 shows conditions where the permanent access driveway would be developed between the end of Waiāhole Valley Road North Branch and the proposed wells/tank site. Lot 50 and nearby project areas are predominantly forested with a canopy of albizia with an understory of java plum, strawberry guava, shoebutton ardisia, fiddlewood, ferns, grasses, and shrubs. Some of the plants observed were native species or Polynesian introductions; none of them are considered rare or listed for protection. Fifteen (15) species of bird were observed during the survey, all of which were introduced species except for a single O‘ahu ‘Amakihi heard near the location of the well site. The only evidence of mammals in the vicinity of Lot 50 was barking dogs and the tracks, trails, and rooting of feral pigs.

No plant or avian species listed under the federal Endangered Species Act (ESA), listed under HRS Chapter 195D, or protected by the Migratory Bird Treaty Act (MBTA) were observed during the biological survey. No listed waterbirds, seabirds, migratory shorebirds, Hawaiian hoary bat, or damselflies were observed. Although not observed, it is likely that waterbirds and Hawaiian hoary bats are periodically present in the project area and it is possible that seabirds overfly the project area during certain times of the year. Waterbirds are most likely present in the portions of the WVWS’ service area where taro lo‘i are present, not where the water distribution pipes are located.

¹⁶ Per BWS rules and regulations 3-301: Waste Disposal Facilities, the BWS has instituted a “no pass zones” where the establishment of IWS are restricted to protect and conserve groundwater resources that have been or could be developed for domestic water supply purposes. The properties within 1,000 feet of the proposed wells are all in the no pass zone. The existing IWS in the no-pass zone have been “grandfathered” from those BWS rules and regulations. No new IWS will be permitted within the no-pass zone; therefore, no additional IWS will be established within 1,000 feet of the proposed well locations.

Figure 3-10: Photograph Showing Flora near Proposed Wells/Tank Site



Source: Planning Solutions, Inc., photograph taken November 29, 2022.

Although no rodents were recorded, it is likely that the roof rat, brown rat, Polynesian rat, and European house mouse are present on and around Lot 50 and throughout the valley. The Indian mongoose and domestic cat are also likely to visit the Lot 50 area and be present throughout the valley. The non-native wildlife, including pigs, dogs, cats, rats, and mongoose, are detrimental to most native species, both flora and fauna. They feed on most types of native wildlife and they disturb the habitat in a manner that benefits invasive plant species so that native plants are consumed or outcompeted.

Figure 3-11: Photograph Showing Flora near Proposed Wells/Tank Site Access Driveway



Source: Planning Solutions, Inc., photograph taken November 29, 2022.

Other project areas primarily consist of existing roadways within the Agricultural District of the valley. The road and vegetation along it are maintained by HHFDC and Waiāhole Valley residents. The action alternatives also involves the decommissioning of the existing water source and other infrastructure that will be rendered unnecessary if a new system is implemented. Like the roadways, the areas where those elements of the existing WVWS occur are maintained by HHFDC personnel and others. No rare or unusual animal or plant species are likely to be present in these developed and maintained areas. The density and diversity of flora and fauna increases in the Conservation District forests where the existing wells are located. Figure 3-12 shows conditions at the existing well site. Observations made in that area show that albizia dominates the forest canopy with other introduced and/or invasive species being common.

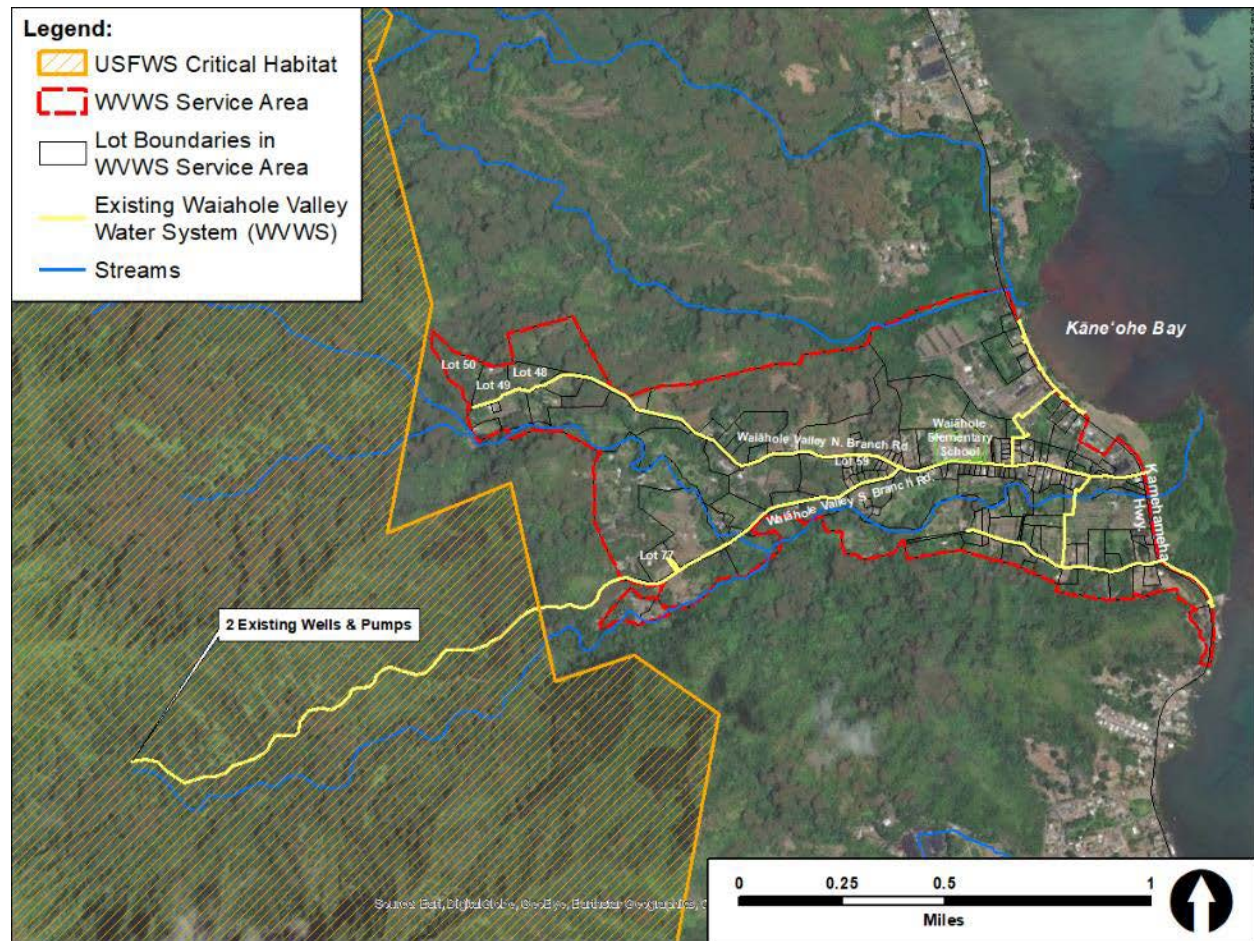
Figure 3-12: Photograph Showing Conditions at Existing Well Site



Source: Planning Solutions, Inc., photograph taken November 29, 2022.

The Resource and Protected subzones of the Conservation District in the back half of Waiāhole Valley have predominately been designated critical habitat by the USFWS (Figure 3-13). The most makai portion of the designated critical habitat is considered critical for the recovery of the O‘ahu elepaio; this area begins roughly 200 feet mauaka of the wells/tank site on Lot 50. Deeper into the valley the habitat is designated critical for the elepaio and many other species, including damselflys and several native plants.

Figure 3-13: Critical Habitat



Source: <https://fws.maps.arcgis.com/home/webmap/viewer.html>

3.4.2 POTENTIAL IMPACTS

The potential impacts of the two action alternatives on biological resources would not be substantially different because the replacement and/or maintenance of the distribution system (BWS vs. WWWS) within the roadway network does not have the potential to affect biological resources in a substantial manner.

In the short-term, the action alternatives would remove some of the vegetation (habitat) on Lot 50 and replace it with the access driveway, tank, wells, and a landscaped area around it. This habitat loss is not considered significant because (i) no listed species are present or depend on the habitat, and (ii) the existing habitat on Lot 50 where the proposed improvements would be made consists of invasive species that are common over a large area. Over the long-term, the existing vegetation would be replaced by the proposed Lot 50 developments (access road, tank, wells, etc.) and landscaping. The area would be maintained over the long-term, which would involve the maintenance of the landscape and potentially the management of vegetation that encroaches into the area, including the removal of tree limbs that extend into the area and pose a hazard to the development or the people working there.

The other long-term effect of the proposed action alternatives on biological resources is that the existing well site and 1 MG tank site would be decommissioned and those areas allowed to renaturalize. The renaturalization of the well site represents a benefit because the area is a designated critical habitat; however, it is not considered a substantial benefit as the surrounding area is dominated by invasive species and those species would likely quickly expand into the existing well site once it has been decommissioned.

The action alternatives would not result in material changes to the non-native predator or habitat degradation threats that protected species face. The action alternatives have the potential to impact certain biological resources protected by the ESA, HRS 195D, and/or MBTA in ways not directly associated with habitat loss/degradation or predation. Those potential impacts could occur in the short-term or long-term and are as follows:

- Seabirds, that may occasionally overfly the project area, could become disoriented by lights associated with construction or operation of the water system. Once disoriented the birds may become exhausted and “fallout,” which means they land or collide with an object and fall to the ground as they become exhausted. They can die from collisions or during interactions with mammals on the ground. The possibility of impact would be greatest during the seabird fledging season from September 15 through December 15 because the fledging chicks are more susceptible to light attraction than adult birds.
- Hawaiian hoary bats could be adversely affected by the trimming and removal of trees they use for sleep, rest, and pup rearing during construction or maintenance activities. The possibility of impact would be greatest during the bat pupping season between June 1 and September 15 because pups are unable to fly to other trees.
- Waterbirds could be disturbed by construction or maintenance activities where such activities take place within 100 feet of nesting habitat, which occurs near taro lo‘i and other wetlands. Waterbirds may abandon their nests, resulting in the loss of the brood, if disturbed too much.

With the implementation of the avoidance and minimization measures outlined in Section 3.4.3, the potential for impacts to these species would be substantially decreased so that no “take” of these species would occur. The impact would be less than significant.

The action alternatives are not anticipated to affect damselflys or shorebirds because these species do not occur in the project area.

The no action alternative would not include new construction, but maintenance of the existing system would continue. The maintenance activities would occasionally require vegetation management in the Conservation District, which has been designated as critical habitat. If project improvements are not made, it would be reasonable to assume that maintenance and repairs on the existing water system would increase in frequency and magnitude. These maintenance activities would not be expected to result in a significant impact because the areas do not appear to harbor listed species and most of the areas need to be maintained for other uses as well.

3.4.3 AVOIDANCE, MINIMIZATION, OR MITIGATION MEASURES

Based on recommendations in the biological survey and the USFWS scoping input, the following measures would be implemented to avoid and minimize potential impacts to biological resources, except for emergency response situations:¹⁷

- Hawaiian hoary bat:
 - Woody plants greater than 15 feet tall would not be disturbed, removed, or trimmed during the bat birth and pup rearing season from June 1 through September 15.
 - Barbed wire would not be used on fences around water infrastructure.
- Seabirds:
 - Construction activities would not occur at night unless highway usage/traffic control permits require night work. If night work is required, it would not occur during seabird fledging season (September 15 through December 15) and fully shielded lights would be used outside of that period.
 - Outside lights installed as part of the project (e.g., security lights at the wells/tank site) would be dark sky compliant and seabird friendly by being fully shielded and considered “acceptable” per the DLNR guidance (<https://dlnr.hawaii.gov/wildlife/files/2016/03/DOC439.pdf>). They would utilize automatic motion sensor switches and controls when possible.
- Waterbirds:
 - During construction or maintenance in areas where waterbirds are known to be present, post and implement reduced speed limits, and inform project personnel and contractors about the presence of endangered species on-site.
 - During construction or maintenance within roughly 200 feet of a taro lo‘i or other wetland (e.g., Waiāhole and Uwao Streams), have a monitor that is familiar with the listed waterbird species’ biology conduct a waterbird nest survey where appropriate habitat occurs. Conduct the survey within 3 days of work starting and after any subsequent work delay of 3 or more consecutive days (during which birds may attempt to nest). If an active nest or brood is found: (i) contact USFWS at 808-792-9400 within 48 hours for further guidance, (ii) establish and maintain a no-work 100-foot buffer around the nests and/or broods until the chicks/ducklings have fledged, and (iii) have a biological monitor that is familiar with the species’ biology present during all construction activity until the chicks/ducklings fledge to ensure that Hawaiian waterbirds and nests are not adversely impacted.

¹⁷ In emergency situation, BMPs will be implemented to the degree possible, but not all measures would be followed, particularly if an emergency occurs during the seasons listed in these items.

3.5 ARCHAEOLOGICAL AND CULTURAL RESOURCES

CSH prepared an Archaeological Literature Review and Field Inspection report (LRFI; CSH 2022; Appendix B) and a Cultural Impact Assessment (CIA; CSH 2023; Appendix E) for the project. The information in this section draws from those reports, which are appended to this EA.

3.5.1 CONTEXT

The ahupua‘a (land division) of Waiāhole is in the district of Ko‘olaupoko on the windward side of O‘ahu. The project is within Waiāhole Ahupua‘a; the well site is very near the boundary between Waiāhole Ahupua‘a and Waikāne Ahupua‘a, which is to the north. Waiāhole is literally translated as “mature āhole water” with the āhole being a type of fish found in both fresh and salt water.

Ko‘olaupoko was rich in many of the resources utilized by traditional Hawaiians. The exploitation of marine resources is evidenced by the many fishponds around the coastal fringe of Kāne‘ohe Bay and by the presence of numerous fishing shrines. Inland from the coast, rich alluvial soils, an equable climate, and abundant water supply allowed the extensive cultivation of traditional crops, especially wetland taro. Handy and Handy (1972) characterized the ahupua‘a in the region as being extremely productive and capable of accommodating a significant population. The coastal plains were converted “into an almost continuous expanse of lo‘i (irrigated terraces) irrigated with water from large streams flowing out of the deep valleys” along the Ko‘olau mountain range.

Dating analyses from previous archaeological studies suggest that occupation of Waiāhole Valley began around AD 1200, while the bulk of activity probably occurred in the late pre- and early post-Contact periods. Early census data indicate that in 1831–32, 419 people lived within the two valleys of Waiāhole and Waikāne. However, the population was likely considerably higher at the time of European contact; by the 1830s, the Native Hawaiian population had already been severely diminished by contact with Western diseases. Also, many of the native inhabitants from these outlying districts had begun moving to the newly burgeoning population centers, such as Honolulu.

In the 1900s the use of the valley remained relatively stable and consisted of a rural area where families lived and agriculture was practiced. Much of the agriculture remained consistent with past practices, including growing taro in lo‘i watered by stream diversion and ‘auwai. In 1977, the State of Hawai‘i purchased approximately 600 acres of land from the heir to the McCandless Estate, Elizabeth Marks. The state paid \$6 million to acquire this land in hopes of developing what was to be called the Waiāhole Agricultural Park. They began negotiating long-term leases with the Waiāhole-Waikāne Community Association, which represented most of the farmers in the valley. This led to the current land use of the valley, which is explained in Section 1.1.

3.5.1.1 *Māhele Land Commission Awards*

During the Māhele, in Waiāhole 53 small Land Commission Awards (LCAs) comprising 106.89 acres were granted. The average size of these awards was 2.02 acres, ranging between 0.47 and 5.6 acres. In addition, four larger awards were granted: (i) LCA 105, which covered 81.6 acres, to William Walker; (ii) LCA 5936, for 225 acres, to Pu‘uiki; (iii) LCA 7137, for 93 acres, to Kaho‘ohanohano; and (iv) LCA 8603, for 57.2 acres, to Kaniau. Subsequently, three large areas of land were granted: Land Grants 702 and 703 (total 264.68 acres) to Kekakeiki in 1860 and Land

Grant 874 (113.33 acres) to Kaopulupulu in 1862. The LCA claims within Waiāhole Valley were primarily for taro lo‘i, kula (pastureland), māla (garden, patch), ‘awa (kawa), and house lots. This illustrates that, at the time of the Māhele, farming traditional crops by Native Hawaiians remained common in the valley despite the population having been substantially reduced.

The proposed well and tank site (Lot 50) is in the area that was granted to Kaopulupulu in 1862.

3.5.1.2 Soils and Agriculture

The soils in the project area are discussed in detail in Section 3.2. The types of soil present are not known to frequently harbor archaeological resources, including iwi kapuna, outside of agriculture-related items like lo‘i, ‘auwai, and house sites. Some of the soil types are known to be frequently used for traditional Hawaiian agriculture, in particular taro lo‘i.

There were and continue to generally be two types of agriculture in the valley: dry land and wetland. Wetland fields, or lo‘i, have been used for taro, rice, and lotus root; today the remaining lo‘i appear to be exclusively used to grow taro. Dry land crops have included cabbage, radish, onion, turnip, bean, other vegetables, banana, pineapple, and other fruit. Dry land agriculture continues in the valley today.

3.5.1.3 Waiāhole Ditch and Tunnel System

The Waiāhole ditch and tunnel system was constructed between 1913 and 1916 by the Waiāhole Water Company, a McCandless family concern. The system began at Kahana Valley and includes a series of production tunnels dug into the Ko‘olau Mountains and transmission tunnels that conveyed the water laterally along the Ko‘olau Mountains and then through the mountains to the leeward side. The system also had surface water intakes, open ditches, gates, flumes, siphons, roads, trails, and camps. A railroad supported the construction effort; it extended roughly 10 miles from the tunnel(s) to a landing at Waikāne.

The ditch and tunnel system was completed in 1916. It was permitted to divert 10 MGD of water from the upper Waiāhole Valley area a day. The full system produced roughly 25 MGD of water. The transmission tunnel through the mountain is 2.7 miles long and was the longest transmountain tunnel in Hawai‘i until the completion of the Molokai tunnel. The O‘ahu Sugar Company used the water to irrigate their sugar plantation lands in leeward and central O‘ahu.

Communication between residents of Waiāhole Valley and the Territorial Governor indicate that when the tunnel was being built there was considerable farming, primarily taro lo‘i, in the valley that relied on the water in the valley’s streams. The farmers were concerned that the tunnel system would reduce the quantity of water in the valley’s streams and render their wetland agricultural practices unsustainable. This indicates that the agriculture evident from the Māhele’s LCA records remained active in the early 1900s.

The tunnel system is now operated by ADC. The tunnels are all well mauka of the action alternative improvements. A road/trail that ADC uses to access one of the production tunnels extends beyond the terminus of Waiāhole Valley Road North Branch, near Lot 50.

3.5.1.4 Previous Archaeological Research

Archaeologists have observed that the valley was once extensively terraced into taro patches and was irrigated by a network of ditches (of which only makai portions were still maintained). Traces of abandoned taro plots and ditches could be readily distinguished along the paths and inland trails. Barrera (1982) concluded “the entire valley of Waiāhole is probably eligible to the State and National Registers of Historic Places as an archaeological district.”

Historic properties identified in the valley include:

- Agricultural features related to traditional taro cultivation and past rice cultivation and habitation areas. These were generally identified in the central portion of the valley with a concentration around the juncture of Waiāhole and Waianu streams.
- Evidence of the manufacture of stone tools within the valley, including a lithic scatter and two adze quarries. These were primarily identified on the southern side of the valley in proximity to Pu‘ukuolani.
- What was believed to be Pōhaku O Kane, which was described as a “place of refuge, a pu‘u honua, for each family from generation to generation. It was not a heiau; it was a single stone monument (he wahi ‘eo‘eo pōhaku ho‘okahi), and a kuahu (altar) with ti and other greenery planted about.” This site was located makai of Kamehameha Highway.

No historic properties have been identified on Lot 50 where the wells and other improvements are proposed.

3.5.1.5 Archaeological Research Conducted for the Subject Project

CSH conducted two field inspections and prepared the Archaeological Literature Review and Field Inspection report in Appendix B. The two inspections were conducted in 2018 and 2022 and included Lot 50, the temporary access road to Lot 50, and the Waiāhole Valley road network where water transmission pipelines would be replaced and/or maintained under the action alternatives.

CSH consulted with SHPD following the field inspections. Those discussions reached general agreement on the following points:

- An archaeology inventory survey (AIS) is not warranted.
- The potential historic properties identified within the project area during the two field inspections may be over 50 years old and, therefore, historic properties; however, they likely do not constitute significant historic properties. Briefly, no historic properties were identified on Lot 50 and the historic properties identified along the roadways included:
 - The network of in-use roadways within Waiāhole Valley themselves. They include Waiāhole Valley Road, including the North and South branches, and Waiāhole Homestead Road. The road network appears as unimproved roads on a 1919 map.

- Several features along the roadways, including mortared basalt and coral retaining and free-standing walls, dry stacked basalt walls, concrete culverts, a fence, and former post-contact house sites.
- A limited archaeological monitoring program (AMP) during project implementation would be appropriate. The monitoring effort would be limited to the grading and excavation activities on Lot 50 and the temporary access road. Monitoring is not recommended for the remainder of the project ground disturbance, which would be within in-use roadways, or as part of laterals off in-use roadways.

CSH's report has been submitted to SHPD via the HICRIS site for consideration of and compliance with HRS 6E-8 and HAR 13-275.

3.5.1.6 Burials

Based on the available documentation, burials have not been encountered in the central portions of the valley. The only reported burials identified in Waiāhole were identified by Perzinski (2002), who identified "historical grave plots" in a coastal area makai of Kamehameha Highway.

3.5.1.7 Cultural Practices

CSH conducted a CIA for the project; their report is provided in Appendix E. The CIA was prepared to comply with the State of Hawai'i's environmental review process under HRS 343, which requires consideration of an action's potential effect on cultural beliefs, practices, and resources. As part of the CIA, background research was conducted and community members who were willing to share their mana'o (thoughts, opinions) and 'ike (knowledge) about the project area and the Waikāne and Waiāhole ahupua'a were interviewed. In addition, numerous Native Hawaiian Organizations (NHO), agencies, and community members were contacted.

As a result of the assessment, the following cultural practices were identified within Waikāne and Waiāhole ahupua'a:

- Manufacturing stone tools. This is considered a traditional practice that is no longer being practiced in the area. Sites identified during archaeological surveys in the valley (Section 3.5.1.4) provided information that stone tools were manufactured in the past.
- Agricultural practices. This is a traditional practice that continues to be practiced in the ahupua'a and including use of 'auwai and taro lo'i among other agricultural activities.
- Loko i'a and fishing. This is a traditional practice that continues to be practiced in the ahupua'a. This is evidenced in the knowledge that many fishponds existed around the coastal fringe of Kāne'ohe Bay and by the presence of numerous fishing shrines. Although there are no active Loko i'a (traditional fishponds) in the immediate project area, there are some in nearby areas of Kāne'ohe Bay. Community members also fish in the area.
- Plant gathering. This is a traditional practice that continues to be practiced in the ahupua'a.

- Religious activities. This is a traditional practice that continues to be practiced in the ahupua‘a.
- La‘au Lapa‘au (healing practices). This is a traditional practice that continues to be practiced in the ahupua‘a.
- Canoe building. This is a traditional practice that continues to be practiced in the ahupua‘a. Recently, albizia trees have been harvested for this purpose.
- Hunting. This is a modern practice and focuses on feral pigs.

3.5.1.8 Previous Ground Disturbance

The valley’s roadways and where the existing WVWS facilities are located have clearly been extensively disturbed in the past. Those disturbances have included road building and utility installation.

Lot 50 is not developed but the upper portion of the lot, where the wells and tank would be placed, has been modified. Evidence that the area has been modified include:

- Several dirt roads are present in the upper elevation area at or near the ridge line (Figure 3-10). Those roads are periodically utilized by unknown vehicles and persons.
- There is trash scattered in the area, including vehicle tires, that could only be placed in the area using vehicles or heavy equipment.
- The topography has been modified, creating unnaturally steep slopes and flatter areas over a broad area.
- Most of the vegetation appears to be of a similar age, indicating that the area was cleared at some time in the past.

3.5.2 POTENTIAL IMPACTS

In the short-term, during construction associated with the BWS alternative, there is the potential for adverse effects to the identified historic properties along the valley’s roadways as BWS-compliant water mains are installed. Over the long-term under both action alternatives, there is the potential for similar impacts as water mains are maintained. As discussed above and in the report in Appendix D, the historic properties along the roadways do not constitute significant historic properties. It is unlikely that those historic properties would be adversely affected because they would naturally be avoided since they are along the margins and shoulders of the roads and the project-related ground disturbance would occur in the travel portion of the roads. Work within the road itself is not considered an adverse effect to the long-standing road network because water pipelines are already present under the roadways, the road alignments would not be altered, and the roads would be restored.

In the short-term, during construction on Lot 50 and elsewhere there is the potential to encounter previously unidentified historic resources. The potential for this is considered low. Nevertheless, as mentioned above, HHFDC would implement a limited AMP during the grading and excavation activities on Lot 50 and the temporary access road. Archaeological monitoring during work within the roadways is not deemed necessary as those areas have been extensively disturbed in the past.

Concerning traditional cultural practices, the CIA identified the following long-term concerns from community members:

- *Potential impacts to aquatic life.* Left unchecked, runoff from construction sites could increase runoff and sedimentation within Waikāne and Waiāhole and exacerbate conditions within the Waiāhole muliwai (river mouth, delta), which is said to be a spawning ground and sanctuary for fish and invertebrate species. Increased runoff and sedimentation could result in an adverse effect to fishing and farming traditional practices. The measures outlined in Section 3.3.4 address this concern. With the implementation of those measures, the potential for long-term adverse effects would be minimized and impacts would be less than significant because the quantity and quality of runoff would not materially change relative to existing conditions.
- *Potential impacts to the restoration of cultivation areas.* Community members report an interest in restoring taro lo‘i and areas for growing māmaki. The only potential for the action alternatives to affect these restoration efforts would be if those efforts were planned to occur on Lot 50 where infrastructure is proposed; no other large non-road areas would be utilized for the project. The Lot 50 area is not suitable for taro lo‘i, does not have high quality soil for other farming endeavors, has never been leased for farming purposes, and has been identified for water infrastructure purposes for some time. In addition, the action alternatives would end the use of Lot 77 for water infrastructure, offsetting the new use of Lot 50. Therefore, the potential for a long-term impact to traditional cultivation areas is nominal and less than significant.
- *Potential impacts to stream flow and groundwater resources.* There was a concern that drawing water from the proposed wells could reduce stream flows that cultural farming practices rely on. There is also a concern that drawing water from the proposed wells could exceed the capacity of the aquifer and result in saltwater intrusion. These concerns are addressed in Section 3.3. Briefly, conditions are such that replacing the existing wells with the proposed wells is most likely to increase stream flow and the proposed pumpage is well below the aquifer’s sustainable yield. Therefore, the potential for long-term impacts to cultural farming practices and the aquifer is minimal and less than significant.

The no action alternative would not include new construction; maintenance of the existing system would continue. The maintenance activities would occasionally require ground disturbance to repair or replace system components. If project improvements are not made, it would be reasonable to assume that maintenance and repairs on the existing water system would increase in frequency and magnitude. These maintenance activities would not be expected to result in a adverse impacts to historic or cultural resources because the work would be performed where ground disturbances occurred when the existing system was installed.

3.5.3 AVOIDANCE, MINIMIZATION, OR MITIGATION MEASURES

Based on recommendations in the archaeological and cultural studies (Appendix D and Appendix E, respectively), the following measures would be implemented to avoid and minimize potential impacts to historic and cultural resources and, where possible, provide benefits for cultural practices:

- Continue consultation with SHPD to complete the HRS 6E-8 review process.
- Include in construction bid documents and contracts that contractors are required to avoid using, disturbing, or damaging the identified historic properties along the roadway.
- Conduct a limited AMP during project implementation. The monitoring effort would be limited to the grading and excavation activities on Lot 50 and the temporary access road. Monitoring is not recommended for the remainder of the project ground disturbance, which would be within in-use roadways, or as part of laterals off in-use roadways.
- Brief project construction workers on the history of the area and inform them of the possibility of inadvertently encountering unknown historic/cultural resources, including human remains.
- Cease all activities if historic/cultural resources are inadvertently encountered during construction activities and notify SHPD pursuant to HAR 13-280-3. If iwi kūpuna (i.e., ancestral remains) are identified, all earth moving activities in the area would stop, the area would be cordoned off, and SHPD, the medical examiner, and the Honolulu Police Department would be notified pursuant to HAR 13-300-40.
- Offer albizia trees of a sufficient size that are harvested during project implementation to members of the community who engage in canoe building.

3.5.4 KA PA‘AKAI ASSESSMENT

As a state agency, HHFDC must consider its action’s effects on cultural resources. This consideration is commonly referred to as the Ka Pa‘akai Assessment because it grew out of the Ka Pa‘akai O Ka‘aina v. Land Use Commission (94 Hawai‘i 31) Hawai‘i Supreme Court decision. Following the process fulfills the agency’s constitutional obligation to preserve and protect traditional and customary practices exercised by Native Hawaiians, to the extent feasible. The assessment is a three-step analytical framework that is informed by the CIA effort. The three steps and the measures employed to fulfill them for the action alternatives follow:

1. Identify whether any valuable cultural, historical, or natural resources are present within the project area, and identify the extent to which Native Hawaiian traditional and customary practices are exercised. This step was completed through the community consultations conducted during the CIA process and the archaeological research conducted. The resources and practices identified are described in Section 3.5.1.
2. Determine the extent to which the identified resources and rights will be affected or impaired by the proposed project. This step was initially considered in the CIA and HHFDC’s determination is presented in Section 3.5.2.
3. Specify feasible actions, if any, to be taken to reasonably protect Native Hawaiian rights if they are found to exist, either currently or possibly in the past. The measure that HHFDC has identified as reasonable and feasibly are those outlined in Section 3.5.3.

3.5.5 HRS CHAPTER 6E-8 PROPOSED DETERMINATION

The proposed HRS 6E determination is that no AIS is needed and that no historic properties will be affected.

Further, an AMP would be prepared for review and acceptance by SHPD and then implemented during project implementation. The monitoring effort would be limited to the grading and excavation activities on Lot 50 and the temporary access road.

3.6 NATURAL HAZARDS

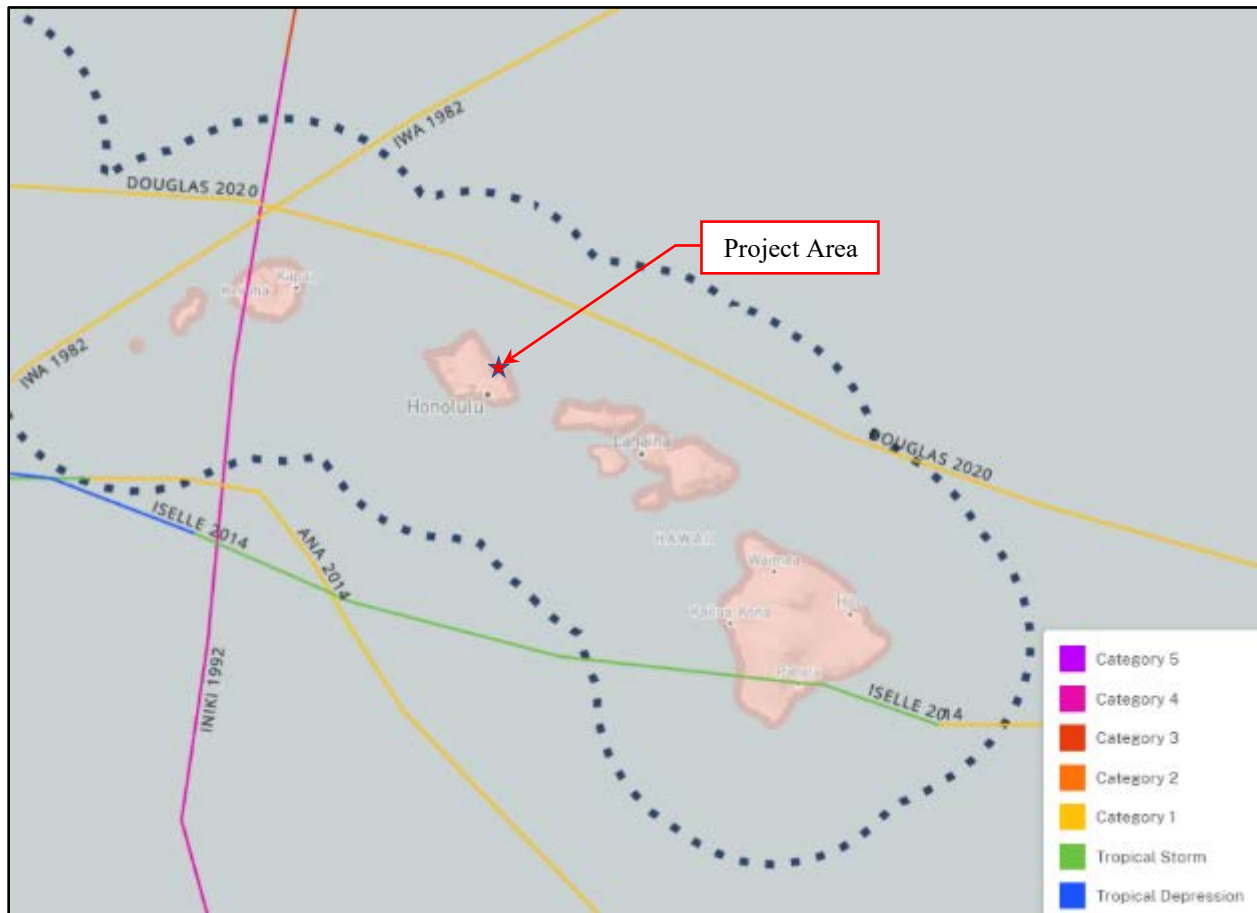
3.6.1 HURRICANES AND TROPICAL STORMS

Tropical cyclones originate over tropical or subtropical waters with organized deep convection and closed surface wind circulation around a well-defined center. Tropical cyclones extract heat energy from the ocean at high temperature and heat export at low temperatures of the upper troposphere. Both hurricanes and tropical storms are tropical cyclones, with hurricanes having sustained wind speed of 74 miles per hour (mph) or more and tropical storms having wind speeds that range from 39 to 73 mph (National Oceanic Atmospheric Administration [NOAA]).

Generally, the National Weather Service's Central Pacific Hurricane Warning Center can expect four to five tropical cyclones in a normal season, with August and September being historically active months for storms in the region. Hurricanes are rare, as the combination of dry air, cooler water, large volcanic mountains, and wind shear result in downgrading to tropical storm as cyclones approach Hawai'i.

The first officially recognized hurricane to materialize in Hawaiian waters was Hurricane Hiki in 1950 and since there have been five hurricanes that have caused significant damage: Nina 1957, Dot 1959, 'Iwa 1982, Estelle 1986, and 'Iniki 1992 (School of Ocean and Earth Science and Technology [SOEST], University of Hawai'i). Figure 3-14 shows the hurricanes have passed within 60 miles of the main Hawaiian Islands in the past 40 years.

Figure 3-14: Hurricanes Within 60 Miles of the Main Hawaiian Islands (1982-2022)

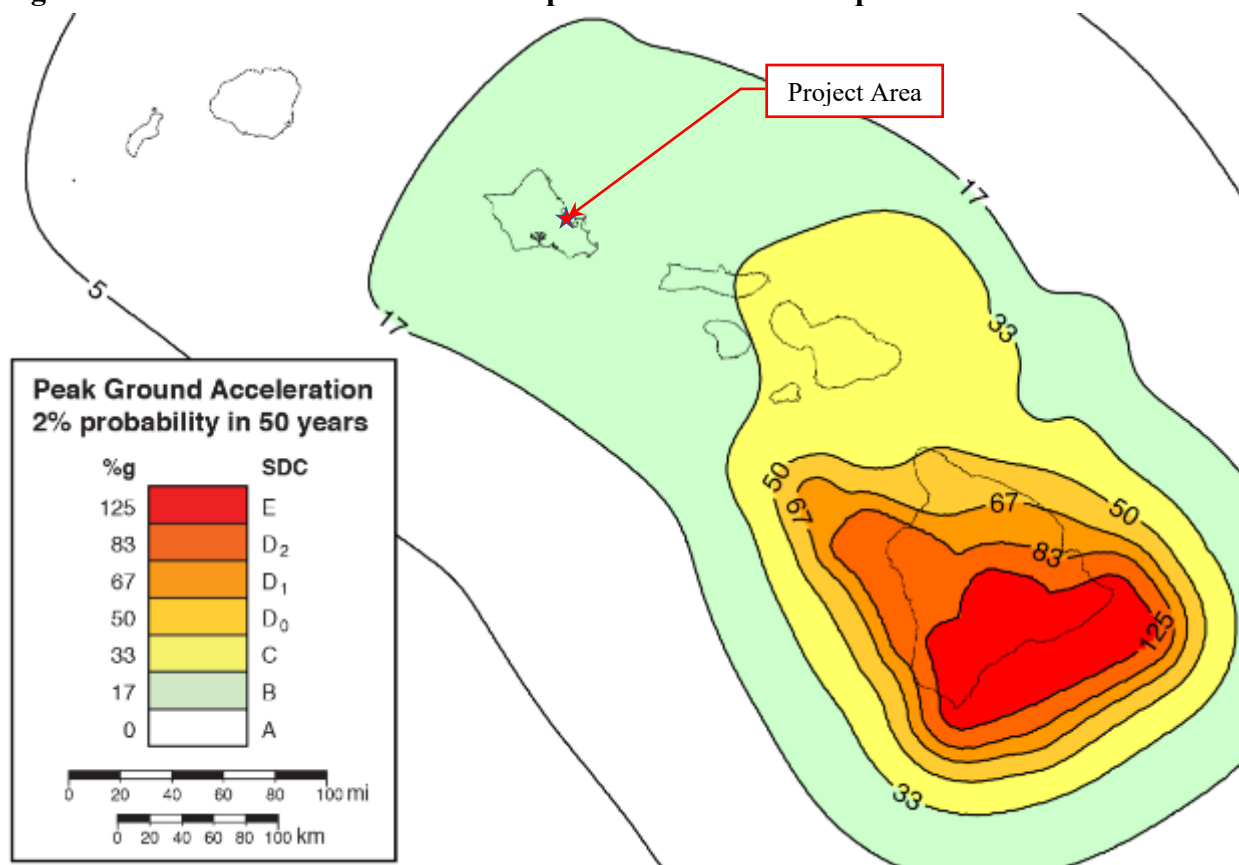


Source: <https://coast.noaa.gov/hurricanes/#map=4/32/-80>.

3.6.2 EARTHQUAKES

The United States Geological Survey (USGS) has developed seismic hazard maps to represent the results of risk analysis and help estimate likely locations of future damaging earthquakes and the hazard they might pose in terms of ground shaking. Based on the USGS Seismic Hazard Map (Figure 3-15), O‘ahu has a general seismic Peak Ground Acceleration (PGA) risk that has a 2 percent chance of exceeding 0.17 percent of Earth’s gravitational acceleration (%g) Peak Ground Acceleration (PGA) in the next 50 years. This corresponds to Seismic Design Category (SDC) B, and potential effects of shaking that include moderate shaking felt by all, some heavy furniture is moved, fallen plaster, and slight damage.

Figure 3-15: USGS Seismic Hazard Map based on Past Earthquakes



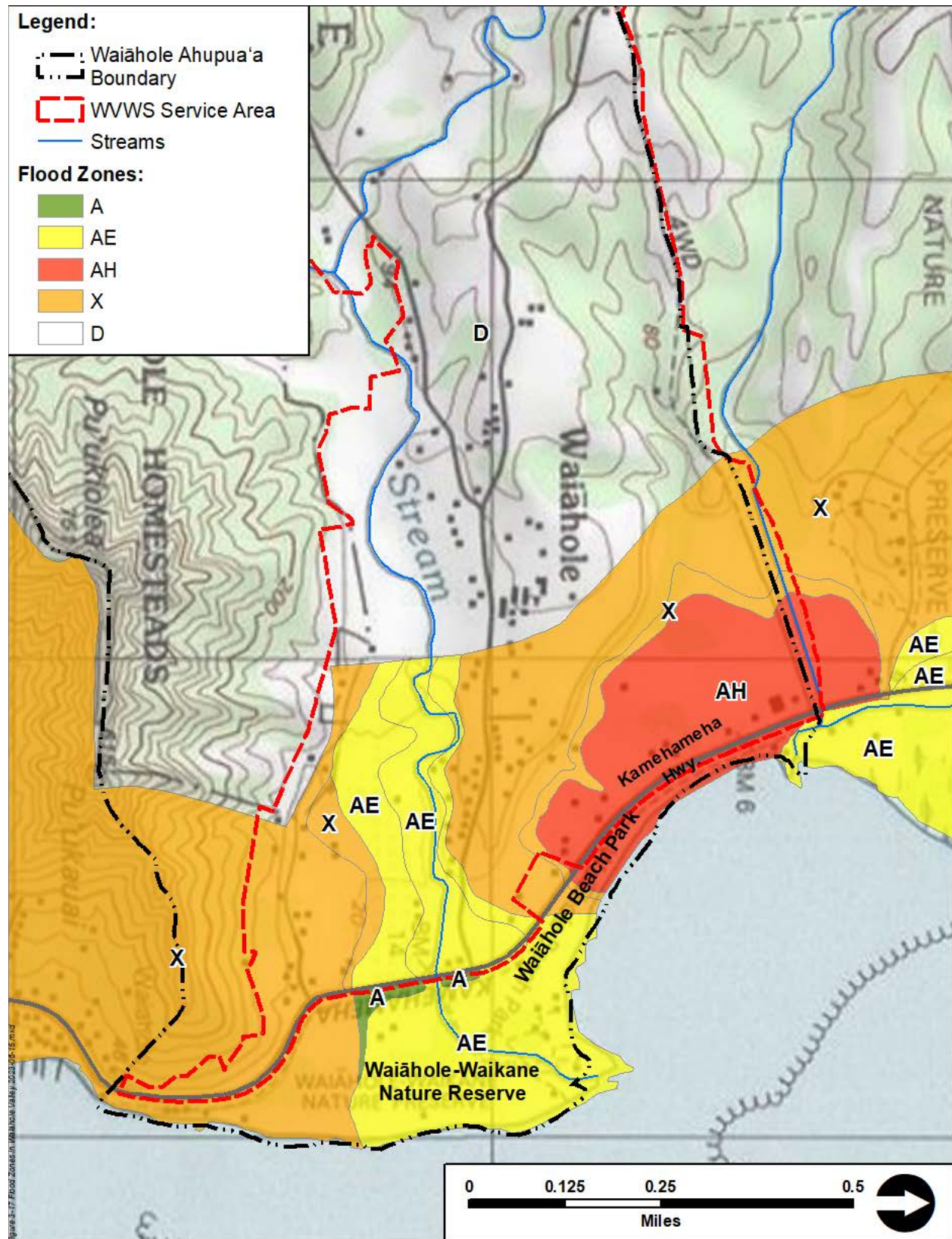
Source: <https://www.usgs.gov/media/images/seismic-hazard-state-hawaii-based-past-earthquakes>

Like all of O‘ahu, the project site is designated by the Uniform Building Code (UBC) as Seismic Zone 2a. Current building codes, including the International Building Code (IBC), include minimum design criteria for structures to address the potential for damage due to seismic disturbances specific to each seismic zone. There is no threat of volcanic eruptions directly affecting the project area.

3.6.3 FLOODING

Figure 3-16 illustrates the flood zones in the valley based on FEMA’s flood assessment tool. The majority of Waiāhole Valley is in flood zones D or X. Zone D designates areas with possible but undetermined flood hazards; these areas have not undergone a detailed flood analysis. In Zone D it is likely that some flooding occurs, particularly near the streams in the valley. Zone X are areas that have been studied and were determined to be outside the 0.2 percent annual chance floodplain. Areas along the river near the coastline are in the AEF, AE, or A flood zones and an area north of the river near the coastline is in the AH flood zone. The zones that begin with the letter A are all special flood hazard areas with at least a 1 percent annual chance of flood.

Figure 3-16: Flood Zones in Waiāhole Valley



Source: FEMA Special Flood Hazard Areas for the State of Hawai'i. GIS shapefiles.

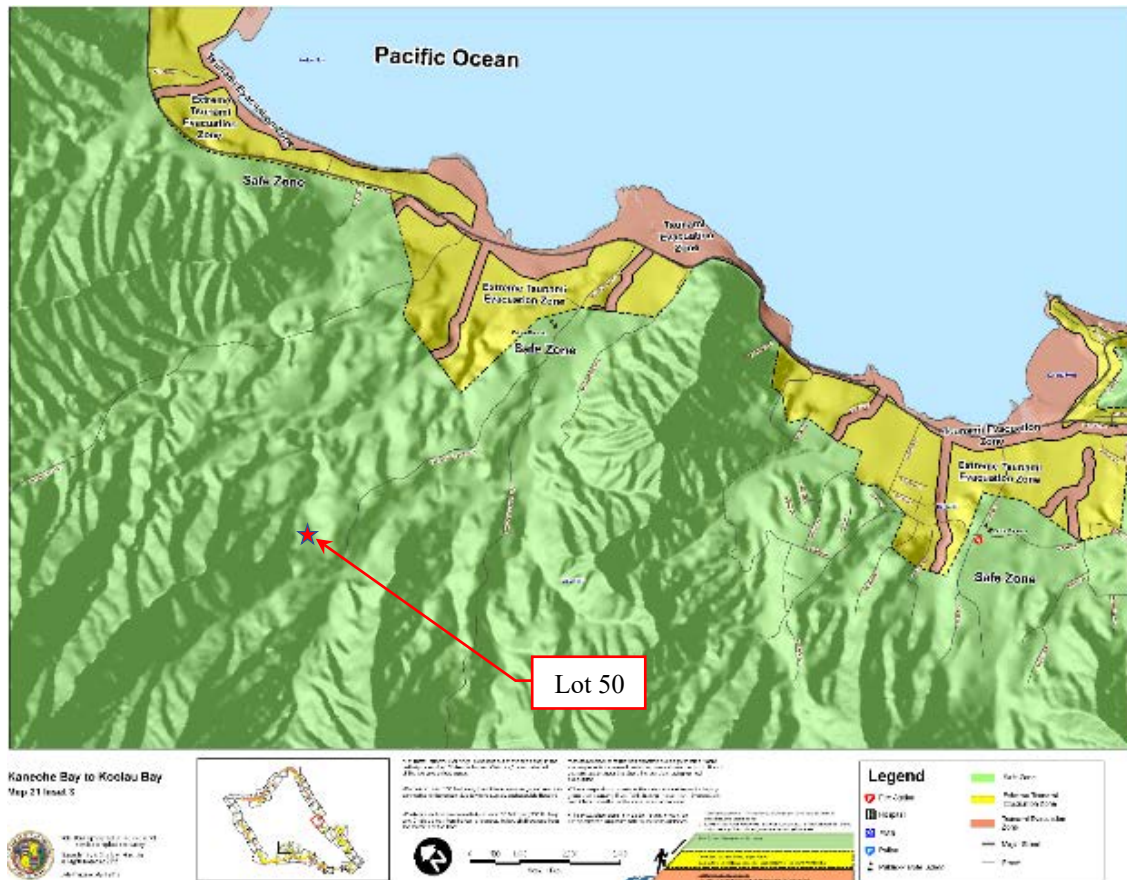
The major elements of the existing WVWS (reservoirs, wells, and booster pumps) are in flood zone D. Relatively short portions of the WVWS water distribution pipelines near Kamehameha Highway are in flood zones AEF, AE, and A.

A storm on March 9, 2021, caused significant flooding of the Waiāhole Valley area and severe damage to the existing WVWS well site, access road, and power supply such that potable water was not available to local residents and businesses for over 48 hours. USGS stream gage records show that during the storm, Waiāhole Stream discharge was nearly 8,600 cfs just upstream of the Kamehameha Highway. That was the highest discharge since the monitoring station was established in 2001. The previous highest discharge rate was 6,000 cfs in 2014 and the daily average discharge is 43 cfs. Although flooding occurred, the March 2021 event was not a “100-year” storm event, suggesting that greater flooding and damage is possible in the future.

3.6.4 TSUNAMI INUNDATION

As illustrated in Figure 3-17, coastal areas of Waiāhole Valley are in the tsunami evacuation zone with nearby areas in the extreme tsunami evacuation zone. The tsunami evaluation zone is similar to the flood zones that start with “A” discussed in Section 3.6.3. The major elements of the existing WVWS (reservoirs, wells, and booster pumps) are outside the evacuation zones and relatively short portions of the WVWS water distribution pipelines near Kamehameha Highway are in the evacuation zones.

Figure 3-17: Tsunami Evacuation Zones, Kāne‘ohe Bay to Ko‘olau Bay



Source: https://www.honolulu.gov/rep/site/dem/dem_docs/tsunami_evac/etez_final/Kaneohe_Bay_to_Koolau_Bay_map21_inset3.pdf

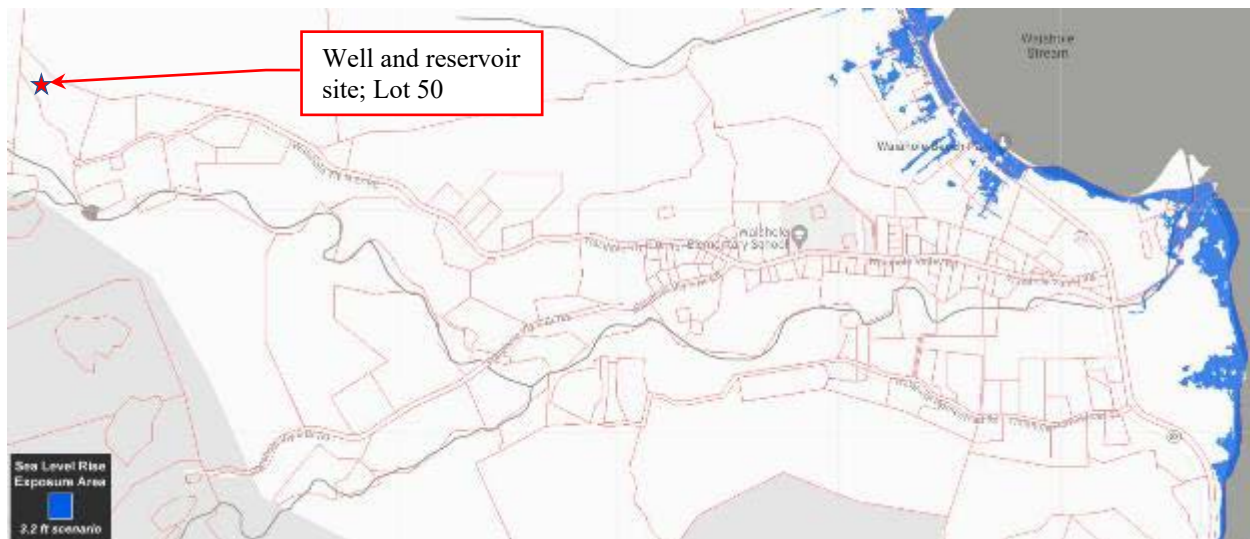
3.6.5 SEA LEVEL RISE

The *Hawai‘i Sea Level Rise Vulnerability and Adaptation Report* (HSLR) (HCCMAC, 2017) combines best available science from the Intergovernmental Panel on Climate Change (IPCC), NOAA, and NASA to project sea level rise and vulnerability scenarios. These scenarios can be used to guide adaptation planning decisions and good practice recommendations.

The IPCC’s “business as usual” scenario predicts up to 3.2 feet of global sea level rise (SLR) by 2100. Other recent observations and projections estimate that 3.2 feet of SLR could be reached as early as 2060. Both the HSLR Report and the 2018 *State of Hawai‘i Hazard Mitigation Plan* recommend using the 3.2 feet SLR as an appropriate planning target when designing future projects.

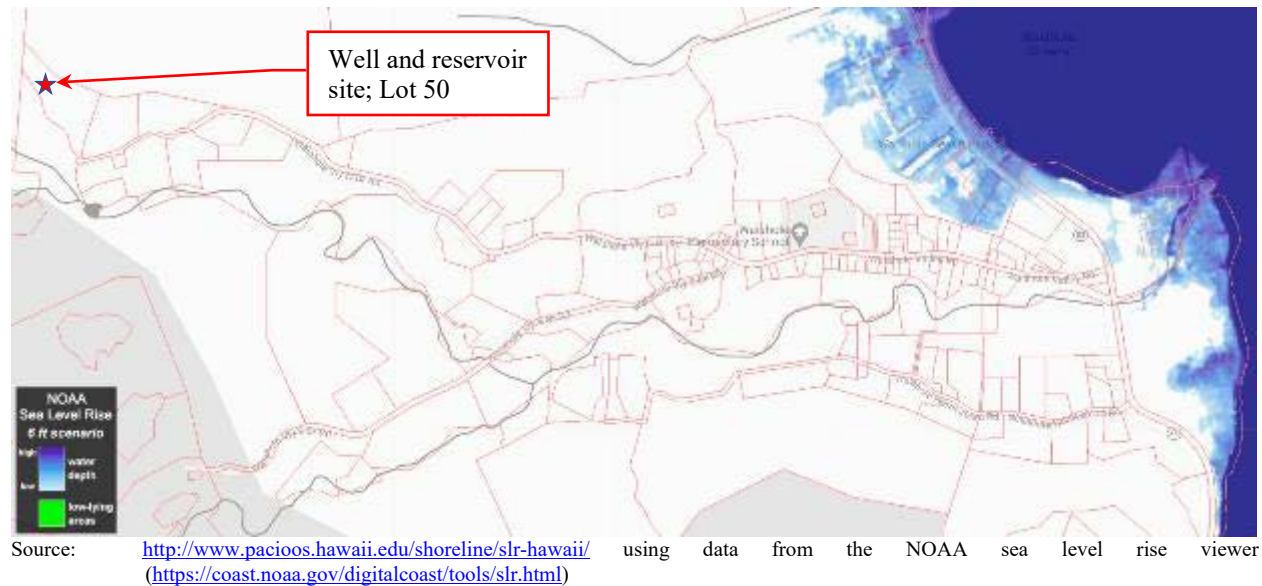
The HCCMAC modeled the three chronic flood hazards associated with 3.2 feet of SLR: (i) passive flooding; (ii) annual high wave flooding; and (iii) coastal erosion. The combined footprint of these three hazards defines what the report terms the “Sea Level Rise Exposure Area” (SLR-XA) and indicates flooding in the area will be associated with “long-term, chronic hazards punctuated by annual or more frequent flooding events.” Figure 3-18 shows the SLR-XA in the vicinity of the project area with 3.2 feet of sea level rise. The HCCMAC model does not indicate that Waiāhole Valley’s coastline is subject to high wave flooding or shoreline erosion, presumably because it is within low-energy Kāne‘ohe Bay. The SLR-XA is based entirely on passive flooding. To consider SLR passive flooding further, Figure 3-19 illustrates passive flooding under a 6-foot SLR scenario according to NOAA.

Figure 3-18: Sea Level Rise Exposure Area in Project Area under a 3.2-foot Sea Level Rise Scenario



Source: <http://www.pacioos.hawaii.edu/shoreline/slr-hawaii/>

Figure 3-19: Passive Flooding under a 6-foot Sea Level Rise Scenario



As these figures show, low lying coastal area, including some areas mauka of Kamehameha Highway, will be prone to flooding due to SLR in the future. The areas mauka of Kamehameha Highway that are prone to SLR passive flooding are similar to the AH flood zone.

3.6.6 POTENTIAL IMPACTS

The potential impacts to the two action alternatives related to natural hazards would not be substantially different because the age and material of the water mains within the roadway network would not have a substantial bearing on the potential for the distribution system to be adversely affected by these hazards.

There are several factors that temper the scale of probable impact associated with hazards on the action alternatives; these include, (i) the new wells and tank would be accessible via a paved driveway off Waiāhole Valley Road North Branch, which is a well-established roadway utilized by area residents; (ii) the driveway from Waiāhole Valley Road North Branch to the tank and well pad would include a drainage system designed to accommodate a 10-year, 1-hour storm per CCH Drainage Standards; and (iii) the water distribution system pipelines associated with either action alternative would be pressurized and underground, except where they cross streams and then they would be strapped to existing bridges.

Nevertheless, hazards could adversely affect the project if they are severe in nature. The hazards are unlikely to directly damage the action alternatives' components unless they are severe enough to damage other infrastructure, such as the roads that the water distribution pipelines are under or the bridges to which they are tied. A more likely, but less severe impact, would be for the hazards to result in a condition, such as flooding and road closures, that could delay responses to system needs. This impact is anticipated to be substantially reduced under the action alternatives than the no action alternative because the water source and its power supply would be more easily accessed.

The no action alternative and the action alternatives would not have a discernable impact on the susceptibility of the area to hazards (e.g., storms, earthquakes, flooding, tsunami, SLR). Hazards

may episodically or chronically impact all or portions of Waiāhole Valley and any improvements within it, including the existing WVWS.

3.6.7 AVOIDANCE, MINIMIZATION, AND MITIGATION MEASURES

One of the goals of the action alternatives is to improve the WVWS' reliability and resiliency. This section details the measures (which are included in the action alternatives) that contribute to the improved WVWS' reliability and resiliency in the event of natural hazards.

- Constructing all new infrastructure in compliance with regulatory controls to meet current seismic, plumbing, building, and critical infrastructure code design requirements, reducing the risk of failure in the event of hazards.
- Moving the water source closer to the service area to provide (i) easier access in the event of a hazard, (ii) electric power service that is less vulnerable to hazards so there would be fewer and shorter outages, and (iii) less infrastructure to maintain.
- Extending the life of the water distribution system with new pipeline infrastructure, reducing maintenance efforts, and decreasing the likeliness of failure.
- Locating all major project elements outside of the flood zones (Figure 3-16), Tsunami Evacuation Zones (Figure 3-17), and SLR-XA (Figure 3-18). The portions of the BWS action alternative's new distribution system that would be located within these zones would be designed to resist and minimize flood damage.
- Implementing a more reliable system and new fire water-supply line to help support the Waiāhole Valley Elementary, which is a Critical Facility and Potential Shelter Location in the event of a natural hazard with a capacity of 1,168 people.

3.7 VISUAL AND AESTHETIC RESOURCES

3.7.1 EXISTING CONDITIONS

The objective of CCH's *O'ahu General Plan* (2021), regarding aesthetic and scenic resources (Chapter III. Natural Environment and Resource Stewardship, Objective B) is to:

preserve and enhance natural landmarks and scenic views of O'ahu for the benefit of both residents and visitors as well as future generations.

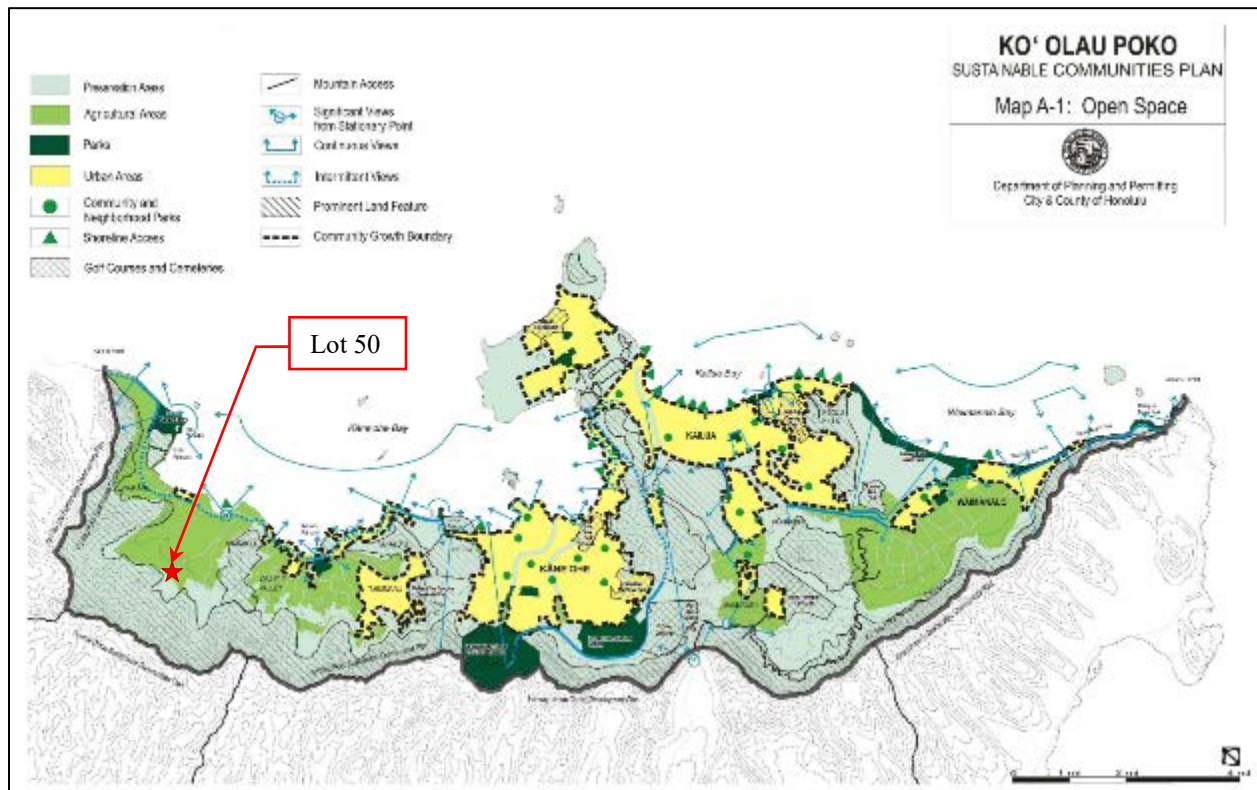
CCH's *Ko'olau Poko Sustainable Communities Plan* (KPSCP; DPP, 2017) reaffirms Ko'olaupoko's role in O'ahu's development patterns as intended in the *O'ahu General Plan*, by establishing policies and guidelines for future development. It makes a clear priority of preserving and enhancing scenic, recreational, and cultural features of the Ko'olaupoko landscape that help define the community's sense of place. It further establishes that:

Ko'olau Poko's striking topographic features, outstanding beaches and bays, lush valleys, perennial streams and other natural features and landmarks continue to visually define the "windward" sense of place. Views of ridgelines or upper slopes of coastal headlands and mountains from the vantage point of coastal waters, major roads, parks and other public places, are kept free from land disturbance

or the encroachment of structures or other projects that would affect the scenic viewplanes.

The KPSCP goes on to describe and define protected scenic land features, viewplanes, and panoramas in *Map A-1* reproduced here as Figure 3-20. It identifies that there are intermittent views from Kamehameha Highway toward Kāneʻohe Bay in the area. It also identifies the view of the bay from the Waiāhole Beach Park, from which the bay is accessible. In addition, significant continuous views are recognized from Kāneʻohe Bay back toward the prominent land feature, which is the Koʻolau Mountains.

Figure 3-20: Open Space and Significant Views in Koʻolau Poko



Source: DPP (2017)

3.7.2 POTENTIAL IMPACTS

Visual and aesthetic resource impacts are long-term in nature. The potential impacts of the two action alternatives on visual and aesthetic resources would not be substantially different because the replacement and/or maintenance of the distribution system (BWS vs. WVWS) within the roadway network does not have the potential to affect these resources in a substantial manner.

The aboveground components of the action alternatives (the tank and other facilities at Lot 50) would not be visible from any of the identified important view locations. This is partially due to the distance between the important view locations (the highway, beach park, and Kāneʻohe Bay) and Lot 50; that distance is more than a mile. The topography and vegetation also restrict views of the action alternatives' elements on Lot 50. Furthermore, the important views from the highway and beach park are toward the bay, not toward the mountains.

Figure 3-21 provides a Google Maps™ Street View screenshot taken from Kamehameha Highway's intersection with Waiāhole Valley Road toward Lot 50 and Figure 3-22 provides a screenshot from Waiāhole Beach Park toward Lot 50, which approximates the view from Kāneʻohe Bay toward Lot 50. As the photographs show, vegetation prevents views of the lower slopes of the Koʻolau Mountains where Lot 50 is located.

No significant adverse impacts to views and scenic vistas are anticipated because the tank and other elements would not be visible from important viewpoints identified in state and regional plans.

Figure 3-21: Landward View from Kamehameha Highway toward Lot 50



Source: Google Maps™ (Street View dated July 2019)

Figure 3-22: Landward View from Waiāhole Beach Park toward Lot 50



Source: Google Maps™ (Street View dated August 2011)

Topography and vegetation will also prevent views of the Lot 50 elements even from the Waiāhole Valley Road North Branch and nearby residences; only the access driveway will be visible from the north branch road. The only locations from which the Lot 50 elements may be visible would be nearby higher elevation points such as Makikiki at 521 feet. Such higher elevation points are generally not publicly accessible and views from them would primarily be toward the bay, not Lot 50.

The no action alternative would not involve the development of new above-ground elements that would be visible from important viewpoints identified in state and regional plans. Therefore, it does not have the potential to have an adverse effect on visual and aesthetic resources.

3.8 ROADWAYS AND TRAFFIC

3.8.1 EXISTING CONDITIONS

The valley has a few roads, which are accessible from Kamehameha Highway. Kamehameha Highway provides connectivity between the valley and the rest of O‘ahu. The improved public roads in the valley include:

- Waiāhole Valley Road and its two branches, Waiāhole Valley Road North Branch and Waiāhole Valley Road South Branch. Most of the residence and farms in the valley are accessible from these roads. The roadway ROW is 44 feet wide and includes two travel lanes, one in each direction, unimproved shoulders, utility poles with electric and communication services, underground water mains, and fire hydrants.

- Waiāhole Homestead Road. This road has a 32-foot-wide ROW and the same facilities as the valley road above.

These roadways are owned and maintained by HHFDC. They are lightly travelled because there is no outlet and there are few residences, farms, and other uses in the valley.

Beyond the improved portion of the branch roads are unimproved roads that are used to access a few private land uses and public uses of the Forest Reserve. The existing WVWS wells are accessible via a one-lane, approximately 7,000-linear-foot (1.33 mile), unpaved road in the Forest Reserve, beyond the end of Waiāhole Valley Road South Branch. ADC also uses this road to access portions of the Waiāhole Ditch System. An unimproved road, that is in much worse condition, at the end of the Waiāhole Valley Road North Branch is also used by ADC to access portions of the Waiāhole Ditch System.

Kamehameha Highway is State Highway 83 and is heavily used. It is a two-lane roadway in a 50-foot-wide ROW with a posted speed limit of 35 miles per hour. It is not unusual for peak hour traffic to have more than 1,000 vehicles with over 600 in the dominant direction; 24-hour traffic volumes exceed 13,000 vehicles. The intersection of Waiāhole Valley Road and the highway can be busy due to the volume of vehicles on Kamehameha Highway and the popularity of the Waiāhole Poi Factory, which is at the intersection.

3.8.2 POTENTIAL IMPACTS

The BWS action alternative would have short-term impacts on the Waiāhole Valley Road system, including Kamehameha Highway, as new BWS-compliant water mains are installed under the roadways. Most of the work would occur in the HHFDC-owned roads in the valley. Work in those roads would be coordinated by HHFDC, occur during normal working hours, and typically result in the closure of one lane for 500 linear feet or less in one or more locations. The lane closures would advance up or down the roadway as work progresses. Access to individual lots along the roadways would be maintained during these lane closures to the maximum extent possible so that individuals are not inconvenienced for more than minutes.

New service connections would also need to be made for each customer under the BWS alternative. Depending on the availability of materials and contractor preferences, the meters could be installed at the same time as the water mains, or they could be installed once the new water mains are in service. Therefore, each customer could experience a lane closure in the vicinity of their home or farm for the water main installation and then a second event when work would be done to connect them to the new main.

Short-term impacts to Kamehameha Highway under the BWS alternative would be limited to making connections to and providing service from existing water mains. No new water mains would be installed within Kamehameha Highway under either action alternative. Therefore, lane closures on Kamehameha Highway would be limited to a few specific locations.

Over the long-term, both action alternatives could have similar impacts on the roads and highway in the event of a water main break or preventative maintenance activities. Partial road closures would occur without notice in the event of a water main break but would typically not last for more than 24 hours. During preventative maintenance, notice would be provided to area residents and

work would likely progress in a manner similar to that described above for the installation of a BWS-compliant system.

Employing the avoidance and minimization measures outlined in Section 3.8.3 would ensure that short-term and long-term impacts are less than significant.

The no action alternative would involve maintenance and repairs to the existing water system, which would likely increase in frequency and magnitude as the existing system aged. The impacts of the no action alternative would be similar to the Wells/WVWS impacts and the same avoidance and minimization measures would be employed.

3.8.3 AVOIDANCE, MINIMIZATION, AND MITIGATION MEASURES

Construction activity related traffic impacts would be avoided and minimized by implementing the following measures:

- Providing construction schedule information to the community association and periodic mailers to schools, businesses, and valley residents.
- Delivering large equipment and materials during off-peak times.
- Using signage, cones, flagmen, and other means to manage traffic, pedestrians, and improve worker safety.
- Obtaining a permit from HDOT prior to conducting any work on Kamehameha Highway. The contractor would be required to follow conditions associated with that permit, which could include only working during off-peak period or working at night.
- Repairing road damage to CCH standards.

3.9 SOCIO-ECONOMIC CONDITIONS

3.9.1 EXISTING CONDITIONS

Waiāhole Valley is a rural, primarily agricultural, valley in the CCH. It is commonly associated with Waikāne Valley immediately to the north. The two valleys make up a census “designated place.” In 2020 it was estimated that 728 people live in the two valleys. The population has been fairly stable since at least 1990, when the population was estimated at 769. The population primarily consists of people of mixed race (53 percent), Pacific Islander (18 percent), and white (15 percent). Per capita income is difficult to estimate; the census data indicates roughly \$43,700 annually with a 10 percent margin of error.

It is expected that Waiāhole, which has more parcels and, based on air photographs, has more residential buildings, is home to the bulk of the 728 people.

3.9.2 POTENTIAL IMPACTS

The action alternatives would not result in any change to the demographics in the area. Its sole potential socio-economic impact would be related to the cost of potable water. The impacts would be long-term in nature. As discussed in Chapter 2, cost effectiveness of the proposed WVWS

improvements is an important alternative selection criterion. Water rates for both the existing WVWS and BWS are summarized in Table 2-2 and Table 2-3.

Should the water system remain private (the wells/WVWS alternative), the established WVWS rates would continue to apply. The WVWS rates are programmed to increase annually based on the Consumer Price Index.

Under the wells/BWS alternative, the WVWS customers would become BWS customers and the BWS rates would apply to them. There is no reason to anticipate that the BWS rates would change specifically due to BWS' absorption of the WVWS. Incremental increases in BWS rates over the years would be expected. These incremental increases would not be expected to outpace inflation. BWS water rates for single-family customers are currently lower than the corresponding current WVWS rate and would likely remain lower in the future. BWS water rates for agricultural customers are currently higher than corresponding WVWS rates and would likely remain higher in the future.

Table 3-3 provides a comparison of customer water bills under the two action alternatives, using current BWS and WVWS rates. The table has three scenarios for different types of customers, including a typical residence (defined as Residential on the current (2023) Water Rate Fee Schedule) using 11,500 gallons a month, a small farm where there is a residence on the lot (defined as Mixed Residential and Agricultural) using 45,000 gallons a month, and a farm with high water demand (defined as Agricultural), 370,000 gallons a month.

Table 3-3: Summary of Annual Potable Water Costs for Waiāhole Valley Residents and Farmers (2023)

<i>Scenario</i>	<i>Customer Cost per Current WVWS Rates</i>	<i>Customer Cost per Current BWS Rates (assuming ¾" Meter Size)</i>	<i>Relative Percent Difference (RPD)</i>
Resident using 11,500 gallons/month	\$79.97	\$72.65	9.6
Farmer with residence on site using 45,000 gallons/month	\$108.81	\$121.31*	11
Farmer using 370,000 gallons/month	\$271.60	\$810.31	99

Notes: Rates are provided in Table 2-2 and Table 2-3.

*BWS does not have a mixed residential and agricultural rate, therefore, the cost was calculated using the BWS Agricultural rate.

Source: Compiled by PSI.

The potential impact of either action alternative on residential customers is anticipated to be minimal. The impact would be beneficial under the wells/BWS alternative and adverse under the wells/WVWS alternative. Given the context (water cost being a relatively minor cost among the many costs incurred maintaining a household) and severity of the impact, both action alternatives are anticipated to have a nominal and insignificant socio-economic impact to residential customers.

The potential impact of the two action alternatives differs for farms that rely on WVWS potable water to irrigate their crops. Under the wells/BWS alternative, the island-wide agricultural rates would apply and be substantially higher than the current WVWS rates. The farms in the valley that utilize potable water from WVWS to water their crops, instead of using water from the

McCandless system, tend to be those engaged in non-traditional agriculture (e.g., not taro lo‘i). Those farms are growing crops (e.g., papaya) for market that compete with farms in other parts of the county/state that obtain water from BWS or other public/private sources that have rates that are higher than WVWS’ current rates. That context means that they should have the means to absorb the high percent rate increase, but relatively small increase in the context of other non-traditional farm expenses. Alternatively, those farmers may have the means to connect to the McCandless system or another non-potable water source for their irrigation needs.

The no action alternative would have similar, but likely larger, impacts to the wells/WVWS action alternative. This is because the no action alternative would involve maintenance and repairs to the existing water system, including the long road and pipeline into the Conservation District. The O&M costs would likely increase over time because the existing system is over 40 years old and would require more frequent preventative maintenance and more frequent leak/failure response. In response, incremental increases in water rates over the years would be expected. These incremental increases would not be expected to substantially outpace inflation. The WVWS rates for single-family customers would continue to increase, at least at a rate equal to the consumer price index.

3.10 OTHER RESOURCES AND TOPICS

Due to the nature of the action alternatives – replacing existing structures with similar new structures to continue the same use, which is consistent with all applicable land use rules and regulations, at the same intensity of use – the action alternatives have no potential to substantially impact other resources or conditions. Therefore, the following topics, which are sometimes discussed in detail in EAs, are only briefly mentioned in this section:

- *Air Quality.* Air quality in the region is good; all federal and state air quality standards have been attained. As discussed in Section 2.4.3, fugitive dust would be controlled during construction. The action alternatives do not involve activities or uses that have the potential to meaningfully affect air quality on a regional scale.
- *Noise.* The predominant noise sources in the vicinity are vehicular traffic from Kamehameha Highway and other roadways, plus the operation of farm equipment. The action alternatives do not involve activities or uses that have the potential to meaningfully affect the sonic environment.
- *Other Public Utilities, Infrastructure, and Services.*
 - *Electricity and communications.* Overhead lines provide electrical and communication services to the valley. This would continue to be the case.
 - *Wastewater.* Waiāhole Valley does not have a central wastewater treatment system. Each use in the valley that produces wastewater uses an Individual Wastewater System (IWS) to manage its waste. The action alternatives would not change the fact that there is not a central wastewater treatment system in the valley.
 - *Storm Water Management.* Storm water management infrastructure is present along the valley’s roadways. There are storm drain lines in parts of the roadway, culvert crossings under the roadway to pass gully flows, CRM

culverts to carry drainage adjacent to roadways and a bridge on the South Fork of Waiāhole Valley Road to pass water of Waianu Stream under the roadway. The action alternatives would not adversely affect that infrastructure. The alternatives would add a new storm drain to address runoff from Lot 50, but that new drain line would not interfere with or degrade the function of the existing storm drain system.

- *Solid Waste.* The action alternatives would generate some waste periodically. During construction, waste would be generated by the decommissioning of the existing 1 MG tank and other infrastructure, plus packaging and other items associated with construction of the proposed infrastructure. The volume and type of waste generated would not be unusual and would be disposed of at on-island facilities in accordance with applicable rules.
- *Fire.* The valley is primarily served by the Kahalu‘u Fire Station No. 37 at 47-306 Waihee Road. There are fire hydrants located roughly every 500 along the roadways where structures are present. The action alternatives would not meaningfully change the location of fire hydrants or the ability for the fire department to respond to fire emergencies. Both action alternatives are designed to provide improved fire flows to the elementary school.
- *Police.* The valley is in Honolulu Police Department District 4, serving Kailua, Kaneohe, and Kahuku. The action alternatives would not affect the operation of the police department.
- *Schools.* The valley is in the Castle-Kahuku public school complex. Children residing in the valley attend Waiāhole Elementary School. The action alternatives would not affect the operation of the school.
- *Parks.* The only park in Waiāhole Valley is Waiāhole Beach Park, which is on the makai side of Kamehameha Highway. The action alternatives would not affect access to or operations at the park.
- *Other services.* Primary medical services for Waiāhole Valley residents and workers are provided by Emergency Medical Services Division staff and ambulance services. The nearest hospital is Adventist Health Castle in Kailua. The action alternatives would not affect the operation or availability of these services.

3.11 CUMULATIVE IMPACTS

Cumulative impacts are those that result from past, present, and reasonably foreseeable future actions, combined with the potential impacts of a specific (proposed) project. Cumulative impacts may result from a series of projects that individually do not generate significant adverse effects, but collectively add up to a significant negative impact on the environment.

Relevant past, present, and reasonably foreseeable actions in this situation include the development of the existing WVWS (a past action), the proposed improvements detailed in the previous sections of this report, and the proposed operation and maintenance of the improved potable water system as detailed in the previous sections of this report. There are no currently foreseeable actions as defined by HRS 343 related to the proposed action. However, if an IWS owner within 1,000 feet

of the proposed wells need to replace their IWS due to failure, then they would be required to (i) apply for a variance and upgrade to an Advanced Treatment Unit (ATU) class of IWS, or (ii) relocate their IWS so that it was more than 1,000 feet from the wells. Such an IWS upgrade or move is not foreseeable currently because the few IWS within 1,000 feet of the proposed wells are presumably operational and there are no known plans to add bedrooms to the uses associated with those IWS.

The impacts of the existing WVWS were disclosed in the *Environmental Impact Statement for the Waiāhole Valley Agricultural Park and Residential Lots Subdivision* (1985). That document identified that the existing water system would have an adverse effect on Conservation Lands but stated that the effect would be less than significant. The water system was anticipated to have no impact or a beneficial impact on other resources. The proposed project would result in the decommissioning of the water systems' components in the Conservation District and, by doing so, reduce the system's long-term adverse effect on resources in the Conservation District.

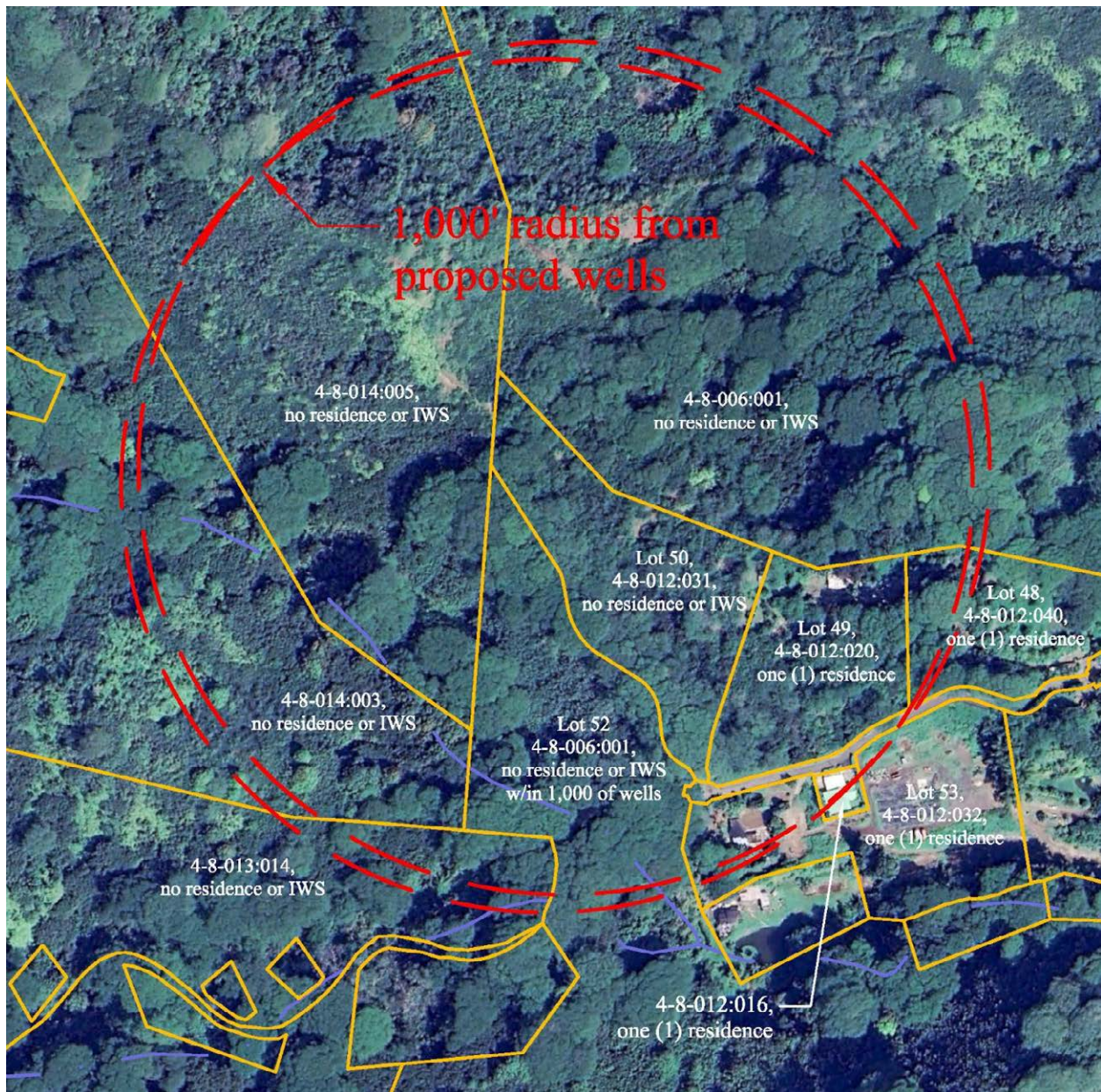
The impacts of the action alternatives, including the future maintenance of the water system, are disclosed in Sections 3.1 through 3.10, above. As disclosed, no significant impacts are anticipated. Chapter 5 further documents that no significant impact is anticipated. Anticipated benefits of the action alternatives include ensuring a reliable supply of water, reducing water losses and leakage in the system, and improving water resource availability for residential, agricultural, and commercial purposes.

Even though an IWS upgrade or move is not now a foreseeable action, the potential impact of such a requirement is discussed here. Four residences appear to be located within 1,000 feet of the proposed wells. These four residences are on parcels zoned AG-2 (TMK 4-8-012:020 (Lot 49), TMK 4-8-012:030 (Lot 48), TMK 4-8-012:032 (Lot 53), and TMK 4-8-012:016 (no lot number)). Those four residences may or may not have IWS within 1,000 feet of the well locations; in some cases it is uncertain because the homes appear to be exactly 1,000 feet away (Figure 3-23).¹⁸ The IWS upgrade or move in the event that the existing IWS within 1,000 feet of the wells fails would involve (i) locating the new IWS more than 1,000 feet from the wells, which could slightly increase the cost of the new IWS due a longer pipe run from the residence to the IWS; or (ii) if the IWS cannot be moved to a location greater than 1,000 feet from the wells, a slightly longer permitting process (to acquire a variance) and a slightly increased operation costs (relative to a cesspool) to maintain the ATU and variance (the variance needs to be renewed every 5 years). The impact of this on the few residences within 1,000 feet of the wells is anticipated to be less than significant because most would be able to locate their new IWS more than 1,000 feet from the wells and the added cost of an ATU is not substantial in the context of a replacing an IWS.

The incremental effects of the action alternatives combined with the effects of present, past, and foreseeable projects are not cumulatively significant.

¹⁸ The 1,000 foot distance is the established by surveying the distance between the outer edge of the well (the well casing) and the outer edge of the IWS nearest the well.

Figure 3-23: 1,000-foot Radius from Proposed Wells



Source: PSI and BEL.

3.12 SECONDARY IMPACTS

Secondary effects are associated with an activity but do not result directly from the activity. The action alternatives do not appear to have the potential to involve significant secondary impacts to property valuation, population, housing, community services, public facility needs, employment, and compatibility with surrounding land uses. This is because the action alternatives would not result in substantial changes in the cost or availability of water or other resources that land use changes and development depend on. For example, the action alternatives:

- Would not change the WVWS service area.

- Would not change employment opportunities associated with in WVWS or other activities the project area.
- Would not increase the volume of water pumped from the aquifer and made available for agricultural, residential, and commercial uses in the current service area or beyond.
- Would not affect the volume of water collected by the Waiāhole Ditch System, delivered from that system to its users, or released from that system to streams.
- Would not change valley stream flows in a manner that adversely affects the availability of water for off-stream agricultural uses.
- Would not result in the subdivision of land for the purposes of residential, agricultural, or commercial development.
- Would not provide access to currently inaccessible areas.
- Does not require other actions to be taken or services to be provided in the project area by government agencies or private parties.

Therefore, the action alternatives would not induce land use changes or demographic changes in the region and would cause significant secondary impacts.

4 CONSISTENCY WITH LAND USE PLANS, POLICIES, AND CONTROLS

This chapter discusses the relationship of the proposed action with applicable land use plans, policies, and regulations at the local and state level.

4.1 STATE OF HAWAI‘I

4.1.1 HAWAI‘I STATE PLAN, HRS §226

Adopted in 1978 and last revised in 1991, the *Hawai‘i State Plan* is intended to guide the future long-range development of the State by:

- Identifying goals, objectives, policies, and priorities for the State;
- Providing a basis for determining priorities and allocating limited resources, such as public funds, services, human resources, land, energy, water, and other resources;
- Improving coordination of federal, state, and county plans, policies, programs, projects, and regulatory activities; and
- Establishing a system for plan formulation and program coordination to provide for an integration of all major state, and county activities.

The *Hawai‘i State Plan* is a policy document. It depends on implementing laws and regulations to achieve its goals. While not all sections of the *Hawai‘i State Plan* are directly applicable to the proposed action, it does directly address objectives and policies for water facility systems; the most relevant are below.

§226-16 Objective and policies for facility systems--water. (a) Planning for the State's facility systems with regard to water shall be directed towards achievement of the objective of the provision of water to adequately accommodate domestic, agricultural, commercial, industrial, recreational, and other needs within resource capacities.

(b) To achieve the facility systems water objective, it shall be the policy of this State to:

(1) Coordinate development of land use activities with existing and potential water supply.

(2) Support research and development of alternative methods to meet future water requirements well in advance of anticipated needs.

(4) Assist in improving the quality, efficiency, service, and storage capabilities of water systems for domestic and agricultural use.

(6) Promote water conservation programs and practices in government, private industry, and the general public to help ensure adequate water to meet long-term needs. [L 1978, c 100, pt of §2; am L 1986, c 276, §15]

Discussion: The Waiāhole Valley Water System Improvements Project aims to ensure the continuous, reliable delivery of potable (domestic) and agricultural water to its service area in the Waiāhole community. It is needed because (i) the existing water system infrastructure is aging and difficult to access, and (ii) to comply with Senate Concurrent Resolution No. 195, encouraging the transfer of the WVWS to the BWS. Understood in this context, the proposed action is fully compliant with the above-referenced objectives and policies of the *Hawai‘i State Plan*. The planning process for the proposed action has been coordinated across State and County agencies and in consultation with the local community (see Chapter 6). It is intended to improve the quality, efficiency, level of service, and storage capability of the WVWS for the benefit of the Waiāhole community. Consequently, HHFDC has concluded that the Waiāhole Valley Water System Improvements Project is consistent with, and advances, these objectives and policies of the *Hawai‘i State Plan*.

The *Hawai‘i State Plan* also establishes specific objectives and policies for land based, shoreline, and marine resources in the physical environment:

§226-11 Objectives and policies for the physical environment--land-based, shoreline, and marine resources. (a) Planning for the State's physical environment with regard to land-based, shoreline, and marine resources shall be directed towards achievement of the following objectives:

- (1) Prudent use of Hawaii's land-based, shoreline, and marine resources.*
- (2) Effective protection of Hawaii's unique and fragile environmental resources.*
- (b) To achieve the land-based, shoreline, and marine resources objectives, it shall be the policy of this State to:*
 - (1) Exercise an overall conservation ethic in the use of Hawaii's natural resources.*
 - (3) Take into account the physical attributes of areas when planning and designing activities and facilities.*
 - (4) Manage natural resources and environs to encourage their beneficial and multiple use without generating costly or irreparable environmental damage.*
 - (5) Consider multiple uses in watershed areas, provided such uses do not detrimentally affect water quality and recharge functions.*
 - (8) Pursue compatible relationships among activities, facilities, and natural resources.*

Discussion: From its inception, the proposed action has been intended to support the prudent management, use, and improvement of water resources and infrastructure in Waiāhole Valley. The planning and design of the proposed action and alternatives have been oriented to the effective protection and conservation of water resources while fulfilling HHFDC's obligation to the community to provide reliable, continuous, and affordable water for domestic and agricultural purposes. The action alternatives in this report have been developed with Waiāhole's unique

environmental context in mind, considering the unique physical and hydrological characteristics of the WVWS service area, and seeking to balance the multiple uses of this watershed without imposing adverse impacts on water quality or groundwater recharge functions in Waiāhole Valley. One important aspect of this has been to avoid infrastructure in the Conservation District. Based on these considerations, HHFDC believes that the proposed action advances these objectives and policies of the *Hawai‘i State Plan* related to prudent management and use of natural resources.

4.1.2 HAWAI‘I 2050 SUSTAINABILITY PLAN

The *Hawai‘i 2050 Sustainability Plan* is a blueprint for Hawai‘i’s preferred future. It is the most comprehensive planning process since the *Hawai‘i State Plan* was developed over four decades ago, and was most recently updated in 2021. The *Hawai‘i 2050 Sustainability Plan* has seventeen major Sustainable Development Goals (SDGs), designed to achieve the State’s preferred future by the year 2050, and relating to: (i) no poverty; (ii) zero hunger; (iii) good health and well-being; (iv) quality education; (v) gender equality; (vi) clean water and sanitation; (vii) affordable and clean energy; (viii) decent work and economic growth; (ix) industry, innovation, and infrastructure; (x) reduce inequalities; (xi) sustainable cities and communities; (xii) responsible consumption and production; (xiii) climate action; (xiv) life below water; (xv) life on land; (xvi) peace, justice, and strong institutions; and (xvii) partnerships.

Considered together, the *Hawai‘i 2050 Sustainability Plan*’s SDGs identify what it hopes to achieve, the strategic actions characterize the paths to achieving the Plan’s goals, and the indicators serve to measure progress along the way. While not all the Plan’s SDGs are directly applicable to the proposed action, the specific SDGs most applicable to the proposed action are:

Sustainable Development Goal 6 – Ensure availability and sustainable management of water and sanitation for all.

The UN goal is to ensure the availability and sustainable management of water and sanitation for all and includes targets that address the following:

Achieving universal continuous access to safe drinking water and sanitation by promoting water-use efficiency and sustainable water withdrawals.

Integrating smart water resource management at all levels.

Increasing water use efficiency across sectors.

Discussion: The Waiāhole Valley Water Systems Improvement Project is wholly consistent with the *Hawai‘i 2050 Sustainability Plan*’s SDG related to clean water and sanitation. By removing aging and failing infrastructure and replacing it with new equipment meeting modern standards will contribute to continuous access to safe drinking and sanitary water, improving the efficiency of the system and ensuring that future withdrawals will be contained within sustainable limits. The proposed action will further this SDG and its targets by introducing modern water resource management tools, methods, and equipment at every level of planning and implementation, and of which this report is a critical component. Finally, the proposed Waiāhole Valley Water Systems Improvement Project has the potential to improve water use efficiency at all levels within the service area, from pumping, to storage, to transmission, to use. For these reasons, HHFDC has concluded that the proposed action, while not interfering with the ability to achieve the other goals

in the *Hawai‘i 2050 Sustainability Plan*, is consistent with and advances the *Hawai‘i 2050 Sustainability Plan*’s SDG for ensuring the availability and sustainable management of clean water and sanitation for all.

4.1.3 HAWAI‘I LAND USE LAW; HRS §205

HRS 205 established the State Land Use Commission and gives this body the authority to designate all lands in the State as Urban, Rural, Agricultural, or Conservation District. The counties make all land use decisions within the Urban District in accordance with their respective county general plans, development plans, and zoning ordinances. The counties also regulate land use in the State Rural and Agricultural Districts, but within the limits specified by HRS 205. The action alternatives involve work in the State’s districts as follows:

- Conservation District: decommission the wells and other components of the existing WVWS that are in the Conservation District.
- Agriculture District: install new wells and make improvements to the potable water distribution system.
- Urban District: make improvements to the potable water distribution system.

Conservation District. The existing wells and infrastructure connecting them to the distribution systems are in the State’s Conservation District. HAR 13-5-10 establishes five distinct subzones within the Conservation District: (i) Protective; (ii) Limited; (iii) Resource; (iv) General; and (v) Special. The wells and infrastructure are in the Resource Subzone. Per HAR 13-5-13(a), the purpose of the Resource Subzone is, “to ensure, with proper management, the sustainable use of the natural resources of those areas.” As identified in HAR 13-5-22(P-8)(B-1), “demolition, removal, or minor alteration of existing structures, facilities, land, and equipment” is an identified use in the Resource Subzone. Further, HAR 13-5-22(b)(2) stipulates that, “Identified land uses beginning with letter (B) require a site plan approval by the department.”

Agricultural District. HRS 205-4.5 identifies the permissible uses within the Agricultural District. It establishes that, within the Agricultural District, the Land Study Bureau (LSB) classifies the productivity on a rating scale from “A” (very good) to “E” (very poor/not suitable). Based on HRS 205-4.5, permitted uses within agricultural districts include, “public, private, and quasi-public utility lines and roadways, transformer stations, communications equipment buildings, solid waste transfer stations, major water storage tanks, and appurtenant small buildings such as booster pumping stations, but not including offices or yards for equipment, material, vehicle storage, repair or maintenance, treatment plants, corporation yards, or other similar structures.”

Urban District. HAR 15-15-18 characterizes the Urban District as exhibiting “city-like” concentrations of people, structures, streets, with an urban level of services and other related land uses. It also stresses the importance of ensuring availability of basic services and utilities in urban areas.

Discussion: A Site Plan Approval (SPA) will be obtained from the DLNR Office of Conservation and Coastal Lands prior to abandoning or decommissioning existing WVWS infrastructure in the Conservation District (Section 2.4.5).

In the Agricultural District, as noted above, utility lines and storage tanks are allowable uses. Portions of the existing system are in areas with C, D, and E LSB productivity ratings. The new well and reservoir site on Lot 50 is located within the Agricultural District where the productivity ratings are D and E. Thus, the proposed project would be considered a permitted use and do not require any additional approvals.

In the Urban District, no state-level permits or approvals are required to implement the action alternatives.

4.1.4 COASTAL ZONE MANAGEMENT PROGRAM, HRS §205A

The objectives of the Hawai‘i CZM Program are set forth in HRS 205A. The State Office of Planning and Sustainable Development administers Hawai‘i’s CZM Program. The program is intended to promote the protection and maintenance of valuable coastal resources. All lands in Hawai‘i are classified as valuable coastal resources. A general discussion of the project’s consistency with the objectives and policies of Hawai‘i’s CZM Program follows.

4.1.4.1 Recreational Resources

Objective: *Provide coastal recreational opportunities accessible to the public.*

Policies:

A) Improve coordination and funding of coastal recreational planning and management; and

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

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

ii) Requiring restoration of coastal resources that have significant recreational and ecosystem value, including but not limited to coral reefs, surfing sites, fishponds, sand beaches, and coastal dunes, when these resources will be unavoidably damaged by development; or requiring monetary compensation to the State for recreation when restoration is not feasible or desirable;

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

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

v) Ensuring public recreational uses of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;

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

- vii) Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and*
- viii) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, and county authorities; and crediting that dedication against the requirements of section 46-6.*

Discussion: The proposed project is distributed across publicly and privately-owned parcels in Waiāhole Valley. There are no parks or public recreational resources within the WVWS service area. The proposed project will not result in any change to existing beach access, open spaces, or recreational opportunities over the existing condition. There is no shoreline access via the project area. Shoreline access will continue to be available via the many public access ways along Kamehameha Highway. No development is proposed in the shoreline setback area, including on any shoreline lot. Therefore, the proposed project is unlikely to have an adverse impact on publicly accessible recreational resources.

4.1.4.2 Historic Resources

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

Policies:

- A) Identify and analyze significant archaeological resources;*
- B) Maximize information retention through preservation of remains and artifacts or salvage operations; and*
- C) Support state goals for protection, restoration, interpretation, and display of historic resources.*

Discussion: An Archaeological Literature Review (Appendix D) and the CIA (Appendix E) were prepared by CSH to assess the potential for impacts to historic and cultural resources as a result of implementing the proposed action. The collective finding of those reviews and assessments is that no historic properties will be affected by the proposed Waiāhole Valley Water System Improvements Project. HHFDC will continue to coordinate with the SHPD and cultural stakeholders in compliance with all state and county laws. The project will include measures to ensure appropriate handling and management of any historic resources that are encountered during project implementation (Section 3.5).

4.1.4.3 Scenic and Open Space Resources

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

Policies:

CZM policies related to scenic and open space are:

- A) Identify valued scenic resources in the coastal zone management area;*
- B) Ensure that new developments are compatible with their visual environment by designing and locating those developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;*
- C) Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources; and*
- D) Encourage those developments that are not coastal dependent to locate in inland areas.*

Discussion: As discussed in Section 3.7, the vast majority of the WVWS infrastructure to be improved is underground or in visually inaccessible areas, where views are precluded by intervening topography, vegetation, and structures. Consequently, the Waiāhole Valley Water Systems Improvement Project is not anticipated to have any significant adverse impact on any valued scenic resources identified in any State or County planning document(s).

4.1.4.4 Coastal Ecosystems

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

Policies:

CZM policies related to coastal ecosystems are:

- A) Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;*
- B) Improve the technical basis for natural resource management;*
- C) Preserve valuable coastal ecosystems of significant biological or economic importance, including reefs, beaches, and dunes;*
- D) Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and*
- E) Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.*

Discussion: As discussed in detail in Section 3.4, HHFDC has determined, in consultation with USFWS, that there is no federally designated critical habitat within, or in the immediate vicinity, of the project area, except where existing components of the WVWS will be decommissioned. Section 3.4 provides a detailed discussion of biota present within the project area, potential impacts resulting from implementation of the proposed action, and measures to avoid and minimize the

potential for the project to adversely affect protected species. Further, the BMPs described in Section 2.4.3 will avoid or minimize the short-term construction phase impacts to water and air quality.

4.1.4.5 Economic Uses

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

Policies:

CZM policies related to economic uses are:

- A) Concentrate coastal dependent development in appropriate areas;*
- B) Ensure that coastal dependent development and coastal related development are located, designed, and constructed to minimize exposure to coastal hazards and adverse social, visual, and environmental impacts in the coastal zone management area; and*
- C) Direct the location and expansion of coastal development to areas designated and used for that development and permit reasonable long-term growth at those areas, and permit coastal development outside of designated areas when:*
 - i) Use of designated locations is not feasible;*
 - ii) Adverse environmental effects and risks from coastal hazards are minimized; and*
 - iii) The development is important to the State's economy.*

Discussion: The proposed action will not encourage new coastal development in any way. The proposed infrastructure improvements are located well away from the coastline and do not service the properties on the makai side of Kamehameha Highway. The improvements are not sized to support expanded development in the area; in fact, the proposed storage tank is half the size of the existing storage tank. All proposed new infrastructure is located outside of special coastal hazard areas; they will be outside of the Tsunami Inundation Zone, outside the Extreme Tsunami Inundation Zone, and are designed in such a way as to minimize exposure to coastal hazards and adverse social, visual, and environmental impacts in the coastal zone management area. Finally, the improved availability and reliability of potable water is consistent with, and supportive of, the economic use objectives and policies identified by the State of Hawai'i.

4.1.4.6 Coastal Hazards

Objective: *Reduce hazard to life and property from coastal hazards.*

Policies:

CZM policies related to coastal hazards are:

- A) Develop and communicate adequate information about the risks of coastal hazards;*

- B) Control development, including planning and zoning control, in areas subject to coastal hazards;*
- C) Ensure that developments comply with requirements of the National Flood Insurance Program; and*
- D) Prevent coastal flooding from inland projects.*

Discussion: The proposed action is well inland of most coastal hazards. All proposed new infrastructure is outside of designated hazard zones. Some of the underground infrastructure which may be improved as part of the proposed action has been and will continue to be in areas designated by the Federal Emergency Management Agency (FEMA) as Special Flood Hazard Zones A, AE, AEF, and AH, as well as within the Tsunami Evacuation and Extreme Tsunami Evacuation Zones. That infrastructure must continue to exist in those zones to service customers in those areas. The proposed action will not increase the vulnerability of the area to the effects of coastal floodings, nor is it anticipated to have any deleterious effects on coastal hazards or emergency response when such hazards occur. Consequently, HHFDC has concluded that the proposed action is consistent with the CZM policies related to coastal hazards.

4.1.4.7 Managing Development

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

Policies:

CZM policies related to managing development are:

- A) Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;*
- B) Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements; and*
- C) Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the public to facilitate public participation in the planning and review process.*

Discussion: The action alternatives comply with applicable laws and policies regarding coastal development. Chapter 6 of this EA details the outreach conducted to date. HHFDC will continue to work cooperatively with all government agencies with oversight responsibilities to facilitate efficient processing of permits and informed decision-making by the responsible parties.

4.1.4.8 Public Participation

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

Policies:

CZM policies related to public participation are:

- A) Promote public involvement in coastal zone management processes;*
- B) Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal issues, developments, and government activities; and*
- C) Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts.*

Discussion: As discussed in Section 1.2, the Waiāhole Valley Water System Improvements Project is intended to provide the Waiāhole community with more robust and reliable water service. This EA has been prepared to disclose potential short-term and long-term impacts of the proposed improvements to interested individuals, organizations, and agencies. A notice of availability for the Draft EA will be published in the Office of Planning and Sustainable Development, ERP's bi-monthly bulletin, *The Environmental Notice* with a request for review and comment. In addition, a presentation was made to the Waiāhole Valley Community Association on April 7, 2022. Project proponents will provide information to association and the neighborhood board during the Draft EA review period. In addition, the project will require a Well Construction and Pump Installation Permit from CWRM, which will provide an additional opportunity for public review and input.

4.1.4.9 Beach and Coastal Dune Protection

Objective: *(A) Protect beaches and coastal dunes for: (i) public use and recreation; (ii) the benefit of coastal ecosystems; and (iii) use as natural buffers against coastal hazards; and (B) Coordinate and fund beach management and protection.*

Policies:

CZM policies related to beaches and coastal dunes are:

- A) Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion;*
- B) Prohibit construction of private shoreline hardening structures, including seawalls and revetments, at sites having sand beaches and at sites where shoreline hardening structures interfere with existing recreational and waterline activities;*
- C) Minimize the construction of public shoreline hardening structures, including seawalls and revetments, at sites having sand beaches and at sites where shoreline hardening structures interfere with existing recreational and waterline activities;*
- D) Minimize grading of and damage to coastal dunes;*
- E) Prohibit private property owners from creating a public nuisance by inducing or cultivating the private property owner's vegetation in a beach transit corridor; and*

F) Prohibit private property owners from creating a public nuisance by allowing the private property owner's unmaintained vegetation to interfere or encroach upon a beach transit corridor.

Discussion: The proposed Waiāhole Valley Water System Improvement Project will not have any impact on area beaches and coastal dunes. The project area is largely composed of alluvium characterized as silty clay and clay (Section 3.2.1); it is removed from the shoreline and no geomorphic dunes are present. The proposed action will not locate any new structures within the shoreline area, nor will it harden any shoreline, via seawall, revetment, or other method. Neither construction nor operation of the proposed water system improvements will interfere with existing recreational activities. No portion of the project will be located within a beach transit corridor, nor will it interfere with or encroach upon any beach transit corridor.

Some grading will be required on Lot 50, which is over a mile from the shoreline. The soil on Lot 50 is silty clay, not sand. HHFDC will obtain an NPDES permit, implement BMPs, and grading activities will be kept to a minimum. These facts and measures will ensure that coastal dunes and beaches are not affected.

4.1.4.10 Marine and Coastal Resources

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

Policies:

CZM policies related to marine resources are:

- A) Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;*
- B) Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency;*
- C) Assert and articulate the interests of the State as a partner with federal agencies in the sound management of ocean resources within the United States exclusive economic zone;*
- D) Promote research, study, and understanding of ocean and coastal processes, impacts of climate change and sea level rise, marine life, and other ocean resources to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources; and*
- E) Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.*

Discussion: The proposed project will be mauka of Kamehameha Highway and will not interact with any littoral or nearshore marine process or resources in any way. The Waiāhole Valley Water System Improvements Project is not anticipated to have any adverse effect on marine or coastal resources and is consistent with these policies of the CZM program.

4.1.5 HAWAI‘I WATER PLAN

The State Water Code, HRS 174C, recognizes the need for a program of comprehensive water resources planning to address supply and conservation of water and establishes the *Hawai‘i Water Plan* (HWP) as the guide for implementing this policy.

The HWP consists of five constituent parts: (i) a *Water Resource Protection Plan* (WRPP) prepared by CWRM; (ii) a *Water Quality Plan* (WQP) which is prepared by HDOH; (iii) a *State Water Projects Plan* (SWPP) which is prepared by the DLNR Engineering Division; (iv) an *Agricultural Water Use and Development Plan* (AWUDP) prepared by the Department of Agriculture, and (v) *County Water Use and Development Plans* (WUDPs) prepared by each separate county.

The WRPP and the WQP provide the overall legal and policy framework that guide the development, conservation, and use of water resources. The SWPP and AWUDP provide information on State and agricultural water needs and development plans. All this information is then integrated into the WUDPs, which set forth the broad allocation of land to water use within each county. The following subsections summarize the objectives and status of each of the HWP’s components.

4.1.5.1 Water Resource Protection Plan

Objective: *Protect and sustain statewide ground- and surface-water resources, watersheds, and natural stream environments. Such protection shall be established through a comprehensive study of occurrence, sustainability, conservation, augmentation, and other resource management measures.*

Discussion: The Waiāhole Water System Improvement Project proposes to relocate the source of water from its existing wells at a 494-foot elevation site to two new wells at a 365-foot elevation site that is much closer to the system’s service area. The new location will eliminate significant maintenance issues related to access and permanent power. The project will protect and sustain groundwater, surface water, and the environment because, as detailed in Section 3.3.3, the new well site is in the same watershed (Waiāhole Valley) and aquifer (Ko‘olaupoko) as the existing wells and the same (or less) water volume will be pumped from the aquifer.

The well portion of the project (install new wells and decommission existing wells) will be overseen by CWRM and/or HDOH SDWB to ensure that objectives are met. This will include confirmation that the new wells can produce potable water that meets or exceeds drinking water quality standards.

4.1.5.2 State Water Projects Plan

Objective: *Provide a framework for planning and implementation of water development programs to meet projected water demands for state projects.*

Discussion: Based on the 2019 BWS Ko‘olau Poko Watershed Management Plan (WMP), the WVWS serves 110 homes and 305 acres of agricultural land. Based on the 2017 KPSCP, the Waiāhole Valley area is not anticipated to experience future potable water demand increase. The

WMP estimates a projected 4 percent decrease in Ko‘olau Poko area population between the years 2000 and 2030.

The KPSCP indicated that WVWS irrigation use was estimated to be 0.1 MGD. Although the valley is not fully planted, the WMP base case estimates a 1 percent increase in agricultural acreage per year between the years of 2000 and 2030. Future increases in agricultural irrigation demand could be met by the project, but free water can also be drawn from the McCandless system, which can deliver another 0.5 MGD. The proposed action is reflective of this situation, proposing system improvements intended to serve the existing residential and agricultural uses of the area, based on projected stable demand for potable and irrigation water.

4.1.5.3 Water Quality Plan

Objective: *Protect the public health and sensitive ecological systems by preserving, protecting, restoring and enhancing the quality of ground and surface waters throughout the State.*

Discussion: The proposed project does not include any new point source discharges to surface waters or injection well facilities that discharge to groundwater. Construction of the project will include measures to preserve and protect surface water quality, as discussed in Sections 2.4.3 and 3.3.4.

4.1.5.4 Agricultural Water Use and Development Plan

Objective: *Develop a long-range management plan that assesses state and private agricultural water use, supply, and irrigation water systems.*

Discussion: The proposed water systems, whether BWS or privately operated, will have a component dedicated to the agricultural demands of the existing Waiāhole Valley residents.

4.1.5.5 County Water Use and Development Plans

Objective: *Set forth the allocation of water to land use through the development of policies and strategies to guide the County in its planning, management, and development of water resources to meet projected demands.*

Discussion: The proposed action would include modification of the WUP allocation so that it would be consistent with past actual water use in the service area. This would result in a modest increase in water allocation, from 0.075 to 0.15 MGD, but not an increase in water use (Table 3-1). This adjustment would make the water allocation consistent with the existing and projected water demand based on recent use and existing land use in the service area, which is consistent with State and County planning.

4.1.6 O‘AHU GENERAL PLAN (2021)

The *O‘ahu General Plan* (2021), originally titled the *General Plan for the City and County of Honolulu*, was adopted in 1977, and has been subsequently amended. The most recent amendment to it was adopted by the Honolulu City Council (HCC) on December 1, 2021, via Resolution 21-023, CD1, and signed by the Mayor on January 14, 2022. The *O‘ahu General Plan* is a comprehensive statement of objectives and policies which sets forth the long-range aspirations of

O‘ahu’s residents and the strategies to achieve them. It is the first tier of and lays the foundation for a comprehensive planning process that addresses physical, social, cultural, economic, and environmental concerns affecting the CCH.

The *O‘ahu General Plan* poses several objectives related to utilities. Chapter V, Transportation and Utilities, Objective B, proposes: “Provide an adequate supply of water and environmentally sound systems of waste disposal for O‘ahu’s existing population and for future generations, and support a one water approach that uses and manages freshwater, wastewater, and storm water resources in an integrated manner.” Further developing this theme, Chapter V, Objective B, Policies 1 through 3 state:

Policy 1

Develop and maintain an adequate, safe, and reliable supply of fresh water in a cost-effective way that supports the long-term sustainability of the resource and considers the impact of climate change.

Policy 2

Help to develop and maintain an adequate, safe, and reliable supply of water for agricultural and industrial needs in a resource-integrated and cost-effective way that supports the long-term health of the resource.

Policy 3

Use technologies that provide water, waste disposal, and recycling services at a reasonable cost and in a manner that addresses environmental and community impacts.

The *O‘ahu General Plan* further develops the theme of utility planning. Chapter V, Transportation and Utilities, Objective C states the CCH’s policy, “To ensure reliable, cost-effective, and responsive service for all utilities with equitable access for residents.” Specific policies follow from that, including:

Policy 1

Maintain and upgrade utility systems in order to avoid major breakdowns and service interruptions.

Policy 2

Provide improvements to utilities in existing neighborhoods to reduce substandard conditions, and increase resilience to use fluctuations, natural hazards, extreme weather, and other climate impacts.

Policy 3

Facilitate timely and orderly upgrades and expansions of utility systems.

Discussion: The proposed action is intended to rehabilitate and modernize aging water utility infrastructure in Waiāhole Valley. It will reduce substandard conditions and minimize major breakdowns and service interruptions. Project approval will facilitate a timely and orderly upgrade of the water system that serves the valley. Thus, the Waiāhole Valley Water Systems Improvement Project actively promotes these policies of the *O‘ahu General Plan*.

4.1.7 KO‘OLAU POKO SUSTAINABLE COMMUNITIES PLAN (2017)

The KPSCP, adopted by the HCC on August 24, 2017 (Ordinance 17-42), is one of eight community-oriented plans intended to help guide public policy, investment, and decision-making through the 2035 planning horizon. Each of these eight plans addresses one of eight geographic planning regions on O‘ahu, responding to the specific conditions and community values of each region.

Two of the eight planning regions, ‘Ewa and the Primary Urban Center, are the areas to which major growth in population and economic activity will be directed over the next 20 years and beyond. The plans for these regions continue to be titled “Development Plans” and will serve as the policy guides for the development decisions and actions required to support that growth.

The remaining six planning regions, including Ko‘olau Poko, are envisioned to remain relatively stable. The plans for those regions have been titled “Sustainable Communities Plans” and are focused on serving as policy guides for public actions in support of that goal. The vision statement and supporting provisions of the KPSCP are oriented toward maintaining and enhancing the region’s ability to sustain its unique character and lifestyle.

The KPSCP (2017) Section 4.2.3 provides a series of guidelines for water utility systems within its plan area; the applicable portion of these guidelines are summarized as follows:

- Where new reservoirs and other aboveground infrastructure are necessary, avoid impacts to significant scenic resources; where such impacts are unavoidable, implement appropriate mitigation measures. Design and locate new water supply facilities to be compatible with the scenic environment.
- Require installation of low-flush toilets, flow constrictors, and other water conserving devices in commercial and residential developments.
- Investigate the feasibility of bulkheading Waiāhole Ditch to restore water in the natural dikes.
- Utilize climate-appropriate, indigenous plant material and drip irrigation systems in newly installed, smaller-scale landscaped areas.
- Confirm that adequate potable and non-potable water is available prior to approval of new residential and commercial development.

Discussion: The proposed project will require a new domestic water reservoir (a 0.5 MG tank) at the 365-foot elevation on Lot 50 on the North Fork of Waiāhole Road. The project also calls for the removal of a 1.0 MG reservoir on Lot 77 on the South Fork of Waiāhole Road. As detailed in Section 3.7, the existing tank is not, and the new tank will not, be visible from the adjacent street or important viewpoints. Both topography and landscaping shield views of the existing and proposed tanks.

Testing, to confirm that adequate potable water is available to serve system customers, will be a pre-requisite for the proposed action to move forward into production. While low-flow toilets and bulkheading Waiāhole Ditch are beyond the scope of the proposed action, no aspect of this project conflicts with these guidelines, nor would it prohibit observance of them, where appropriate.

4.1.8 LAND USE ORDINANCE, ROH §21

The purpose of the CCH’s Land Use Ordinance (LUO), contained in ROH 21, is to regulate land use in a manner that will encourage orderly development in accordance with adopted land use policies, including the *O’ahu General Plan* and the KPSCP. These standards govern the location, height, area, and siting of structures, yard areas, off-street parking facilities, and open spaces, and the use of structures and land for agriculture, industry, business, residences, and other purposes.

Discussion: The discussion here is limited to the proposed aboveground infrastructure because the LUO does not apply to: (i) the State Conservation District, (ii) roadway ROWs, or (iii) underground infrastructure. The components of the action alternatives discussed here are those proposed on Lot 50, which is in the CCH’s AG-2 General Agricultural Zoning District (Figure 1-3). Per ROH 21-10.1, this water infrastructure is best characterized as “Utility Installation, Type A”:

“Type A utility installations” are those with minor impact on adjacent land uses and typically include: 46 kilovolt transmission substations, vaults, water wells and tanks and distribution equipment, sewage pump stations, telecommunications antennas (except as provided in the paragraph below on Type B utility installations), and other similar uses.

According to the LUO’s Master Use Table 21-3, Type A Utility Installations are an allowable use in the AG-2 Agricultural District, subject to the standards contained in Article 5. HHFDC has reviewed the standards in Article 5 and concluded that the infrastructure planned for Lot 50 is consistent with them. Applicable section of Article 5 only address transmitting antennas and require a fence to restrict access to areas with certain power density; these requirements are not anticipated to be triggered by the action alternatives. In addition, the proposed structures will meet applicable design standards with respect to minimum lot area and width/depth, minimum front and side yards, height, and other factors, as summarized in Table 4-1. Thus, the proposed action is consistent with the CCH’s LUO.

Table 4-1: Summary of LUO Compliance, Lot 50 (TMK 4-8-012:031)

<i>LUO Standard</i>	<i>AG-2 General Agriculture Zone</i>	<i>Proposed Action</i>
Minimum Lot Area (acres)	3 for major livestock production, 2 for all other uses.	5.544
Minimum lot width and depth (feet)	150	Lot is oddly shaped; street frontage is only 30 feet wide; lot depth exceeds 500 feet
Front Yard (feet)	15	>700
Side Yard (feet)	10	>20
Rear Yard (feet)	10	>20
Maximum Building Area (percent of zoning lot)	10 ¹	<0.01 (the only “building” will be the control building, and depending on the design, a separate shack for the backup generator)
Maximum Height	15-25 ²	The control building will be less than 15 feet high; The 0.5 MG storage tank will be approximately 22 feet high

Notes: 1. For non-agricultural structures.
2. Fifteen feet for non-agricultural structure and dwellings; up to 25 feet are permitted if height setbacks are provided, per ROH, §21-3.50-4(c).

Source: LUO Standard and AG-2 Zone columns: Land Use Ordinance, Department of Planning and Permitting, City and County of Honolulu, December 2020, Revised to January 22, 2021. Proposed Action column: Planning Solutions, Inc.

4.1.9 SPECIAL MANAGEMENT AREA

In the project region the SMA extends from the coast inland roughly 400 to 3,500 feet; it includes areas mauka of Kamehameha Highway similar to the flood zones (Figure 3-16). All proposed aboveground work will be outside of the SMA, except for activities associated with fire hydrants. Activities within the SMA will include replacement and/or maintenance of underground potable water pipelines and above ground fire hydrants. Those activities within the SMA do not qualify as “development” per the CCH’s Special Management Area rules, contained in ROH 25.¹⁹ Therefore, no SMA permit is triggered.

The SMA objectives and policies are similar to those under the CZM program, which is discussed in Section 4.1.4.

4.1.10 SHORELINE SETBACK ORDINANCE

No work is proposed makai of Kamehameha Highway; no parcels makai of Kamehameha Highway are within the WVWS service area. No work will occur within roughly 100 feet of the shoreline. Therefore, no work in the shoreline setback area.

¹⁹ Pursuant to ROH, Chapter 25-1.3(2)(D)(N), installation of underground utility lines and appurtenant aboveground fixtures less than four feet in height along existing corridors, does not qualify as development within the SMA.

5 ANTICIPATED DETERMINATION

5.1 SIGNIFICANCE CRITERIA

HAR 11-200.1-14 establishes procedures for determining if an EIS should be prepared or if a Finding of No Significant Impacts (FONSI) is warranted. HAR 11-200.1-14(d) provides that proposing agencies should issue an EIS preparation notice for actions that it determines may have a significant effect on the environment. HAR 11-200.1-13(b) lists the following criteria to be used in making that determination.

In most instances, an action shall be determined to have a significant effect on the environment if it:

1. Involves an irrevocable commitment to loss or destruction of any natural or cultural resource;
2. Curtails the range of beneficial uses of the environment;
3. Conflicts with the State's long-term environmental policies or goals as expressed in Chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders;
4. Substantially affects the economic or social welfare of the community or State;
5. Substantially affects public health;
6. Involves substantial secondary impacts, such as population changes or effects on public facilities;
7. Involves a substantial degradation of environmental quality;
8. Is individually limited but cumulatively has considerable effect on the environment or involves a commitment for larger actions;
9. Substantially affects a rare, threatened, or endangered species, or its habitat;
10. Detrimentially affects air or water quality or ambient noise levels;
11. Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters;
12. Substantially affects scenic vistas and viewplanes identified in county or state plans or studies; or,
13. Requires substantial energy consumption.

5.2 FINDINGS

The potential effects of the proposed action were evaluated relative to these 13 significance criteria. HHFDC's findings with respect to each criterion are summarized in the following subsections.

5.2.1 IRREVOCABLE LOSS OR DESTRUCTION OF VALUABLE RESOURCE

While the proposed new infrastructure (e.g., access driveway, wells, and 0.50 MG storage tank) will occupy some agriculturally-zoned land, as discussed in Section 3.2, the soil on the site is not considered a valuable agricultural resource. Furthermore, the placement of the infrastructure on the site does not represent an irrevocable loss of the resources because the infrastructure can be removed in the future. This is demonstrated by the decommissioning of the existing wells and tank as part of the proposed project. The existing tank site has the same type of soil as the proposed tank site; the existing wells are within designated critical habitat. Allowing the existing well site to renaturalize will be a beneficial effect and potentially restore a valuable resource.

5.2.2 CURTAILS BENEFICIAL USES

Once construction is complete, the Waiāhole Valley Water System Improvements Project's aboveground infrastructure will be limited to the AG-2 General Agricultural zoning district. Underground water distribution infrastructure will be located where water lines currently exist, and the proposed aboveground project elements are in areas where the proposed use is consistent with existing land use designations. The improvements will minimize water waste and will be constructed in compliance with all environmental regulations. Because the water this project will produce and distribute is intended for residential and agricultural use, the proposed action may be deemed a beneficial use of the environment. Further, it is a continuation of a long-standing use of the area for residential and agricultural purposes, and will not curtail other beneficial uses of the area.

5.2.3 CONFLICTS WITH LONG-TERM ENVIRONMENTAL POLICIES OR GOALS

As discussed in Chapter 4, the proposed action is consistent with applicable plans, policies, and controls, including the *Hawai'i State Plan* and the *O'ahu General Plan*. Further, the proposed action is consistent with the State of Hawai'i's long-term environmental policies and goals, as expressed in HRS 344 and elsewhere in state law.

5.2.4 SUBSTANTIALLY AFFECTS ECONOMIC OR SOCIAL WELFARE

The proposed action will make a modest contribution to the Island's economic or social welfare. Its purpose is to demolish and remove aging water utility equipment and structure and replace them with modern infrastructure so that the WVWS can continue to provide reliable and affordable water for the residences and farms of Waiāhole Valley. This is considered an economic and social welfare benefit.

5.2.5 PUBLIC HEALTH EFFECTS

The proposed action will not adversely affect air or water quality. Neither will it generate other emissions that will have a significant adverse effect on public health. The continued availability of clean potable water facilitated by the project is considered a public health benefit.

5.2.6 PRODUCE SUBSTANTIAL SECONDARY IMPACTS

The proposed action will not produce substantial secondary impacts, nor will it foster population growth, promote economic development, or stress public facilities or services. The only secondary

impacts are expected to be the relocation or upgrade of IWS within 1,000 feet of the proposed wells, should the existing IWS in that area fail. As discussed in Section 3.11, the effects of this are expected to be beneficial because they will protect well water quality and provide for better treatment of domestic wastewater within the area.

5.2.7 SUBSTANTIALLY DEGRADE THE ENVIRONMENT

The proposed action will not have substantial long-term environmental effects. The work will temporarily elevate noise levels and generate limited nuisance airborne dust during construction, but these impacts will be localized and of limited duration. Adequate measures will be taken to control the intensity of construction noise and dust, and the effects will be brief and minimal.

5.2.1 CUMULATIVE EFFECTS OR COMMITMENT TO A LARGER ACTION

The proposed action does not represent a commitment to a larger action and is not intended to facilitate substantial economic or population growth. It is solely intended to allow for continued potable water service that is reliable and resilient for the valley's residents and farmers.

5.2.2 EFFECTS ON RARE, THREATENED, OR ENDANGERED SPECIES

As discussed in Section 3.4, no rare, threatened, or endangered species are known to utilize the project site, and no activities are contemplated that would pose a threat to rare, threatened, or endangered species, or their habitat. In addition, the proposed action does not utilize any resource or habitat needed for the protection of rare, threatened, or endangered species. Measures outlined in Section 3.4.3 will be implemented to avoid and minimize potential effects to rare, threatened, or endangered species.

In addition, the decommissioning of the existing wells, which are within designated critical habitat, has the potential to provide a benefit to rare, threatened, or endangered species.

5.2.3 AFFECTS AIR OR WATER QUALITY OR AMBIENT NOISE LEVELS

Noise levels and airborne emissions will temporarily increase during demolition, removal, and construction activities. BMPs will be implemented, and any effects will be brief, relatively minor, and restricted to the immediate vicinity of the project site. Once construction is completed, the proposed project will not produce airborne emissions or waterborne pollution. Operation of the pumps will produce low levels of noise at a distance from other land uses and will not result in a discernible increase in ambient noise levels for nearby uses.

5.2.4 ENVIRONMENTALLY SENSITIVE AREA

As discussed in Section 3.6, the project will serve all existing WVWS customers. Some lots are within flood plains and Tsunami Evacuation Zones. Water system improvements to lots in the flood plain zones and tsunami zones will be below ground, as is currently the case. The upgraded system will be less vulnerable to damage by natural hazards than the existing system and minimal impact is anticipated.

5.2.5 AFFECTS SCENIC VISTAS AND VIEW PLANES

As discussed in Section 3.7, there are no identified scenic vistas or viewplanes on the project site. All water system improvements consist of pipelines below grade except for the proposed 0.5 MG reservoir on Lot 50 and decommissioning of a 1.0 MG reservoir on Lot 77. Due to topography and the extensive vegetation at those sites, the aboveground project elements will not be visible from the adjacent roadways or places identified in plans as having important views. The proposed action will not have an adverse effect on scenic vistas or viewplanes.

5.2.6 REQUIRES SUBSTANTIAL ENERGY CONSUMPTION

The proposed action will consume the same or less energy than the existing system.

5.3 ANTICIPATED DETERMINATION

In view of the foregoing significance criteria, HHFDC's draft assessment is that the proposed action will not have a significant adverse impact on the environment. Consequently, it is anticipated that HHFDC will issue a FONSI.

6 CONSULTATION AND DISTRIBUTION

6.1 EARLY CONSULTATION

A critical component of the planning effort for the proposed action was developing and implementing an early consultation program to inform public agencies and obtain their input regarding the project's purpose, scope, potential impacts, and recommended avoidance, minimization, and mitigation measures. Pursuant to HAR, 11-200.1-18, HHFDC sought the advice and input of DPP, the CCH agency responsible for implementing the *General Plan for the City and County of Honolulu*, other agencies that have jurisdiction over resources with the potential to be affected by the proposed action, and interested community groups. Table 6-1 identifies the parties that were sent early consultation letters. The complete text of all scoping letters and responses are provided in Appendix A.

Table 6-1: Early Consultation

<i>Recipient</i>	<i>Response Received</i>
U.S. Fish & Wildlife Service (USFWS)	Yes
U.S. Army Corps of Engineers Regulatory Branch (USACE)	Yes
Agribusiness Development Corporation (ADC)	Yes
Department of Business, Economic Development and Tourism (DBEDT)	
State Historic Preservation Division (SHPD)	
DLNR, Engineering Division	Yes
DLNR, Division of Aquatic Resources (DAR)	Yes
DLNR, Division of Forestry and Wildlife (DOFAW)	
DLNR, Commission on Water Resource Management (CWRM)	Yes
DLNR, Land Division	Yes
DLNR, Office of Conservation & Coastal Lands (OCCL)	Yes
Office of Hawaiian Affairs (OHA)	
Office of Planning and Sustainable Development - Environmental Review Program (ERP)	
Hawaii Department of Agriculture (HDOA)	
Hawaii Department of Transportation (HDOT)	
Department of Health (DOH), Clean Air Branch	
Department of Health (DOH), Safe Drinking Water Branch	
Department of Health (DOH), Clean Water Branch	
Department of Planning and Permitting (DPP)	Yes
Office of Climate Change, Sustainability & Resiliency	
Board of Water Supply (BWS)	Yes
Honolulu Police Department (HPD)	Yes
Honolulu Fire Department (HFD)	Yes
District 2 Honolulu City Council Member	
Kahalu'u Neighborhood Board, Chair	Yes
Waiāhole-Waikane Community Association	

Source: Compiled by Planning Solutions, Inc.

6.2 DISTRIBUTION OF THE DEA

HHFDC has provided this EA to the parties listed in Table 6-2 with a request for review and comment.

Table 6-2: DEA Distribution List

Federal Agencies	Other
U.S. Army Corps of Engineers, Honolulu District	Waiahole-Waikane Community Association
U.S. Fish and Wildlife Service, Pacific Islands Field Office	Ko‘olaupoko Aha Moku
State Agencies	City and County of Honolulu
Department of Agriculture	Board of Water Supply
Department of Agriculture, Agribusiness Development Corporation	Department of Community Services
Department of Accounting and General Services	Department of Design and Construction
Department of Business, Economic Development, and Tourism (DBEDT)	Department of Environmental Services
DBEDT, Hawai‘i State Energy Office	Department of Facility Maintenance
DBEDT, Office of Planning and Sustainable Development	Department of Parks and Recreation
Department of Defense	Department of Planning and Permitting
Department of Education	Department of Transportation Services
Department of Hawaiian Home Lands	Honolulu Fire Department
Department of Health (DOH), Clean Air Branch	Honolulu Police Department
DOH, Clean Water Branch	Office of Climate Change, Sustainability & Resiliency
DOH, Environmental Health Services Division	Waiāhole Residents
DOH, Safe Drinking Water Branch	Richard & Labriano Garcia
DOH, Wastewater Branch	Francis & Stephanie Teixeira
Department of Human Services	Kameleonalani Richardson
Department of Labor and Industrial Relations	Ruben Villanueva
DLNR, Commission on Water Resource Management	Robert Fernandez
DLNR, Land Division	Wenceslau & Betty Batalona
Department of Transportation	Ilaisa Manufekai
Office of Hawaiian Affairs	Jared K. Bauske
Utilities	Hi Dept. Of Education
Hawai‘i Gas	Hi Dept. Of Education
Hawaiian Electric Co., Inc.	Dolores Boydon
Hawaiian Telcom	Chula Clark
Libraries and Depositories	Oliver Kupau Iii
Hawai‘i State Library Documents Center	Danny Casler
Kaneohe Public Library	Lilia Galicinao
Media	Silvestre Longboy Ulep
Honolulu Star Advertiser	Brenda Collins
Honolulu Civil Beat	Stanley Miranda
Elected Officials	George N. Caldeira
Governor Josh Green	Glennell & Micah Dano, Belinda Dano -Aiona
Nani Medeiros, Chief Housing Officer	Duane Lam Ho
Mayor Rick Blangiardi	Charles Fu
State Senator Brenton Awa, District 23	Nitin Singh
State Representative Lisa Kitagawa, District 48	Warren M./Patrick Adolpho
Councilmember Matt Weyer, District 2	Theodore Saizon
Kahalu‘u Neighborhood Board No. 29	Jose Q. & Elizabeth P. Royos
	Rosalind Saizon
	Isaac Manalo, Sr.

Waiāhole Residents (continued)	
Elizabeth & Dustin Plunkett	Robert Cappella
Daniel Kadowaki	Serphine Lopes & Linda Char
Frank Shiroma	Vernon T. & Dianna Ota
Molly Blossom	Albert Badiyo Jr
Kimberly Balauro	Philip Gernler
Patrick Cullen	Charlie Pedrina
John M. Frias Iii	Francisco N. & Joel Pedrina
Cy J. Moriwaki	Patrick F. & Roxanne M. Dumadag
Chris Farley	Joseph M. & Bernadette Panoncial
Michael W. Farley	Ty & Shelley Ah Nee
Nathan Oshima	John M.G. Tolentino
Leonard E. & Candace A. Picanco	James Y.S. Song
Peggy Villanueva	Laverne T-Tarumoto
Manuel R. & Dailinda M. Cabral	John & Lori Mossman, Virginia L. Apana
Clarine Lagapa	Daniel & Edna Taira
Charles K. Carson, Jr.	Hope & Jane Miura
David C. & Cynthia J.K. Costa	Minnie Recarte & Violet Roberts
Kim Matayoshi	Leslie-Carissima Bajet & Kelsie Burgher
Norman Sadoyama	Lico Hoe
Norman Sadoyama	Bernard Lam Ho
Jensen N & Kameleonani G Richardson	Reiko Fernandez
Lawrence S. & May S. Carvalho	Jonathan & Julee Gibson
Laurence I. & Helene L. Uyemura	Maureen & Matthew Bolivar
Toni Cano	Agustine & Kuincey Aricayos
Philemon Pilanca	Ulewellyn & Ket K. Kamalani
Clifford K. Miller Trust	Michael V. Garcia
Kaiolohia Maii	Joe Saringan
Roy H. Oshima	Joe Saringan & Magdalena Lazo
Serikaku Farm	Jimmy & Rosita Magallanes
Brian Oshima	Elena Sagolili
Maxine Prudencio	Bernie Toi Lam Ho
Guong Thi Vu	Madonna & John Keohukapu-Meria
Mrs. Kathleen Leleo	Lydia Guillermo
James Kaleo	Tom Chance
Byron W.Y. & Mercedesk.A.Ho	Arthur Reppun
Rhonda Akima, Greg Mayo	Esmiragdo Lagapa
Kathleen E.Oshiro Trust	Bernard Lam Ho
James Kane	James Cano
Soonee Kim & Richard Davis	Sue Ebanetz
Bernard U. & Shona M. Lam Ho	Stanley J. & Barnette M. Jumawan
Serphine Lopes & Linda Char	John Hoopii Iii/Melvin Carbal
Tony Fraiola	Keti Kamalani
Dennis Kaeka	Tamyra T. Ige
Hoe Reppun	Melvin M. Ige
Alan Jacobsen	

Source: Compiled by Planning Solutions, Inc.

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Appendix A. Early Consultation Letters and Responses



November 3, 2022

**Subject: Pre-Assessment Consultation for the
Waiāhole Valley Water System Improvements, Waiāhole, O‘ahu, Hawai‘i
Tax Map Key Plates (1) 4-8-001 and 4-8-006 through 4-8-013**

Dear Sir/Madam:

The Hawai‘i Housing Finance and Development Corporation (HHFDC) has initiated the preparation of a Chapter 343, Hawai‘i Revised Statutes (HRS), Environmental Assessment (EA) for the Waiāhole Valley Water System (WVWS) Improvements Project (Project). Planning Solutions, Inc. (PSI) and Bills Engineering, Inc. (BEI) are assisting HHFDC with the planning and design of the Project, including the preparation of the EA.

The existing WVWS is owned and operated by HHFDC and provides potable water to the surrounding community. It has two primary components: (a) the water source and (b) the distribution system. Attachment 1 shows the location of the two groundwater wells near Waiāhole Stream, which is where the water originates. Certain components of the WVWS are unreliable, experience power outages, are difficult to access and maintain, and/or have reached the end of their design life. The purpose of the Project is to modernize the WVWS, which would provide long-term stability and reliability for the community that uses the water, and allows for cost-effective operation and maintenance.

Through early consultation with the community and other stakeholders, HHFDC has identified and is considering several WVWS improvement alternatives to include in the EA. These alternatives include two water source alternatives and two distribution system alternatives. These alternatives can be combined into different combinations for a total of four alternatives. An overview of each alternative is provided below and are described in greater detail in the attachments:

- Water Source Alternatives:
 - *Wells.* HHFDC would construct two new wells within the State Land Use Commission (LUC) Agricultural District near the north branch of Waiāhole Valley Road at an elevation of approximately 350 feet above sea level (ASL). See Attachment 2.
 - *Tunnel.* HHFDC would build an approximately 1-mile-long access road and water pipeline through the LUC Conservation District to the entrance of the Uwao Tunnel. HHFDC would modify the tunnel, at an elevation of approximately 920 feet ASL, so that it could be used as the new water source. See Attachment 3.

- Distribution System Alternatives:
 - *Private Distribution System.* HHFDC would construct a new reservoir near the north branch of Waiāhole Valley Road with minor modifications to the existing water distribution system, and extend a 12-inch-diameter waterline from Kamehameha Highway to Waiāhole Elementary School. See Attachment 4.
 - *Board of Water Supply Operated Distribution System.* HHFDC would construct a new reservoir near the north branch of Waiāhole Valley Road, upgrade the existing system to bring the water system up to full compliance with Board of Water Supply (BWS) standards, and build a new 12-inch-diameter waterline from the reservoir to Waiāhole Elementary School. See Attachment 5.

All alternatives described above would involve removing or abandoning in-place the existing wells, pumps, water pipelines, powerlines, and roads that are in the LUC Conservation District parallel to Waiāhole Stream.

The EA will document potential environmental impacts associated with alternative(s) selected for further consideration. The no action alternative will be included as a baseline comparison. We are seeking your input on the following topics:

- The range and content of the alternatives that should be considered.
- The nature and scope of the analyses to be included in the Draft EA.
- Information regarding resources, uses, or activities present in the region and information regarding other projects in the region.
- Potential environmental impacts associated with the Project, and measures to avoid, minimize, or mitigate those potential impacts.

Please provide your written comments within 30 days from the date of this letter. Comments should be sent to:

Julia Ham Tashima, Planner
Planning Solutions, Inc.; 711 Kapi‘olani Boulevard #950; Honolulu, HI 96813
julia@psi-hi.com

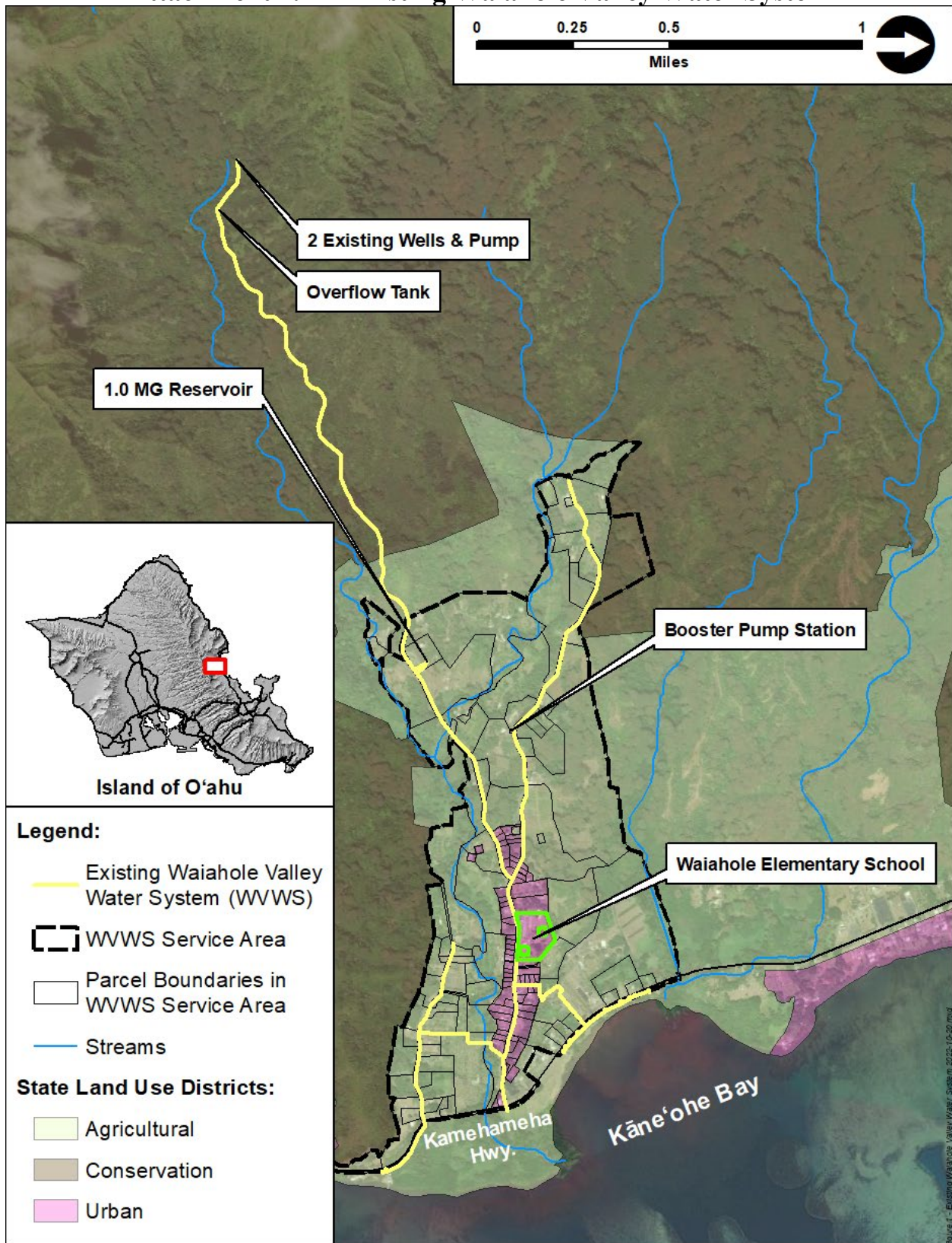
Thank you for participating in the planning process for this proposal. If you have any questions or need clarification regarding the proposal, please contact me at jim@psi-hi.com or 808-550-4559.

Sincerely,

James T. Hayes
Principal Environmental Planner

Attachments

Attachment 1. Existing Waiāhole Valley Water System



Source: HHFDC, PSI, BEI, and State of Hawaiʻi GIS layers.

Attachment 2. Well Water Source Alternative

This alternative involves the construction and operation of two potable groundwater wells at an elevation approximately 350 feet ASL on Lot 50, Tax Map Key (TMK) (1) 4-8-012:031. This location is shown on the figure below; it is located at the end of Waiāhole Valley Road North Branch and is in the LUC Agricultural District. Prior to drilling the wells, a permit would be obtained from the Commission of Water Resource Management (CWRM).

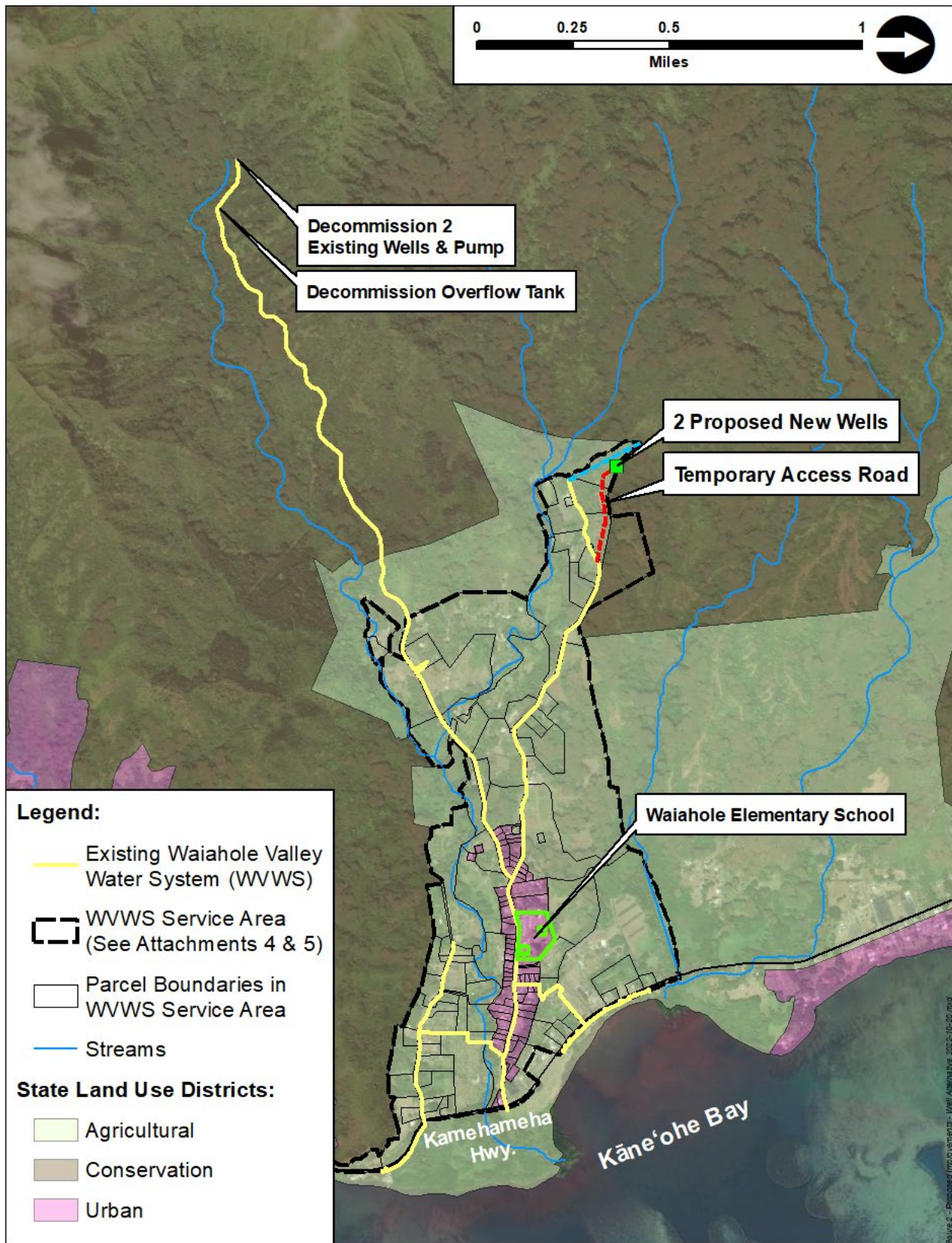
The wells would tap into the Ko‘olaupoko Aquifer System, which CWRM estimates has a sustainable yield of 28 million gallons per day (MGD). The total current permitted water use is 10.3 MGD.

Exact well construction details would depend on conditions observed in the field. It is envisioned that the borings would be 21-inches in diameter and reach an elevation of approximately minus 250 feet (about $600\pm$ feet below ground surface). It is anticipated that the static groundwater level will be roughly 10 feet in elevation ASL (340 feet below ground surface). The wells would be outfitted with pumps to extract water from the aquifer during system operation.

A temporary access road would be built to support the construction of the wells, which would be decommissioned after the wells have been constructed. The temporary road would cross lots 48 and 49 (TMKs (1) 4-8-012:030 and 020, respectively).

The existing WVWS wells are in the Ko‘olaupoko Aquifer System and would be decommissioned once the new wells were operational. Also removed or abandoned would be other WVWS infrastructure in the LUC Conservation District parallel with Waiāhole Stream. That infrastructure includes water pipelines, electrical lines, unimproved roads, and an overflow tank.

Well Water Source Alternative Overview



Source: HHFDC, PSI, BEI, and State of Hawai'i GIS layers.

Attachment 3. Tunnel Water Source Alternative

This alternative requires construction and operation of an approximately 1-mile-long access road and water pipeline through the LUC Conservation District to the entrance of Uwao Tunnel. The general alignment of the road and water pipelines are shown on the figure below. The tunnel is part of the Waiāhole Ditch System and was built in the early 1900s. Modification to the tunnel would need to be made to use it as a water source for the WVWS. A Conservation District Use Permit (CDUP) and the creation of land use approvals and entitlements (e.g., easements, rights of entry, etc.) would be obtained prior to proceeding with this alternative.

The tunnel captures groundwater in the Ko‘olaupoko Aquifer System, which CWRM estimates has a sustainable yield of 28 million gallons per day (MGD). The total current permitted water use is 10.3 MGD. The Hawai‘i Department of Health (DOH) currently considers Uwao Tunnel water a non-potable water source. For a period, the water would need to be successfully tested daily at the tunnel to monitor water quality for the DOH, Safe Drinking Water Branch to consider the Uwao Tunnel water potable.

The road and pipeline would be located on Lot 52 (TMK (1) 4-8-012:005) for a short distance from the end of Waiāhole Valley Road North Branch. It would then enter the LUC Conservation District and Forest Reserve, which is TMK (1) 4-8-013:014. The road would be gated and would need to meet Honolulu Fire Department design requirements. An 8-inch-diameter water pipeline would be installed along the road from the tunnel to the new reservoir. The Agribusiness Development Corporation (ADC) owns TMK (1) 4-8-013:014 onto which the road would be built and where the tunnel is located at. Agreements would need to be reached with ADC prior to proceeding.

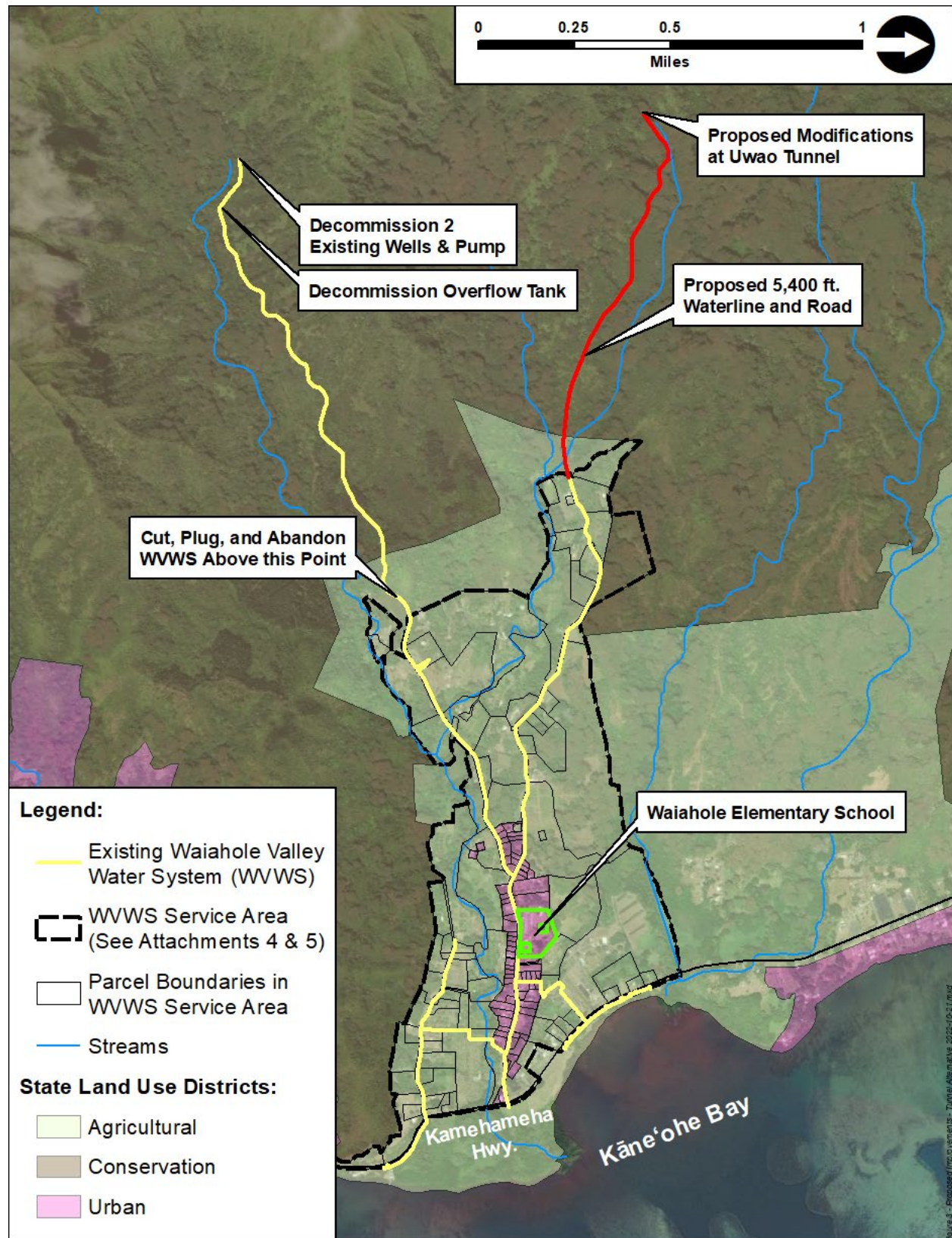
The tunnel entrance is at an elevation of approximately 920 feet ALS. Modifications to and improvements near the entrance of the tunnel would likely include:

- First, a weir would be built inside Uwao Tunnel, partially inhibiting flow, and thus raising the water level above the level of the nearby Waiāhole Transmission Tunnel.
- Second, installing an 8-inch diameter water pipeline underneath the Waiāhole Transmission Tunnel and the concrete bulkhead at the entrance of the Uwao Tunnel, traveling up Uwao Tunnel and beneath the newly constructed weir. This 8-inch diameter water pipeline would then draw water impounded above the new weir in Uwao Tunnel, carrying it down the new 8-inch pipeline to provide water to the WVWS.
- Third, and finally, the portion of the pipeline above the new weir in Uwao Tunnel would be equipped with a well screen, and potentially, a water filtration system.

Based on calculated water demand, a maximum of 0.2 MGD would be captured from the tunnel during system operation.

The existing WVWS wells are in the Ko‘olaupoko Aquifer System and would be decommissioned once the tunnel source was operational. Also decommissioned or abandoned would be other WVWS infrastructure in the LUC Conservation District parallel with Waiāhole Stream. That infrastructure includes water pipelines, electrical lines, and unimproved road, and an overflow tank.

Tunnel Water Source Alternative Overview



Attachment 4. Private Distribution System Alternative

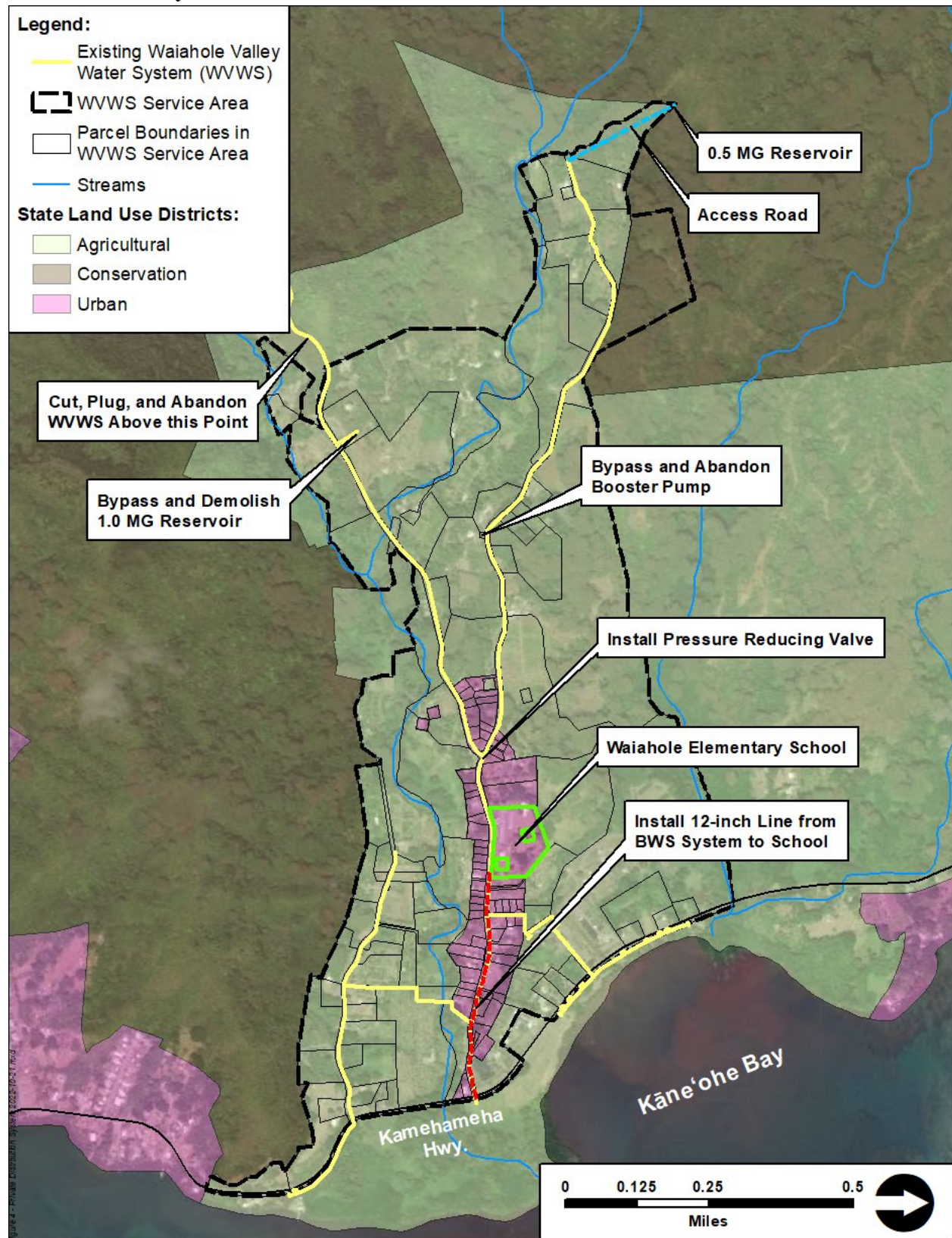
This alternative requires construction and operation of a 0.5-million-gallon (MG) reservoir at an elevation of approximately 350 feet ASL on Lot 50, TMK (1) 4-8-012:031. This location is at the end of Waiāhole Valley Road North Branch and is in the LUC Agricultural District. A new access road would be built on Lot 50 from near the end of Waiāhole Valley Road North Branch to the reservoir.

Modification to the existing distribution system within the WVWS service area would be limited, are illustrated on the figure below, and include:

- Bypassing the booster pump station on Lot 59, which is located along Waiāhole Valley Road North Branch. The existing booster pump station would be abandoned.
- Bypass and demolish the 1.0 MG reservoir on 77, which is located near the end of Waiāhole Valley Road South Branch.
- Install a pressure reducing valve near where Waiāhole Valley Road branches.

In addition to these changes to the WVWS distribution system, a new 12-inch-diameter line would be extended from BWS's main under Kamehameha Highway to the Waiāhole Elementary School parcel (TMK (1) 4-8-009:010). This water pipeline would not be part of the WVWS; it would be owned by BWS. This is necessary to provide the requisite water pressure to meet the fire code requirements at the Waiāhole Elementary School parcel.

Private Water System Alternative Overview



Source: HHFDC, PSI, BEI, and State of Hawai'i GIS layers.

Attachment 5. BWS Supply Operated Distribution System Alternative

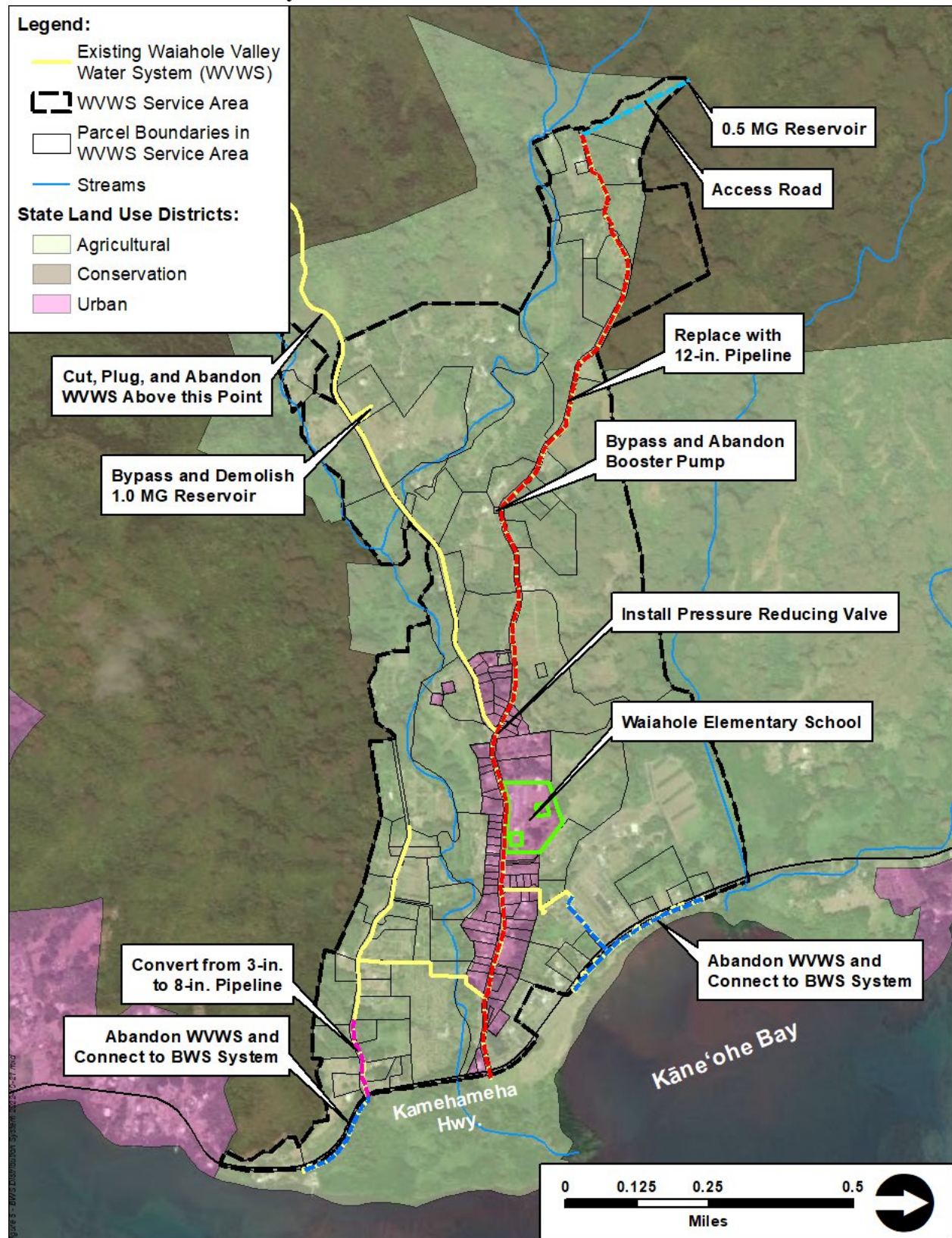
Based on BWS standards, this alternative is estimated to require construction and operation of a 0.5-million-gallon (MG) reservoir at an elevation of approximately 350 feet ASL on Lot 50, TMK (1) 4-8-012:031. This location is at the end of Waiāhole Valley Road North Branch and is in the LUC Agricultural District. An access road would be built on Lot 50 from near the end of Waiāhole Valley Road North Branch to the reservoir.

Modification to the existing distribution system within the WVWS service area are illustrated on the figure below and would include:

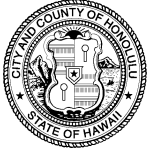
- The water pipeline from Kamehameha Highway to Lot 50 would be replaced with a 12-inch-diameter water pipeline designed to BWS Standards and be connected to the BWS water main under Kamehameha Highway. This pipeline, which runs in front of the Waiāhole Elementary School parcel (TMK (1) 4-8-009:010), would provide the requisite water pressure to meet the fire code requirements at the Waiāhole Elementary School parcel.
- Bypassing the booster pump station on Lot 59, which is located along Waiāhole Valley Road North Branch. The booster pump station would be abandoned.
- Bypass and demolish the 1.0 MG reservoir on 77, which is located near the end of Waiāhole Valley Road South Branch.
- Install a pressure reducing valve (PRV) near where Waiāhole Valley Road branches. This PRV would be built to BWS Standards.
- A portion of the water pipeline under Waiāhole Homestead Road near Kamehameha Highway would be replaced so that the entire line under Waiāhole Homestead Road was 8-inches in diameter and meeting BWS Standards. The water pipeline would connect to the BWS main under Kamehameha Highway.
- Portions of the WVWS water pipelines along or near Kamehameha Highway would be abandon and lots fronting the highway serviced by those lines would be served directly from the BWS main under Kamehameha Highway.
- Other improvements as may be required to comply with BWS requirements.

Once these modifications were complete, the WVWS would be ceded to the BWS. Upon BWS acceptance of the new system, WVWS would no longer operate as a private water system and WVWS customers would become BWS customers. BWS would operate and maintain the potable water system in Waiāhole Valley thereafter.

BWS Water Distribution System Alternative Overview



Source: HHFDC, PSI, BEI, and State of Hawai'i GIS layers.



KAHALU'U NEIGHBORHOOD BOARD NO. 29

(He'eia Kea, 'Āhuimanu, Kahalu'u, Waihe'e, Ka'alaea, Waiāhole, Waikāne, Hakipu'u, Kualoa)

C/o Neighborhood Commission Office ♦ 925 Dillingham Boulevard, Suite 160 ♦ Honolulu, Hawaii 96817

PHONE (808) 768-3710 ♦ FAX (808) 768-3711 ♦ INTERNET: <http://www.honolulu.gov/nco>

"LET US NOT EVER HAVE AN UNHAPPY MINORITY; RATHER, LET US BUILD A COMMUNITY CONSENSUS."

November 14, 2022

Julia Ham Tashima, Planner
Planning Solutions, Inc.
711 Kapi'olani Boulevard #950
Honolulu, HI 96813
julia@psi-hi.com

RE: Kahalu'u Neighborhood Board #29 Board Motion Regarding Waiāhole Valley Water Systems

Aloha mai,

In our November 9, 2022, Kahalu'u Neighborhood Board #29 (KNB) regular meeting, we added the topic of Waiāhole Valley Water Systems to our agenda based on the letter received by your organization on November 7. As shared in the letter received, Hawai'i Housing Finance and Development Corporation (HHFDC) has initiated the preparation of a Chapter 343, Hawai'i Revised Statutes (HRS), Environmental Assessment (EA) for the Waiāhole Valley Water System (WVWS) Improvements Project (Project). The letter also states that organization, Planning Solutions, Inc. (PSI) and Bills Engineering, Inc. (BEI) are assisting HHFDC with the planning and design of the Project, including the preparation of the EA.

Although the letter states that the HHFDC has identified and is considering several WVWS improvement alternatives to include in the EA through early consultation with the community and other stakeholders, the improvement proposal of Waiāhole Valley's WWCA Water Committee (attached) was not included in the pre-assessment consultation for the Project. Following the discussion on this important topic, KNB unanimously passed the following motion and we share this as our comments:

KNB #29 strongly requests that HHFDC and Planning Solutions include in the Pre-Assessment Consultation for the Waiāhole Valley Water System Improvements the WWCA Water Committee Proposal for a gravity flow system as an alternative in the Draft EA.

Please reach out (kaanoiwalk@gmail.com) if you have any questions or seek additional information. Mahalo for this opportunity to offer comments.

Me ka ha'aha'a,



Ka'ano'i Walk, Chair
Kahalu'u Neighborhood Board #29

CC: Hawai'i Housing Finance and Development Corporation (HHFDC)

October 2018

WWCA Water Committee Proposed Potable Water System Improvement.

HHFDC is proposing the improvement of the existing Waiāhole Water system by building a new reservoir at the end of the Waiāhole Valley North Branch Road, to be fed by new wells and pumps. This reservoir would be at a higher elevation than the existing one, thereby eliminating the need for the booster pumps on the North Road and improving service at the two higher elevation ends of the water system. An additional problem that the current system faces is the leaking of the reservoir. This old system has been expensive to run and the WWCA Water Committee, with input from the entire community, would like to propose and have examined an alternative that would eliminate the need for new wells and pumps, and possibly even a new reservoir.

What we are proposing is that the valley source its water from the Waiāhole Ditch itself, at an elevation of around 750 feet. The old McCandless line does just this, but after coming out of the tunnel's main bore and coming down the mountain it empties into the Waianu stream bed and a short distance on reenters the pipe and travels partway down the valley to an open overflow box. That box represents the "head" of the system; and that dictates the pressure.

Obviously, there are a number of opportunities for contamination, and points where routine maintenance is necessary. Running a pipe that connects the existing valley water delivery system directly to the source in the tunnel would eliminate these points of contamination. If the pipe intake was located in one of the development tunnels the possibility of contamination by surface water leaking into the mainline would be eliminated. The development tunnels, which run more or less perpendicular to the main bore, penetrate the dike system deep into the mountain. They are equivalent to wells. The only possible contamination would be by some animal swimming, flying, or walking up current into the tunnel. A bulkhead that would prevent access would not have to be capable of sealing the tunnel to the extent that water storage would be possible, a much more difficult and often undoable undertaking. In Waihe'e Valley there is a development tunnel (the BWS runs tours into it) that is bulkheaded and stores potable water supplied to the BWS system.

One of the reasons the Waiāhole Community feels that their proposal should be considered is that it is based on the old LL. McCandless system that was the only source of water for most of the valley, both for potable and for agricultural uses. This system was called the "McCandless" system because when the water was taken - we say stolen - and sold to the Waikāne Water Company and the Waiāhole Water Company, the LL. McCandless Resolution reserved "no less than 500,000 gallons" of water per day for the use of the Valleys. Presumably, this was a way to keep the residents from being too upset that most of their water was being taken. This "McCandless" system is still functioning and being maintained and used by a number of farmers and residents. Many in the valley feel that this is a "water right" that cannot and should not be taken from them.

Sourcing the valleys new system from the ditch tunnel, while having many practical benefits, would also honor a precedent that has been in place for a hundred years.

Besides the approximately thirty-year history of living with a system that has not functioned well and been expensive to operate and maintain and the precedent of the McCandless system, there is a third reason that the WWCA feels so strongly that our proposed system should be carefully researched. The increasingly obvious impacts of climate change and an awareness of the causes has led Hawaii to set the goal of 100% replacement of fossil fuels with renewable resources by 2045, the first and only

state to do so. (About to be joined by California). A water system that is completely dependent on grid supplied electricity to run pumps demonstrates a lack of commitment to meeting the states energy goals. We believe that in our valleys we have the opportunity first to imagine a better way, and then with the collaboration of HHFDC to build a water system that our whole state can be proud of.

We are not engineers, but we feel that our proposal is feasible and could result in a system that would require no pumping, and therefore no energy costs, and very little maintenance.

Again, we are not engineers, but here are some of our thoughts and questions:

1. Delivery Infrastructure: There are two ends to the valley water supply line, one on each of the roads. Would one end be better than the other to connect to? The Waiāhole end already has a road all the way to the tunnel.
2. Source(s): There are a number of development tunnels. Are there differences between them in terms of suitability as a water source? Does this depend on depth of the tunnel, quantity of water developed, configuration of dikes? Or does the answer to this question depend on the answer to #1?
3. Pressure/Pipe Size: Water sourced at 750 ft. would be under a lot of pressure at lower elevations. How would this be dealt with? Pressure reducers; reservoirs? Because of the high pressure, couldn't a much smaller pipe (smaller than in the rest of the valley system) be used?
4. Additional Benefits: Could this high-pressure water be used to generate electricity, thereby contributing to the state's energy self sufficiency goal? This would also lower pressure.
5. Water Quality Requirements: If contamination is a concern, what level of treatment would be needed? Is water from the Waihe'e tunnel treated? Are there other BWS tunnel sources? It would be easy to test water coming out of the development tunnels.
6. Associated Maintenance Costs: Are there any maintenance costs associated with BWS tunnels?

For purposes of comparison, it would be important to understand more about the present and proposed systems that are based on pumping:

1. What are the costs of each of the systems, existing and projected? How do these costs break down into the separate costs of electricity, maintenance, repairs, water treatment, etc.?
2. Is the cost of electricity projected to rise or fall over the coming decades?
3. What is the carbon footprint of the new system? Besides using electricity, the system would require transportation to regularly monitor the pumps and reservoir, periodic replacement of pumps and other components.
4. How do the costs of a pump system and a gravity flow system compare over time? We believe that even if the gravity flow system were to cost more initially, over time it would pay for itself.

June 2022

It was in October of 2018 that we wrote a summary of the community's proposal of how to build a better water system in Waiāhole, in response to the State's plan to replace the aging existing system. Since then we have continued to think about the idea of a gravity fed system, with hydropower generated electricity as a by-product, and to present it to and discuss it with everyone we could, with very positive response. Meanwhile, in March, 2021 a flood did major damage to the existing pump station and infrastructure and more than a million dollars was spent in repairs. We are told that within about five years a new system will have to be decided on and implementation begun. A study was done for the agency that is the landlord for the valley, HHFDC. This cursory study concluded that a gravity flow system was far more expensive than the other alternative, namely, building a new, pumped based system. We are not convinced, indeed, it has become clear to us that it is not within the capacity of nor is it even the responsibility of HHFDC to conceive, design, and build the system we propose. We are therefore seeking to enlist support from a much broader base of agencies, non-profit funders, interested engineers, as behooves a project that we know will help the state to move towards its goals of food and energy self-sufficiency. Mitigating climate change and resiliency in its face are ultimately what this kind of project is about, even if in a not-so-big way. We also see Waiāhole Valley, with its mix of residential and agricultural lots, largely owned by the State from mauka to makai, with the potential to be energy and water self-sufficient, and the as yet unfulfilled potential to contribute significantly to the State's food security, as a model for future resilient community and agriculture development.

More specifically, here are some of our thoughts, efforts, questions, and things learned since the initial presentation of our proposal.

We have had contact with the community of Wood Valley in Ka'u on Hawaii Island, which maintains a community owned and operated gravity flow piped water system that serves residential and agricultural users. They have expressed interest in Waiāhole and are willing to visit us and share information.

We have also contacted Canyon Hydro, a company in California that builds Hydropower systems. Based on information we have given them, they see the potential and would be very willing to send someone to see the site and meet with us. They have sent us some pictures of hydro power installation that would be similar to what we would need.

We met with the staff and executive director of the Water Commission (COWRM). They too were very interested in our alternative and, in our discussion of water rights and allocations, the McCandless water line, the role of ADC and COWRM, the implications of the Waiāhole Ditch case, all indications were that there would be no obstacles in the permitting of water use.

We have been told that Hawaiian Electric Co. has done a study on hydropower potential in Waiāhole. We don't know what quantities of water, and at what head, were looked at. We have not been allowed to see this study.

The engineering report that was done for HHFDC, which concluded that a gravity flow system was too expensive, bears some rebuttal.

- Cost: All the pipes in the valley would ideally be replaced with BWS standards pipe. This is not absolutely necessary, but the State would like to do it. In addition a connection from the school to the BWS line at the highway would be necessary, for fire protection. This would apply to all three alternatives and should not be assigned to only the gravity system.
- Cost: A road would need to be built up to the tunnel from which the water would be sourced and where the pipe would begin. This would be expensive. There is no mention in this report of the two roads that access the tunnel, one up to Waianu and the other to Uwau, the two streams that are in the Waianu Watershed. These roads are undoubtedly in great disrepair, but they did exist, and do so in remnants. There is no mention in the report of horizontal and vertical distances, and therefore of grade, either for the road or the pipe.

- Cost: The pipe would have to be buried. That does not seem to us as a foregone conclusion. On the Waiāhole side of the valley Waiāhole Irrigation Company (Oahu Sugar) used to pump one million gallons of water a day up to the tunnel in a large pipe mounted on cement pylons. If the pipe in Waianu was done in the same fashion it would be more accessible and easier to maintain in the event of a disturbance, such as a landslide. It would probably, we think, be a much smaller pipe, but capable of carrying far more water, because of the downhill instead of uphill flow, and the greater head. Again, the report mentions pipe size and length, but not grade. There is no mention of the quantity of water, or of the pressure generated at the lowest end. As a result of the Waiāhole Ditch water case three million gallons are released out of the tunnel daily into Waianu stream. While that quantity of water definitely benefits the environment downstream and out into the ocean, it does not benefit the environment at the site where it is released. It is too much water, unlike springs, seeps and waterfalls that gradually add to a stream's flow. According to our discussion with COWRM staff, that water could just as well be released into the stream. This greatly enlarges the potential for hydropower.
- Cost: A reservoir is needed. Again, if this is true, it is true of all alternatives and should not be applied to only the gravity system. Even in the first alternative, which is to upgrade the existing system, an entirely new reservoir would have to be built. The purpose of a reservoir is to buffer the system against high water use. The current one million gallon reservoir allows for water to be withdrawn at a much higher rate than the pumps can supply. (We do not know what the pumping rate is, but the pumps are not supposed to run continuously). We believe a pipe with hundreds of feet of head would easily carry far more than sufficient water to supply the valley needs, obviating the need for a reservoir, or at least greatly reducing its size.
- Cost: Three phase electricity would have to be brought to the site. Once again, this would apply, if true, to all three alternatives. In the gravity system, however, electricity would be generated instead of consumed. No pumps would be needed.
- Cost: Operating the current system costs HHFDC about \$200,000 a year. That is the base cost, and does not include repairs and replacement of equipment. It does not include the costs borne by Hawaiian Electric to fly a helicopter to troubleshoot and send a crew in to fix the power lines coming over the ridge from Ka'alaea (A frequent occurrence). We believe that the maintenance costs associated with a gravity flow system would be far lower. No pump to service. Less commuting, Hawaiian Electric could maintain the hydropower system, or perhaps the valley residents could, as in Wood Valley. Doonewood, the water service provider, could read the meters.
- Cost: The water needs to be treated. Again, true of all three systems. The COWRM staff has told us that water sourced from up inside the development tunnel would not be considered surface water. It would be considered like ground water coming out of a well, but not subject to all of the pollution that plagues much of our island groundwater supply.

Most importantly, in the report there is no consideration given to the benefits of a gravity system over time. Even if it did cost more to build initially, how would the systems compare in the long run? Pump based systems would pump forever. Pump and reservoirs would not last forever. Gravity is not going to end.

Attached are three maps that help to understand the valley water systems and our proposal;

Map (1) shows the entire ditch system. The Transmission Tunnel is inside the mountain at about 800ft. elevation.

There are release points in Kahana, Waiakane, Waianu and Waiahole where millions of gallons of water are released into respective streams, as mandated by the Waiahole Ditch water case. At possibly any of these points hydroelectricity could be generated, as a byproduct of stream restoration. The Trans-Ko'olau Tunnel is about 3 miles long.

Map (2) shows the existing domestic and agricultural water system for the valley. The electricity to run the pumps at "D" comes in a transmission line running through the mountain and over the ridge that separates Waiahole from Ka'alaea to the SE.

Map (3) is helpful in understanding our proposal. "A" is the Uwao development tunnel, perpendicular to the main transmission tunneling penetrating the dike system in the mountain. It delivers the most water of all the development tunnels. We propose sourcing the valley water system in this tunnel and piping it to "B", about where Uwao and Waianu streams join, and close to where the valley road and pipe infrastructures extend to. This is where a hydropower system could be located. The horizontal distance is about 1 mile and the drop in elevation around 400ft. An alternative would be to run the pipe in the tunnel, which is a very gentle grade, to "C", the North Portal, also about 1 mile. There is already an operational road to the North Portal and the pipe could be run down that road to the beginning of the existing pipe system at "D".

Map # 1

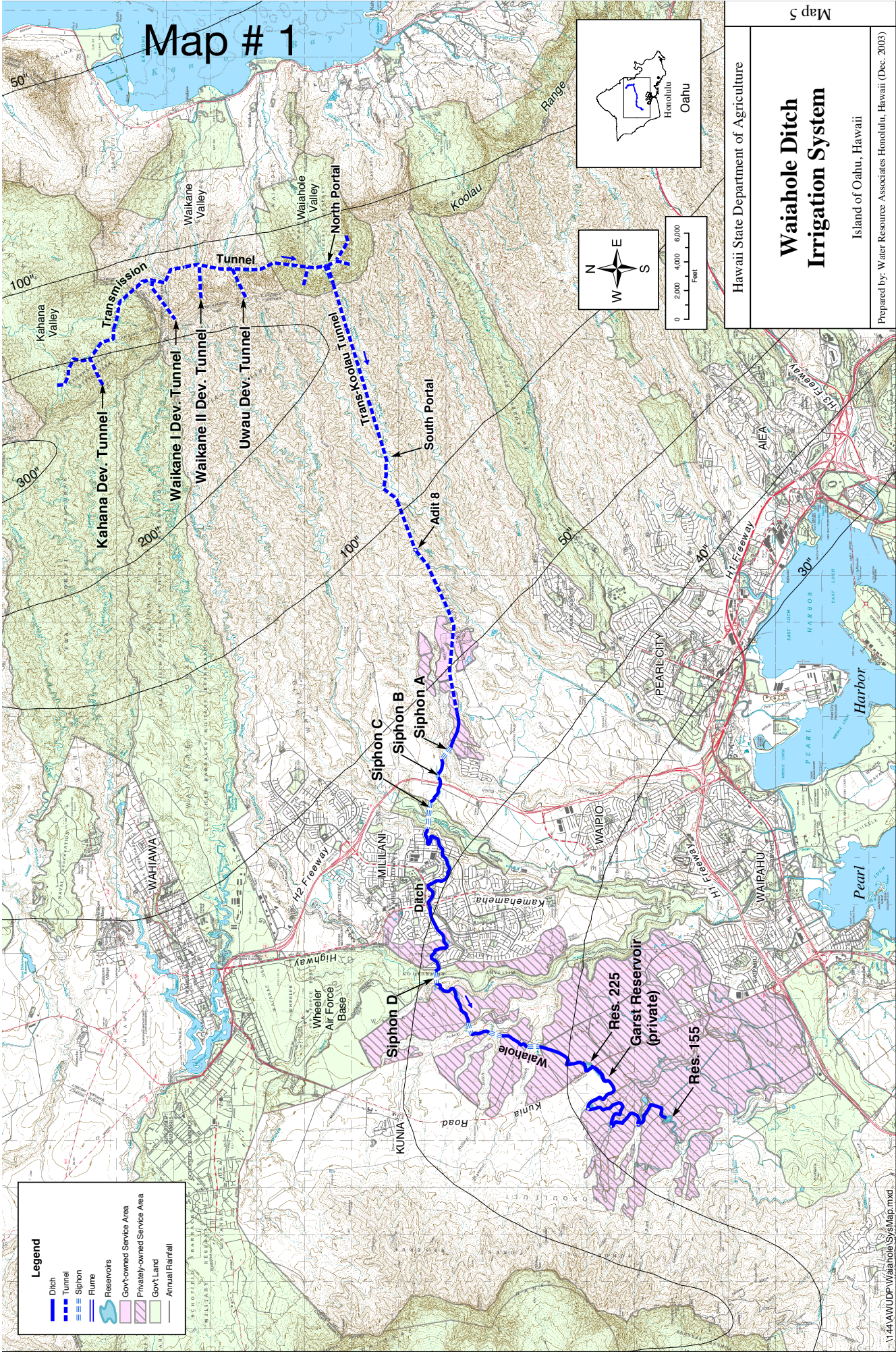
Map 5

Hawaii State Department of Agriculture

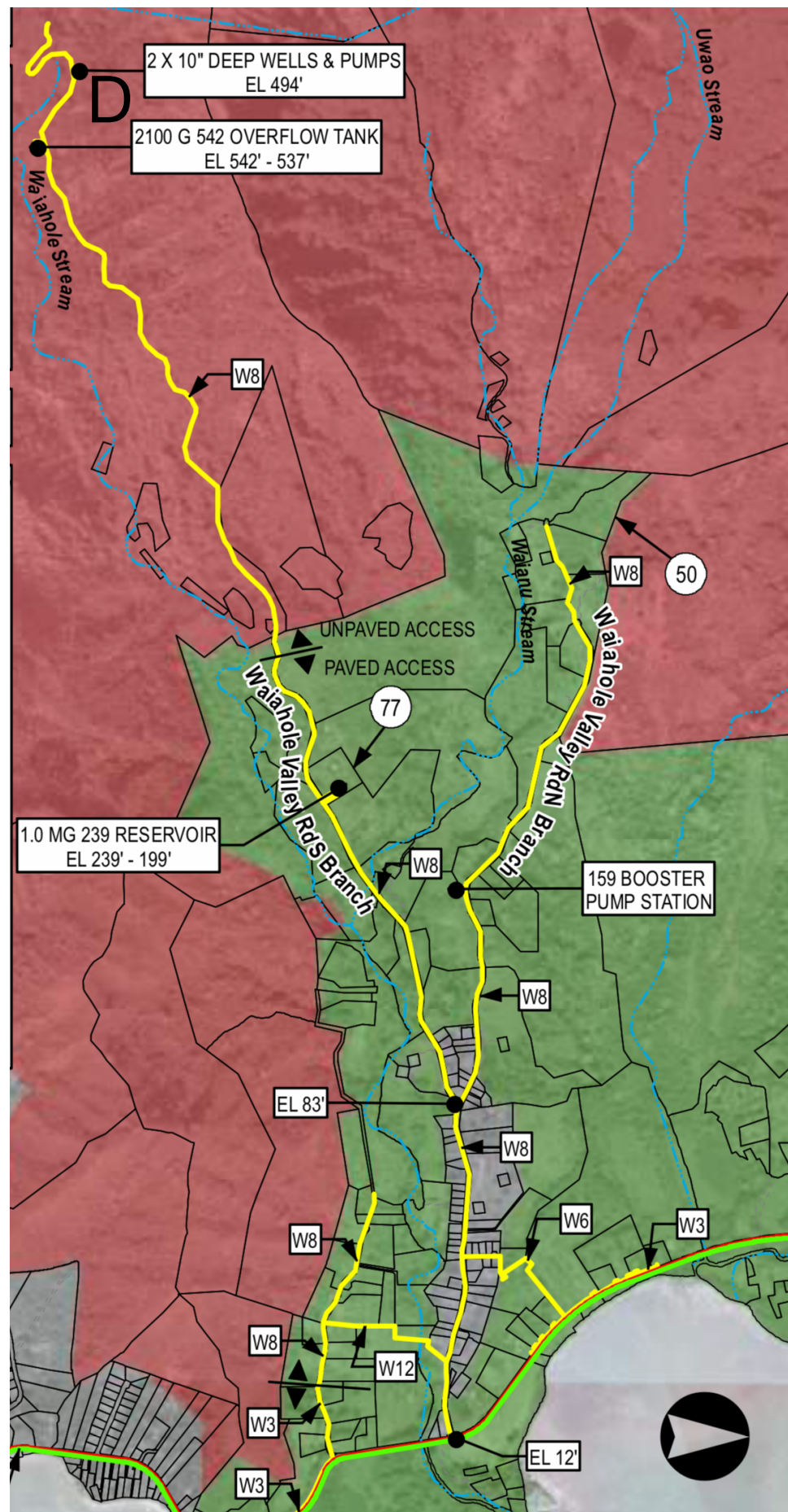
Waiahole Ditch Irrigation System

Island of Oahu, Hawaii

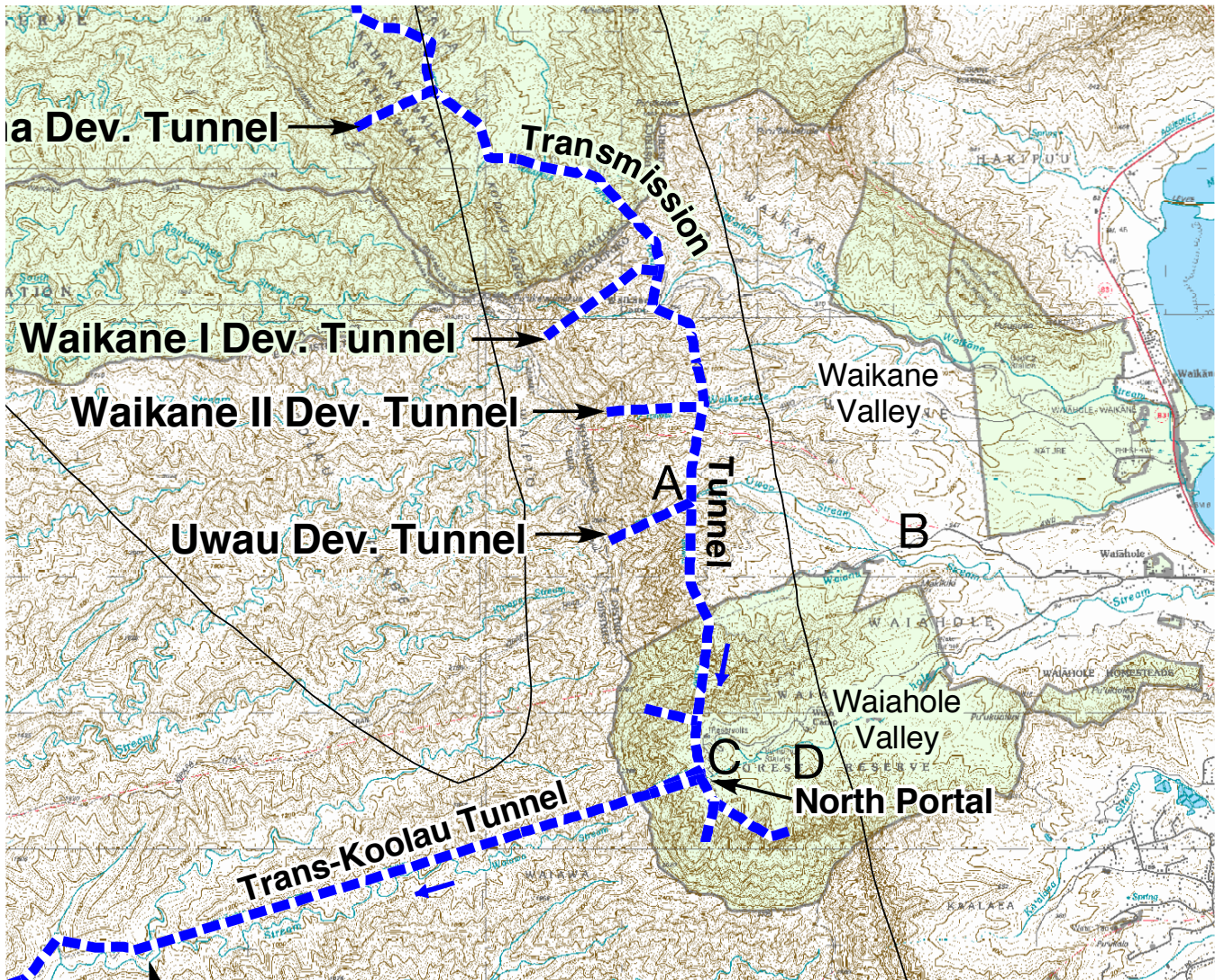
Prepared by: Water Resource Associates Honolulu, Hawaii (Dec. 2003)



Map # 2



Map #3



Julia Ham Tashima

From: Morgan, Jeremy K CIV USARMY CEPOH (USA) <Jeremy.K.Morgan@usace.army.mil>
Sent: Tuesday, November 22, 2022 5:39 PM
To: Julia Ham Tashima
Subject: POH-2022-00167 Waiahole Valley Water System Improvements

Follow Up Flag: Flag for follow up
Flag Status: Flagged

Aloha Julia Ham Tashima,

A determination of the requirement for a Corps permit cannot be made based on the provided plans. But, I can include some information to consider in your planning process.

A Corps permit would be needed for the placement of structures in, under, or over navigable waters of the U.S. and/or other work affecting the course, location, condition or navigable capacity of such waters according to Section 10 of the Rivers and Harbors Act of 1899. A Corps permit would also be needed for the discharge (placement) of dredged and/or fill material into waters of the U.S., including wetlands according to Section 404 of the Clean Water Act.

From looking at your plans, it appears that there is potential for work in streams. This would require a permit if there is a discharge of fill below the ordinary high water mark (OHWM) of streams or in wetlands. Include detailed plans/drawings of the proposed project where streams or wetlands are present if applying for a permit. Include a clear line indicating the OHWM in your plans and you would also want to include the amount of fill that would be placed below the OHWM.

Please visit <https://www.poh.usace.army.mil/Missions/Regulatory/Permits/Nationwide-Permits/> to find more information about our program and to apply for a permit. Email permit applications to CEPOH-RO@usace.army.mil as we have gone paperless. Feel free to contact me with any further questions.

Mahalo,

Jeremy Morgan
Biologist
Regulatory Office
U.S. Army Corps of Engineers
Honolulu District
Building 252 Fort Shafter, HI 96858-5440
Phone: (808) 835-4308
Jeremy.K.Morgan@usace.army.mil

From: Takemoto, Mark H <Mark.H.Takemoto@hawaii.gov>

Sent: Tuesday, November 29, 2022 2:17 PM

To: Jim Hayes <jim@psi-hi.com>

Cc: Pico, Vernon E <Vernon.E.Pico@hawaii.gov>; Nakatani, James <James.Nakatani@hawaii.gov>; Marushige, Lynette H <lynette.h.marushige@hawaii.gov>; Tavui, Jasmine HT <jasmine.ht.tavui@hawaii.gov>

Subject: Waiahole Valley Water System Improvements

Aloha Jim,

Follow up to my voicemail. Thank you for the opportunity to comment on the proposed project plan. Some questions/concerns have arisen on the "Pre-Assessment consultation for the Waiahole Valley Water System Improvements" memo we received, a copy is attached.

1. We need clarification regarding option 2, "Tunnel Water Source Alternative". We have questions about the impact of the weir and bulkhead proposed in the development tunnel and the flow of water for the system.
 - a. We need to confirm our ability to deliver sufficient water to the farmers.
 - b. Confirm we will be able to release the required water volumes to the streams.
 - c. The impact to monitoring and maintenance of the system.
2. The road construction of the various proposals, understanding on how the construction and access may affect the system.

When you have time we would like to meet to understand the proposed plan more fully.

Thank you,

Mark Takemoto

Agribusiness Development Corporation

235 S. Beretania Street, Room 205

Honolulu, Hawaii 96813

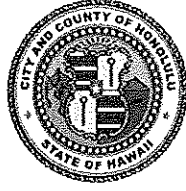
Email: mark.h.takemoto@hawaii.gov

Phone: (808)586-0181

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

RICK BLANGIARDI
MAYOR



SHELDON K. HAO
FIRE CHIEF

JASON SAMALA
DEPUTY FIRE CHIEF

November 25, 2022

Ms. Julie Ham Tashima, Planner
Planning Solutions Inc.
Pacific Park Plaza, Suite 950
711 Kapiolani Boulevard
Honolulu, Hawaii 96813-5213

Dear Ms. Tashima:

Subject: Preassessment Consultation
Waiahole Valley Water System Improvements
Waiahole, Hawaii
Tax Map Key Plates: 4-8-001 and 4-8-006 through 4-8-013

In response to a letter received on November 9, 2022, from Mr. James Hayes regarding the abovementioned subject, the Honolulu Fire Department (HFD) reviewed the submitted information and requires that the following be complied with:

1. Fire department access roads shall be provided such that any portion of the facility or any portion of an exterior wall of the first story of the building is located not more than 150 feet (46 meters) from fire department access roads as measured by an approved route around the exterior of the building or facility. (National Fire Protection Association [NFPA] 1; 2018 Edition, Sections 18.2.3.2.2 and 18.2.3.2.2.1, as amended.)

A fire department access road shall extend to within 50 feet (15 meters) of at least one exterior door that can be opened from the outside and that provides access to the interior of the building. (NFPA 1; 2018 Edition, Section 18.2.3.2.1.)

2. Fire department access roads shall be in accordance with NFPA 1; 2018 Edition, Section 18.2.3.

Ms. Julie Ham Tashima, Planner

Page 2

November 25, 2022

3. An approved water supply capable of supplying the required fire flow for fire protection shall be provided to all premises upon which facilities, buildings, or portions of buildings are hereafter constructed or moved into the jurisdiction. The approved water supply shall be in accordance with NFPA 1; 2018 Edition, Sections 18.3 and 18.4.
4. Submit civil drawings to the City and County of Honolulu's Department of Planning and Permitting and route them to the HFD for review and approval.
5. The abovementioned provisions are required by the HFD. This project may necessitate that additional requirements be met as determined by other agencies.

Should you have questions, please contact Acting Battalion Chief Kendall Ching of our Fire Prevention Bureau at 808-723-7154 or kching3@honolulu.gov.

Sincerely,

A handwritten signature in black ink, appearing to be 'CU' followed by a long horizontal stroke.

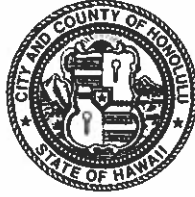
CRAIG UCHIMURA
Acting Assistant Chief

CU/MD:bh

POLICE DEPARTMENT
CITY AND COUNTY OF HONOLULU

801 SOUTH BERETANIA STREET • HONOLULU, HAWAII 96813
TELEPHONE: (808) 529-3111 • INTERNET: www.honolulupd.org

RICK BLANGIARDI
MAYOR



ARTHUR J. LOGAN
CHIEF

KEITH K. HORIKAWA
RADE K. VANIC
DEPUTY CHIEFS

OUR REFERENCE EO-GK

November 29, 2022

SENT VIA EMAIL

Ms. Julia Ham Tashima
julia@psi-hi.com

Dear Ms. Tashima:

This is in response to a letter from Mr. James T. Hayes of Planning Solutions, Inc., dated November 3, 2022, requesting input on the Pre-Assessment Consultation for the Waiahole Valley Water System Improvements Project by the Hawaii Housing Finance and Development Corporation.

The Honolulu Police Department has reviewed the project and does not have comments at this time. However, it is advised that school(s), businesses, and residents be informed in the event of any scheduled disruptions in the area.

If there are any questions, please call Major Crizalmer Caraang of District 4 (Kaneohe, Kailua, Kahuku) at (808) 723-8639.

Thank you for the opportunity to review this project.

Sincerely,

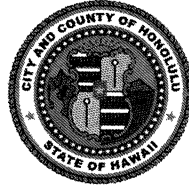
A handwritten signature in black ink that reads "Glenn Hayashi".

GLENN HAYASHI
Assistant Chief of Police
Support Services Bureau

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.honolulu.gov/dpp • CITY WEB SITE: www.honolulu.gov

RICK BLANGIARDI
MAYOR



DAWN TAKEUCHI APUNA
DIRECTOR DESIGNATE

December 2, 2022

2022/ELOG-2314 (tb)
2266679

Ms. Julia Ham Tashima
Planning Solutions, Inc.
711 Kapiolani Boulevard, Suite 950
Honolulu, Hawaii 96813

Dear Ms. Tashima:

SUBJECT: Pre-Assessment Consultation for the
Waiahole Valley Water System Improvements
Waiahole, Oahu, Hawaii
Tax Map Keys 4-8-001, 4-8-006 through 013

Thank you for your letter, received on November 7, 2022, requesting comments on the preparation of an Environment Assessment (EA) for the proposed Waiahole Valley Water System Improvements (Project). Below are comments from the Department of Planning and Permitting that the Draft EA should include or address:

1. A discussion of the relationship between the proposed action and the policies and guidelines of the Oahu General Plan (GP) and the Koolau Poko Sustainable Communities Plan, particularly to substantiate conformance with the narratives on water systems and drainage systems. Please note, an updated GP was recently adopted as Resolution 21-023, CD1.
2. For portions of the proposed Project located within the State Land Use Urban District, identify the City and County's Zoning District, whether the proposed Project components will require any development or land use permits, and whether structural components of the proposed Project will be in compliance with the development standards of the Land Use Ordinance.
3. Based on the initial information presented, it does not appear that development activities are proposed within the Special Management Area. However, the Draft EA should confirm this.
4. A discussion of water rights pursuant to the Hawaii Constitution, and clarified in Hawaii Supreme Court cases. Identification of water users, present and future, that will be impacted by the proposed Project.

5. A discussion of the potential impacts on the Waiahole Ditch Water System and changes, if any, to the downstream flows based on the proposed actions in each of the water source and distribution system alternatives.
6. A discussion of which agency or entity would maintain the proposed infrastructure in each of the alternatives.
7. Consultation with the Office of Climate Change, Sustainability, and Resilience, if not already done, as part of this environmental review prior to publication of the Draft EA.
8. A discussion on whether and how the proposed Project will improve the resiliency of the components of the Waiahole Valley Water System to climate change and related potential hazards, and whether long-term resiliency strategies are being incorporated into the proposed Project design.
9. Describe the standard conditions, mitigation measures, adaptation measures, and Best Management Practices proposed to be implemented for both regulatory compliance (e.g., standard stop-work measures for historic/archaeological resources), and to avoid or minimize potential impacts to sensitive resources (e.g. wetlands, surface and groundwater quality, protected flora and fauna species).
10. Confirmation that the proposed Project shall comply with the City's "Storm Drainage Standards" and the "Rules Relating to Water Quality" and that the proposed Project's compliance to these standards and rules will be verified at the time that grading and/or construction plans are submitted for review.
11. Descriptions of the proposed access roads for the various alternatives. Descriptions of the proposed width, pavement type, and anticipated users/frequency of use should be included.
12. List all required city, state, and federal approvals required for the Proposed Project.

Should you have any questions, please contact Franz Kraintz, of our staff, at fkraintz@honolulu.gov or at (808) 768-8046.

Very truly yours,



Dina L.T. Wong
Planning Division Chief

DLTW:ah



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

SUZANNE D. CASE
CHAIRPERSON

MICHAEL G. BUCK
ELIZABETH A. CHAR, M.D.
NEIL J. HANNAHS
AURORA KAGAWA-VIVIANI, PH.D.
WAYNE K. KATAYAMA
PAUL J. MEYER

M. KALEO MANUEL
DEPUTY DIRECTOR

November 28, 2022

REF: RFD.4699.3

TO: Julia Ham Tashima, Planner
Planning Solutions, Inc.

FROM: M. Kaleo Manuel, Deputy Director *Kaleo Manuel*
Commission on Water Resource Management

SUBJECT: Pre-Assessment Consultation for the Waiahole Valley Water System Improvements, Waiahole,
Oahu, Hawaii

FILE NO.: RFD.4699.3
TMK NO.: (1) 4-8-001 and 4-8-006 through 4-8-013

Thank you for the opportunity to review the subject document. The Commission on Water Resource Management (CWRM) is the agency responsible for administering the State Water Code (Code). Under the Code, all waters of the State are held in trust for the benefit of the citizens of the State, therefore all water use is subject to legally protected water rights. CWRM strongly promotes the efficient use of Hawaii's water resources through conservation measures and appropriate resource management. For more information, please refer to the State Water Code, Chapter 174C, Hawaii Revised Statutes, and Hawaii Administrative Rules, Chapters 13-167 to 13-171. These documents are available via the Internet at <http://dlnr.hawaii.gov/cwm>.

Our comments related to water resources are checked off below.

- ☒ 1. We recommend coordination with the county to incorporate this project into the county's Water Use and Development Plan. Please contact the respective Planning Department and/or Department of Water Supply for further information.
- ☐ 2. We recommend coordination with the Engineering Division of the State Department of Land and Natural Resources to incorporate this project into the State Water Projects Plan.
- ☐ 3. We recommend coordination with the Hawaii Department of Agriculture (HDOA) to incorporate the reclassification of agricultural zoned land and the redistribution of agricultural resources into the State's Agricultural Water Use and Development Plan (AWUDP). Please contact the HDOA for more information.
- ☒ 4. We recommend that water efficient fixtures be installed and water efficient practices implemented throughout the development to reduce the increased demand on the area's freshwater resources. Reducing the water usage of a home or building may earn credit towards Leadership in Energy and Environmental Design (LEED) certification. More information on LEED certification is available at <http://www.usgbc.org/leed>. A listing of fixtures certified by the EPA as having high water efficiency can be found at <http://www.epa.gov/watersense>.
- ☒ 5. We recommend the use of best management practices (BMP) for stormwater management to minimize the impact of the project to the existing area's hydrology while maintaining on-site infiltration and preventing polluted runoff from storm events. Stormwater management BMPs may earn credit toward LEED certification. More information on stormwater BMPs can be found at <http://planning.hawaii.gov/czm/initiatives/low-impact-development/>
- ☒ 6. We recommend the use of alternative water sources, wherever practicable.
- ☐ 7. We recommend participating in the Hawaii Green Business Program, that assists and recognizes businesses that strive to operate in an environmentally and socially responsible manner. The program description can be found online at <http://energy.hawaii.gov/green-business-program>.
- ☐ 8. We recommend adopting landscape irrigation conservation best management practices endorsed by the Landscape Industry Council of Hawaii. These practices can be found online at

http://www.hawaiiscape.com/wp-content/uploads/2013/04/LICH_Irrigation_Conservation_BMPs.pdf.

- ☒ 9. There may be the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.
- ☒ 10. The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit is required prior to use of water. The Water Use Permit may be conditioned on the requirement to use dual line water supply systems for new industrial and commercial developments.
- ☒ 11. The Hawaii Water Plan is directed toward the achievement of the utilization of reclaimed water for uses other than drinking and for potable water needs in one hundred per cent of State and County facilities by December 31, 2045 (§ 174C-31(g)(6), Hawaii Revised Statutes). We strongly recommend that this project consider using reclaimed water for its non-potable water needs, such as irrigation. Reclaimed water may include, but is not limited to, recycled wastewater, gray water, and captured rainwater/stormwater. Please contact the Hawai'i Department of Health, Wastewater Branch, for more information on their reuse guidelines and the availability of reclaimed water in the project area.
- ☒ 12. A Well Construction Permit(s) is (are) are required before the commencement of any well construction work.
- ☒ 13. A Pump Installation Permit(s) is (are) required before ground water is developed as a source of supply for the project.
- ☒ 14. There is (are) well(s) located on or adjacent to this project. If wells are not planned to be used and will be affected by any new construction, they must be properly abandoned and sealed. A permit for well abandonment must be obtained.
- ☐ 15. Ground-water withdrawals from this project may affect streamflows, which may require an instream flow standard amendment.
- ☐ 16. A Stream Channel Alteration Permit(s) is (are) required before any alteration can be made to the bed and/or banks of a stream channel.
- ☐ 17. A Stream Diversion Works Permit(s) is (are) required before any stream diversion works is constructed or altered.
- ☐ 18. A Petition to Amend the Interim Instream Flow Standard is required for any new or expanded diversion(s) of surface water.
- ☐ 19. The planned source of water for this project has not been identified in this report. Therefore, we cannot determine what permits or petitions are required from our office, or whether there are potential impacts to water resources.

☒ OTHER: Planning -

CWRM (Commission) would like to expand the water audit program to include ways to address water losses and data validity challenges from the affected PWS. Act 169 affects different public water systems (PWS) which are not utilities and do not have customers in the traditional sense that a typical water utility does. We recommend participating in the Water Audit Program and updating your water usage data to further increase water efficiency in the water system. Please coordinate with the respective Planning Department and/or Department of Water Supply to incorporate this project into the county water use and development plan. If the Honolulu Board of Water Supply is intended to take control of the WWS then the final EIS should acknowledge that the Honolulu Board of Water Supply (HBWS) conducts annual water audits to assess their system water losses. If the water will be provided by the Board of Water Supply, coordination is required with the Commission to determine any potential impacts that this project will have on the HBWS's allocations.

Groundwater -

The Commission requires each owner or operator of a pumping well to report their monthly water use. These data are summarized in updates to the Water Resources Protection Plan available at <http://dlnr.hawaii.gov/cwrmp/planing/hiwaterplan/wrpp/> and will be used to evaluate the volume of pumping from active production wells on a 12-month moving average basis.

Furthermore, ground-water withdrawals may affect streamflows. Impacts to ground water dependent ecosystems are becoming an emerging issue as impacts to these are related to impacts to traditional & customary practices of sustenance from these ecosystems. We

recommend consultation with the region's (moku) Aha Moku Council on whether a land use conversion or project that uses water will impact any traditional & customary practices.

If you have any questions, please contact Ryan Imata of the Regulation Branch at (808) 587-0225 or Katie Roth of the Planning Branch at 587-0218.

DAVID Y. IGE
GOVERNOR OF HAWAII



SUZANNE D. CASE
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

December 08, 2022

LD 0480

Julia Ham Tashima, Planner
Planning Solutions, Inc.
711 Kapiolani Boulevard
Honolulu, HI 96813

Via email: julia@psi-hi.com

Dear Ms. Tashima:

SUBJECT: Pre-Assessment Consultation
Waiāhole Valley Water System Improvements
Waiāhole, Island of Oahu, Hawaii
TMK Plats (1) 4-8-001 and 4-8-006 through 4-8-013

Thank you for the opportunity to review and comment on the subject project. The Land Division of the Department of Land and Natural Resources (DLNR) distributed copies of your request to DLNR's various divisions for their review and comment.

Enclosed are a response and comments received from our (a) Division of Aquatic Resources, (b) Engineering Division, and (c) Office of Conservation and Coastal Lands. Should you have any questions, please feel free to contact Barbara Lee via email at barbara.j.lee@hawaii.gov. Thank you.

Sincerely,

Russell Tsuji

Russell Y. Tsuji
Land Administrator

Attachments

cc: Central Files



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

November 18, 2022

LD 0480

MEMORANDUM

TO: DLNR Agencies:
X Div. of Aquatic Resources (via email: kendall.l.tucker@hawaii.gov)
 Div. of Boating & Ocean Recreation
X Engineering Division (via email: DLNR.engr@hawaii.gov)
X Div. of Forestry & Wildlife (via email: rubyrosa.t.terrago@hawaii.gov)
 Div. of State Parks
X Commission on Water Resource Management (via email: DLNR.CWRM@hawaii.gov)
X Office of Conservation & Coastal Lands (via email: sharleen.k.kuba@hawaii.gov)
X Land Division – Oahu District (via email: barry.w.cheung@hawaii.gov)
Russell Tsuji

FROM: Russell Y. Tsuji, Land Administrator

SUBJECT: Pre-Assessment Consultation

LOCATION: Waiāhole Valley Water System Improvements
Waiāhole, Island of Oahu, Hawaii

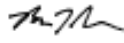
APPLICANT: TMK Plats: (1) 4-8-001 and 4-8-006 through 4-8-013
Planning Solutions on behalf of Hawai'i Housing Finance and Development Corporation

Transmitted for your review and comment is information on the above-referenced project. Please review the attached information and submit any comments by the internal deadline of **December 01, 2022** to barbara.j.lee@hawaii.gov at the Land Division.

If no response is received by the above due date, we will assume your agency has no comments at this time. Should you have any questions about this request, please contact Barbara Lee at the above email address. Thank you.

BRIEF COMMENTS:

() We have no objections.
(☒) We have no comments.
() We have no additional comments.
() Comments are included/attached.

Signed: 
Print Name: Brian Neilson
Division: Aquatic Resources
Date: Dec 1, 2022

Attachments
Cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII



SUZANNE D. CASE
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 18, 2022

LD 0480

MEMORANDUM

FROM: ~~TO:~~

DLNR Agencies:

- ☒ Div. of Aquatic Resources (via email: kendall.tucker@hawaii.gov)
- ☐ Div. of Boating & Ocean Recreation
- ☒ **Engineering Division** (via email: DLNR.engr@hawaii.gov)
- ☒ Div. of Forestry & Wildlife (via email: rubyrosa.t.terrago@hawaii.gov)
- ☐ Div. of State Parks
- ☒ Commission on Water Resource Management (via email: DLNR.CWRM@hawaii.gov)
- ☒ Office of Conservation & Coastal Lands (via email: sharleen.k.kuba@hawaii.gov)
- ☒ Land Division – Oahu District (via email: barry.w.cheung@hawaii.gov)

Russell Tsuji

TO: ~~FROM:~~

Russell Y. Tsuji, Land Administrator

~~SUBJECT:~~

Pre-Assessment Consultation

LOCATION:

Waiāhole Valley Water System Improvements

Waiāhole, Island of Oahu, Hawaii

APPLICANT:

TMK Plats: (1) 4-8-001 and 4-8-006 through 4-8-013

Planning Solutions on behalf of Hawai'i Housing Finance and Development Corporation

Transmitted for your review and comment is information on the above-referenced project. Please review the attached information and submit any comments by the internal deadline of **December 01, 2022** to barbara.j.lee@hawaii.gov at the Land Division.

If no response is received by the above due date, we will assume your agency has no comments at this time. Should you have any questions about this request, please contact Barbara Lee at the above email address. Thank you.

BRIEF COMMENTS:

- ☐ We have no objections.
- ☐ We have no comments.
- ☐ We have no additional comments.
- ☒ Comments are included/attached.

Signed:

Print Name:

Cary S. Chang, Chief Engineer

Division:

Engineering Division

Date:

Nov 29, 2022

Attachments

Cc: Central Files

**DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION**

LD/Russell Y. Tsuji

Ref: Pre-Assessment Consultation

Waiahole Valley Water System Improvements

Location: Waiahole, Island of Oahu, Hawaii

TMK(s): (1) 4-8-001 and 4-8-006 through 4-8-013

Applicant: Planning Solutions on behalf of Hawai'i Housing Finance and Development Corporation

COMMENTS

The rules and regulations of the National Flood Insurance Program (NFIP), Title 44 of the Code of Federal Regulations (44CFR), are in effect when development falls within a Special Flood Hazard Area (high-risk areas). State projects are required to comply with 44CFR regulations as stipulated in Section 60.12. Be advised that 44CFR, Chapter 1, Subchapter B, part 60 reflects the minimum standards as set forth by the NFIP. Local community flood ordinances may stipulate higher standards that can be more restrictive and would take precedence over the minimum NFIP standards.

The owner of the project property and/or their representative is responsible to research the Flood Hazard Zone designation for the project. Flood Hazard Zones are designated on FEMA's Flood Insurance Rate Maps (FIRM). The official FIRMs can be accessed through FEMA's Map Service Center (msc.fema.gov). Our Flood Hazard Assessment Tool (FHAT) (<http://gis.hawaiiinfip.org/FHAT>) could also be used to research flood hazard information.

If there are questions regarding the local flood ordinances, please contact the applicable County NFIP coordinating agency below:

- Oahu: City and County of Honolulu, Department of Planning and Permitting (808) 768-8098.
- Hawaii Island: County of Hawaii, Department of Public Works (808) 961-8327.
- Maui/Molokai/Lanai: County of Maui, Department of Planning (808) 270-7139.
- Kauai: County of Kauai, Department of Public Works (808) 241-4896.

The applicant should include water demands and infrastructure required to meet project needs. Please note that all State projects requiring water service from their local Department/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.

The applicant is required to provide water demands and calculations to the Engineering Division so it can be included in the State Water Projects Plan Update projections.

Signed: _____



CARTY S. CHANG, CHIEF ENGINEER

Date: _____

Nov 29, 2022

DAVID Y. IGE
GOVERNOR OF HAWAII



0A-23-98
23-96
SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

RECEIVED
OFFICE OF CONSERVATION
AND COASTAL LANDS

STATE OF HAWAII 2022 NOV 21 A 10:43
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

DEPT. OF LAND &
NATURAL RESOURCES
STATE OF HAWAII

November 18, 2022

LD 0480

MEMORANDUM

TO: **DLNR Agencies:**
☒ Div. of Aquatic Resources (via email: kendall.l.tucker@hawaii.gov)
☐ Div. of Boating & Ocean Recreation
☒ Engineering Division (via email: DLNR.engr@hawaii.gov)
☒ Div. of Forestry & Wildlife (via email: rubyrosa.t.terrago@hawaii.gov)
☐ Div. of State Parks
☒ Commission on Water Resource Management (via email: DLNR.CWRM@hawaii.gov)
☒ Office of Conservation & Coastal Lands (via email: sharleen.k.kuba@hawaii.gov)
☒ Land Division – Oahu District (via email: barry.w.cheung@hawaii.gov)
Russell Tsuji

FROM: Russell Y. Tsuji, Land Administrator

SUBJECT: **Pre-Assessment Consultation**

LOCATION: **Waiāhole Valley Water System Improvements**
Waiāhole, Island of Oahu, Hawaii

APPLICANT: **TMK Plats: (1) 4-8-001 and 4-8-006 through 4-8-013**
Planning Solutions on behalf of Hawai'i Housing Finance and Development Corporation

Transmitted for your review and comment is information on the above-referenced project. Please review the attached information and submit any comments by the internal deadline of **December 01, 2022** to barbara.j.lee@hawaii.gov at the Land Division.

If no response is received by the above due date, we will assume your agency has no comments at this time. Should you have any questions about this request, please contact Barbara Lee at the above email address. Thank you.

BRIEF COMMENTS:

- () We have no objections.
() We have no comments.
() We have no additional comments.
(x) Comments are included/attached.

Water Improvements in the
Conservation District
appear to be an identified
land use pursuant to

Signed:

Print Name:

Division:

Date:

[Signature]
K. Tiger Mills
DLNR - Oahu
11/21/2022

Attachments

Cc: Central Files

HAR, Sec. 13-5-22

P-6 Public Purpose Uses



United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawai'i 96850



In Reply Refer To:
2023-0014869-S7-001

December 9, 2022

Mr. James Hayes
Planning Solutions, Inc.
711 Kapi'olani Blvd., #950
Honolulu, Hawai'i 96813

Subject: Technical Assistance for the Proposed Waiāhole Valley Water System
Improvements Project, O'ahu

Dear Mr. Hayes:

Thank you for your letter of November 3, 2022, requesting a species list and guidance in preparation of your environmental assessment for the proposed Waiāhole Valley Water System (WVWS) Improvements Project, on the island of O'ahu [TMKs (1) 4-8-001 and 4-8-006 through 4-8-013]. Planning Solutions, Inc. and Bills Engineering, Inc. are assisting the Hawai'i Housing Finance and Development Corporation (HHFDC) with the planning and design of the proposed project. The existing WVWS is owned and operated by HHFDC and provides potable water to the surrounding community. It has two primary components: (a) the water source and (b) the distribution system. The purpose of the proposed project is to modernize the WVWS, which would improve long-term stability and reliability for the community that uses the water and allows for cost-effective operation and maintenance. Several WVWS improvement alternatives are being considered. These alternatives include two water source alternatives and two distribution system alternatives which can be combined into different combinations for a total of four alternatives.

Water Source Alternatives:

- *Wells:* HHFDC would construct two new wells within the State Land Use Commission (LUC) Agricultural District near the north branch of Waiāhole Valley Road at an elevation of approximately 350 feet above sea level (ASL).
- *Tunnel:* HHFDC would build an approximately 1-mile long access road and water pipeline through the LUC Conservation District to the entrance of the Uwao Tunnel. HHFDC would modify the tunnel, at an elevation of approximately 920 ft ASL, so that it could be used as the new water source.

PACIFIC REGION 1

IDAHO, OREGON*, WASHINGTON,
AMERICAN SAMOA, GUAM, HAWAII, NORTHERN MARIANA ISLANDS

*PARTIAL

Distribution System Alternatives:

- *Private Distribution System:* HHFDC would construct a new reservoir near the north branch of Waiāhole Valley Road with minor modifications to the existing water distribution system and extend a 12-inch diameter waterline from Kamehameha Highway to Waiāhole Elementary School.
- *Board of Water Supply (BWS) Operated Distribution System:* HHFDC would construct a new reservoir near the north branch of Waiāhole Valley Road, upgrade the existing system to bring the water system up to full compliance with BWS standards and build a new 12-inch diameter waterline from the reservoir to Waiāhole Elementary School.

All alternatives described above would involve removing or abandoning in-place the existing wells, pumps, water pipelines, powerlines, and roads that are in the LUC Conservation District parallel to Waiāhole Stream.

This letter has been prepared under the authority of and in accordance with provisions of the Endangered Species Act of 1973 (16 U.S.C. 1531 *et seq.*), as amended (ESA). We have reviewed the information you provided and pertinent information in our files, as it pertains to federally listed species in accordance with section 7 of the ESA. Our data indicate the following federally listed species may occur or transit through the vicinity of the proposed project area: the endangered 'ōpe'ape'a (Hawaiian hoary bat, *Lasiurus cinereus semotus*); endangered 'ua'u (Hawaiian petrel, *Pterodroma sandwichensis*), endangered Hawai'i distinct population segment (DPS) of 'akē'akē (band-rumped storm-petrel, *Hydrobates castro*), and threatened 'a'o (Newell's shearwater, *Puffinus auricularis newelli*) (hereafter collectively referred to as Hawaiian seabirds); the endangered koloa (Hawaiian duck, *Anas wyvilliana*), endangered 'alae ke'oke'o (Hawaiian coot, *Fulica americana alai*), endangered ae'o (Hawaiian stilt, *Himantopus mexicanus knudseni*), and the endangered 'alae 'ula (Hawaiian gallinule, *Gallinula galeata sandvicensis*) (hereafter collectively referred to as Hawaiian waterbirds); and the endangered blackline Hawaiian damselfly (*Megalagrion nigrohamatum nigrolineatum*).

Hawaiian hoary bat

The Hawaiian hoary bat roosts in both exotic and native woody vegetation across all islands and will leave young unattended in trees and shrubs when they forage. If trees or shrubs 15 feet or taller are cleared during the pupping season, there is a risk that young bats could inadvertently be harmed or killed since they are too young to fly or may not move away. Hawaiian hoary bats forage for insects from as low as 3 feet to higher than 500 feet above the ground and can become entangled in barbed wire used for fencing.

To avoid and minimize impacts to the endangered Hawaiian hoary bat we recommend you incorporate the following applicable measures into your project description:

- Do not disturb, remove, or trim woody plants greater than 15 feet tall during the bat birthing and pup rearing season (June 1 through September 15).
- Do not use barbed wire for fencing.

Hawaiian seabirds

Hawaiian seabirds may traverse the project area at night during the breeding, nesting and fledging seasons (March 1 to December 15). Outdoor lighting could result in seabird

disorientation, fallout, and injury or mortality. Seabirds are attracted to lights and after circling the lights they may become exhausted and collide with nearby wires, buildings, or other structures or they may land on the ground. Downed seabirds are subject to increased mortality due to collision with automobiles, starvation, and predation by dogs, cats, and other predators. Young birds (fledglings) traversing the project area between September 15 and December 15, in their first flights from their mountain nests to the sea, are particularly vulnerable.

To avoid and minimize potential project impacts to seabirds we recommend you incorporate the following applicable measures into your project description:

- Fully shield all outdoor lights so the bulb can only be seen from below bulb height and only use when necessary.
- Install automatic motion sensor switches and controls on all outdoor lights or turn off lights when human activity is not occurring in the lighted area.
- Avoid nighttime construction during the seabird fledging period, September 15 through December 15.

Hawaiian waterbirds

Hawaiian waterbirds are currently found in a variety of wetland habitats including freshwater marshes and ponds, coastal estuaries and ponds, artificial reservoirs, kalo or taro (*Colocasia esculenta*) lo'i or patches, irrigation ditches, sewage treatment ponds, and in the case of the Hawaiian duck, montane streams and marshlands. Hawaiian stilts may also be found wherever ephemeral or persistent standing water may occur. Threats to these species include non-native predators, habitat loss, and habitat degradation. Hawaiian ducks are also subject to threats from hybridization with introduced mallards.

Based on the project details provided, your project may result in the creation of standing water or open water that could attract Hawaiian waterbirds to the project site. In particular, the Hawaiian stilt is known to nest in sub-optimal locations (e.g. any ponding water), if water is present. Hawaiian waterbirds attracted to sub-optimal habitat may suffer adverse impacts, such as predation and reduced reproductive success, and thus the project may create an attractive nuisance. Therefore, we recommend you work with our office during project planning so that we may assist you in developing measures to avoid impacts to listed species (e.g., fencing, vegetation control, predator management).

To avoid and minimize potential project impacts to Hawaiian waterbirds we recommend you incorporate the following measures into your project description:

- In areas where waterbirds are known to be present, post and implement reduced speed limits, and inform project personnel and contractors about the presence of endangered species on-site.
- If water resources are located within or adjacent to the project site, incorporate applicable best management practices regarding work in aquatic environments into the project design (see enclosure).
- Have a biological monitor that is familiar with the species' biology conduct Hawaiian waterbird nest surveys where appropriate habitat occurs within the vicinity of the proposed project site prior to project initiation. Repeat surveys again within 3 days of

project initiation and after any subsequent delay of work of 3 or more days (during which the birds may attempt to nest). If a nest or active brood is found:

- Contact the Service within 48 hours for further guidance.
- Establish and maintain a 100-foot buffer around all active nests and/or broods until the chicks/ducklings have fledged. Do not conduct potentially disruptive activities or habitat alteration within this buffer.
- Have a biological monitor that is familiar with the species' biology present on the project site during all construction or earth moving activities until the chicks/ducklings fledge to ensure that Hawaiian waterbirds and nests are not adversely impacted.


Blackline Hawaiian damselfly

Hawaiian damselflies are found in aquatic habitats across the islands, with high species endemism within islands. Breeding habitat includes anchialine pools, perennial streams, marshes, ponds, and even artificial pools and seeps. Specifically, the blackline Hawaiian damselfly occurs in slow sections or pools along mid-reach and headwater sections of upland streams and seep-fed pools. Major threats include introduced fish, amphibians, and invertebrates in streams, reduced stream flow from drought and water diversion, small isolated populations, reduced habitat quality from ungulates and nonnative plants, and possibly over-collection.

The proposed project, specifically alternative 3, may impact habitat of the blackline Hawaiian damselfly. Surveys have confirmed the presence of several populations of the blackline Hawaiian damselfly in portions of the Uwau Stream catchment of Waiāhole Valley. Permits are required for accurate surveys of this species; therefore, we recommend you consult with the Service. The Service will also need additional design information to determine if the habitat of the blackline Hawaiian damselfly will be impacted.

We appreciate your efforts to conserve protected species. If you have questions regarding this response, please contact Charmian Dang, Fish and Wildlife Biologist (phone: 808-792-9400, email: Charmian_Dang@fws.gov). When referring to this project, please include this reference number: 2023-0014869-S7-001.

Sincerely,

 Digitally signed by
JINY KIM
Date: 2022.12.09
08:20:08 -10'00'

Acting Island Team Manager
O'ahu, Kaua'i, Northwestern
Hawaiian Islands, and American Samoa

Enclosure: U.S. Fish and Wildlife Service Recommended Standard Best Management Practices

**U.S. Fish and Wildlife Service
Recommended Standard Best Management Practices**

The U.S. Fish and Wildlife Service (Service) recommends the following measures to be incorporated into project planning to avoid or minimize impacts to fish and wildlife resources. Best Management Practices (BMPs) include the incorporation of procedures or materials that may be used to reduce either direct or indirect negative impacts to aquatic habitats that result from project construction-related activities. These BMPs are recommended in addition to, and do not over-ride any terms, conditions, or other recommendations prepared by the Service, other federal, state or local agencies. If you have questions concerning these BMPs, please contact the Service's Aquatic Ecosystems Conservation Program at 808-792-9400.

1. Authorized dredging and filling-related activities that may result in the temporary or permanent loss of aquatic habitats should be designed to avoid indirect, negative impacts to aquatic habitats beyond the planned project area.
2. Dredging/filling in the marine environment should be scheduled to avoid coral spawning and recruitment periods, and sea turtle nesting and hatching periods. Because these periods are variable throughout the Pacific islands, we recommend contacting the relevant local, state, or federal fish and wildlife resource agency for site specific guidance.
3. Turbidity and siltation from project-related work should be minimized and contained within the project area by silt containment devices and curtailing work during flooding or adverse tidal and weather conditions. BMPs should be maintained for the life of the construction period until turbidity and siltation within the project area is stabilized. All project construction-related debris and sediment containment devices should be removed and disposed of at an approved site.
4. All project construction-related materials and equipment (dredges, vessels, backhoes, silt curtains, etc.) to be placed in an aquatic environment should be inspected for pollutants including, but not limited to; marine fouling organisms, grease, oil, etc., and cleaned to remove pollutants prior to use. Project related activities should not result in any debris disposal, non-native species introductions, or attraction of non-native pests to the affected or adjacent aquatic or terrestrial habitats. Implementing both a litter-control plan and a Hazard Analysis and Critical Control Point plan (HACCP – see <https://www.fws.gov/policy/A1750fw1.html>) can help to prevent attraction and introduction of non-native species.
5. Project construction-related materials (fill, revetment rock, pipe, etc.) should not be stockpiled in, or in close proximity to aquatic habitats and should be protected from erosion (e.g., with filter fabric, etc.), to prevent materials from being carried into waters by wind, rain, or high surf.
6. Fueling of project-related vehicles and equipment should take place away from the aquatic environment and a contingency plan to control petroleum products accidentally

spilled during the project should be developed. The plan should be retained on site with the person responsible for compliance with the plan. Absorbent pads and containment booms should be stored on-site to facilitate the clean-up of accidental petroleum releases.

7. All deliberately exposed soil or under-layer materials used in the project near water should be protected from erosion and stabilized as soon as possible with geotextile, filter fabric or native or non-invasive vegetation matting, hydro-seeding, etc.

Appendix B. Assessment of the Potential Impact on Surface Waters

Assessment of the Potential Impact on
Surface Water of the Proposed New Wells for
Hawaii Housing Finance & Department Corporation's
Waiahole Water System

Prepared for:

Planning Solutions, Inc.
Pacific Park Plaza
711 Kapiolani Boulevard – Suite 950
Honolulu, Hawaii 96813

Prepared by:

Tom Nance Water Resource Engineering
560 N. Nimitz Hwy. - Suite 213
Honolulu, Hawaii 96817

February 2023

Table of Contents

	<u>Page</u>
Introduction	1
Impact on Streamflow of the Two Existing Wells.....	1
Well Pumpage Versus Metered Customer Use.....	1
Potential Reduction of Streamflow by the Two Proposed New Wells.....	6
Magnitude of Streamflow	6
Summary Conclusions	6

List of Figures

<u>No.</u>	<u>T i t l e</u>	<u>Page</u>
1	Locations of the Proposed Storage Tank and New Wells	2
2	Locations of the Existing and Proposed New Wells of HHFDC's Waiahole Water System .	3
3	Total Reported Pumpage in the Koolaupoko Aquifer System	4
4	Combined Pumpage of Waiahole Wells A and B	5
5	Daily Flow Rates at USGS Stream Gage 16294100 on Waiahole Stream	7

Introduction

This report provides an assessment of the potential impact on surface water of the proposed two new Wells for Hawaii Housing Finance & Department Corporation's (HHFDC) Waiahole Water System. The location of the two Wells will be at about 340-foot elevation and near to the proposed new 0.5 MG storage tank refer to Figure 1. The Wells would be drilled at the makai edge of an exposure of Koolau volcanics and would draw water from that volcanic formation.

At present, the HHFDC system is supplied by two existing Wells located at about 490-foot elevation in the interior of Waiahole Valley and identified as State Nos. 2853-004 and 2853-005. Their locations are shown on Figure 2. Each of these Wells is outfitted with an 800 GPM pump. These Wells would be abandoned and sealed if the proposed two new Wells prove to have sufficient yield. The two existing Wells are operated under a Water Use Permit (WUP) amount of 0.075 million gallons per day (MGD). Over the last 10 years, their use has typically exceeded the WUP amount.

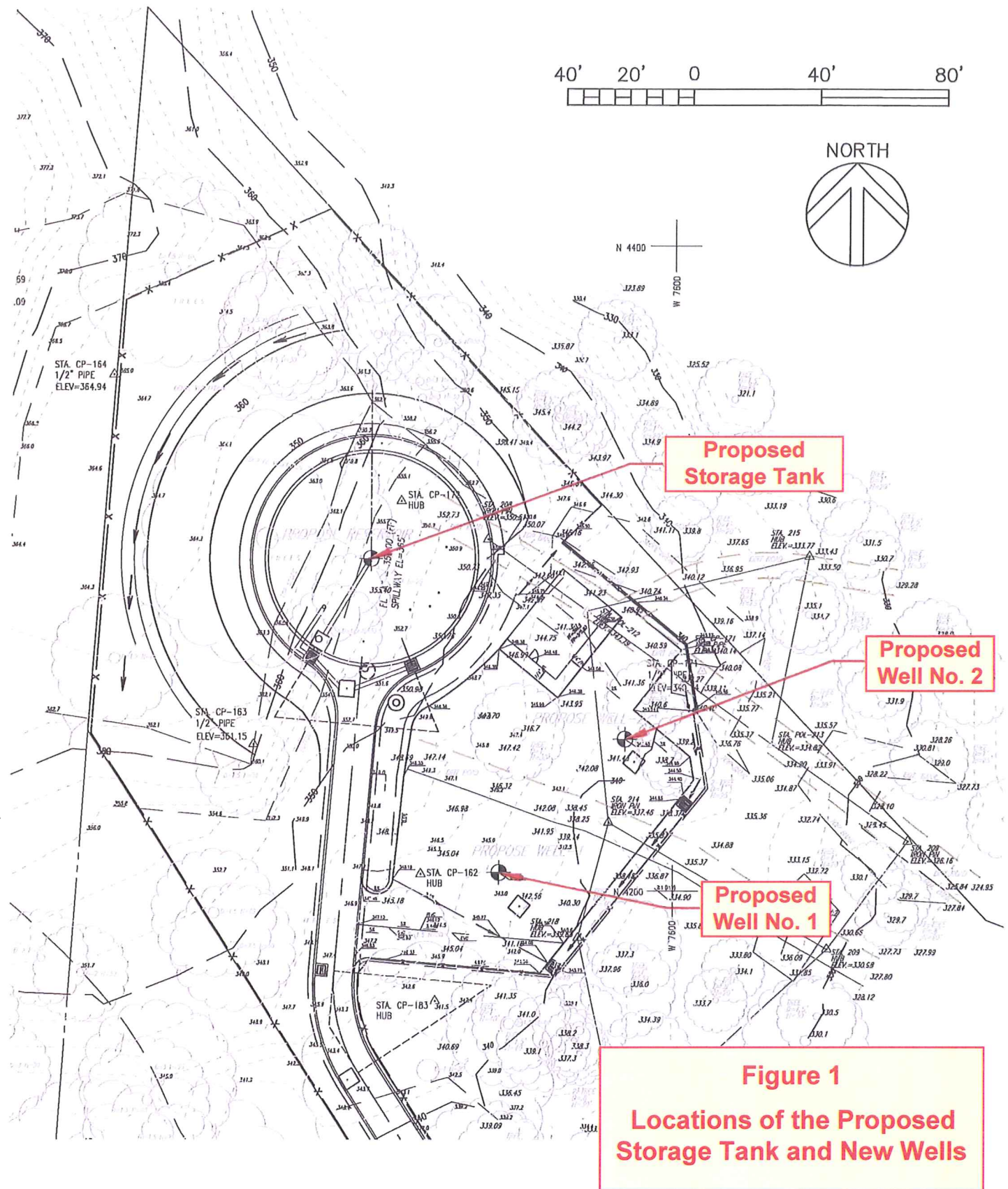
The two existing and proposed new Wells would all be located in the Koolaupoko Aquifer System which has a 28 MGD sustainable yield and a total of the WUP of 10.312 MGD. Since January 1994, reported pumpage has typically been somewhat greater than the sum of the WUP, but far less than the sustainable yield (Figure 3).

Impact on Streamflow of the Two Existing Wells

The daily logs for construction of the two existing Wells indicate that they tap into high-level groundwater. For Well No 2853-004, groundwater was encountered at a drilled depth of 12 feet and stayed at a level of seven (7) feet below ground throughout the drilling to a depth of 493 feet. For Well No. 2853-005, its reported water level is just three (3) feet below ground. This groundwater level in the two Wells is higher than the invert of the nearby Waiahole Stream (the wells are within 50 feet of the Stream) meaning that there is the potential for the groundwater tapped by the Wells is discharging into the stream. As such, pumpage by the Wells has the potential to reduce streamflow on up to a 1:1 basis and may have been doing so since the use of the Wells began in 1989. That possible reduction is relatively small compared to the volume of streamflow. USGS Stream Gage 16294100 measures the flowrate on Waiahole Stream at a location just inland from Kamehameha Highway. Its data are available from October 1, 2001 to the present. In other words, it does not provide streamflow data prior to the start of the use of the Wells to see if a potential reduction of streamflow attributable to use of the Wells can be determined. During the March 1994 Commission on Water Resource Management (CWRM) meeting in which the WUP was approved, there was an assumption that due to the very high groundwater levels in the Wells, a streamflow reduction on a 1:1 basis was occurring but without an adverse impact. The WUP was approved without objection.

Well Pumpage Versus Metered Customer Use

Based on data provided by the CWRM, Figure 4 depicts the combined pumpage of the two existing Waiahole Wells in comparison to their 0.075 MGD permitted use. The 12-month moving average (12-MAV) of pumpage (the 12-MAV on Figure 4) was often greater than the permitted use. Based on data compiled by Doonwood Engineering for HHFDC, Well pumpage exceeded metered customer use by a significant amount. On an actual basis, the exceedance amounted to 16.44 million gallons (MG) in 2019, 18.25 MG in 2020, and 17.15 MG in 2022. These amounts were equivalent to 32, 34, and 31.6



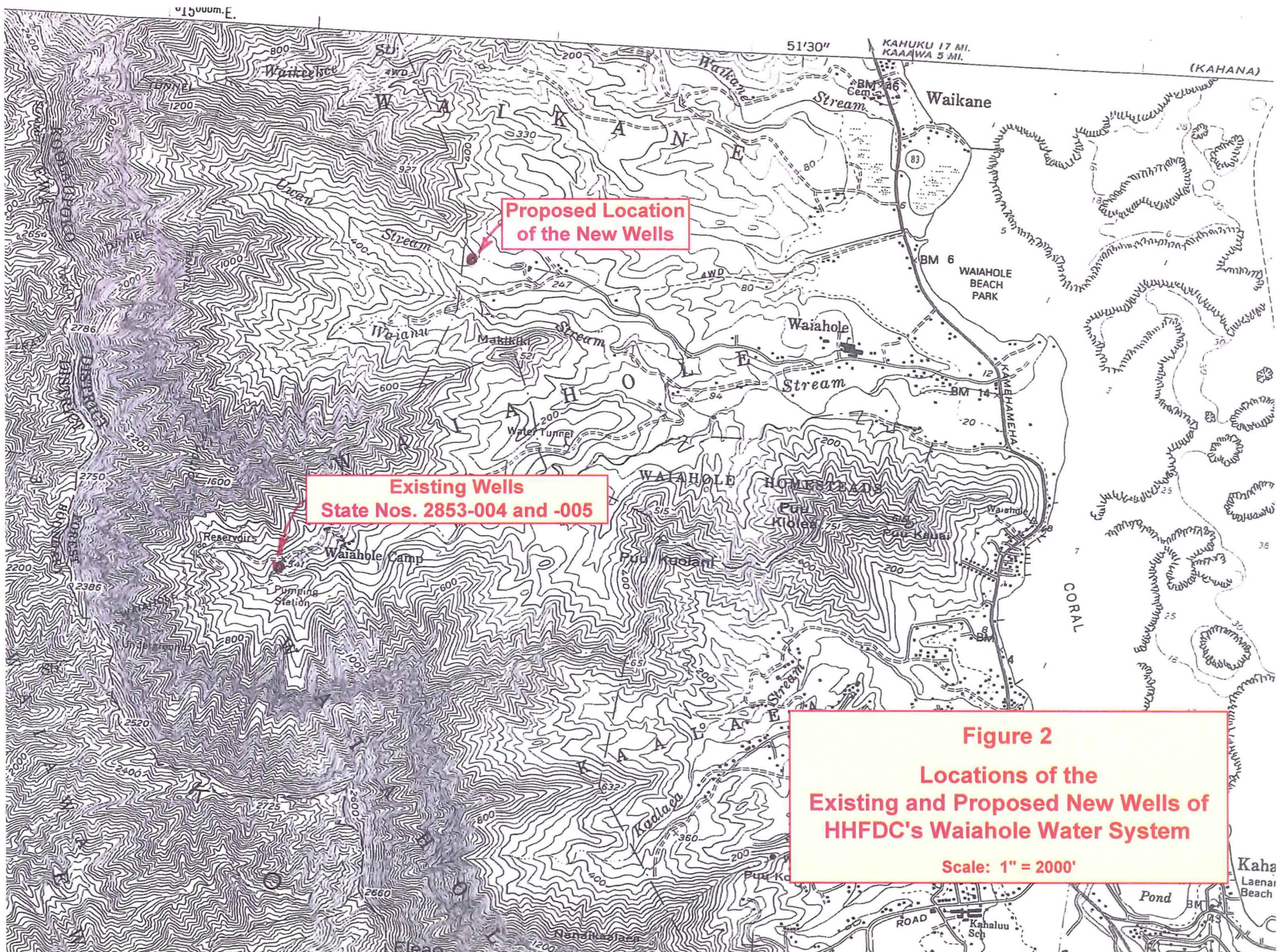


Figure 3
Total Reported Pumpage in the Koolaupoko Aquifer System

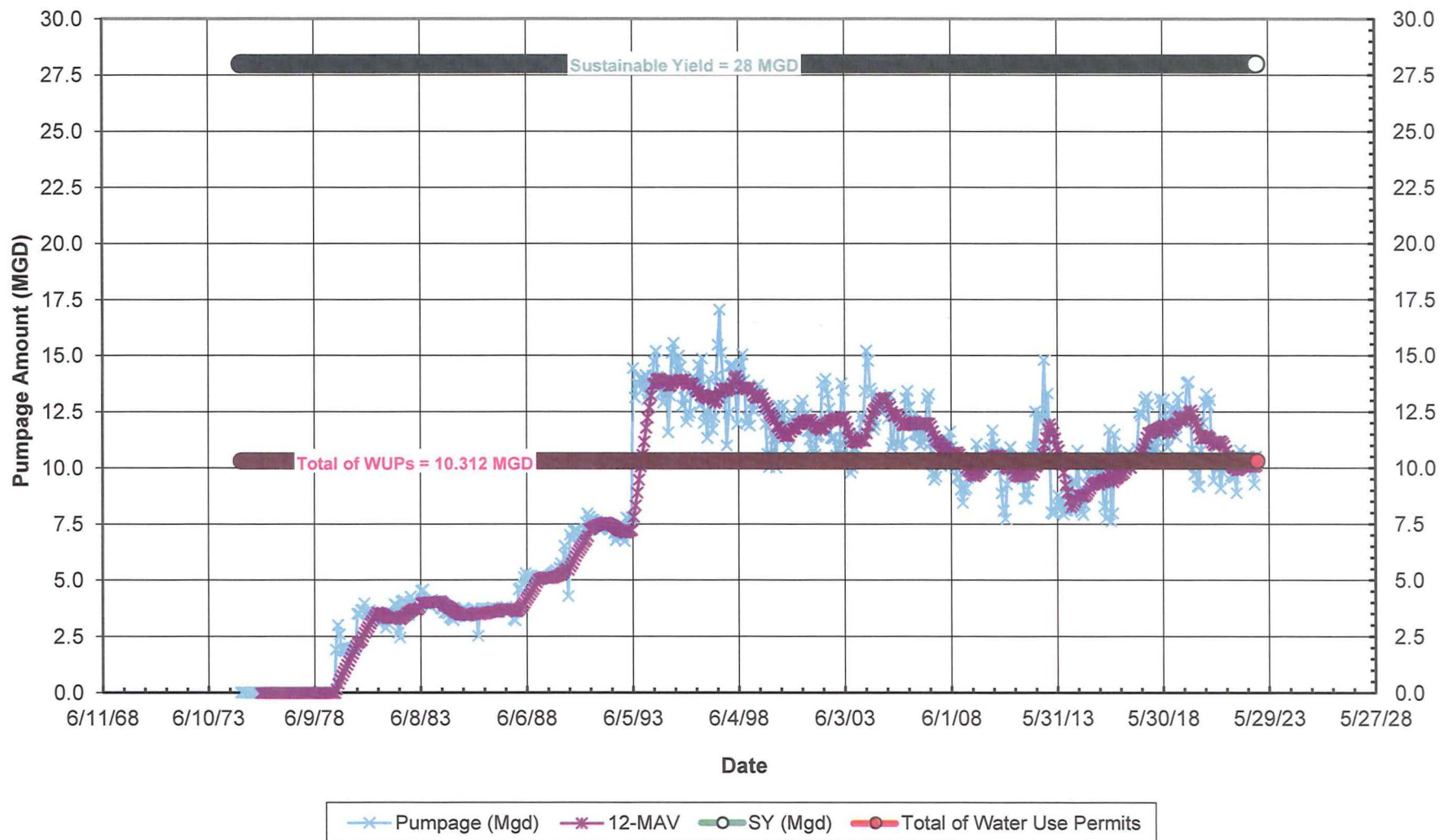
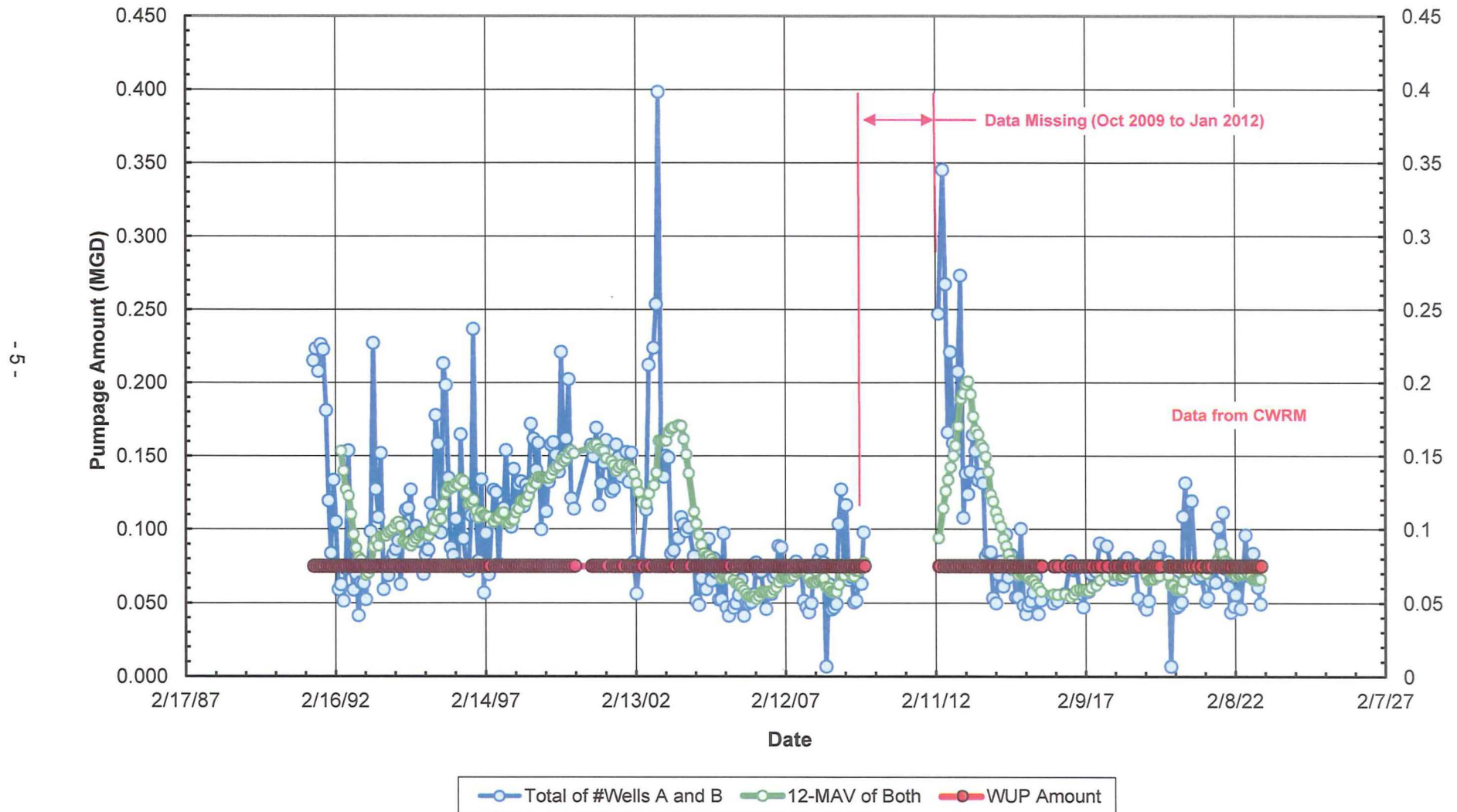


Figure 4
Combined Pumpage of Waiahole Wells A and B



percent of all the Well pumpage in those three years, respectively. This excess is attributed to known leakage losses (at the system's 1.0 MG storage tank, for example) and possibly unmetered use. In any event, the average use of the Well's over the 2019 to 2022 year period was 0.143 MGD, the appropriate amount for a WUP for the two new Wells.

Potential Reduction of Streamflow by the Two Proposed New Wells

The groundwater level at the site of the proposed new Wells is not known and will not be known until the pilot borehole of the first Well is drilled. There are no other Wells in the vicinity tapping into the Koolau volcanics from which to approximate the groundwater level. It may be relatively high as the alluvium covering the volcanics between the Well sites and the shoreline is likely to impede the groundwater movement toward the shoreline. Uwau Stream passes about 400 feet away from the closest of the two proposed Wells with an invert elevation about 80 feet lower than the ground elevation at the Wells. At this location and all along its route to connect with Waiahole Stream, the stream flows over consolidated non-calcareous alluvium, not the Koolau volcanics from which the groundwater will be withdrawn.

This alluvial layer of admittedly unknown thickness creates a physical separation from the groundwater in the volcanics beneath it and the flow in the stream. In other words, the alluvium provides a physical barrier from the Wells' draft of groundwater from the Koolau volcanics and the flow in the stream. As such, a reduction in streamflow due to pumpage by the proposed new Wells considered to be highly unlikely.

Magnitude of Streamflow

USGS Stream Gage 16294100 is located at 14-foot elevation on Waiahole Stream a short distance inland from Kamehameha Highway. It measures the Waiahole Streamflow plus the flow of the Uwau and Waianu Streams which discharge into the Waiahole Stream channel at about 60-foot elevation. Figure 5 illustrates the magnitude and variability of the stream's flowrate. For the 19-year period from 2002 through 2020, the measured flowrate averaged about 38.3 cubic feet per second (CFS), equivalent to 24.7 MGD. Based on the presumption of a 1:1 reduction of streamflow due to pumping the two existing Wells in the amounts shown on Figure 4, use of the Wells has been and continue to reduce the streamflow measure at the USGS Stream Gage by less than 0.5 percent, an obviously insignificant amount compared to the total streamflow. Discontinuing use of these Wells will presumably increase the streamflow by the ongoing Well pumpage amount. The increase will be too small to detect at the USGS Stream Gage.

Summary Conclusions

The assumed ongoing reduction in streamflow in Waiahole Stream caused by use of the existing Wells would be terminated when the Wells are taken out of use. The expected lack of a streamflow reduction by use of the proposed Wells means that there would be a net addition to streamflow. This conclusion needs to be verified during construction and testing of the new Wells.



USGS 16294100 Waiahole Stream above Kamehameha Hwy, Oahu, HI

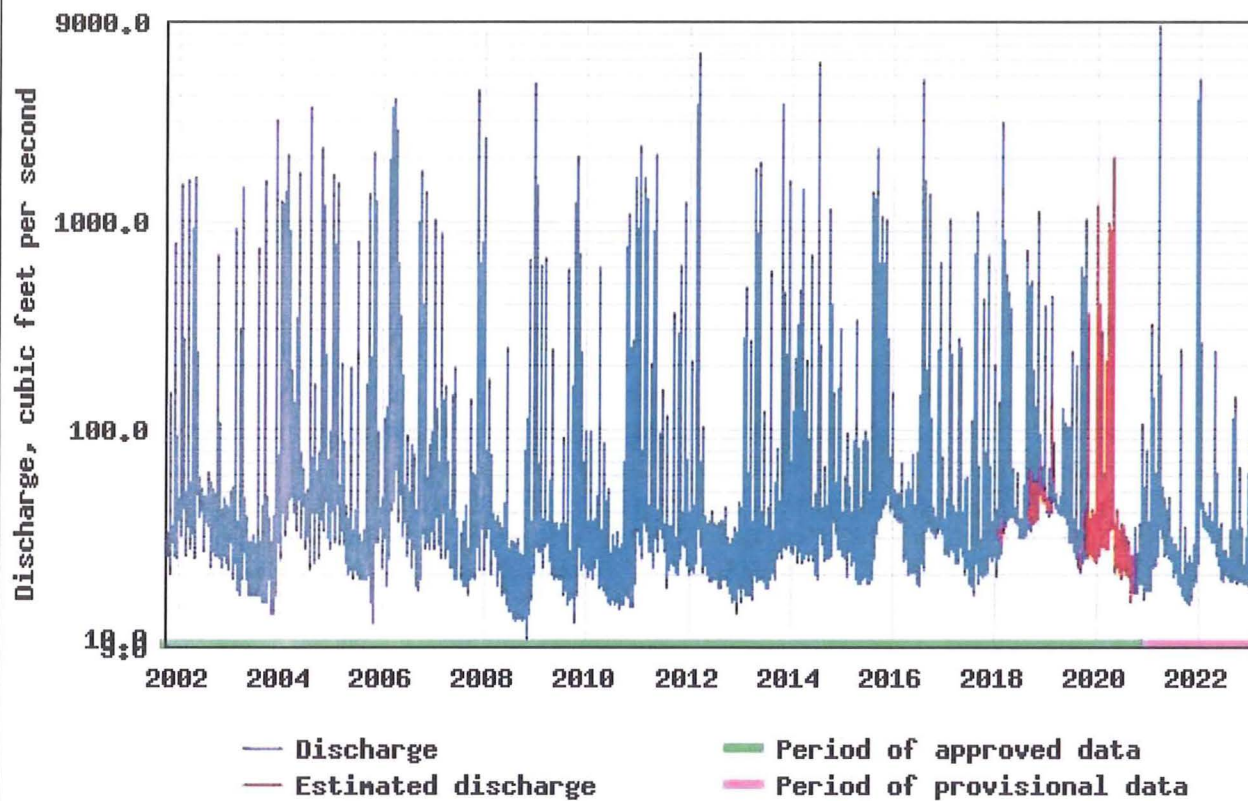
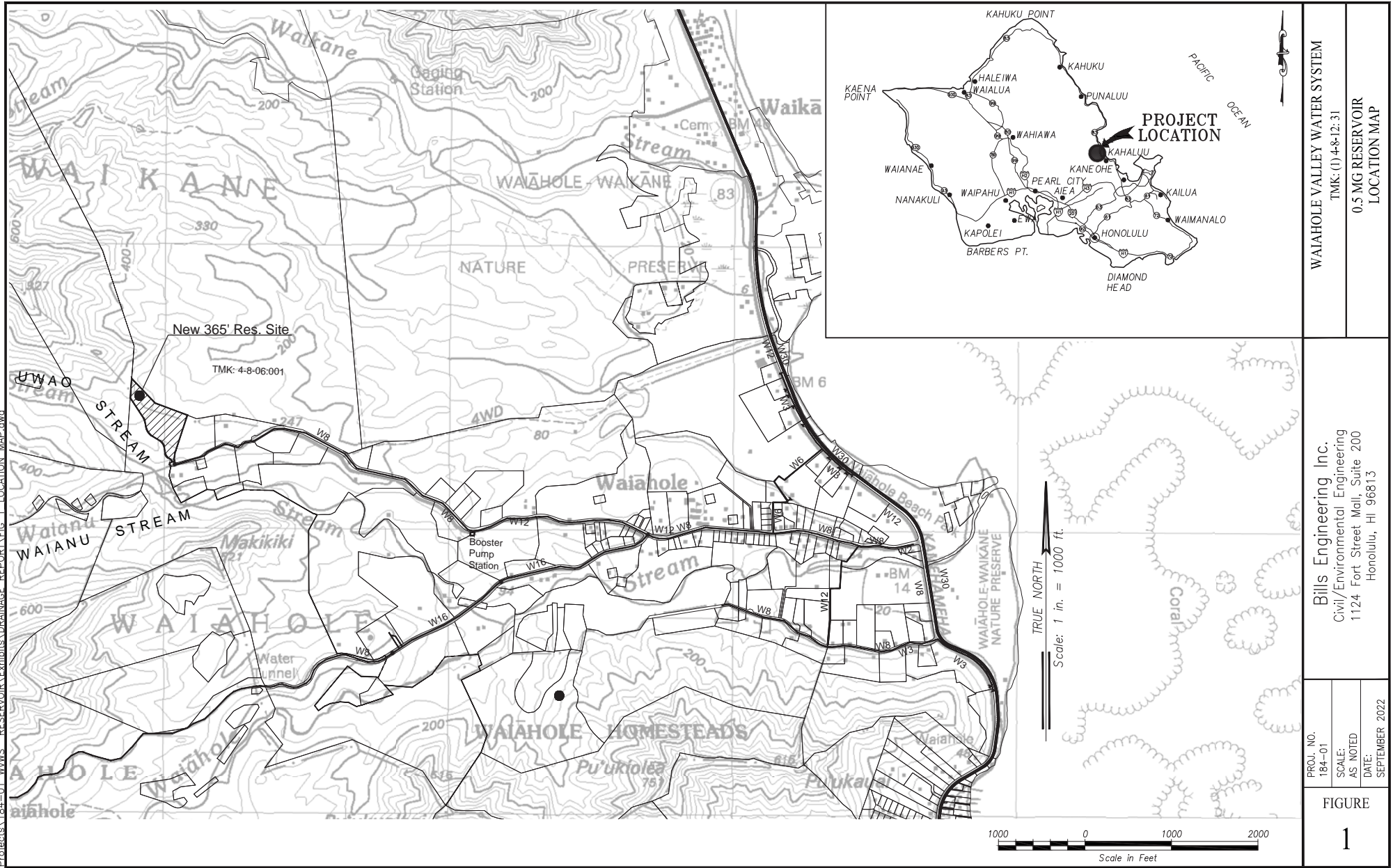
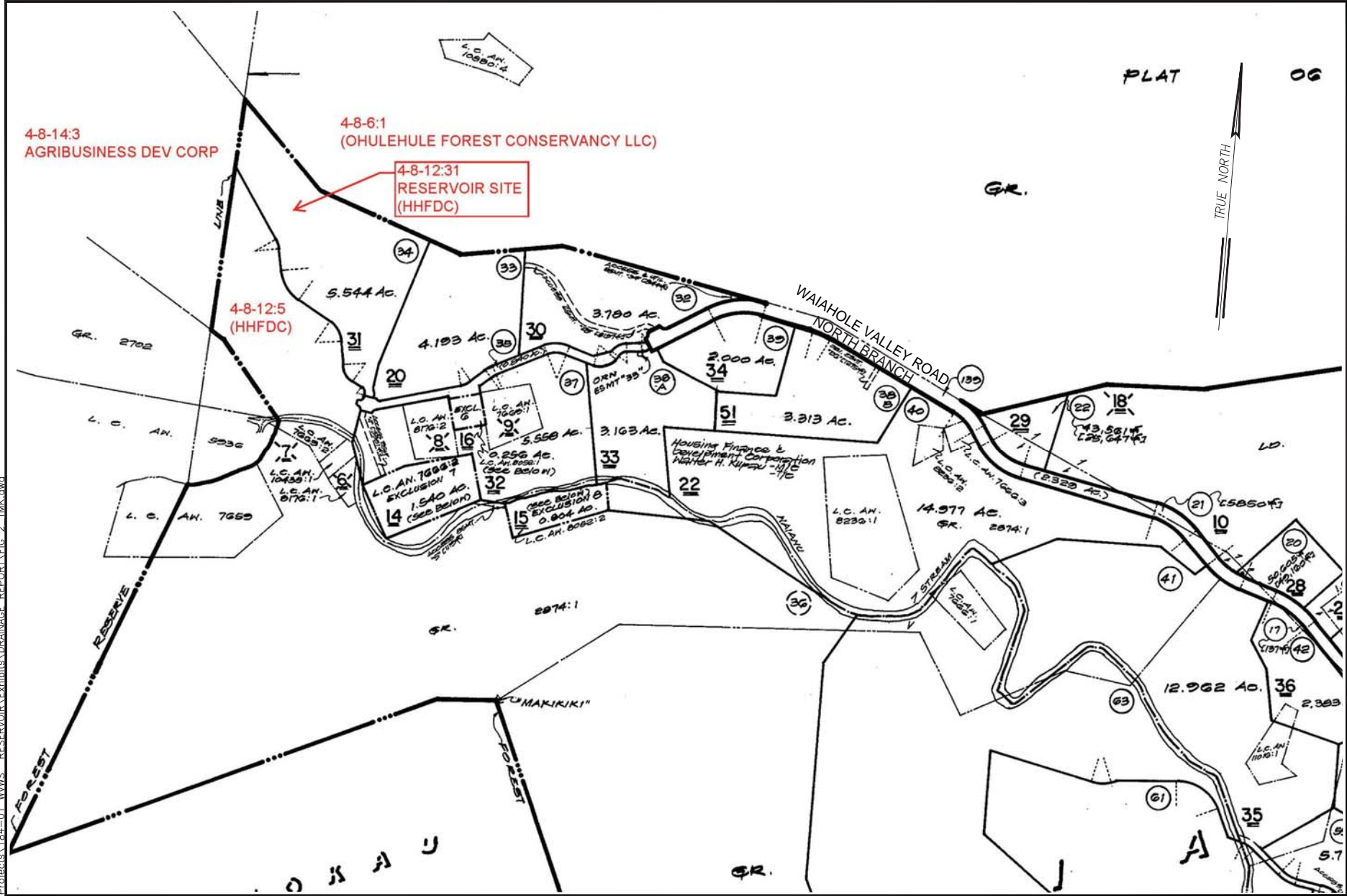


Figure 5
Daily Flow Rates at
USGS Stream Gage 16294100
on Waiahole Stream

Appendix C. Lot 50 Runoff Calculations





WAIHOLE VALLEY WATER SYSTEM

TMK: (1) 4-8-12: 31

0.5 MG RESERVOIR

TAX MAP KEY

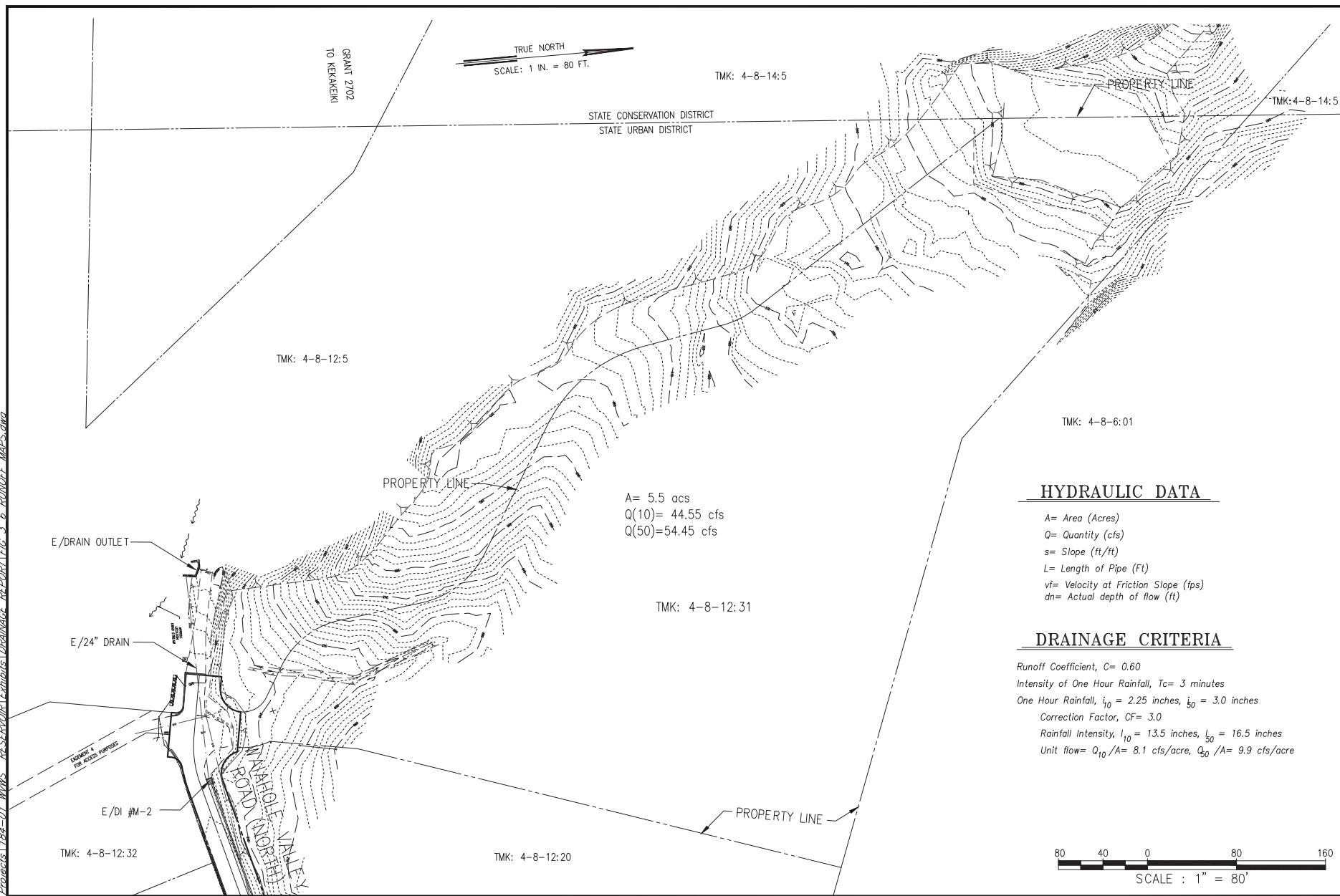
Bills Engineering Inc.
Civil/Environmental Engineering
1124 Fort Street Mall, Suite 200
Honolulu, HI 96813

PROJ. NO.
184-01
SCALE:
NOT TO SCALE
DATE:
SEPTEMBER 2022

FIGURE

2

Thu, 01 Sep 2022 - 10:15am
N:\Projects\184-01\184S - Reservoir Exhibits\DRainage Report\Fig. 3.6 Runoff Maps.dwg



A= 5.5 acs
Q(10)= 44.55 cfs
Q(50)=54.45 cfs

HYDRAULIC DATA

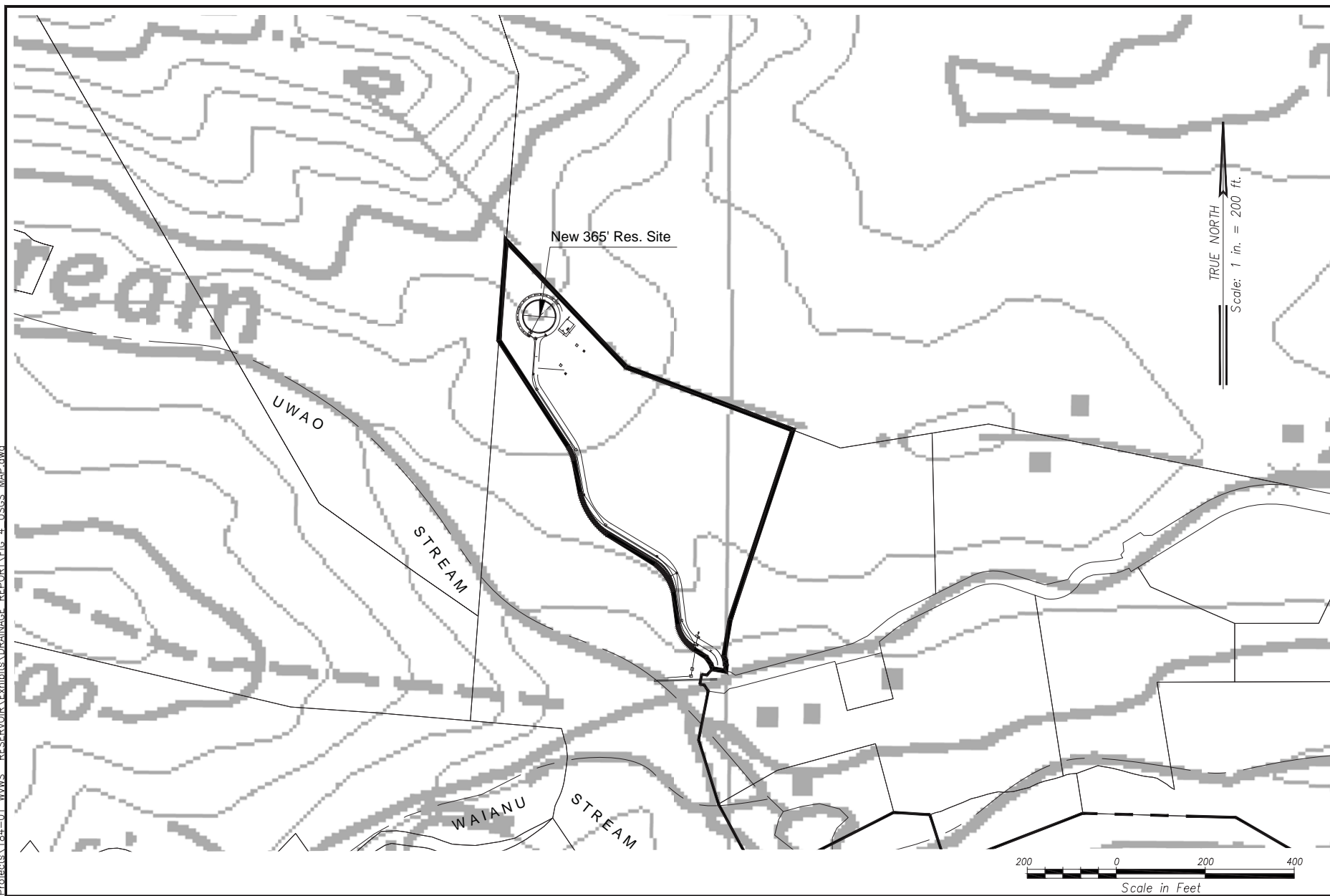
A= Area (Acres)
Q= Quantity (cfs)
s= Slope (ft/ft)
L= Length of Pipe (Ft)
vf= Velocity at Friction Slope (fps)
dn= Actual depth of flow (ft)

DRAINAGE CRITERIA

Runoff Coefficient, C= 0.60
Intensity of One Hour Rainfall, Tc= 3 minutes
One Hour Rainfall, i_{10} = 2.25 inches, i_{50} = 3.0 inches
Correction Factor, CF= 3.0
Rainfall Intensity, i_{10} = 13.5 inches, i_{50} = 16.5 inches
Unit flow= Q_{10}/A = 8.1 cfs/acre, Q_{50}/A = 9.9 cfs/acre



WAIHOLE VALLEY WATER SYSTEM	
TMK: (1) 4-8-12: 31	
0.5 MG RESERVOIR	
EXISTING CONDITIONS RUNOFF MAP	
Bills Engineering Inc. Civil/Environmental Engineering 1124 Fort Street Mall, Suite 200 Honolulu, HI 96813	
PROJ. NO. 184-01	FIGURE
SCALE: AS NOTED	3
DATE: SEPTEMBER 2022	



PROJ. NO. 184-01		Bills Engineering Inc. Civil/Environmental Engineering 1124 Fort Street Mall, Suite 200 Honolulu, HI 96813	WAIHOLE VALLEY WATER SYSTEM	
SCALE: AS NOTED			TMK: (1) 4-8-12: 31	
DATE: SEPTEMBER 2022			0.5 MG RESERVOIR USGS MAP	
FIGURE 4				

Appendix D. Archaeological Literature Review and Field Inspection Report

**Archaeological Literature Review and Field Inspection
for the Waiāhole Valley Water System Improvements
and Reservoir Project,
Waikāne and Waiāhole Ahupua‘a,
Ko‘olaupoko District, O‘ahu Island,
TMKs: [1] 4-8-007 through [1] 4-8-012**

**Prepared for
Bills Engineering, Inc.
On behalf of
Hawaii Housing Finance and Development Corporation**

**Prepared by
Gina M. Farley, M.A.,
Thomas Martel III, B.A.,
and
Matt McDermott, M.A.**

**Cultural Surveys Hawai‘i, Inc.
Kailua, Hawai‘i
(Job Code: WAIKANE 6)**

December 2022

O‘ahu Island	Maui Island	Hawai‘i Island	Kaua‘i Island
P.O. Box 1114	1860 Main Street	399 Hualani St.	2970 Kele St.
Kailua, HI 96734	Wailuku, HI 96793	Suite 124	Suite 114
Ph: (808) 262-9972	Ph: (808) 242-9882	Hilo, HI 96720	Lihua‘e, HI 96766
Fax: (808) 262-4950	Fax: (808) 244-1994	Ph. (866) 956-6478	Ph. (808) 245-9374

Management Summary

Reference	Archaeological Literature Review and Field Inspection for the Waiāhole Valley Water System Improvements and Reservoir Project, Waikāne and Waiāhole Ahupua‘a, Ko‘olaupoko District, O‘ahu, TMKs: [1] 4-8-007 through [1] 4-8-012 (Farley et al. 2022)
Date	December 2022
Project Number	Cultural Surveys Hawai‘i, Inc. (CSH) Job Code: WAIKANE 6
Investigation Permit Number	CSH completed the fieldwork component of this study under archaeological fieldwork permit numbers 18-15 and 22-02, issued by the Hawai‘i State Historic Preservation Division (SHPD) per Hawai‘i Administrative Rules (HAR) §13-282.
Agencies	SHPD; State of Hawai‘i Department of Business Economic Development and Tourism; Hawaii Housing Finance and Development Corporation (HHFDC); State of Hawai‘i Department of Transportation (HDOT)
Land Jurisdiction	State of Hawai‘i, City and County of Honolulu, Private
Project Proponent and Funding	HHFDC
Project Location	The proposed project will pursue one of two options: Option 1 (Board of Water Supply [BWS] Compliant System) and Option 2 (Private System). The project area comprises the combined extent of these two options and includes the length of Waiāhole Valley Road from its intersection with Kamehameha Highway to its division into the North and South Branch roads; Waiāhole Valley Road North Branch and a portion of Waiāhole Valley Road South Branch; an HHFDC-owned land parcel at the <i>mauka</i> (inland) terminus of Waiāhole Valley Road North Branch; a portion of Waiāhole Homestead Road; and portions of Kamehameha Highway north of Waiāhole Valley Road and north and south of Waiāhole Homestead Road. The project area is shown on a portion of the 1998 Kaneohe U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle (Figure 1), a tax map plat (Figure 2), and a 2020 aerial photograph (Figure 3).
Project Acreage	The project area is approximately 10 acres (4.05 hectares).
Project Description	The proposed project will pursue one of two options. Option 1, BWS Compliant System, involves the installation of a new water system that could be dedicated to the BWS (Figure 4). This option would improve the water system to BWS standards and turn it over to BWS to own, operate, and maintain. Option 2, Private System, involves modification of the existing system that could be managed by a company specializing in water system operation and management

	<p>(Figure 5). This option would improve the water system and turn it over to a private water system management company to operate and maintain; the ownership would continue to be HHFDC. If Option 1 is not feasible, Option 2 would be pursued. However, for either Option 1 or Option 2 to be feasible, a suitable well site at the 365-foot (ft) elevation reservoir site must be developed. The well site would be located on Lot 50 at the end of Waiāhole Valley Road North Branch. Development of the wells would include drilling, testing, and allocation of water allotments.</p> <p>Option 1, BWS Compliant System, would require the following project elements (see Figure 4):</p> <ol style="list-style-type: none"> 1. Install temporary access road and two water production wells on Lot 50. 2. Install long-term access road, 0.5 MG reservoir, pumps, water line from reservoir to road, 3-phase power to the well/reservoir site, and other accessory improvements on Lot 50. 3. Replace all potable water system piping in both north and south branches of Waiāhole Valley Road with ductile iron pipe class 53 to BWS standards, as well as potable water meters with backflow preventors to each lot. The new potable water system would be fed by the new 0.5 MG reservoir. 4. Provide emergency feed connection to the new 365-ft elevation reservoir by installing dual fire hydrants on the north branch of Waiāhole Valley Road and the main Waiāhole Valley Road. 5. Provide a connection to the BWS 265 water system on Kamehameha Highway to serve all lots below the fork in Waiāhole Valley Road and upgrade fire flow to Waiahole Valley Elementary School to the required 2,000 gallons per minute (gpm). 6. Connect all valley lots fronting Kamehameha Highway to the existing BWS 265 water system in the highway. 7. Provide a connection to the BWS 265 water system in Kamehameha Highway to serve all lots on Waiāhole Homestead Road. 8. Abandon the existing water system on Waiāhole Valley Road South Branch above the State Conservation/Urban Land Use boundary and decommission the existing two 1.0 MG wells in accordance with the Commission on Resource Water Management (CWRM) rules. In addition,
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	<p>the existing booster pump station on Waiāhole Valley Road North Branch would no longer be required, and the station would be decommissioned.</p> <p>Option 2, Private System, would require the following project elements (see Figure 5):</p> <ol style="list-style-type: none"> 1. Install temporary access road and two water production wells on Lot 50. 2. Install long-term access road, 0.5 MG reservoir, pumps, water line from reservoir to road, 3-phase power to the well/reservoir site, and other accessory improvements on Lot 50. <p>(Note: Items 1 and 2 are identical to Option 1).</p> <ol style="list-style-type: none"> 3. The existing potable water pipes would remain as potable and irrigation water service lines, and all lots would be provided with a water meter and backflow preventor. The primary difference is that the potable water system would be fed by the new well and 0.5 MG reservoir at the end of Waiāhole Valley Road North Branch instead of the existing wells. The existing water system on Waiāhole Valley Road South Branch would be abandoned above the State Conservation/Urban Land Use boundary, and the two existing 1.0 MG wells would be decommissioned in accordance with the CWRM rules. In addition, the existing booster pump station on Waiāhole Valley Road North Branch would no longer be required, and the station would be decommissioned. 4. The existing potable water pipe would be connected to the BWS 265 water system in Kamehameha Highway. The connection would be equipped with a BWS Detector Check Meter (DC Meter) and 12-inch water line to Waiahole Elementary School to provide adequate fire protection (2,000 gpm). <p>Associated work with all construction will be traffic control, erosion and sediment control, staging area management, material delivery management, possible temporary water delivery during water system change-over, construction equipment management, and inspection services.</p>
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Proposed Ground Disturbance	<p>Assuming successful well verification, the proposed project calls for the installation of a permanent access road, 0.5 MG reservoir, and well outfitting at the 365 reservoir site. This will include clearing and grubbing for the access road, 0.5 MG reservoir, and well sites. Grading will then follow clearing and grubbing for the roadway construction, 0.5 MG reservoir installation, and well outfitting. The permanent access road will be 12 ft wide with a maximum cut of 6 ft and fill of 2 ft. Grading for the 0.5 MG reservoir (74-ft diameter with surrounding temporary 10-ft-wide access road) will encompass 3 acres, with the cut ranging from 2–6 ft, and fill ranging from 2.5 ft (for the temporary access road) up to 6 ft (for a 13,600-sq-ft temporary earth pad). No additional grading will be necessary for the Reservoir Control Building and well outfitting.</p> <p>The permanent access road will include paving, water line installation, drain line installation, and underground electric and telecommunications installation. There is no adequate power available to the beginning of the access road, so new overhead electric and telecommunications will be brought to the beginning of the access road and converted to an underground system leading to the site's well pumps and control room. The 12-inch diameter drain line will be installed within the access road, with depth ranging from 3–4.5 ft. The 12-inch diameter water line will be installed within the reservoir access road, with depth ranging from 3–5 ft. Overhead electric and telecommunications will be installed from the intersection of Waiāhole Valley Road North and South Branches to the Reservoir Control Building. Overhead pole spacing will be 100 ft along the shoulder of the access road and Waiāhole Valley Road North Branch, with typical pole depth of 10 ft.</p> <p>Water line installation will include trenching, water line installation, and backfilling of the water line trench, with the final surface being asphaltic concrete paving. Lateral installation to individual lots will include service connections to the new water mains, terminating with a meter installation and shut-off valve just inside each lot property line. Installation of 8- and 12-inch water lines in existing roadways will involve a 4-ft-wide trench approximately 3–6 ft deep. The 1–2-inch water laterals to lot street frontages will have an average length of 20 ft, width of 2 ft, and depth of 2 ft.</p> <p>Note: Option 1, BWS Compliant System, would involve substantially more ground disturbance than Option 2, Private System.</p>
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Historic Preservation Regulatory Context	The proposed project is largely within State of Hawai‘i land and is funded by the HHFDC. It is therefore subject to historic preservation review under Hawai‘i Revised Statutes (HRS) §6E-8 and HAR §13-275. There is no federal involvement that would trigger compliance with federal historic preservation review legislation (e.g., Section 106 of the National Historic Preservation Act). HRS §6E-8 compliance is triggered by HHFDC approvals and funding.
Document Purpose	This investigation was designed—through historical, cultural, and archaeological background research and field inspection of the project area—to determine the likelihood that historic properties may be affected by the project and, based on findings, to consider cultural resource management recommendations. This document is intended to facilitate the project’s planning and to support the project’s historic preservation review compliance.
Natural Environment	<p>The project area is within Waikāne and Waiāhole Ahupua‘a on the Windward side of O‘ahu. The project area ranges from approximately 50 m (0.03 miles) to 2.5 km (1.55 miles) inland of Kāne‘ohe Bay. Elevations range from 1 m (3.3 ft) above sea level near the coast to 96.5 m (316.7 ft) above sea level in the <i>mauka</i>-most area. The Waiāhole Valley Road North Branch portion of the project area is along a prominent ridge. Average temperatures in the project area range from 22.5–23.1° C (72.5–73.6° F) (Giambelluca et al. 2014).</p> <p>Like all of the Windward valleys, Waikāne and Waiāhole valleys are affected by the prevailing winds in the island, which are the northeast trades that blow against the Ko‘olau Mountains (Juvik and Juvik 1998:55). The mountains create an orographic effect that results in an annual rainfall of up to 160 inches (4,064 mm) per year in the <i>mauka</i> sections of the valley. Rainfall in the project area ranges from 1,503 mm (59 inches) in <i>makai</i> (seaward) areas to 2,639 mm (104 inches) at the <i>mauka</i>-most point (Giambelluca et al. 2013). This rainfall produces strong flowing perennial streams, including Waiāhole Stream, Waianu Stream, and Uwao Stream in the immediate vicinity of the project area. These streams would have provided plentiful waters for both domestic and agricultural needs.</p> <p>According to the U.S. Department of Agriculture (USDA) Soil Survey Geographic (SSURGO) database (2001) and soil survey data gathered by Foote et al. (1972) (Figure 6), the project area’s soils consist of silty clays from the Waikane, Hanalei, and Alaeloa Series, as well as Pearl Harbor clay.</p>

Built Environment	As observed during 2018 (Figure 8 through Figure 20) and 2022 (Figure 21 through Figure 41) field inspections, most of the project area is along asphalt-paved roads. Kamehameha Highway is the main road along the coast, while the others are part of a residential development with an elementary school and one- and two-story single-family homes fronted by landscaped lawns. However, the area is not densely populated, and agricultural plots and large undeveloped tracts remain in the vicinity. The project area also includes a land parcel adjacent to the <i>mauka</i> terminus of Waiāhole Valley Road North Branch; it is largely overgrown with vegetation, but also includes a breadfruit farm and active residences.
Background Research Methods	Background research included a review of previous archaeological studies on file at the SHPD; review of documents at Hamilton Library of the University of Hawai‘i at Mānoa, the Hawai‘i State Archives, the Mission Houses Museum Library, the Hawai‘i Public Library, and the Bishop Museum Archives; study of historical photographs at the Hawai‘i State Archives and the Bishop Museum Archives; and study of historical maps at the Survey Office of the Department of Accounting and General Services. Historical maps and photographs from the CSH library were also consulted. In addition, Māhele records were examined from the Waihona ‘Aina database (Waihona ‘Aina 2000). This research provided the environmental, cultural, historical, and archaeological background for the project area.
Waikāne and Waiāhole Cultural Context	<p>The <i>ahupua‘a</i> (land divisions) of Waikāne and Waiāhole are in the district of Ko‘olaupoko on the windward side of O‘ahu. Ko‘olaupoko was rich in many of the resources utilized by traditional Hawaiians. The exploitation of marine resources is evidenced by the many fishponds around the coastal fringe of Kāne‘ohe Bay and by the presence of numerous fishing shrines. Inland from the coast, rich alluvial soils, an equable climate, and abundant water supply allowed the extensive cultivation of traditional crops, especially wetland taro. Handy and Handy (1972) characterized the <i>ahupua‘a</i> in the region as being extremely productive and capable of accommodating a significant population. The coastal plains were converted “into an almost continuous expanse of <i>lo‘i</i> (irrigated terraces) irrigated with water from large streams flowing out of the deep valleys” along the Ko‘olau mountain range (Handy and Handy 1972:452).</p> <p>Dating analyses from previous archaeological studies suggest that occupation of Waiāhole Valley began around AD 1200 (Tomonari-Tuggle and Tuggle 1984:1–16), while the bulk of activity probably occurred in the late pre- and early post-Contact periods (Shapiro et al. 1988:36). Early census data indicate that in 1831–32, 419 people lived within the two valleys of Waiāhole/Waikāne (Schmitt 1973:19). However, the population was likely considerably higher at the time of</p>

	<p>European contact; by the 1830s, the native Hawaiian population had already been severely diminished by contact with Western diseases. Also, many of the native inhabitants from these outlying districts had begun moving to the newly burgeoning population centers, such as Honolulu (Schmitt 1973:19, 33).</p>
Traditional and Historical Background	<p>During the Māhele, the <i>ahupua'a</i> of Waikāne was relinquished by L. Konia, and the <i>'ili</i> (land division smaller than an <i>ahupua'a</i>) of Kahala'a and Kai'iki were relinquished by Kaihiwa and N. Namau'u, respectively, to Kamehameha III. These lands were retained by the Government (i.e., Kingdom of Hawaii). According to the Waihona 'Āina land database, 42 claims for <i>kuleana</i> (commoner) parcels were made in Waikāne. In Waiāhole, two <i>'ili</i> (Hopeka and Makawai) were kept as "Crown Lands," and five <i>'ili</i> (Apua I, Makanilua, Poahamai, Poa, and Uau) were taken as "Government Lands." Fifty-three small Land Commission Awards (LCAs) comprising 106.89 acres were granted in Waiāhole. The average size of these awards is 2.02 acres, ranging between 0.47 and 5.6 acres. In addition, four larger awards (LCA 105 to William Walker [81.6 acres], LCA 5936 to Pu'uiki [225 acres], LCA 7137 to Kaho'ohano'hano [93 acres], and LCA 8603 to Kaniau [57.2 acres]) were also granted. Subsequently, three large areas of land were granted: Land Grants 702 and 703 (total 264.68 acres) to Kekakeiki in 1860 and Land Grant 874 (113.33 acres) to Kaopulupulu in 1862. Land Commission Awards within and in the vicinity of the project area are depicted on Figure 42 through Figure 44. Land Commission Awards within the project area are summarized in Table 1. The claims within the project area are for taro <i>lo'i</i>, <i>kula</i> (pastureland), <i>māla</i> (garden, patch) for <i>'awa</i> (<i>kawa</i>), and house lots.</p> <p>As indicated by Māhele documentation, the valleys of Ko'olaupoko, including Waiāhole and Waikāne, were known for extensive cultivation of traditional Hawaiian crops, particularly wetland taro. However, an increasing amount of land was left fallow as the population steadily declined post-Contact. A 1906 map (Figure 45) shows the <i>mauka</i> portions of the project area within "grazing lands," while the <i>makai</i> portions are within wetland areas utilized for the cultivation of taro and/or rice. After a long period of decline, the population of Ko'olaupoko once again began to increase in the 1870s; this seems to have been directly related to the development of the rice growing industry in the region, which began in the late 1860s or early 1870s. Rice production on former taro lands throughout the islands was attributed primarily to the Chinese (Miyagi 1963:106). By 1880, there were three rice plantations in Waikāne (Bowser, in Devaney et al. 1982:51), and 200 acres of land were under rice cultivation by 1892 (Coulter and Chun, in Miyagi 1963:108).</p>

	<p>Following the rice industry’s peak in Hawai‘i ca. 1910, it rapidly declined. By 1925, most rice fields were abandoned when the former Chinese residents moved to Honolulu or back to China (Young 1975:5). However, the Waikāne-Waiāhole area continued to be rural and primarily dependent on agriculture throughout the twentieth century. While rice cultivation came to dominate the landscape, taro cultivation remained common, and other crops including introduced vegetables and fruits were also grown. These included cabbage, radishes, onions, turnips, beans, lotus root, litchi, mango, lungan, pomelo, and banana (Devaney et al. 1982:53). A series of maps and aerial photographs (Figure 46 through Figure 51) reflect the slow development of the project area and surrounding lands throughout the twentieth century.</p> <p>Lincoln McCandless was a cattle rancher, industrialist, and politician for the Territory of Hawaii. He and his brother had financial interests in the Oahu Sugar Company in Waipahu, and expansion of the plantation required additional sources of water that could be provided with the construction of the Waiāhole ditch and tunnel system. The system, constructed between 1913 and 1916, began at Kahana Valley, and a series of tunnels were dug through the Ko‘olau Mountains. McCandless sub-leased water rights above 600 ft elevation (<i>mauka</i> of the current project area) for the Waiāhole Tunnel Project but maintained water rights within the lower elevations of Waikāne and Waiāhole (Griffin and Pyle 1974:12).</p> <p>On 27 May 1916, the tunnel was fully operational, and the waters were diverted from Waiāhole, Waikāne, and Kahana Valleys to the ‘Ewa plains. As the Oahu Sugar Company began shutting down in the mid-1990s, three Windward O‘ahu community organizations petitioned the Water Commission to restore flows to Ko‘olaupoko streams, including Waikāne and Waiāhole streams and their tributaries. In December of 1994, the Water Commission directed that 8 million gallons per day would flow through the tunnels to Leeward O‘ahu, and the rest would flow to the Windward streams (State of Hawai‘i 1997:4).</p> <p>The Department of the Army entered into a lease with Lincoln McCandless’ heirs and the Waiāhole Water Company in 1942 for 1,061 acres, establishing the Waikane Valley Training Area (north of the current project area). The Army used this training area until 1953, when the Marine Corps was substituted as the lessee. The land was “utilized for advanced training in offensive warfare and air-to-ground practice bombing” during World War II, and the Marine Corps continued this type of training after assuming the lease in 1953. The</p>
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	<p>U.S. Marines abandoned a plan to use this training area in 2003, because the unexploded ordinance on site was too dense (Cole 2011).</p> <p>In 1977, the State of Hawai‘i purchased 600 acres of land from the heir to the McCandless Estate, Elizabeth Marks. The State paid \$6 million to acquire this land in the hopes of developing what was to be called the Waiāhole Agricultural Park. They began “negotiating long term leases with the Waiāhole-Waikāne Community Association, which represents most of the farmers in the valley” and were looking at ways to develop the necessary infrastructure to support the farm and house lots. Of the 600 acres, “365 are to be leased for agricultural use, 52 acres leased for residential, and almost all the remainder (including steep sloped land) will be open space” (Environment Hawaii 1994).</p>
Prior Archaeological Studies	<p>Previous archaeological studies within and in the vicinity of the project area are presented in Figure 52 and summarized in Table 2. Previously identified historic properties in the vicinity are presented in Figure 53 and summarized in Table 3. Previous studies that are at least partially within the current project area are discussed below.</p> <p>Barrera (1982) presented the results of a brief reconnaissance and literature review in support of the Waiāhole Valley Agricultural Park project. He noted an abandoned system of taro terraces in the vicinity of LCA 10230. He concluded, “the entire valley of Waiāhole is probably eligible to the State and National Registers of Historic Places as an archaeological district” (Barrera 1982:3).</p> <p>Tomonari-Tuggle (1983) reported on a more in-depth archaeological reconnaissance survey in support of the Waiāhole Valley Agricultural Park project studied previously by Barrera (1982, see above). This consisted of five discrete survey areas in the central portion of Waiāhole Valley. Tomonari-Tuggle (1983) documented 28 historic properties, 19 of which are in the area of the juncture of Waiāhole and Waianu streams. The historic properties included habitation areas, stone tool manufacturing workshops, and agricultural features related to both traditional taro cultivation and historical rice cultivation. Of these, three are in relatively close proximity to the current project area (within 30 m). State Inventory of Historic Places (SIHP) #s 50-80-10-3509 (bridge foundation), 50-80-10-3510 (agricultural field deposits), and 50-80-10-3513 (ditches) are near the current project’s Option 1 (BWS Compliant System), as well as SIHP # 50-80-10-3514 (artifact scatter) near both Option 1 (BWS Compliant System) and Option 2 (Private System).</p> <p>In 1984, Tomonari-Tuggle and Tuggle documented excavation and mapping work at SIHP #s 50-80-10-3509 through -3513 and -3526, all near the confluence of Waiāhole and Waianu streams and</p>

	<p>previously described in an earlier work (Tomonari-Tuggle 1983, see above); none of these historic properties are within or in the immediate vicinity of the current project area. Tomonari-Tuggle and Tuggle (1984) reported six radiocarbon dates from SIHP # -3512 (the locus of most of their research) and concluded the site was used for both agriculture and habitation from the late pre-Contact period into the post-Contact period.</p> <p>CSH (Hammatt et al. 1987) conducted archaeological testing of a lithic workshop (SIHP # 50-80-10-3512, previously documented by Tomonari-Tuggle 1983, see above) on a low knoll overlooking the confluence of Waianu and Waiāhole streams. Both habitation and flaking activity were documented by Hammatt et al. (1987), who suggest final stage flaking of adzes was the single most important economic activity at the site. The single radiocarbon date, AD 1655–1950, was regarded as consistent with six of the dates reported by Tomonari-Tuggle (1983), while the earlier Tomonari-Tuggle (1983) dates were questioned due to their apparent shared stratigraphic context with later dates (Hammatt et al. 1987:41).</p> <p>CSH (Walsh et al. 1995) conducted a literature review and field inspection of coastal areas of Waiāhole and Waikāne. The study notes vaguely defined fields with <i>lo'i</i> type soils, a possible <i>'auwai</i>, and a buried cultural layer with possible water-worn basalt flakes and charcoal. However, no SIHP numbers were assigned.</p> <p>CSH (Perzinski et al. 2002) conducted an AIS of a 21-acre parcel at coastal Waiāhole. Two historic properties were identified, SIHP # 50-80-10-1086 (historical grave plots) and 50-80-10-6396 (the probable <i>Pōhaku O Kāne</i>). Kamakau (1961:32, in Perzinski et al. 2002) describes the <i>Pōhaku O Kāne</i> as a “place of refuge, a <i>pu'u honua</i>, for each family from generation to generation. It was not a <i>heiau</i>; it was a single stone monument (<i>he wahi 'eo 'eo pōhaku ho 'okahi</i>), and a <i>kuahu</i> altar with ti and other greenery planted about.” Both historic properties were recommended for preservation; neither are within the current project area.</p> <p>CSH (O'Leary et al. 2005) conducted an AIS of a 9-acre parcel at coastal Waiāhole. Three historic properties were identified: SIHP #s 50-80-10-6756 (subsurface structural remnant), 50-80-10-6757 (historical road segment), and 50-80-10-6758 (agricultural complex). SIHP # -6758, subsurface <i>lo'i</i> soil, and SIHP # -6758 Feature C, <i>'auwai</i>, are adjacent to the current project area (Option 1, BWS Compliant System). Of note, the Feature C <i>'auwai</i> begins at a culvert that extends beneath Kamehameha Highway, within the current project area (Figure 54). The <i>'auwai</i> is described as an “earthen ditch,” and O'Leary et al. (2005:79) note, “While the <i>'auwai</i> was dry</p>
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	<p>at the time the field work was conducted, at one time it would have carried the water that was used for the <i>lo'i</i>.”</p> <p>Keala Pono (McElroy and Duhaylonsod 2015) conducted an AIS (reported as an archaeological assessment) of TMK: [1] 4-8-008:003 in Waiāhole. The AIS included a pedestrian survey and five test excavations. Although SIHP # 50-80-10-3506, a ditch, was thought to extend through the subject property, it was not identified. The entire property appeared to have been disturbed, and no historic properties were documented.</p>
Background Summary and Predictive Model	<p>The windward <i>ahupua'a</i> of Waiāhole and Waikāne are rich in resources valued by traditional Hawaiians, including the marine resources of Kāneʻohe Bay, abundant perennial streams and alluvial soils for the cultivation of taro and other crops, and veins of high-quality basalt for the manufacture of stone tools. Not surprisingly, relatively early radiocarbon dates (ca. AD 1200) suggest occupation of Waiāhole Valley by the end of the Foundation Period or beginning of the Early Expansion Period within the Hawaiian Cultural Sequence (Kirch 2010). Certainly by the time of Western contact in 1778, these valleys were intensely cultivated. Mid-nineteenth century Māhele records list 42 <i>kuleana</i> claims within Waikāne Valley and 53 within Waiāhole Valley, along with several larger Land Grants and Royal Patents. Land Commission Awards within the project area are for taro <i>lo'i</i>, <i>kula</i>, <i>māla</i> for <i>awa</i>, and house lots.</p> <p>A previous archaeological study by O'Leary et al. (2005) documented SIHP # -6758, subsurface <i>lo'i</i> soil, and SIHP # -6758 Feature C, <i>'auwai</i>, adjacent to the current project area (Option 1, BWS Compliant System). Of note, the Feature C <i>'auwai</i> begins at a culvert that extends beneath Kamehameha Highway, within the current project area. In addition, SIHP #s -3509 (bridge foundation), -3510 (agricultural field deposits), and -3513 (ditches) are in relatively close proximity (within 30 m) to the current project's Option 1 (BWS Compliant System), while SIHP # -3514 (artifact scatter) is in proximity to both Option 1 (BWS Compliant System) and Option 2 (Private System).</p> <p>Historic properties within the project area may also include the network of in-use roadways within Waiāhole Valley, which consist of Waiāhole Valley Road, including the North and South Branches, and Waiāhole Homestead Road. This road network appears as unimproved roads on a 1919 map (see Figure 46), with improvements (i.e., paving) beginning ca. 1968 (see Figure 50). Although these in-use roadways are potentially over 50 years old, they are not significant archaeological historic properties.</p>

Fieldwork Methods	<p>During the two field inspections, the archaeologists walked along both sides of the streets that are included in the project area. For the parcel at the <i>mauka</i> end of the project area (i.e., at the <i>mauka</i> end of Waiāhole Valley Road North Branch), the archaeologists generally walked in transects oriented <i>mauka-makai</i> and spaced approximately 10 m apart; however, a breadfruit farm and active residences within this parcel were not inspected. One archaeologist's track log each from the 2018 and 2022 field inspections are presented in Figure 55 and Figure 56, respectively.</p> <p>Photographs of the project area were taken to show the natural and built environment within and surrounding the project area. Potential historic properties within and in the immediate vicinity of the project area were documented with scaled photographs, a brief written description, and GPS point(s) taken with a hand-held Garmin GPSMAP 64s. These handheld units provide horizontal accuracy between 3 and 5 m.</p>
Initial Field Inspection (2018)	<p>The initial field inspection was conducted on 12 and 20 April 2018 by Gina Farley, M.A., Erika Nielsen, M.A., and Ena Sroat, B.A., under the general supervision of Matt McDermott, M.A. This work required approximately 2.5 person-days to complete. Photographs were taken of all portions of the project area, as it was understood at the time (see Figure 7 through Figure 20).</p> <p>Most of the asphalt-paved roads have neither curbing nor a sidewalk. Evidence of existing subsurface utility infrastructure in the form of storm drains, culverts, fire hydrants, and manholes was observed. Vegetation in the immediate vicinity includes ornamental <i>tī</i> (<i>Cordyline fruticosa</i>), mango (<i>Mangifera indica</i>) and papaya (<i>Carica papaya</i>) trees, coconut palms (<i>Cocos nucifera</i>), <i>hala</i> (<i>Pandanus tectorius</i>), monkeypod trees (<i>Albizia saman</i>), birds of paradise (<i>Strelitzia reginae</i>), <i>Ficus</i> spp., 'ape (giant taro, <i>Alocasia macrorrhizos</i>), tomato (<i>Solanum lycopersicum</i>), and orchids (<i>Orchidaceae</i> spp.).</p> <p>The parcel at the <i>mauka</i> terminus of the project area comprises moderately sloping land that is overgrown with vegetation including fiddle-leaf fig (<i>Ficus lyrata</i>) and strawberry guava (<i>Psidium cattleianum</i>) trees (see Figure 17 through Figure 19). Three access roads, or road remnants, were identified in this area during the field inspection. Several discarded automobile tires were by one of the roads, indicating it was traversed by vehicles at some point. One of the roads was lined with what appeared to be relatively recently planted saplings (see Figure 19). Two modern glass bottles and a modern hunting blind were also identified in this portion of the project area.</p>

	<p>Eight potential historic properties designated as CSH 1 through CSH 8 were identified during the field inspection (Figure 57 through Figure 70). One, CSH 7, was identified as being within the project area, while the rest, CSH 1 through CSH 6 and CSH 8, were identified as being in the immediate vicinity but just outside the project area. However, CSH 8 also appears to be within the current project area, which was expanded subsequent to the 2018 field inspection. CSH 7 and CSH 8 are both at the <i>mauka</i> terminus of Waiāhole Valley Road North Branch.</p> <p>The eight potential historic properties are described below:</p> <p>CSH 1 is a mortared basalt and coral retaining wall on the south side of Waiāhole Valley Road. The wall exhibits four phases of construction, which are designated as Features A through D (see Figure 58 through Figure 60).</p> <p>CSH 2 comprises a concrete culvert, designated as Feature A, and an associated mortared basalt retaining wall, designated as Feature B, on the north side of Waiāhole Valley Road (Figure 61 and Figure 62).</p> <p>CSH 3 is a mortared basalt and concrete culvert on the north side of Waiāhole Homestead Road (see Figure 63).</p> <p>CSH 4 is a mortared basalt retaining wall on the south side of Waiāhole Homestead Road (see Figure 64).</p> <p>CSH 5 is a mortared basalt culvert at the northwest corner of the Waiāhole Valley Road–Kamehameha Highway intersection (see Figure 65 and Figure 66).</p> <p>CSH 6 is a mortared basalt retaining wall on the north side of Waiāhole Valley Road South Branch (see Figure 67).</p> <p>CSH 7 is a remnant of a fence composed of wood posts and barbed wire in the project area adjacent to the terminus of Waiāhole Valley Road North Branch (see Figure 68). The fenceposts are aligned roughly north-south, following the ridgeline, and continue north beyond the boundary of the project area for an indeterminate distance. This fence likely served as a boundary marker.</p> <p>CSH 8 comprises a mortared basalt culvert, designated as Feature A, and an associated mortared basalt ditch, designated as Feature B (see Figure 69 and Figure 70). Feature A was documented on both sides of a paved road, just beyond the terminus of Waiāhole Valley Road North Branch, leading to the confluence of Uwao and Waianu streams. A concrete pipe associated with Feature A extends beneath the road; in one area, the pipe is exposed at the surface and exhibits damage from a basalt boulder. Feature A connects with Feature B on</p>
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	the south side of the road, transporting water down to nearby Uwao Stream.
Second Field Inspection (2022)	<p>Subsequent to the initial field inspection in 2018, the proposed project was revised, and the project area was expanded to include a larger area at the <i>mauka</i> terminus of Waiāhole Valley Road North Branch, as well as additional portions of Waiāhole Valley Road North and South Branches, Waiāhole Homestead Road, and Kamehameha Highway (see Figure 3). Hence, a second field inspection was conducted in 2022, targeting the portions of the project area not addressed by the 2018 field inspection (discussed above).</p> <p>The fieldwork for the second field inspection was conducted on 30 June 2022 and 01 July 2022 by Thomas Martel III, B.A., Kellen Tanaka, B.A., and Gage Bailey, B.A., under the general supervision of Matt McDermott, M.A. This work required approximately six person-days to complete. Photographs were taken of the additional portions of the project area, including lateral extensions (see Figure 21 through Figure 41).</p> <p>As documented during the initial field inspection, most of the asphalt-paved roads have neither curbing nor a sidewalk. Evidence of existing subsurface utility infrastructure in the form of storm drains, culverts, fire hydrants, and manholes was noted. Vegetation in the immediate vicinity includes ornamental <i>tī</i> (<i>C. fruticosa</i>), mango (<i>M. indica</i>) and papaya (<i>C. papaya</i>) trees, coconut palms (<i>C. nucifera</i>), <i>hala</i> (<i>P. tectorius</i>), monkeypod trees (<i>A. saman</i>), birds of paradise (<i>S. reginae</i>), <i>Ficus</i> spp., ‘ape (giant taro, <i>A. macrorrhizos</i>) taro (<i>Colocasia esculenta</i>), breadfruit (<i>Artocarpus altilis</i>), ginger (<i>Zingiber</i> sp.), tomato (<i>S. lycopersicum</i>), and orchids (<i>Orchidaceae</i> spp.).</p> <p>The large parcel at the <i>mauka</i> terminus of the project area comprises moderately sloping land overgrown with vegetation, including fiddle-leaf fig (<i>F. lyrata</i>) and strawberry guava (<i>P. cattleyanum</i>) trees (see Figure 21 through Figure 25). Portions of this parcel appear to function as a breadfruit farm and active residences (see Figure 21). Access roads, or road remnants, were identified in this area during the field inspection (see Figure 22), as were numerous abandoned vehicles (see Figure 23 and Figure 24). Modern hunting blinds and traps are also in this portion of the project area (see Figure 25).</p> <p>Twenty-three potential historic properties designated as CSH 9 through CSH 20 and CSH 22 through CSH 32 were identified during the second field inspection (Figure 71 through Figure 100); CSH 21 was eliminated after the field inspection. In addition, SIHP # -6758 Feature C, ‘<i>auwai</i> documented by O’Leary et al. (2005) adjacent to</p>

	<p>the current project area, was inspected and photographed (see Figure 53, Figure 54, Figure 101, and Figure 102). Four of the potential historic properties, CSH 14 through CSH 17, are within the project area, at the <i>mauka</i> terminus of Waiāhole Valley Road North Branch. The rest are in the immediate vicinity but appear to be just outside the project area. The potential historic properties and SIHP # -6758 Feature C are described below:</p> <p>CSH 9 comprises two features in close proximity to one another, designated as Features A and B, likely part of a historical habitation complex. It is on the north side of Waiāhole Valley Road North Branch, near an overgrown driveway with bollards installed. Both features are concrete structural remnants, likely associated with former habitations. Feature A comprises a rectangular raised concrete perimeter with metal rebar (see Figure 71). Feature B comprises a wood-formed raised rectangular concrete slab (see Figure 72). The features are surrounded by historical to modern trash, as well as wood, nails, and corrugated metal that were likely part of the former structures (see Figure 73).</p> <p>CSH 10 is a concrete structural remnant, likely associated with a former habitation, near the north edge of the project area's <i>mauka</i> parcel. It comprises a raised rectangular concrete slab with a metal fence on the downslope (northeast) side. Metal poles are installed in the ground at the corners of CSH 10, which is surrounded by likely historical to modern trash (see Figure 74).</p> <p>CSH 11 is a likely pet grave composed of basalt cobbles, bricks, and concrete with a wood two-by-four serving as a headstone. The wood is inscribed "ONE EYE WILLY" in marker (see Figure 75). CSH 11 is in close proximity to CSH 10, discussed above. Note: this pet grave did not appear to be greater than 50 years old.</p> <p>CSH 12 is a mortared basalt bridge/culvert that spans Uwau Stream near its confluence with Waianu Stream. Two metal pipes function as the culvert portion of CSH 12. Both ends of the bridge have been impacted by erosion (see Figure 76).</p> <p>CSH 13 comprises two mortared basalt walls on the north side of Waiāhole Valley Road North Branch, designated as Features A and B. They are free-standing walls, faced on both sides, with concrete caps. They are generally linear, paralleling the road, then curve out to the north, with an approximately 10-m gap between the two (see Figure 77 and Figure 78). They likely served as property boundaries, with the gap as a driveway entrance. The west end of Feature A and east end of Feature B both transition to metal fences.</p>
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	<p>CSH 14 is a mortared basalt retaining wall on the north side of Waiāhole Valley Road North Branch (see Figure 79). It is faced on the south side and has a concrete cap with a metal fence installed on the top, as well as PVC drainage holes near the base (see Figure 80). It curves along the north side of the road.</p> <p>CSH 15 is a mortared basalt retaining wall on the north side of Waiāhole Valley Road North Branch (see Figure 81). It is faced on the south side and has a concrete cap with a metal fence installed on the top, as well as PVC drainage holes near the base.</p> <p>CSH 16 is a mortared basalt retaining wall on the southeast side of Waiāhole Valley Road North Branch (see Figure 82). It is faced on the southeast (downslope) side and has a concrete cap with a metal fence installed on the top. It retains the roadside and is of relatively shorter height than the other walls.</p> <p>CSH 17 is a mortared basalt retaining wall on the southeast side of Waiāhole Valley Road North Branch, near the gate at the <i>mauka</i> end of the road (see Figure 83). It does not have a metal fence installed on the top but rather a remnant barbed wire fence.</p> <p>CSH 18 is a mortared basalt retaining wall on the north side of Waiāhole Valley Road North Branch (see Figure 84). It is faced on the north (downslope) side and has a concrete cap with a metal fence installed on the top. It retains the roadside.</p> <p>CSH 19 is a mortared basalt retaining wall on the south side of Waiāhole Valley Road North Branch (see Figure 85). It is faced on the south (downslope) side and has a concrete cap with a metal fence installed on the top. It retains the roadside.</p> <p>CSH 20 is a mortared basalt retaining wall on the south side of Waiāhole Valley Road North Branch (see Figure 86). It is faced on the south (downslope) side and has a concrete cap with a metal fence installed on the top. It retains the roadside and curves along the south side of the road.</p> <p>CSH 22 is a mortared basalt retaining wall on the northwest side of Waiāhole Valley Road South Branch (see Figure 87). It is a blocky “U”-shaped wall faced on the southeast (downslope), northeast, and southwest sides. It has a concrete cap with a metal fence installed on the top and PVC drainage holes near the base.</p> <p>CSH 23 is a mortared basalt retaining wall on the southeast side of Waiāhole Valley Road South Branch (see Figure 88). It is faced on the north side and has a concrete cap with a metal fence installed on the top, as well as PVC drainage holes near the base.</p>
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	<p>CSH 24 comprises two earthen ditches/‘<i>auwai</i> on the southwest side of Kamehameha Highway, designated as Features A and B (see Figure 89 through Figure 91). The ditches are on either side of a private property and drain water from the property into an earthen ditch and culverts along the side of Kamehameha Highway. These ditches may represent a persistence of the modified ‘<i>auwai</i> portions of the agricultural system that was once present in the area. Taro is growing in portions of the ditch/‘<i>auwai</i> within the private property, as well as within the roadside portions of the ditch.</p> <p>CSH 25 is a mortared basalt retaining wall on the south side of Waiāhole Homestead Road (see Figure 92). It is faced on the north side and has a concrete cap with a metal fence installed on the top, as well as PVC drainage holes near the base.</p> <p>CSH 26 is a mortared basalt retaining wall on the southeast side of Waiāhole Homestead Road (see Figure 93). It is faced on the northwest side and has a concrete cap with a metal fence installed on the top, as well as PVC drainage holes near the base. North of CSH 26 is a set of stairs and another retaining wall built with similar materials and construction style.</p> <p>CSH 27 is a mortared basalt retaining wall on the northwest side of Waiāhole Homestead Road (see Figure 94). It is faced on the northwest (downslope) side and has a concrete cap with a metal fence installed on the top.</p> <p>CSH 28 is a mortared basalt ditch and culvert on the southwest side of Waiāhole Homestead Road (see Figure 95). The ditch is composed of sloping mortared basalt walls and floor with a metal fence installed on the tops of either side (southeast and northwest). Farther southwest, the ditch is earthen. The culvert is concrete with a metal grate on the roadside. Other similarly constructed ditches and culverts were identified in the vicinity but are within fenced areas along the roadside; hence, they were not assigned temporary CSH numbers.</p> <p>CSH 29 is a mortared basalt retaining wall on the north side of Waiāhole Homestead Road (see Figure 96). It is faced on the north side and has a concrete cap with a metal fence installed on the top. An additional sloped section of mortared basalt is at the east end of the retaining wall. The sloped retaining wall portion is relatively low in height and extends downslope and towards north.</p> <p>CSH 30 is a mortared basalt retaining wall on the northwest side of Waiāhole Homestead Road (see Figure 97). It is faced on the southeast side and likely also faced on the downslope, unobserved northwest side. It exhibits evidence of multiple stages of construction/repair, including a newer concrete cap on the southwest</p>
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	<p>end. A gap in the middle of the retaining wall houses a set of stairs that descends to a private property.</p> <p>CSH 31 is a mortared basalt ditch and culvert at the southeast corner of the intersection of Waiāhole Homestead Road and Kamehameha Highway (see Figure 98). The ditch is heavily overgrown with vegetation that includes <i>'ape</i>. The culvert directs water from the ditch on the west side of the highway to the opposite (<i>makai</i>) side of the highway, where the water exits through a concrete culvert (Figure 99).</p> <p>CSH 32 is a dry stacked basalt retaining wall on the east (<i>makai</i>) side of Kamehameha Highway (Figure 100). It parallels the highway and is faced on the downslope side.</p> <p>SIHP # -6758 Feature C, <i>'auwai</i>, begins at a culvert that extends beneath Kamehameha Highway within the project area. The concrete culvert intake on the west side of the highway is attached to an active <i>lo'i</i> and <i>'auwai</i> system that is obscured by cloth fencing installed at the property boundary (see Figure 101). The concrete culvert outtake on the east side of the highway extends to the Feature C <i>'auwai</i>, an earthen depression/ditch that is dry and heavily overgrown with vegetation (see Figure 102); the current condition of the <i>'auwai</i> and adjacent culvert appears to be similar to that documented by O'Leary et al. (2005; see Figure 51).</p>
Consultation	<p>Preliminary consultation between the SHPD and CSH was conducted on 27 April 2018. Discussion focused on the historical roads and related elements, such as culverts and retaining walls, and the need to document these potential historic properties and features.</p> <p>On 22 September 2022, Matt McDermott of CSH discussed this project with Susan Lebo of SHPD in person; the discussion was codified the next day, 23 September 2022, in an email from Mr. McDermott to Dr. Lebo. Per the in-person discussion and subsequent email, based on the literature review and field inspection (LRFI) background research and fieldwork, CSH does not feel an AIS is needed. The potential historic properties identified within the project area during the two field inspections may be over 50 years old and therefore by definition historic properties; however, they likely do not constitute significant historic properties. Hence, the LRFI will include a recommendation for a limited archaeological monitoring program to be conducted as historic property inventory as the next step in the project's historic preservation review process. As part of the monitoring program, prior to the start of construction, the potential historic properties identified within the project area during the two field inspections will be documented and assigned SIHP numbers, if appropriate. Monitoring during construction will be limited to the</p>

	grading and excavation at the large water tank site at the <i>mauka</i> end of the project area (i.e., at the <i>mauka</i> terminus of Waiāhole Valley Road North Branch). Monitoring is not recommended for the remainder of the project ground disturbance, which will be within in-use roadways, or as part of laterals off in-use roadways.
Likelihood of Archaeological Historic Properties To Be Present	<p>Background research indicates SIHP # -6758, subsurface <i>lo'i</i> soil, and SIHP # -6758 Feature C, <i>'auwai</i>, are adjacent to the current project area (Option 1, BWS Compliant System). Of note, the Feature C <i>'auwai</i> begins at a culvert that extends beneath Kamehameha Highway, within the current project area. Background research further suggests additional historic properties within the project area may include house sites and habitation features, cultural activity areas, <i>'auwai</i>, historical roads and related features (e.g., culverts and retaining walls), and human burial sites.</p> <p>The 2018 field inspection identified one potential historic property, CSH 7, within the project area as it was understood at the time. CSH 7 is a remnant of a fence composed of wood posts and barbed wire. In addition, a second potential historic property identified during the 2018 field inspection, CSH 8, is now understood to be within the project area, which has been expanded. CSH 8 comprises a mortared basalt culvert, designated as Feature A, and an associated mortared basalt ditch, designated as Feature B. CSH 7 and CSH 8 are both at the <i>mauka</i> terminus of Waiāhole Valley Road North Branch, within both Option 1 (BWS Compliant System) and Option 2 (Private System).</p> <p>The 2022 field inspection identified an additional four potential historic properties within the project area, CSH 14–17, which are mortared basalt retaining walls along Waiāhole Valley Road North Branch. Like CSH 7 and CSH 8, these are at the <i>mauka</i> terminus of the project area and are within both Option 1 (BWS Compliant System) and Option 2 (Private System).</p> <p>CSH 7, 8, and 14–17, as well as SIHP # -6758 Feature C are depicted on Figure 103.</p>
Historic Preservation Review Steps	Based on the results of the LRFI, and in consultation with SHPD (in-person discussion and email correspondence between Matt McDermott of CSH and Susan Lebo of SHPD), a limited archeological monitoring program to be conducted as historic property inventory is the next step in the project's historic preservation review. An archaeological monitoring plan (AMP) will be prepared for the review and acceptance of the SHPD. As part of the monitoring program, prior to the start of construction, the potential historic properties identified within the project area during the two field inspections will be documented and assigned SIHP numbers, if appropriate. Archaeological monitoring during

	construction will be limited to the grading and excavation at the large water tank site at the <i>mauka</i> terminus of the project area (i.e., at the <i>mauka</i> terminus of Waiāhole Valley Road North Branch). Monitoring is not recommended for the remainder of the project ground disturbance, which the remainder of the project ground disturbance will be within in-use roadways, or as part of laterals off in-use roadways.
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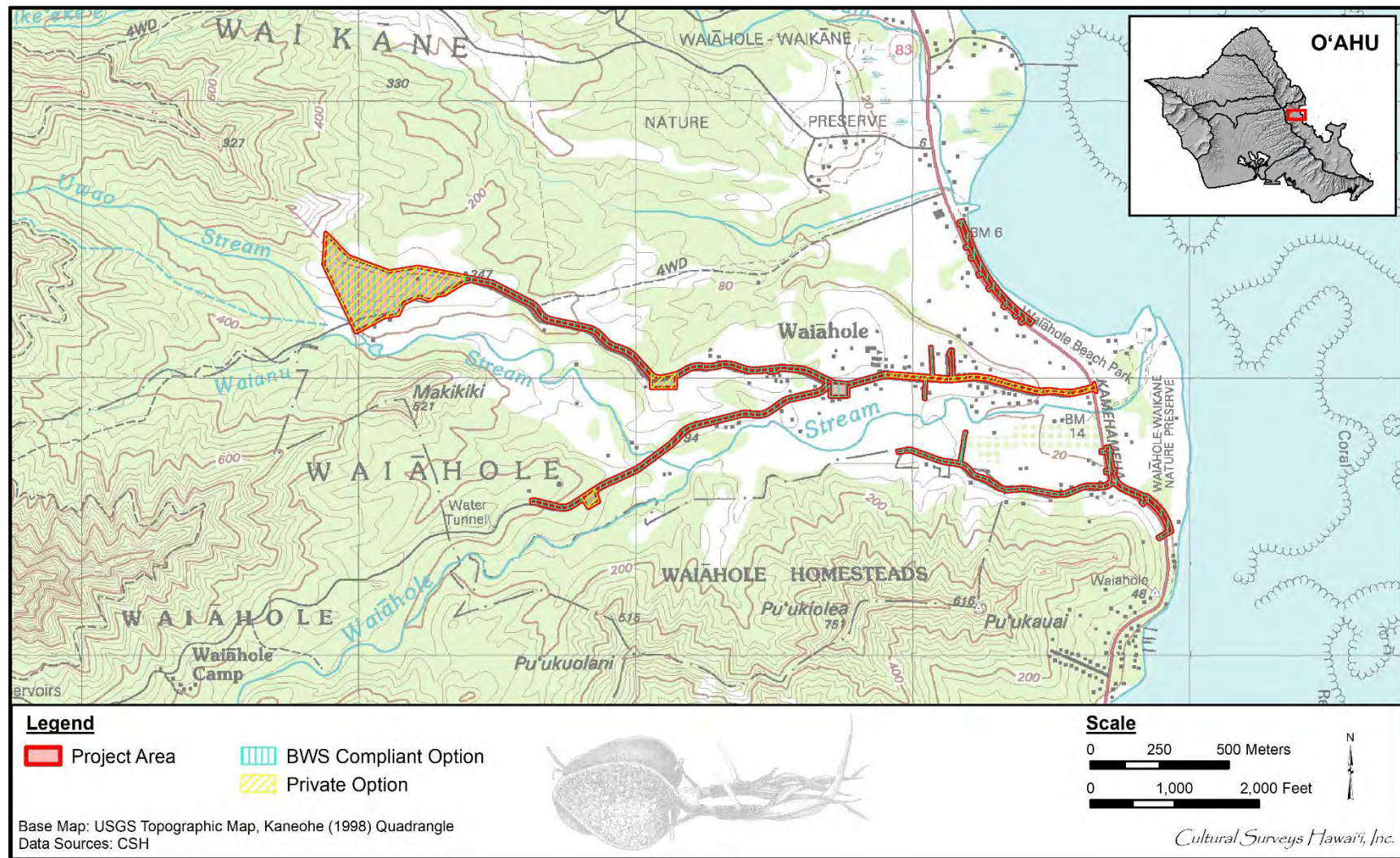


Figure 1. Portion of the 1998 Kaneohe USGS 7.5-minute topographic quadrangle showing the two project options (BWS Compliant and Private) within the project area

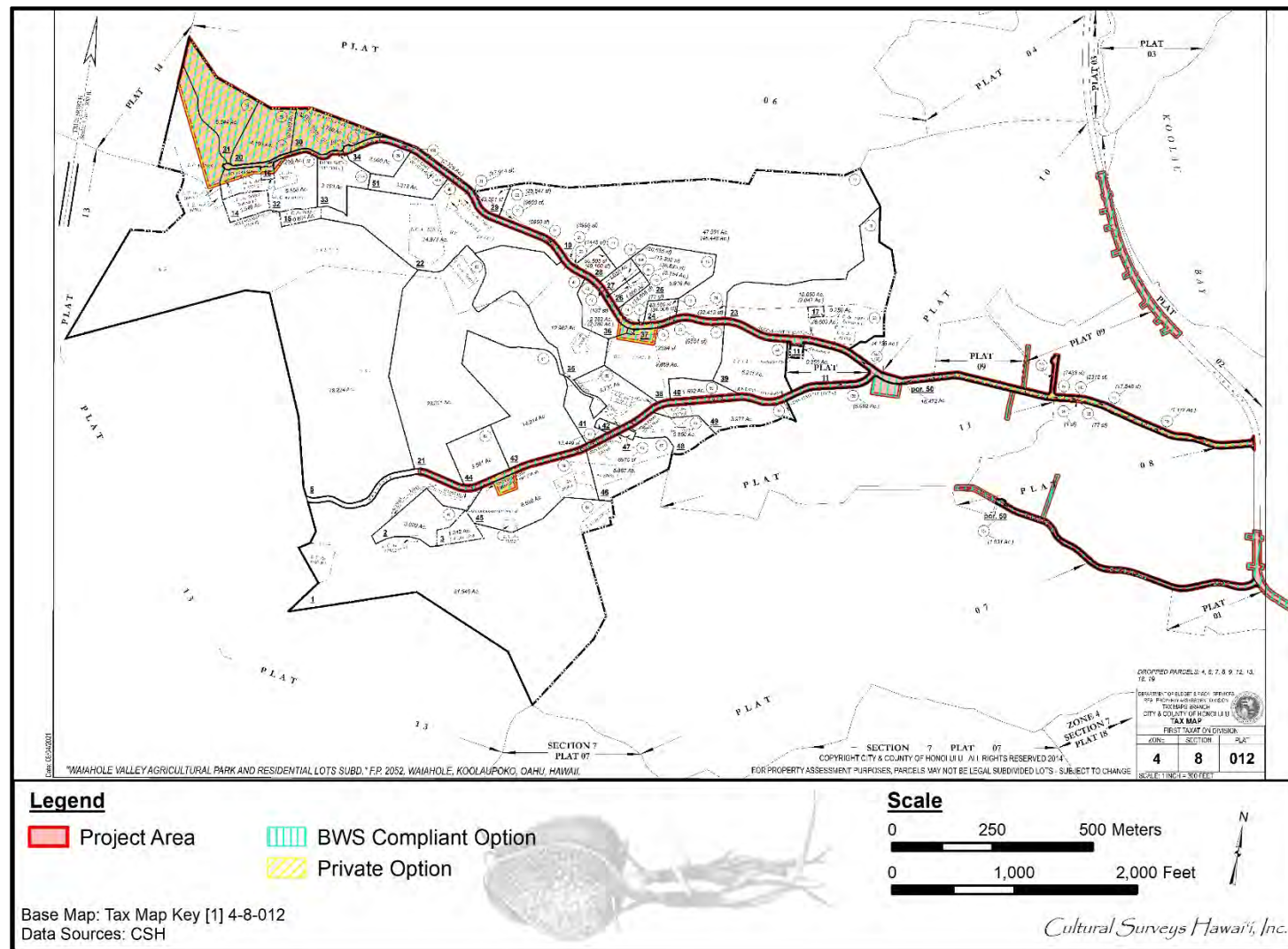


Figure 2. Tax Map Key (TMK) [1] 4-8-012, showing the two project options (BWS Compliant and Private) within the project area (Hawai'i TMK Service 2014)

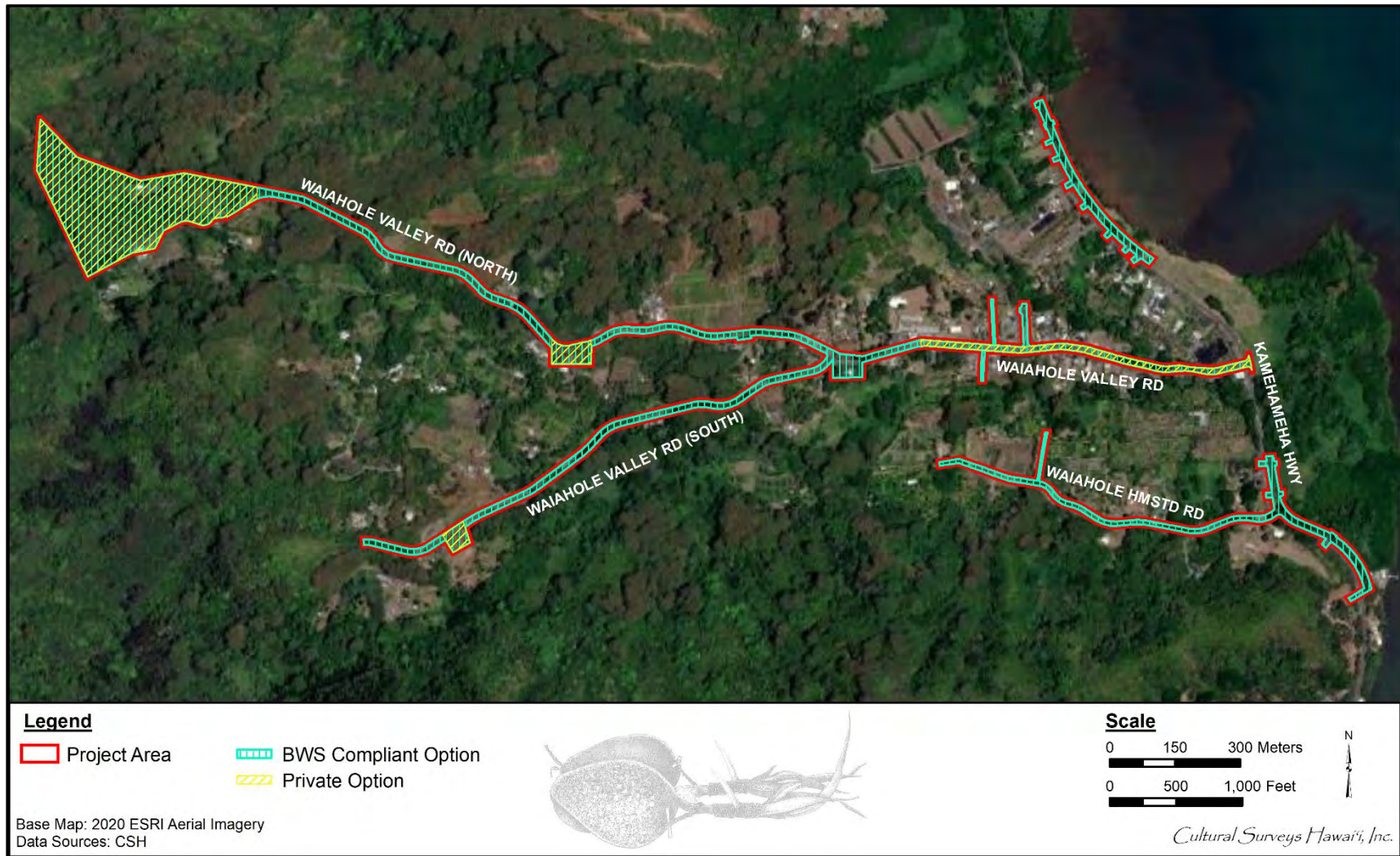


Figure 3. Aerial photograph showing the two project options (BWS Compliant and Private) within the project area (ESRI 2020)

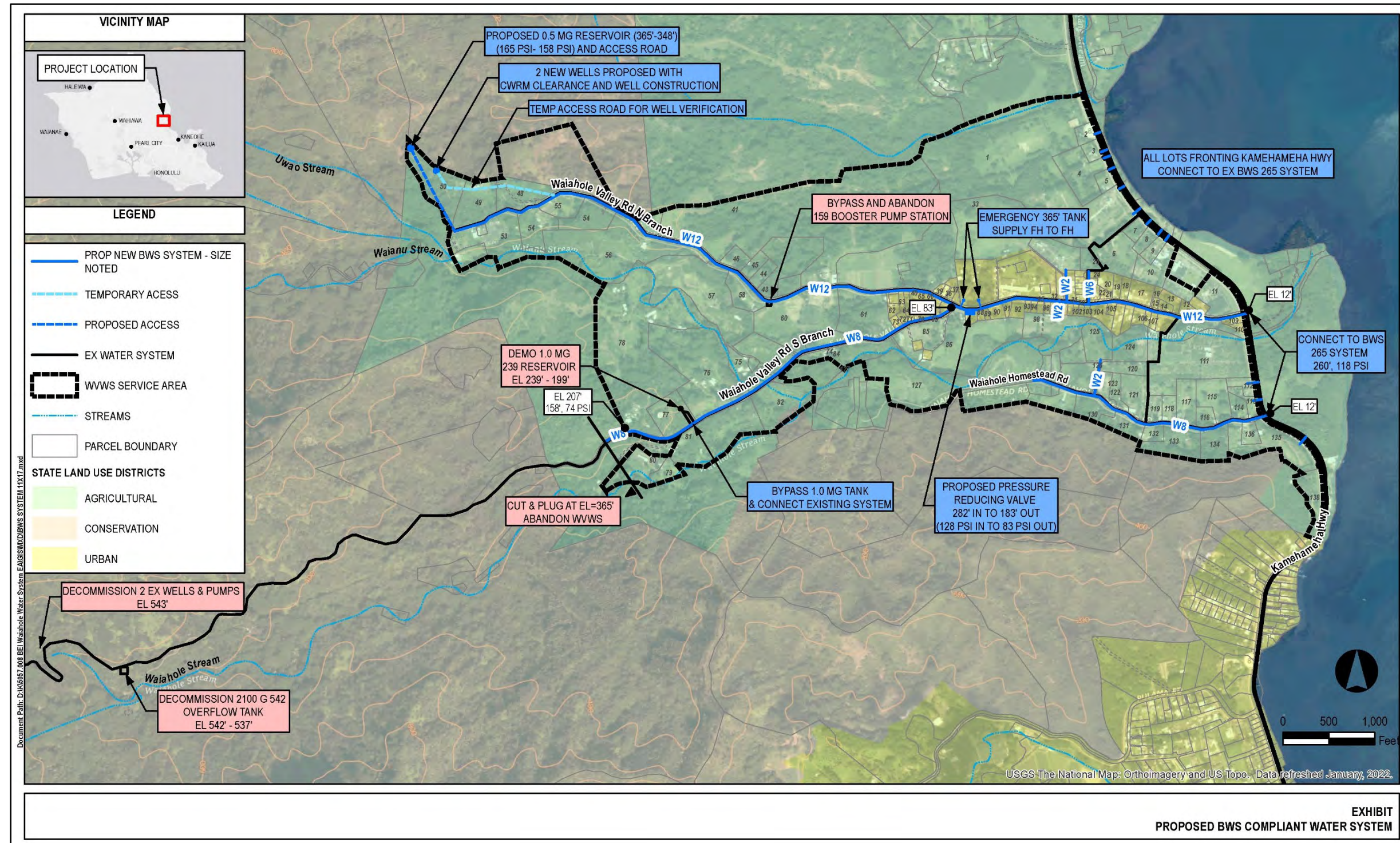


Figure 4. Option 1, BWS Compliant System (provided by client)

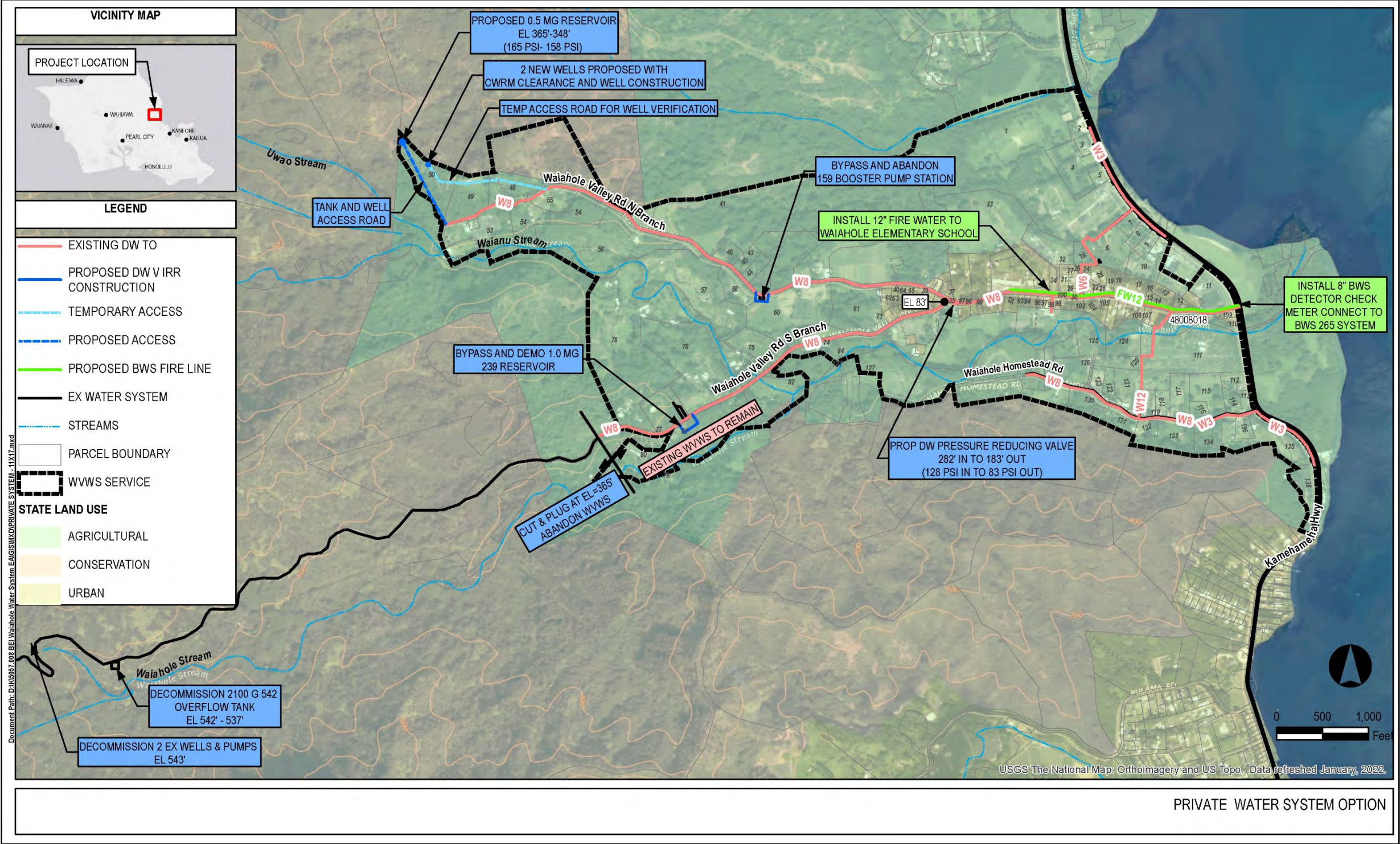


Figure 5. Option 2, Private System (provided by client)

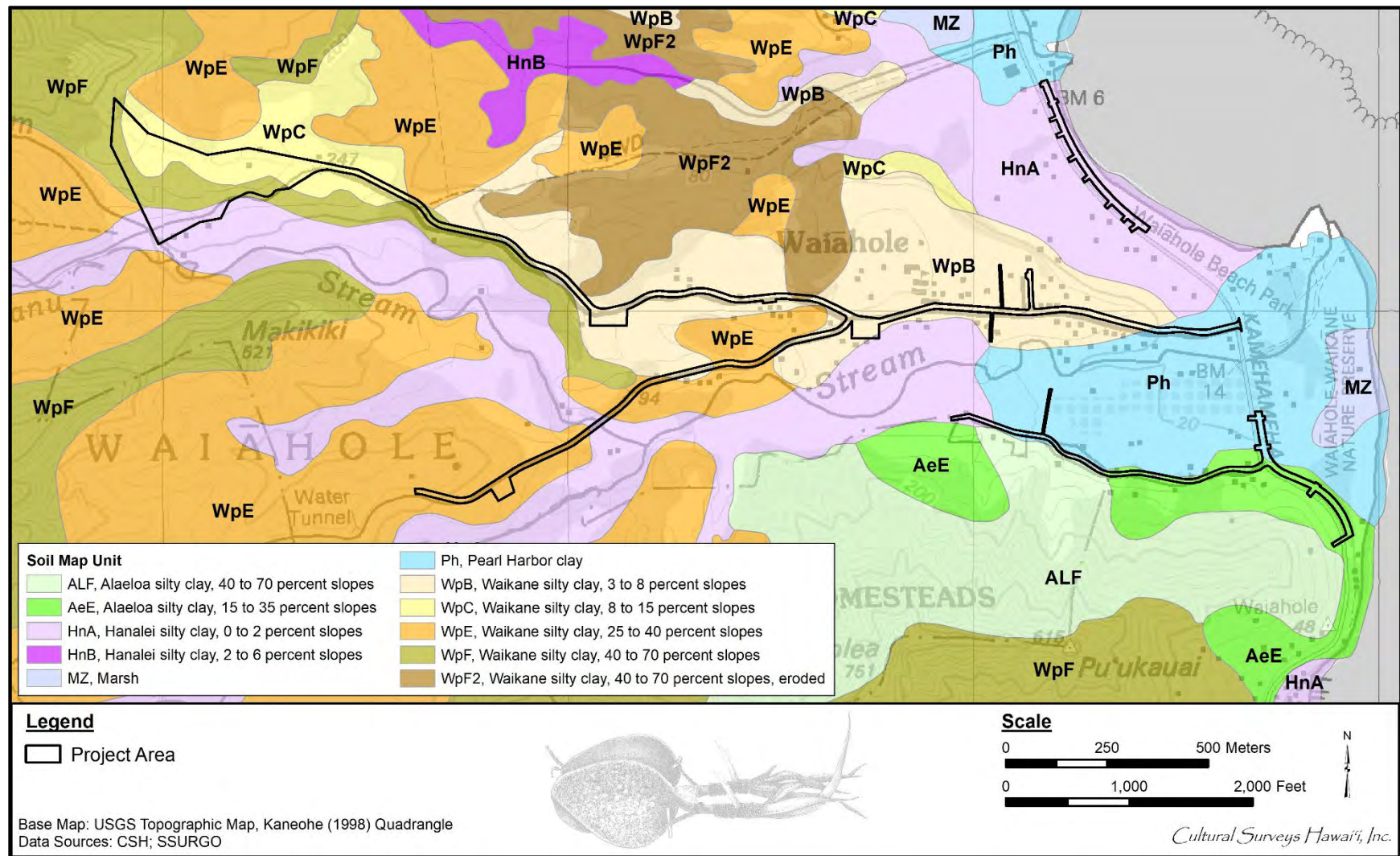


Figure 6. Overlay of *Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii* (Foote et al. 1972), indicating soil types within and surrounding the project area (USDA SSURGO 2001)

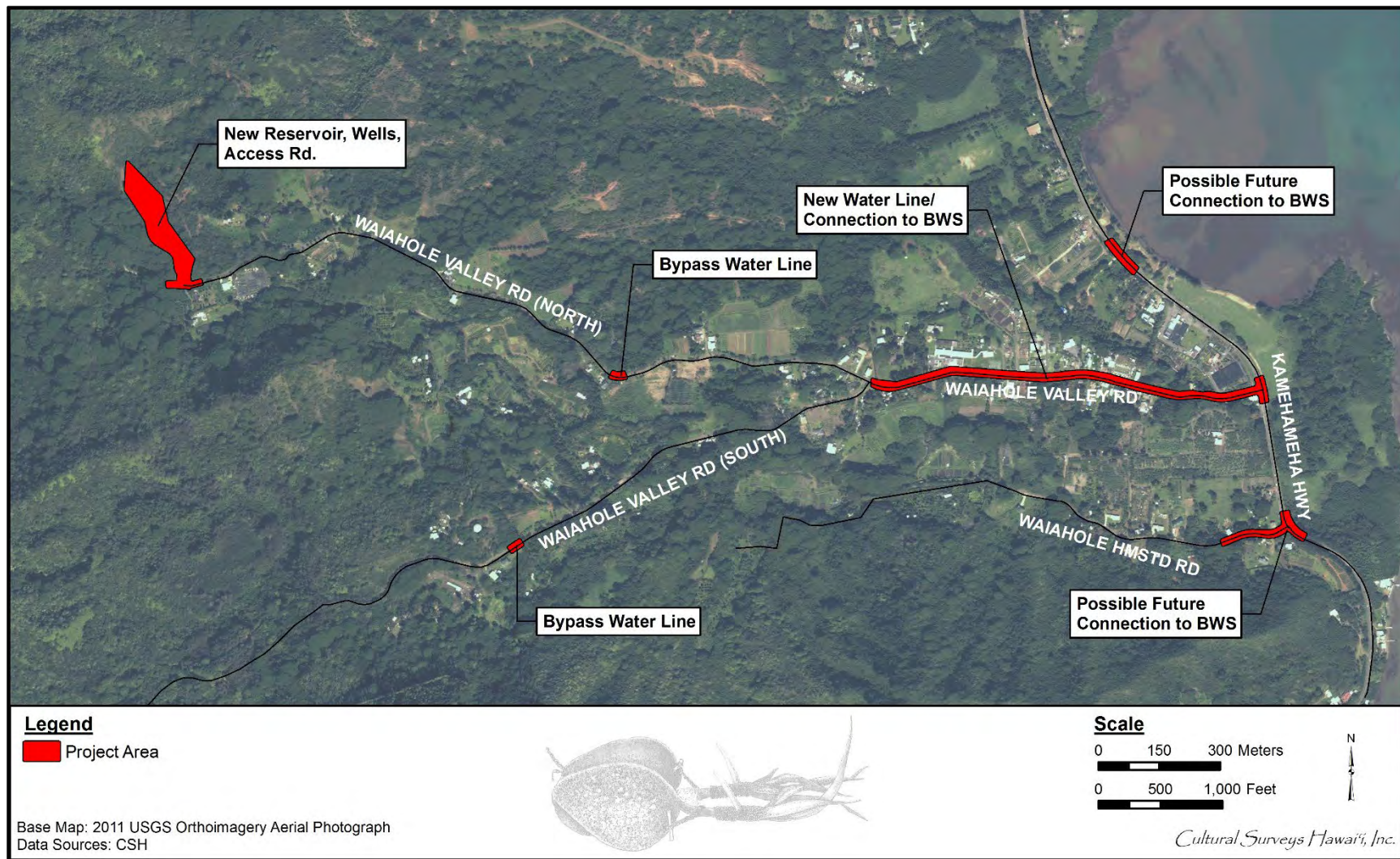


Figure 7. 2011 USGS orthoimagery aerial photograph showing the project area as it was understood at the time of the 2018 field inspection a



Figure 8. Intersection of Waiāhole Valley Road and Kamehameha Highway, view to south; Waiāhole Poi Factory on right (CSH 2018)



Figure 9. Portion of the project area on Waiāhole Valley Road view to west; CSH 1 Feature C, mortared basalt retaining wall, in left background (CSH 2018)



Figure 10. Central portion of the project area on Waiāhole Valley Road, view to west (CSH 2018)



Figure 11. *Mauka* (west) portion of the project area on Waiāhole Valley Road, view to west; Waiahole Elementary School in right background (CSH 2018)



Figure 12. Intersection of Waiāhole Homestead Road and Kamehameha Highway, view to south (CSH 2018)



Figure 13. *Makai* (east) portion of the project area on Waiāhole Homestead Road, view to west (CSH 2018)



Figure 14. Portion of the project area on Waiāhole Homestead Road, view to southwest; CSH 4, mortared basalt wall, on left (CSH 2018)



Figure 15. Portion of the project area on Waiāhole Valley Road South Branch, view to southwest (CSH 2018)



Figure 16. Portion of the project area on Waiāhole Valley Road North Branch, view to southeast (CSH 2018)



Figure 17. Southeast end of the *mauka* parcel adjacent to Waiāhole Valley Road North Branch, view to northwest (CSH 2018)



Figure 18. Northwest end of the *mauka* parcel adjacent to Waiāhole Valley Road North Branch, view to north (CSH 2018)



Figure 19. Access road near the northwest end of the *mauka* parcel adjacent to Waiāhole Valley Road North Branch, view to northwest; note recently (as of 2018) planted trees along the road's edge (right) (CSH 2018)



Figure 20. Typical vegetation growth within the *mauka* parcel adjacent to Waiāhole Valley Road North Branch, view to south (CSH 2018)



Figure 21. Northwest portion of the project area on Waiāhole Valley Road North Branch with active lot, view to west (CSH 2022)



Figure 22. Representative view of overgrown dirt road, with tire and metal can visible, view to southeast (CSH 2022)



Figure 23. Representative view of abandoned vehicles in the *mauka* parcel adjacent to Waiāhole Valley Road North Branch, view to west (CSH 2022)



Figure 24. Representative view of abandoned vehicles in *mauka* parcel adjacent to Waiāhole Valley Road North Branch, view to north (CSH 2022)



Figure 25. Representative view of modern hunting trap, view to west (CSH 2022)



Figure 26. Existing booster pump station on the south side of Waiāhole Valley Road North Branch, view to south (CSH 2022)



Figure 27. Proposed BWS location at the southeast corner of the intersection of Waiāhole Valley Road North Branch (left background) and Waiāhole Valley Road South Branch (foreground), view to northeast (CSH 2022)



Figure 28. Proposed BWS location on the south side of Waiāhole Valley Road South Branch (currently a goat farm), view to southwest (CSH 2022)



Figure 29. Close-up of the proposed BWS location on the south side of Waiāhole Valley Road South Branch (currently a goat farm), view to south (CSH 2022)



Figure 30. Gate at the end of Waiāhole Valley Road North Branch, view to west (CSH 2022)



Figure 31. Close-up of the gate at end of Waiāhole Valley Road South Branch (CSH 21 visible on right), view to west (CSH 2022)



Figure 32. Gate at the end of Waiāhole Homestead Road, view to northwest (CSH 2022)



Figure 33. Proposed lateral alignment extending north from Waiāhole Homestead Road, view to north (CSH 2022)



Figure 34. Proposed lateral alignment extending north from Waiahole Valley Road at Maihwa Place, view to north (CSH 2022)



Figure 35. Proposed lateral alignment extending north from Waiāhole Valley Road at the end of Maihwa Place, view to north (CSH 2022)



Figure 36. Proposed lateral alignment extending north from Waiāhole Valley Road at unnamed road, view to north (CSH 2022)



Figure 37. Proposed lateral alignment extending north from Waiāhole Valley Road at end of unnamed road, view to north (CSH 2022)



Figure 38. Proposed lateral alignment extending south from Waiāhole Valley Road at unnamed road, view to south (CSH 2022)



Figure 39. Modern bridge (1988) over Waianu Stream at Waiāhole Valley Road South, view to north (CSH 2022)



Figure 40. Concrete culvert along Kamehameha Highway, view to south (CSH 2022)



Figure 41. Concrete culvert along Kamehameha Highway, view to east (CSH 2022)

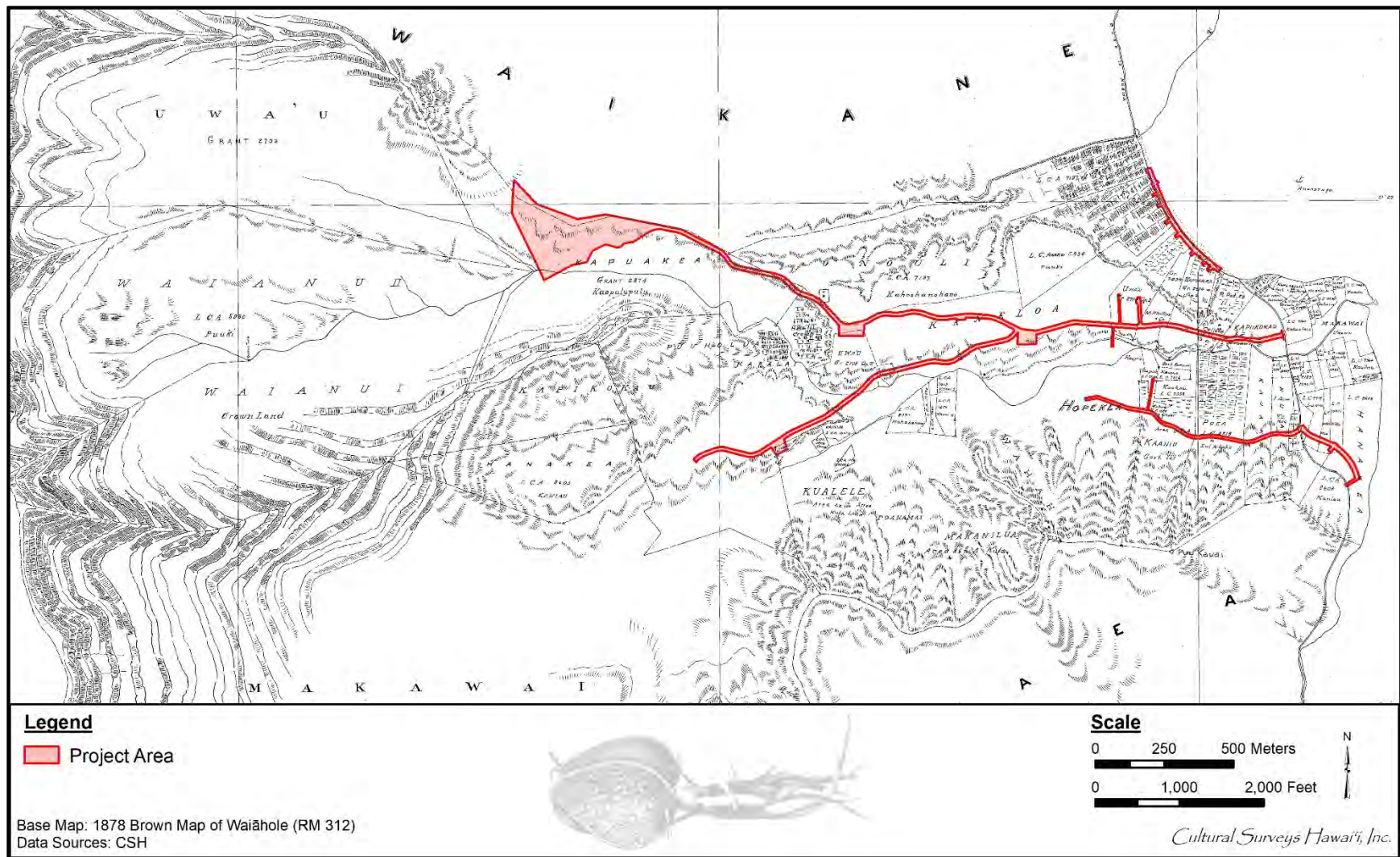


Figure 42. 1878 Brown map of Waiāhole (RM 312) showing the project area in relation to LCAs

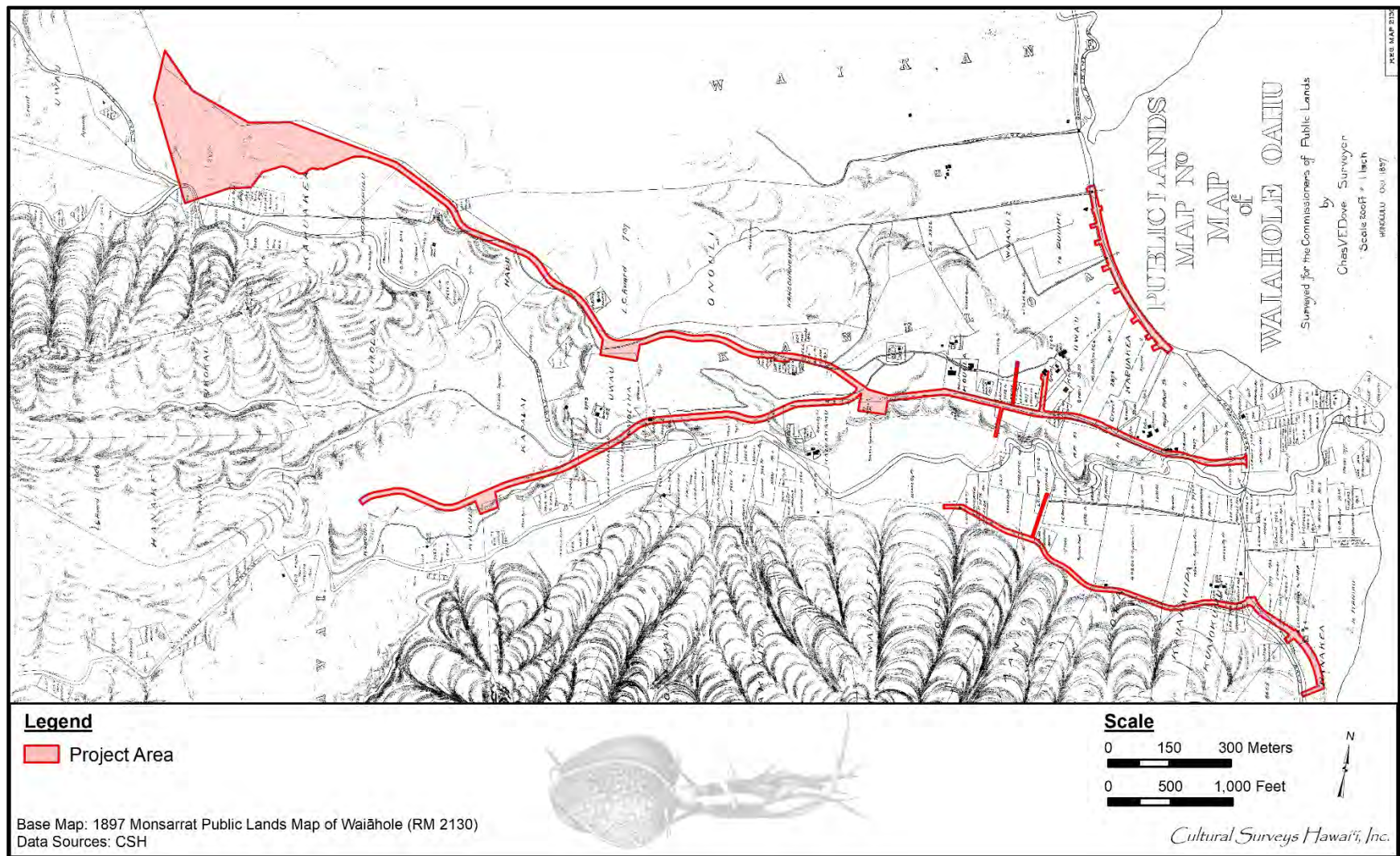


Figure 43. 1897 Monsarrat Public Lands Map of Waiāhole (RM 2130) showing the project area in relation to LCAs

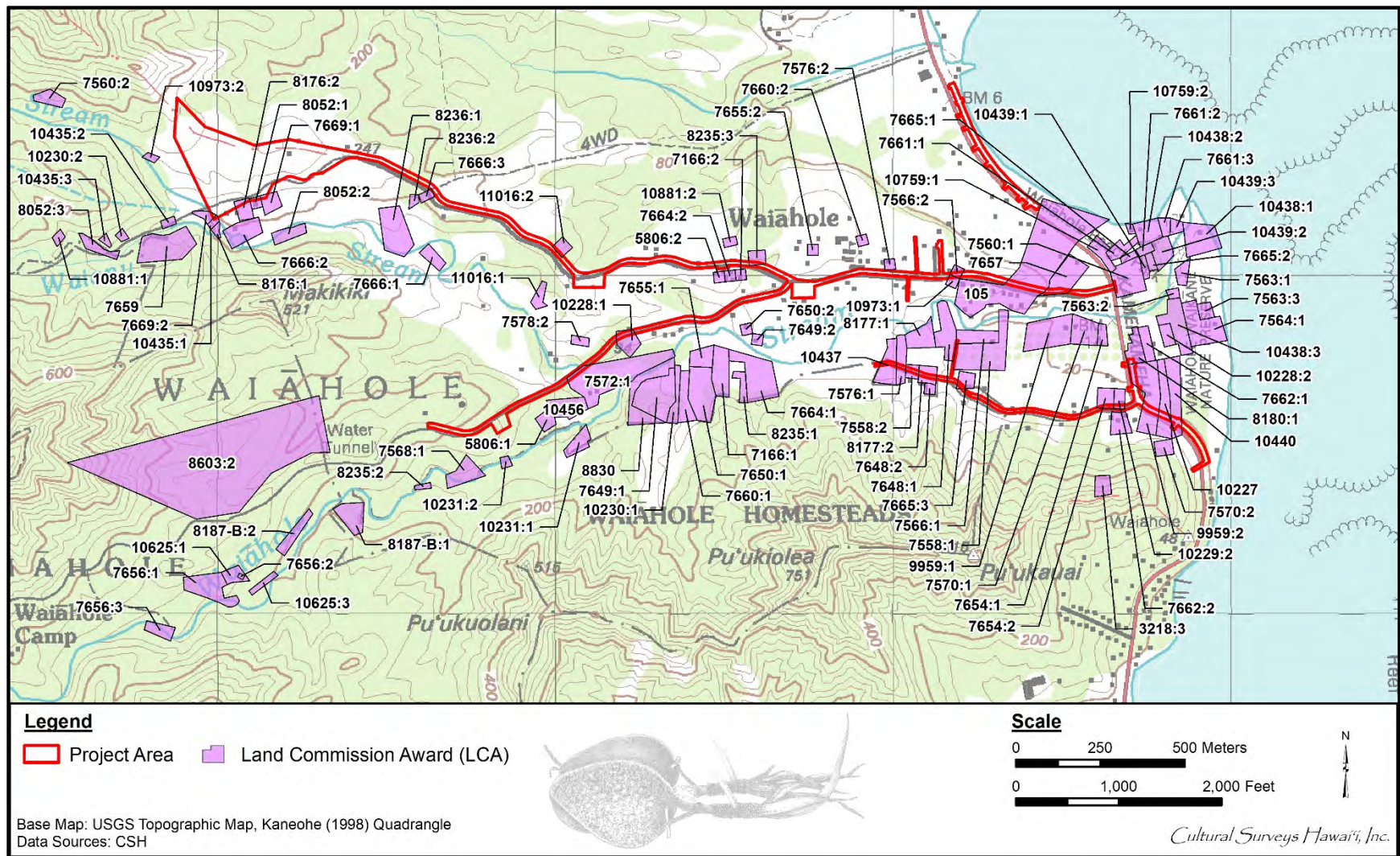


Figure 44. A portion of the 1998 Kaneohe USGS 7.5-minute topographic quadrangle with overlay of LCAs in the vicinity of the project area

Table 1. Land Commission Awards within the project area

LCA #	Awardee	Area (acres)	<i>Ili/Ahupua'a</i>	Land Use
105	William Walker (Huaka)	11.66	Oii, Waiāhole	–
7558:1, 2	Kaakau, Kahunoku (heir)	3.3	Waiāhole	Two <i>lo'i</i> , one <i>kula</i> , one house lot
7560:1	Kekaulaau, Kaleihohia (grandson; heir)	0.47	U'wau, Waiāhole	Three <i>lo'i</i>
7566:1, 2	Keawe, Kaleikohea	1.55	Kaneloa, Waiāhole	Six <i>lo'i</i> , one <i>kula</i> , one house lot, one <i>māla</i> of 'awa
7572:1	Kupoepoe	4.85	Waiāhole	Twelve <i>lo'i</i> , one <i>kula</i> ,
7576:1, 2	Kalaloa	1.17	Hopekea, Waiāhole	Six <i>lo'i</i> , one house lot, one <i>māla</i> of 'awa
7654:2	Kimo	0.25	Kuaiokumu, Waiāhole	House lot
7657	Kaukulima, Kaumuloa (daughter; heir)	2.0	Kapiko'okau, Waiāhole	Three <i>lo'i</i>
7662:1	Kaumaka	0.8	Waiāhole	Three <i>lo'i</i>
7669:1, 2	Kuiki	1.35	Waianu, Waiāhole	Six <i>lo'i</i> , one <i>kula</i> , one house lot
8052:1	Ehu	0.25	Waiāhole	House lot
8176:2	Hokii	0.5	Waiāhole	One <i>kula</i> , one house lot
8177:2	Hoopio	0.4	Hopekea, Waiāhole	House lot
8180	Haole, Lotona, Kiailuakini (grandson; heir)	1.1	Apau, Waiāhole	Four <i>lo'i</i>
8235:2	Inulama	0.16	Waiāhole	Three <i>lo'i</i>
9959:2	Lumai/Luna'ai/Lumae	3.3	Poea, Waiāhole	Six <i>lo'i</i>
10227	Moo I	0.98	Kanakahipa, Waiāhole	Ten <i>lo'i</i> , two <i>kula</i> , one house lot
10228:1	Moo 2	1.55	Kaululoa, Waiāhole	<i>Kula</i>
10229:2	Malule	0.25	Kaululoa, Waiāhole	House lot

10437	Naaweawe	1.5	Kukaikoo, Waiāhole	Six <i>lo'i</i> , one <i>kula</i>
10440	Nika	2.22	Hanakea, Waiāhole	Seven <i>lo'i</i> , one <i>kula</i>
10973:1	Wahahee	0.25	Waiāhole	House lot
11016:2	Waipio	0.5	Waiāhole	One <i>kula</i> , one house lot

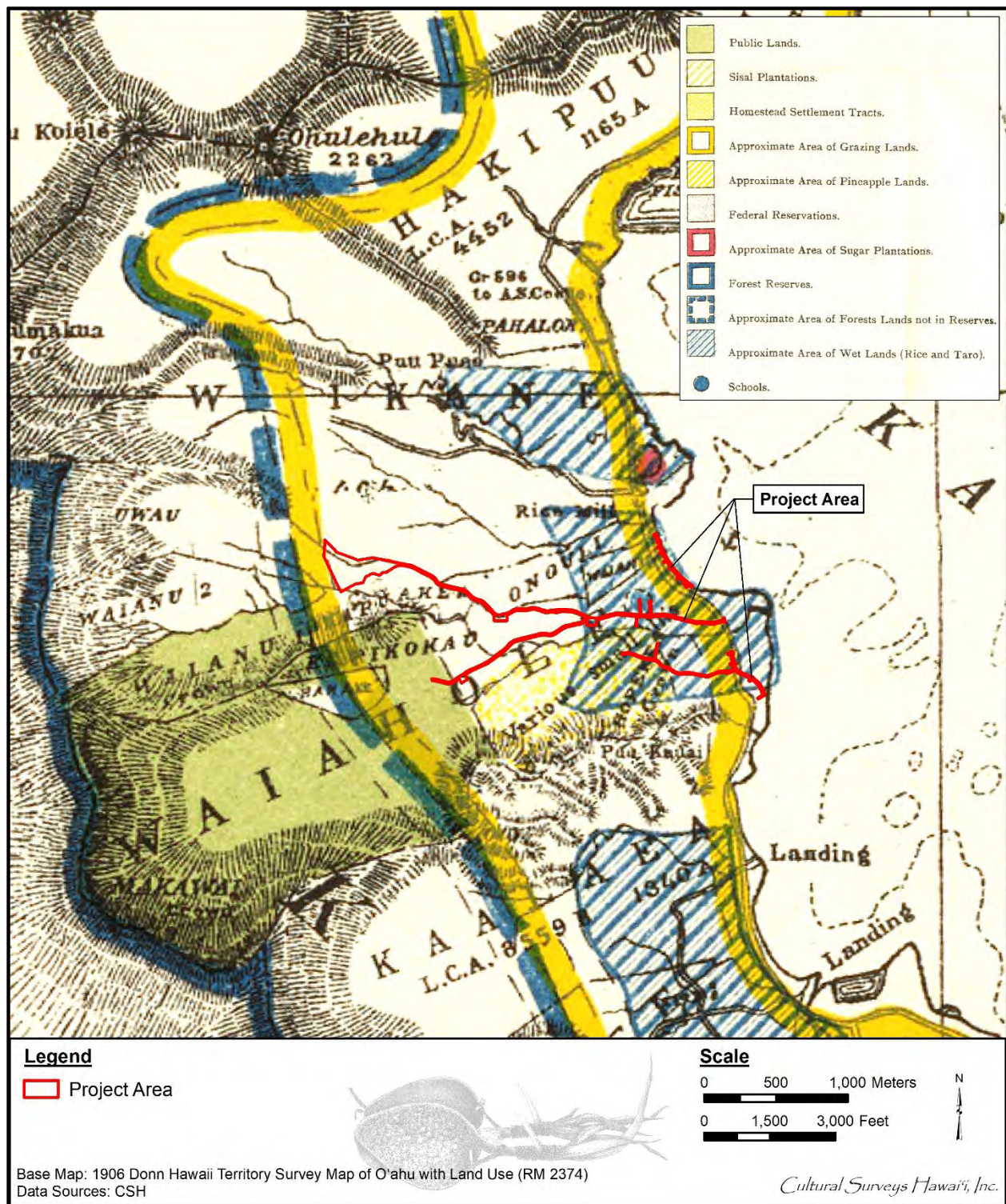


Figure 45. Portion of the 1906 Donn Hawaii Territory survey Map of O‘ahu with land use (RM 2374), showing the *makai* portions of the project area in wetland cultivation of taro and/or rice and the *mauka* portions within grazing lands

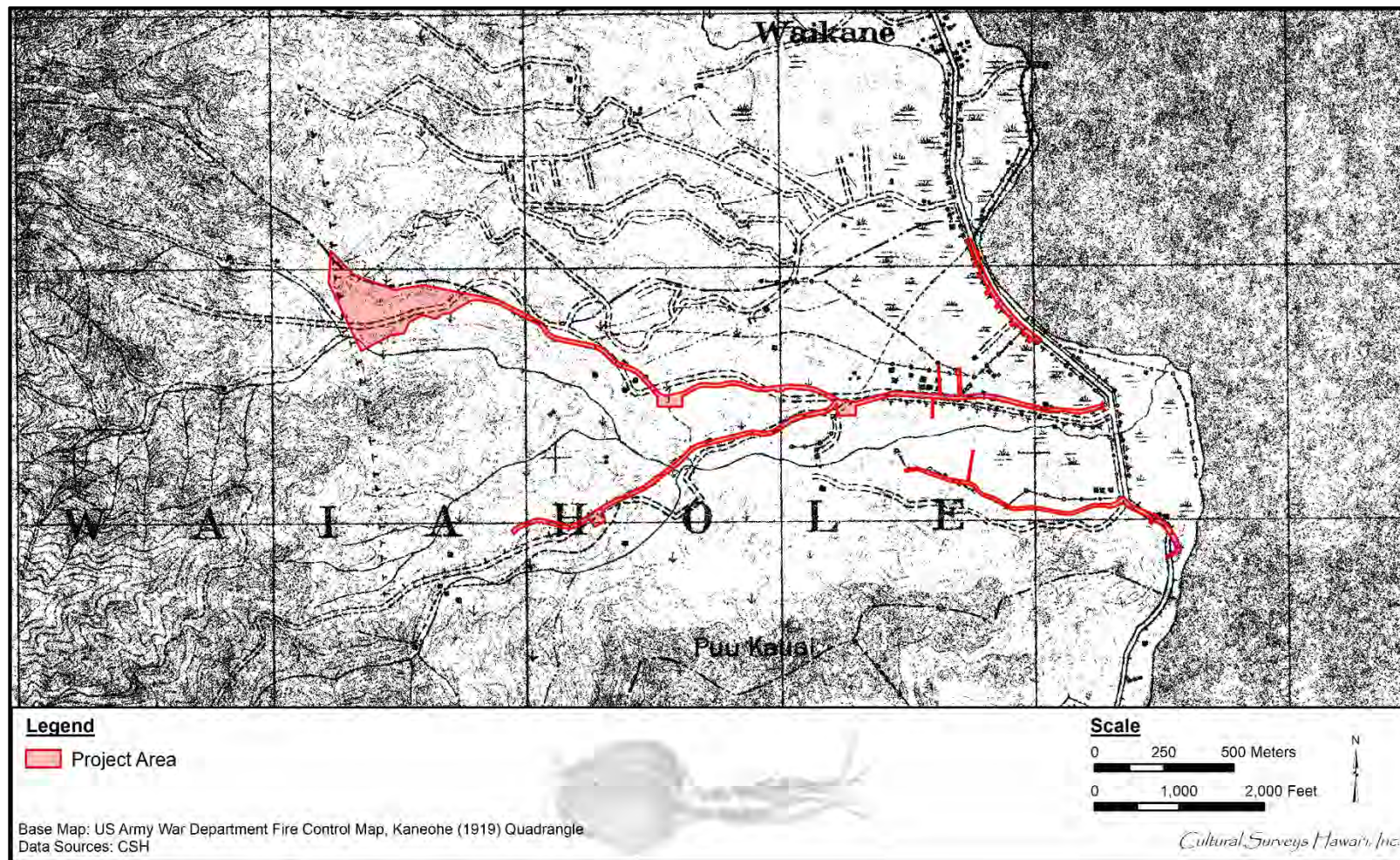


Figure 46. Portion of the 1919 Kaneohe Quadrangle U.S. Army War Department fire control map showing the project area; an early alignment of Kamehameha Highway is depicted along the coast; the other roads within the project area are depicted but appear to be unimproved (Waiāhole Homestead Road also appears to have a slightly different alignment); scattered buildings are indicated throughout the area, particularly along Waiāhole Valley Road and Kamehameha Highway

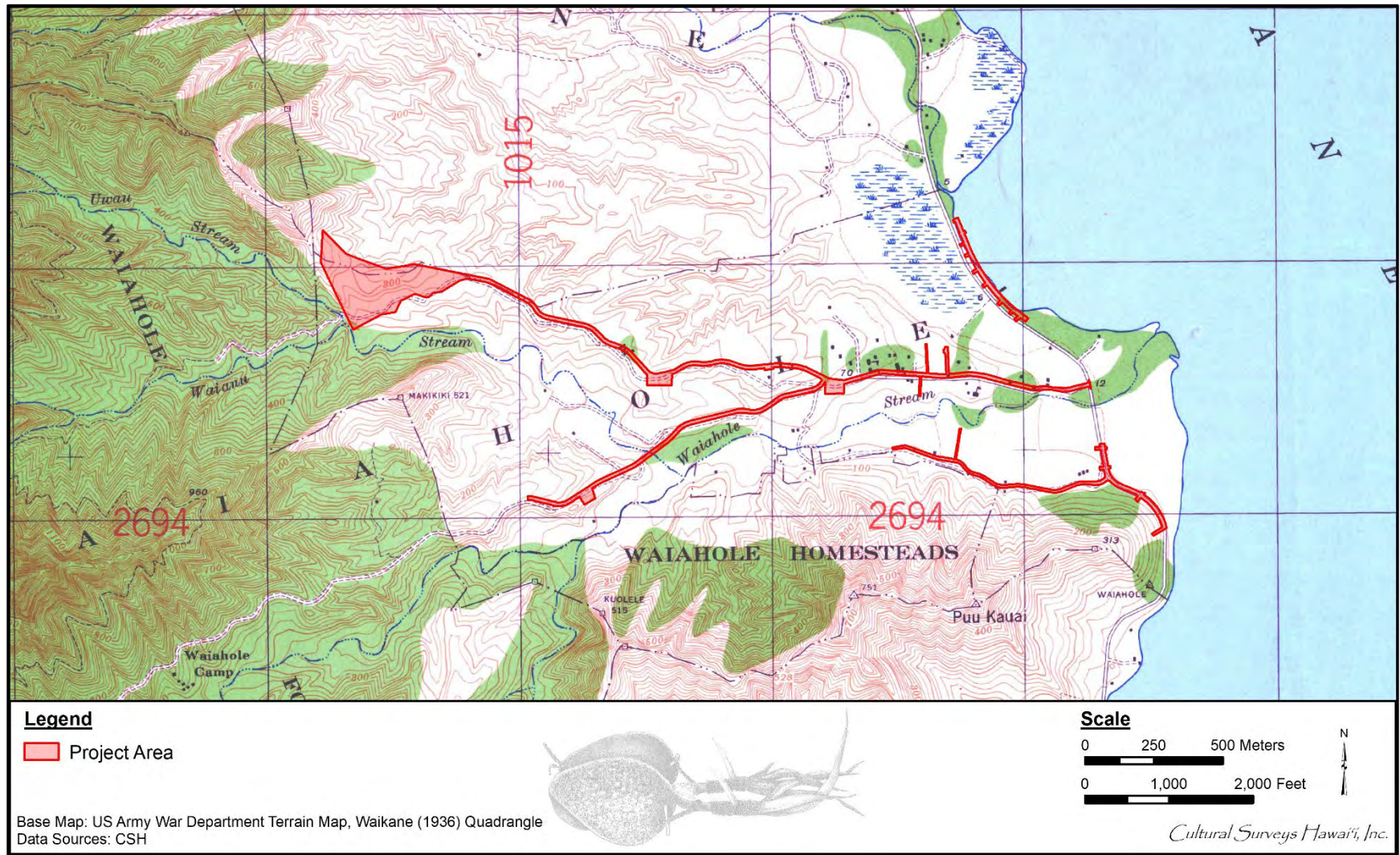


Figure 47. Portion of the 1936 Waikane Quadrangle U.S. Army War Department terrain map showing the project area; most of the project area roads are still unimproved, but Waiāhole Homestead Road appears more in line with its current alignment

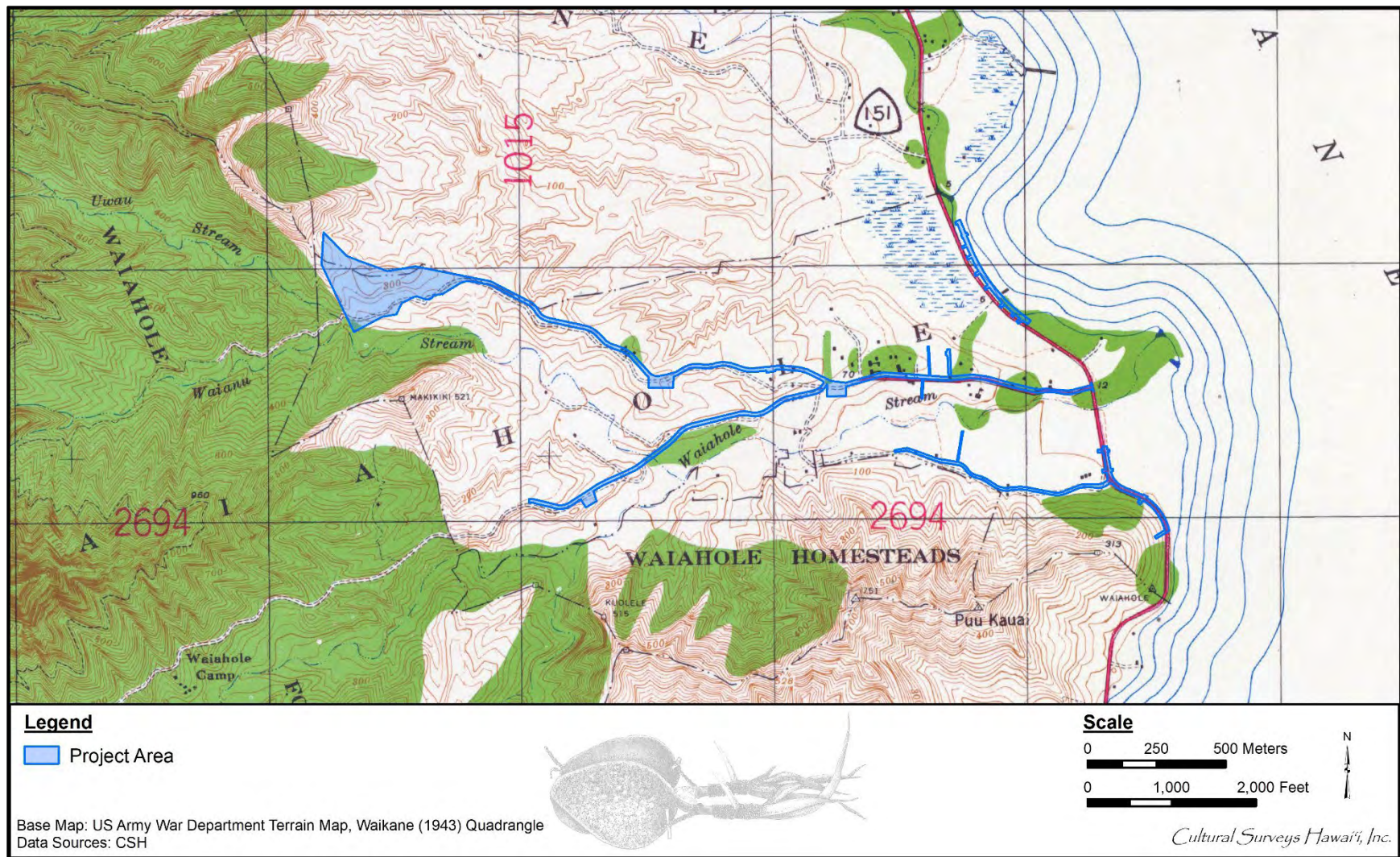


Figure 48. Portion of the 1943 Waikane Quadrangle U.S. Army War Department terrain map showing the project area; no additional development is indicated since the previous map

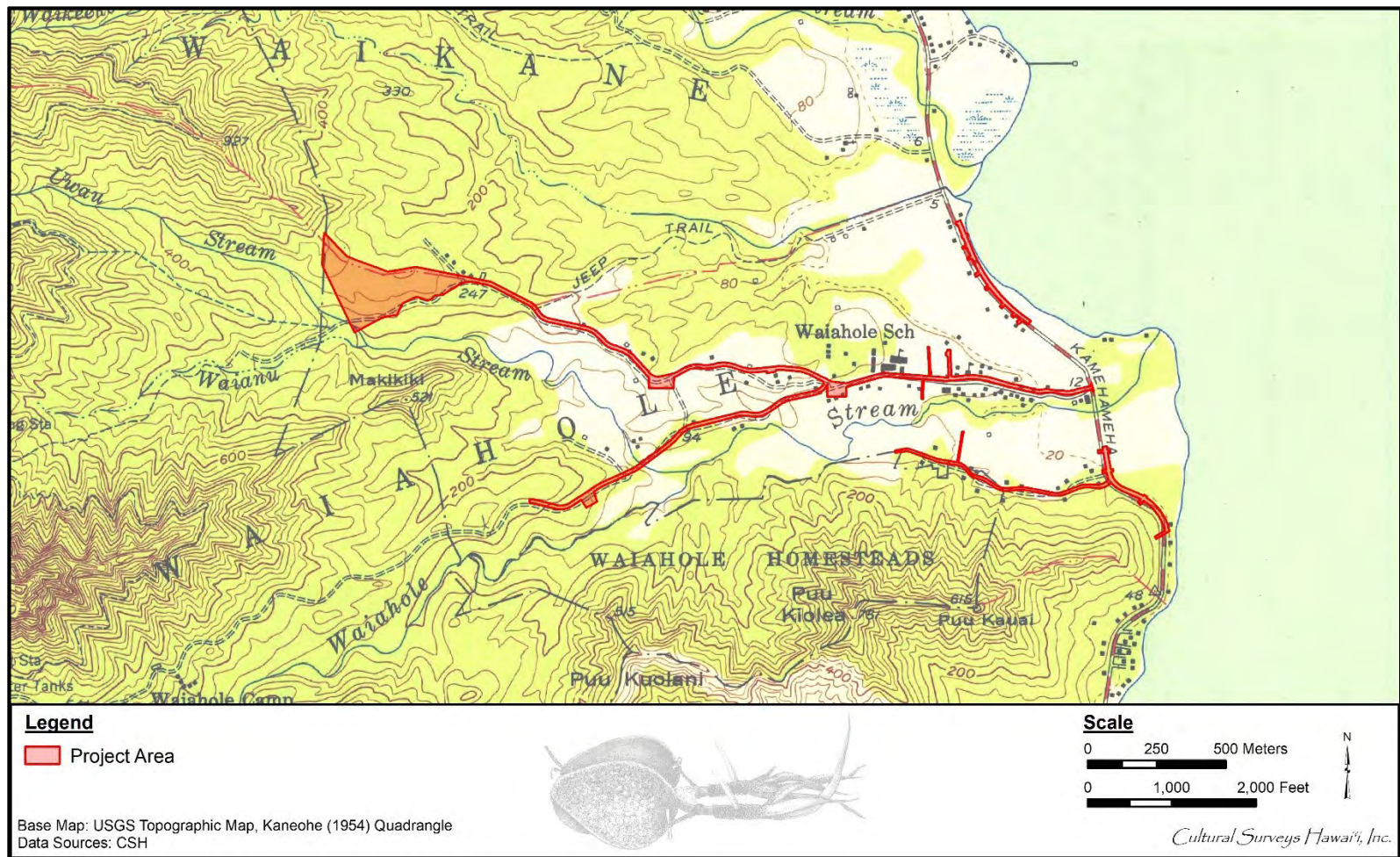


Figure 49. Portion of the 1954 Kaneohe Quadrangle USGS topographic map showing the project area; Kamehameha Highway is called out as a major coastal route; development is still relatively sparse, although additional buildings are indicated along the coast, along Waiāhole Valley Road and Waiāhole Homestead Road, and in more *mauka* locations; Waiahole Elementary School is also indicated



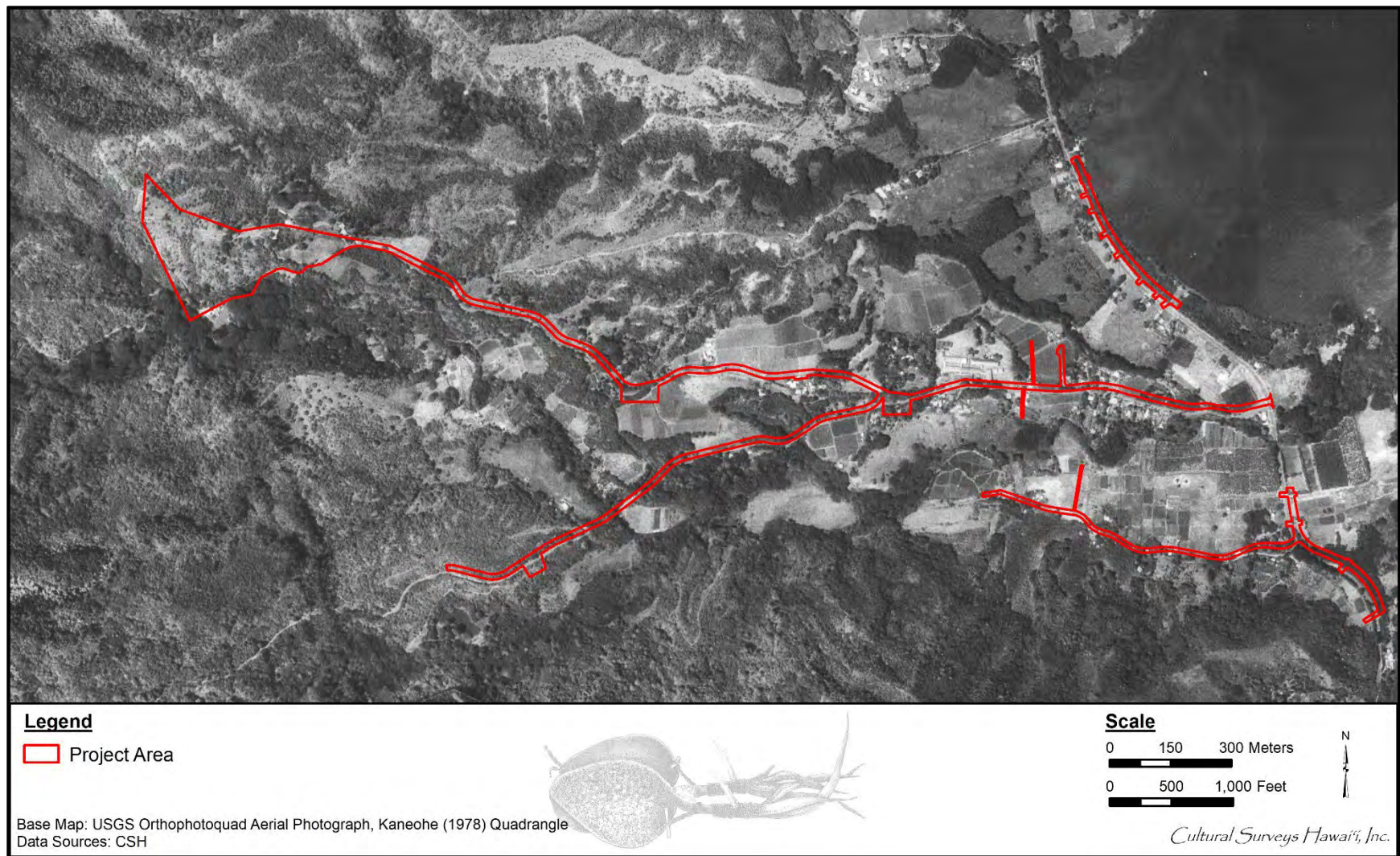


Figure 51. 1978 Kaneohe Quadrangle USGS orthophotoquad aerial photograph showing the project area; the *mauka* areas are still situated in relatively undeveloped land

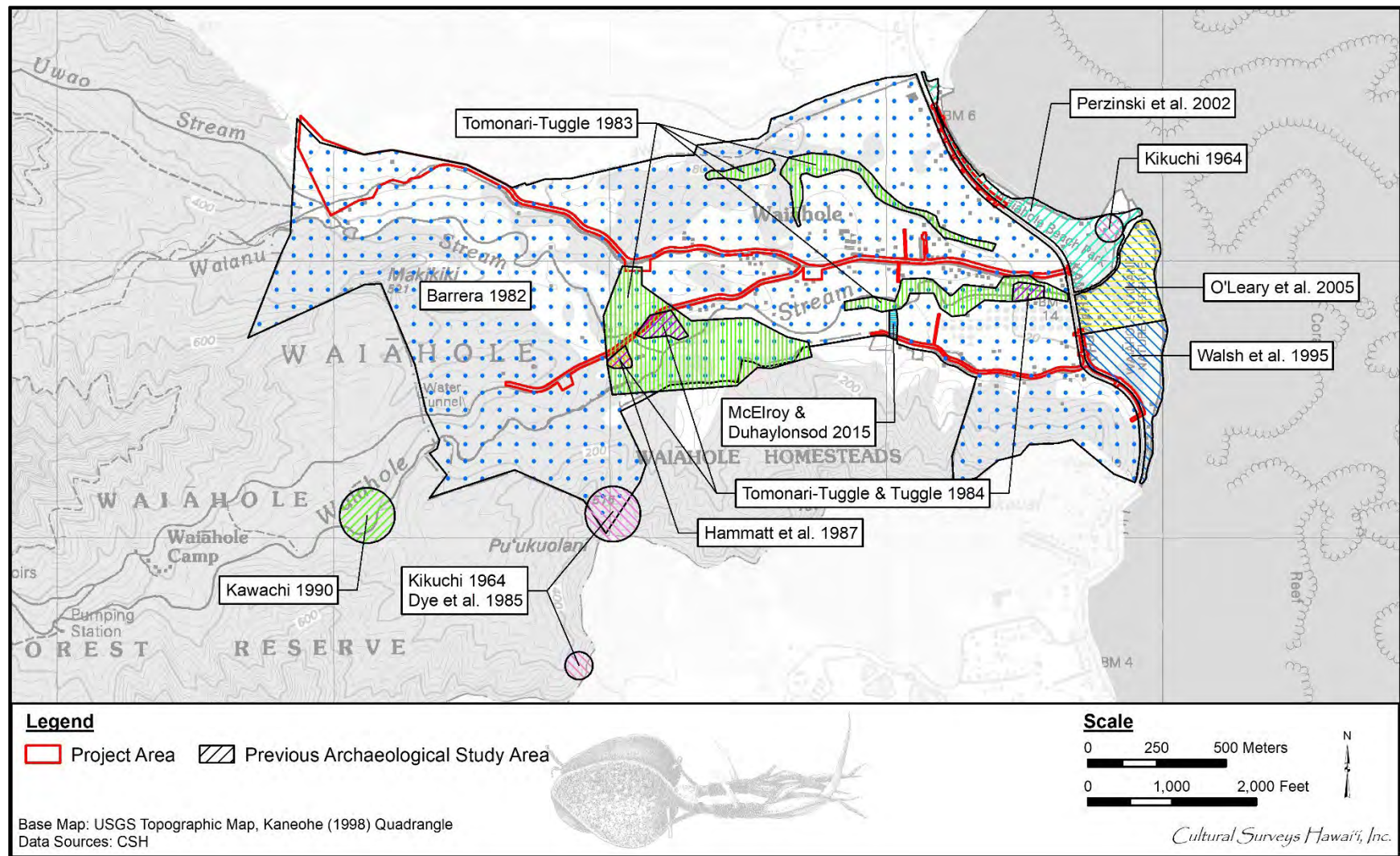


Figure 52. Portion of the 1998 Kaneohe USGS 7.5-minute topographic quadrangle with overlay of previous archaeological studies in the project area vicinity

Table 2. Previous archaeological studies in the vicinity of the project area

Reference	Type of Study	Location	Results (SIHP # 50-80-10-)
Kikuchi 1964	Archaeological reconnaissance survey	Waiāhole Valley	Three historic properties identified in the current project area vicinity: SIHP #s -2472 and -2475 (adze quarries) and -2476 (lithic scatter)
Barrera 1982	Archaeological reconnaissance survey	Waiāhole Valley Agricultural Park	Notes an abandoned system of taro terraces in the vicinity of LCA 10230
Tomonari-Tuggle 1983	Archaeological reconnaissance survey	Waiāhole Valley Agricultural Park	Identified 28 historic properties, including habitation areas, lithic workshops, and traditional and historical agricultural sites
Tomonari-Tuggle and Tuggle 1984	Mapping and excavation report	Waiāhole Valley Agricultural Park	Documentation of work at SIHP #s -3509 through -3513 and -3526
Dye et al. 1985	Adze quarry study	Pu'u Kuolani, Waiāhole	Studied a Waiāhole quarry complex that includes SIHP #s -2472, -2475, and -2476 (identified by Kikuchi 1964, see above)
Hammatt et al. 1987	Archaeological testing	SIHP # -3512, central Waiāhole Valley	Archaeological testing at SIHP # -3512 (lithic workshop, previously studied by Tomonari-Tuggle and Tuggle 1984, see above); habitation and flaking activity were documented
Kawachi 1990	Field check	SIHP # -4246, central Waiāhole Valley	Documented numerous agricultural terraces
Walsh et al. 1995	Archaeological literature review and field inspection	Coastal areas of Waikāne and Waiāhole	Identified fields with <i>lo'i</i> type soils and possible <i>'auwai</i> at Waiāhole and historical structures or features in Waikāne
Perzinski et al. 2002	Archaeological inventory survey	Coastal Waiāhole	Two historic properties, SIHP #s -1086 (human burials) and -6396 (<i>Pōhaku O Kāne</i>), recommended for preservation
O'Leary et al. 2005	Archaeological inventory survey	Coastal Waiāhole	Identified three historic properties: SIHP #s -6756 (subsurface structural remnant), -6757 (historical road segment), and -6758 (agricultural complex)
McElroy and Duhaylonsod 2015	Archaeological inventory survey	Waiāhole, TMK: [1] 4-8-008:003	No historic properties identified

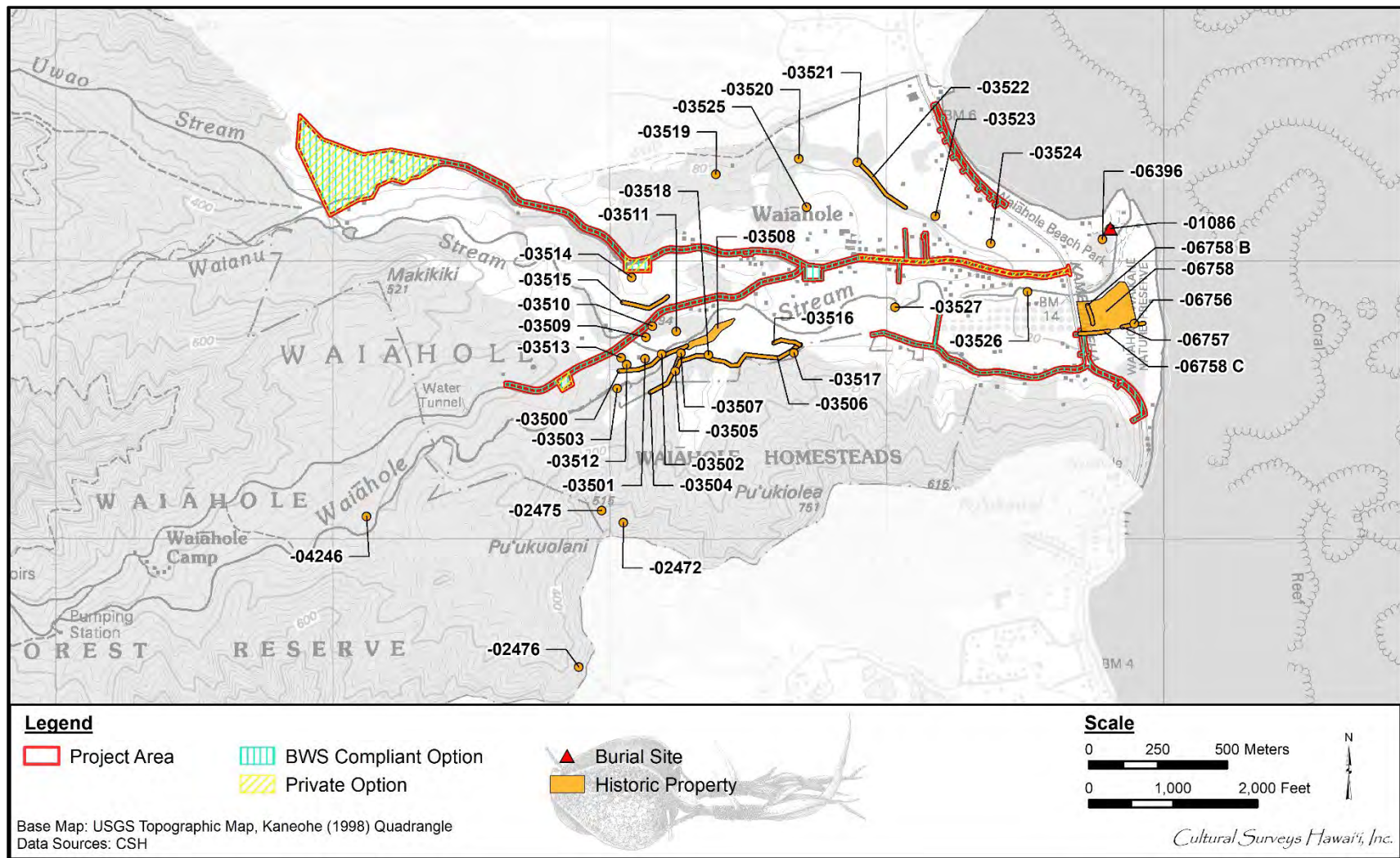


Figure 53. Portion of the 1998 Kaneohe USGS 7.5-minute topographic quadrangle with overlay of previously identified historic properties in the project area vicinity

Table 3. Historic properties previously identified in the project area vicinity

SIHP # (50-80-10-)	Type/Name	Description	Reference
-1086	Human burials	Six individuals	Perzinski et al. 2002
-2472	Adze quarry	Pre-Contact	Kikuchi 1964
-2475	Adze quarry	Pre-Contact	Kikuchi 1964; Dye et al. 1985
-2476	Lithic scatter	Pre-Contact	Kikuchi 1964; Dye et al. 1985
-3500	Irrigation ditch	Shallow, unfaced ditch	Tomonari-Tuggle 1983
-3501	Platform	Constructed of rounded boulders with cobble fill; in poor condition	Tomonari-Tuggle 1983
-3502	Terrace	Moderate to good condition, but “has little excavation potential...[and] little public or cultural value” (Tomonari-Tuggle 1983:58)	Tomonari-Tuggle 1983
-3503	Terrace	Remnant; fair condition	Tomonari-Tuggle 1983
-3504	Irrigation ditch	Excellent condition; generally unfaced, although some large boulders may be a remnant facing	Tomonari-Tuggle 1983
-3505	Basalt flake deposit	Layer of in situ flakes in upper 20–30 cm of exposure, overlying flakes in an eroded slump deposit	Tomonari-Tuggle 1983
-3506	Irrigation ditch	Well-formed channel with an iron or concrete pipe	Tomonari-Tuggle 1983
-3507	Mounded wall	Possible levee to protect adjacent field from flood waters	Tomonari-Tuggle 1983
-3508	Agricultural complex	Remnant terrace facings and a possible irrigation channel	Tomonari-Tuggle 1983
-3509	Bridge foundation	Post-Contact; concrete and stone	Tomonari-Tuggle 1983; Tomonari-Tuggle and Tuggle 1984
-3510	Agricultural field deposits	—	Tomonari-Tuggle 1983; Tomonari-Tuggle and Tuggle 1984
-3511	Irrigation-related structure	Post-Contact; poorly preserved canal and adjacent embankment	Tomonari-Tuggle 1983; Tomonari-Tuggle and Tuggle 1984

SIHP # (50-80-10-)	Type/Name	Description	Reference
-3512	Habitation complex	Pre- and post-Contact; buried occupation deposit with lithics, firepits, and scattered charcoal	Tomonari-Tuggle 1983; Tomonari-Tuggle and Tuggle 1984; Hammatt et al. 1987
-3513	Irrigation ditches	Post-Contact; consists of two dirt-faced channels cut across the knoll separating Waianu and Waiāhole streams	Tomonari-Tuggle 1983; Tomonari-Tuggle and Tuggle 1984
-3514	Artifact scatter	Pre- and post-Contact; consists of lithic material, crockery, bottle glass, and volcanic glass flakes	Tomonari-Tuggle 1983
-3515	Road or irrigation ditch	Level, linear area on a slope	Tomonari-Tuggle 1983
-3516	Irrigation ditch	—	Tomonari-Tuggle 1983
-3517	Historic house site	Post-Contact; abandoned wood frame house and trash pit	Tomonari-Tuggle 1983
-3518	Historic house site	Post-Contact; abandoned, three-room wood frame house	Tomonari-Tuggle 1983
-3519	Ka Loko Manu Pond	First identified on 1897 map	Tomonari-Tuggle 1983
-3520	Irrigation ditch	Narrow ledge on the face of an escarpment; fair condition	Tomonari-Tuggle 1983
-3521	Embankment	Resembles a railroad berm	Tomonari-Tuggle 1983
-3522	Road bed	Wide, level bench at the base of an escarpment	Tomonari-Tuggle 1983
-3523	McCandless Rice Mill	Constructed in late 19th century	Tomonari-Tuggle 1983
-3524	Agricultural complex	Irrigation canal and rice fields	Tomonari-Tuggle 1983
-3525	Artifact scatter	Lithics and a porcelain sherd	Tomonari-Tuggle 1983
-3526	Agricultural deposits	—	Tomonari-Tuggle 1983; Tomonari-Tuggle and Tuggle 1984
-3527	Irrigation ditch	Feeds off Waiāhole Stream	Tomonari-Tuggle 1983
-4246	Agricultural complex	—	Kawachi 1990
-6396	<i>Pōhaku O Kāne</i>	God stone; pre-Contact	Perzinski et al. 2002
-6756	Subsurface structure foundation	Pre- and post-Contact	O'Leary et al. 2005
-6757	Historic road	Post-Contact	O'Leary et al. 2005

SIHP # (50-80-10-)	Type/Name	Description	Reference
-6758	<i>Lo'i</i> complex	Subsurface <i>lo'i</i> soils; pre- and post-Contact	O'Leary et al. 2005
-6758B	Earthen berm	Associated with <i>lo'i</i> complex; pre- and post-Contact	O'Leary et al. 2005
-6758C	<i>'Auwai</i>	Associated with <i>lo'i</i> complex; pre- and post-Contact	O'Leary et al. 2005



Figure 54. SIHP # -6758 Feature C, *'auwai*, beginning at concrete culvert beneath Kamehameha Highway (from O'Leary et al. 2005)

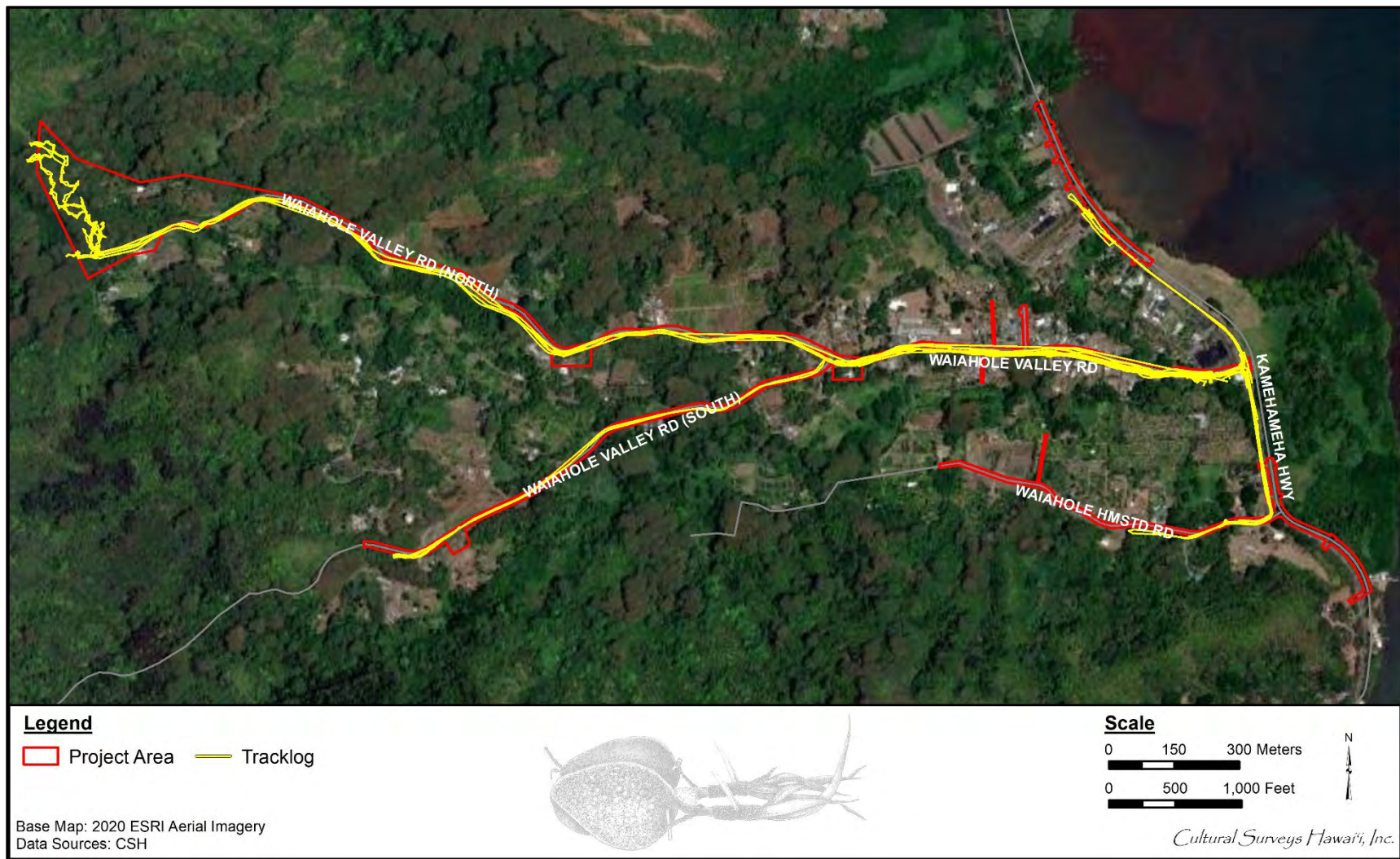


Figure 55. 2020 ESRI aerial imagery with overlay of one archaeologist's track log from the 2018 field inspection of the project area, as it was understood at the time

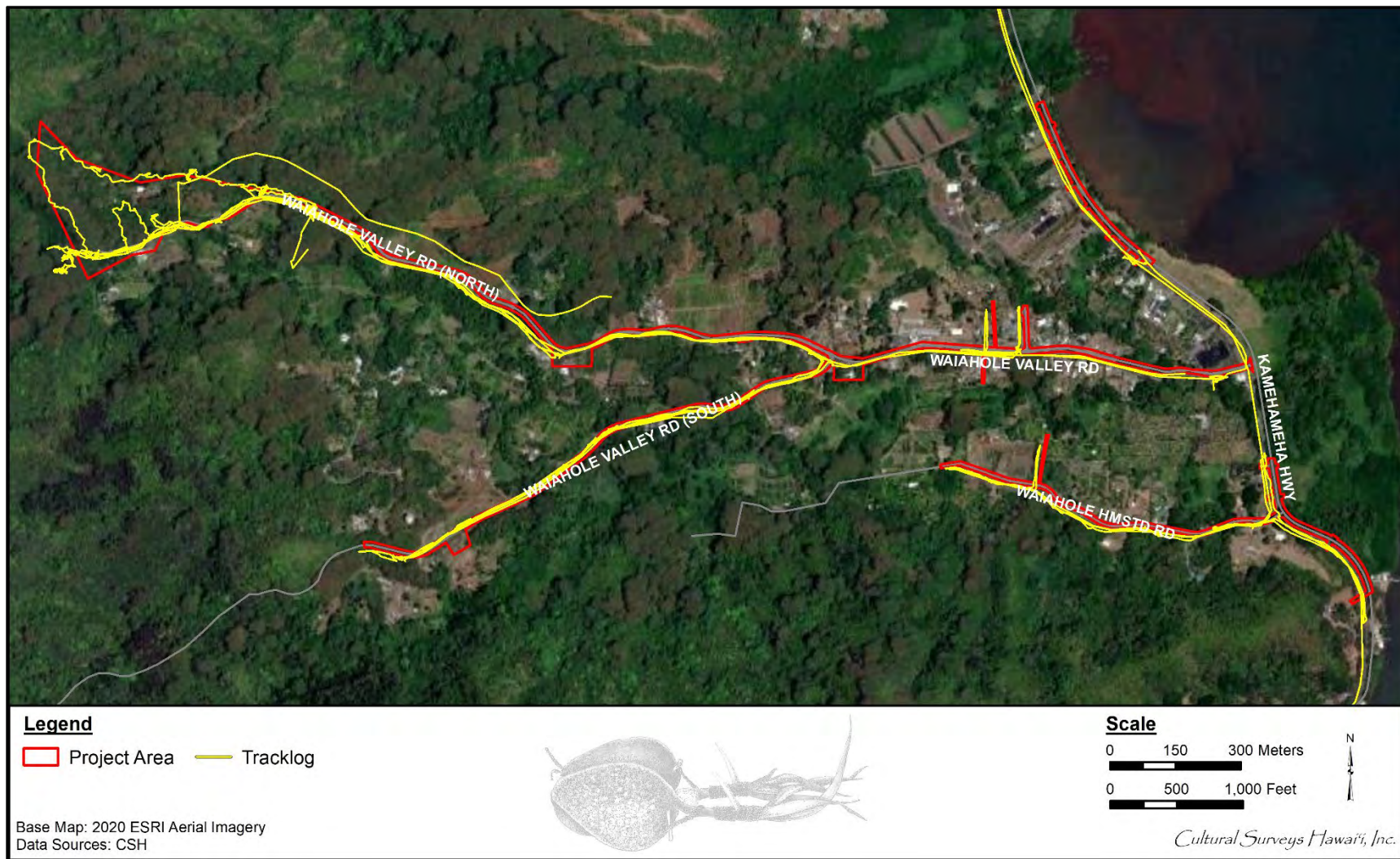


Figure 56. 2020 ESRI aerial imagery with overlay of one archaeologist's track log from the 2022 field inspection of the project area



Figure 57. 2020 ESRI aerial imagery showing potential historic properties identified during 2018 and 2022 field inspections, designated as CSH 1 through CSH 20 and CSH 22 through CSH 32 (CSH 21 was eliminated)



Figure 58. CSH 1 Feature C, mortared basalt retaining wall on the south side of Waiāhole Valley Road, view to southwest (CSH 2018)



Figure 59. CSH 1, retaining wall, showing Feature A (right), Feature B (left), and Feature C (top), view to northeast (CSH 2018)



Figure 60. CSH 1, retaining wall, showing Feature C (top) and Feature D (bottom) (CSH 2018)



Figure 61. CSH 2 Feature A (concrete culvert, bottom) and Feature B (mortared basalt retaining wall, top) on the north side of Waiāhole Valley Road, view to north (CSH 2018)



Figure 62. CSH 2 Feature A (concrete culvert, center) and Feature B (mortared basalt retaining wall, right) from the opposite angle, view to southwest (CSH 2018)



Figure 63. CSH 3, concrete and mortared basalt culvert on the north side of Waiāhole Homestead Road, view to southeast (CSH 2018)



Figure 64. CSH 4, mortared basalt retaining wall on the south side of Waiāhole Homestead Road, view to southwest (CSH 2018)



Figure 65. CSH 5, mortared basalt culvert on the northwest corner of the Waiāhole Valley Road–Kamehameha Highway intersection, view to southwest (CSH 2018)



Figure 66. Close-up of the east end of CSH 5, mortared basalt culvert, showing the ca. 50-cm diameter opening, view to southeast (CSH 2018)



Figure 67. CSH 6, mortared basalt retaining wall on the north side of Waiāhole Valley Road South Branch, view to northeast (CSH 2018)



Figure 68. Close-up of a wood fencepost and barbed wire associated with CSH 7, view to north (CSH 2018)



Figure 69. North portion of CSH 8 Feature A, mortared basalt culvert with concrete pipe, view to south (CSH 2018)



Figure 70. South portion of CSH 8 Feature A (culvert) and Feature B (ditch) in relation to the stream (in background), view to west (CSH 2018)



Figure 71. Plan view of CSH 9 Feature A, concrete structural remnant (CSH 2022)



Figure 72. CSH 9 Feature B, concrete structural remnant, view to west (CSH 2022)



Figure 73. Disarticulated building remnants associated with CSH 9, view to east (CSH 2022)



Figure 74. CSH 10, concrete structural remnant with metal fence, view to northeast (CSH 2022)



Figure 75. CSH 11, likely pet grave, view to northeast (CSH 2022)



Figure 76. CSH 12, mortared basalt bridge/culvert spanning Uwau Stream, view to north (CSH 2022)



Figure 77. CSH 13, mortared basalt wall, view to north (CSH 2022)



Figure 78. CSH 13, mortared basalt wall, view to northeast (CSH 2022)



Figure 79. CSH 14, mortared basalt retaining wall with metal fence, view to west (CSH 2022)



Figure 80. CSH 14, close-up of PVC drainage pipe near base, view to northwest (CSH 2022)



Figure 81. CSH 15, mortared basalt retaining wall, view to west (CSH 2022)



Figure 82. CSH 16, mortared basalt retaining wall, view to southwest (CSH 2022)



Figure 83. CSH 17, mortared basalt retaining wall, view to east (CSH 2022)



Figure 84. CSH 18, mortared basalt retaining wall, view to north (CSH 2022)



Figure 85. CSH 19, mortared basalt retaining wall, view to south (CSH 2022)



Figure 86. CSH 20, mortared basalt retaining wall, view to southeast (CSH 2022)



Figure 87. CSH 22, mortared basalt retaining wall, view to west (CSH 2022)



Figure 88. CSH 23, mortared basalt retaining wall, view to southeast (CSH 2022)



Figure 89. CSH 24 Feature A, earthen ditch/‘auwai, view to southwest (CSH 2022)



Figure 90. CSH 24 Feature B, earthen ditch/‘auwai, view to southwest (CSH 2022)



Figure 91. CSH 24 Feature B, earthen ditch/‘auwai as it flows into ditch along Kamehameha Highway, view to east (CSH 2022)



Figure 92. CSH 25, mortared basalt retaining wall, view to west (CSH 2022)



Figure 93. CSH 26, mortared basalt retaining wall with staircase, view to south (CSH 2022)



Figure 94. CSH 27, mortared basalt retaining wall, view to east (CSH 2022)



Figure 95. CSH 28, mortared basalt culvert, view to southwest (CSH 2022)



Figure 96. CSH 29, mortared basalt retaining wall with downslope portion, view to west (CSH 2022)



Figure 97. CSH 30, mortared basalt retaining wall, view to north (CSH 2022)



Figure 98. CSH 31, mortared basalt culvert, view to east (CSH 2022)



Figure 99. CSH 31, concrete culvert outlet on opposite side of Kamehameha Highway from mortared basalt portion, view to southeast (CSH 2022)



Figure 100. CSH 32, basalt retaining wall along *makai* side of Kamehameha Highway, view to northwest (CSH 2022)



Figure 101. Concrete culvert intake associated with SIHP # -6758 Feature C, *'auwai*, view to northeast (CSH 2022)



Figure 102. Concrete culvert outtake associated with SIHP # -6758 Feature C, *'auwai*, view to northwest (CSH 2022)



Figure 103. 2020 ESRI aerial imagery with overlay of potential historic properties identified within the project area during two field inspections by CSH (CSH 7, 8, and 14–17) and a historic property previously identified immediately adjacent to the project area (SIHP # -6758 Feature C)

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Appendix E. Cultural Impact Assessment

Draft
Cultural Impact Assessment for the Waiāhole Valley
Water System Improvements and Reservoir Project,
Waikāne and Waiāhole Ahupua‘a,
Ko‘olaupoko District, O‘ahu
TMKs: (1) 4-8-007 through 012: various

Prepared for
Bills Engineering, Inc.
on behalf of
Hawaii Housing Finance and Development Corporation

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(Job Code: WAIKANE 7A)

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Management Summary

Reference	Cultural Impact Assessment for the Waiāhole Valley Water System Improvements and Reservoir Project, Waikāne and Waiāhole Ahupua'a, Ko'olaupoko District, O'ahu, TMKs: (1) 4-8-007 through 012: various (Spencer et al. 2023)
Date	April 2023
Project Number	Cultural Surveys Hawai'i, Inc. (CSH) Job Code: WAIKANE 7A
Agencies	Hawaii Housing Finance and Development Corporation (HHFDC)
Land Jurisdiction	State of Hawai'i
Project Location	<p>The project area includes the length of Waiāhole Valley Road from its intersection with Kamehameha Highway to its division into the North and South Branch roads; portions of Waiāhole Valley Road North Branch and Waiāhole Valley Road South Branch; an HHFDC-owned land parcel at the <i>mauka</i> (toward the mountains) terminus of Waiāhole Valley Road North Branch; a portion of Waiāhole Homestead Road; and portions of Kamehameha Highway north of Waiāhole Valley Road and south of Waiāhole Homestead Road. Most of the project area is within Waiāhole Ahupua'a, with a portion extending into adjacent Waikāne Ahupua'a.</p> <p>The project area is shown on a portion of the 1998 Kaneohe U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle, a tax map plat, and a 2020 aerial photograph.</p>
Project Description	<p>The proposed project will pursue one of two options. Option 1, Board of Water Supply (BWS) Compliant System, involves the installation of new wells, a new tank, and complete replacement of the distribution system. This option would improve the water system to BWS standards and turn it over to BWS to own, operate, and maintain. Option 2, Private System, involves new wells, a new tank, and spot improvements to the distribution system. This option would improve the water system and turn it over to a private water system management company to operate and maintain; the ownership would continue to be HHFDC. If Option 1 is not feasible, Option 2 would be pursued. However, for either Option 1 or Option 2 to be feasible, a suitable well site at the 365-foot (ft) elevation reservoir site must be developed. The well site would be located on Lot 50 at the end of Waiāhole Valley Road North Branch. Development of the wells would include drilling, testing, and a transfer of the water use permit from the existing wells to the new wells.</p> <p>Assuming successful well verification, the proposed project calls for the installation of a permanent access road, 0.5 MG reservoir, and well outfitting at Lot 50. This will include clearing, grubbing, and</p>

	<p>grading for the access road, 0.5 MG reservoir, and well site. The permanent access road will include paving, water line installation, drain line installation, and underground electric and telecommunications installation. Water line installation under Option 1 will include trenching, water line installation, and backfilling of the water line trench, with the final surface being asphaltic concrete paving.</p> <p>Note Option 1 (BWS Compliant System) would involve substantially more ground disturbance than Option 2 (Private System).</p>
Project Acreage	The project area is approximately 10 acres (4.05 hectares).
Document Purpose	<p>This cultural impact assessment (CIA) was prepared to comply with the State of Hawai‘i’s environmental review process under Hawai‘i Revised Statutes (HRS) §343, which requires consideration of the proposed project’s potential effect on cultural beliefs, practices, and resources. Through document research and cultural consultation efforts, this report provides information compiled to date pertinent to the assessment of the proposed project’s potential impacts to cultural beliefs, practices, and resources (pursuant to the Office of Environmental Quality Control’s <i>Guidelines for Assessing Cultural Impacts</i>). These resources may be significant historic properties under State of Hawai‘i significance Criterion e, pursuant to Hawai‘i Administrative Rules (HAR) §13-275-6. Significance Criterion e refers to historic properties that “have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group’s history and cultural identity” (HAR §13-275-6). The document will likely also support the project’s historic preservation review under HRS §6E-8 and HAR §13-275.</p>
Results of Background Research	<p>Background research for this project yielded the following results:</p> <ol style="list-style-type: none"> 1. The <i>ahupua‘a</i> (traditional land division usually extending from the mountains to the sea) of Waiāhole and Waikāne are in the Ko‘olaupoko District on the Windward side of O‘ahu. According to Pukui et al. (1974:219), the name Waiāhole was Wai-āhole and is literally translated as “mature <i>āhole</i> (a fish) water.” Pukui et al. (1974:223) also note the name Waikāne was Wai-a-Kane and is literally translated as “Kāne’s water.” “The name of this land is Waikāne because it was here that Kāne first dug for water for the benefit of Paliuli.”

	<ol style="list-style-type: none"> 2. Like all of the Windward valleys, Waikāne and Waiāhole valleys are affected by the prevailing winds in the island, which are the northeast trades that blow against the Ko‘olau Mountains (Juvik and Juvik 1998:55). The mountains create an orographic effect that results in an annual rainfall of up to 160 inches (4,064 mm) per year in the <i>mauka</i> sections of the valley. This rainfall produces strong flowing perennial streams, including Waiāhole Stream, Waianu Stream, and Uwao Stream in the immediate vicinity of the project area. These streams would have provided plentiful waters for both domestic and agricultural needs. 3. The management of marine sources in the <i>moku</i> (district) of Ko‘olaupoko is evident by the multitude of fishponds and by the existence of numerous fishing shrines. Two notable <i>loko i‘a</i> (fishpond) were in Waikāne; though one name has been forgotten, the name of the other <i>loko i‘a</i> was Kolowalu. Squid was an abundant resource and most popular amongst the residents of Waiāhole and Waikāne. In the mid-1800s, the squid was listed as <i>kapu</i> (sacred) by the King (Devaney et al. 1982:136). 4. Two <i>heiau</i> (pre-Christian place of worship) in Waikāne were noted by McAllister, Kukuianiani Heiau and Ka‘awakoa Heiau (McAllister 1933:170–171). Kukuianiani Heiau was located at the foot of Pu‘u Pueo and Ka‘awakoa Heiau, believed to be a companion structure, was a few hundred feet south of Kukuianiani. 5. Waikāne was one of the three <i>pu‘uhonua</i> (place of refuge) in Ko‘olaupoko (Kamakau 1964:18). If a person was to break any law or was a non-combatant during times of war, they could find safety and shelter within a <i>pu‘uhonua</i>. 6. Adze quarries have been identified on the ridges between the valleys, and evidence of the manufacture of stone tools has been found in the valley floors. In a 1964 report, Kikuchi found considerable evidence of the manufacture of stone tools within the valley, including a lithic scatter in a bulldozed field (Kikuchi 1964). 7. The first census conducted on O‘ahu from 1831 to 1832 reported 419 people in the Waikāne and Waiāhole Ahupua‘a (Schmitt 1973:19) 8. While rice cultivation came to dominate the landscape at Waikāne and Waiāhole, taro cultivation remained common although rice appears to have been the preferred crop within the project area and its vicinity. Other crops such as introduced vegetables and fruits were grown. These included cabbage, radishes, onions, turnips, beans, lotus root, litchi,
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	<p>mango, lungan, pomelo, and banana (Devaney et al. 1982:53).</p> <ol style="list-style-type: none"> 9. Pineapple cultivation also occurred for a brief time and a train track was used to transport pineapples, likely the same track constructed by the Waiāhole Water Company in 1913. Condé and Best (1973:337) wrote that “ten miles of railroad were built, including an ocean pier. One portion of the railroad was laid at the landing at Waikane [...]” 10. Between 1913–1916 the Waiāhole ditch and tunnel system was constructed. The system began at Kahana Valley and included a series of tunnels dug into the Ko‘olau Mountains. The Waiāhole Ditch system and other facilities were designed to channel water from the Windward O‘ahu watershed to irrigate Central and Leeward O‘ahu sugarcane fields (State of Hawai‘i 1997:6). 11. According to a study conducted of the Waiāhole, Waikāne, Kahana and Punalu‘u areas by G.K. Lassison in 1916, these streams produced at least three million gallons daily during dry weather season (at elevations of 500 ft or more above sea level) which no other streams on O‘ahu produced (Hood 2004:31). 12. On 27 May 1916, the tunnel was fully operational and the waters were diverted from Waiāhole, Waikāne, and Kahana Valleys to the ‘Ewa plains. The tunnel ran for 2.7 miles and was the longest transmountain tunnel in Hawai‘i until the completion of the Molokai tunnel (Hood 2004:7). 13. One share of the waters in Waikāne is owned by the Hui Aina of Waikane through Royal Patent Grant 464; this was leased to Waiahole Water Company on 3 May 1922 for a term of 20 years, expiring in 1942. 14. In December 1994, the Water Commission directed that 8 million gallons per day (mgd) would flow through the tunnels to Leeward O‘ahu and the rest would flow to the windward streams (State of Hawai‘i 1997:4). 15. A survey done after the water had been returned to the Waiāhole Stream for approximately six months and the Waianu Stream about one month and both habitats had shown a promising re-establishment of native populations of ‘o‘opu (Hawaiian freshwater goby), ‘opae (Hawaiian red shrimp), and hīhīwai (<i>Neritina graposa</i>) indicated the species were returning from the ocean to the streams (State of Hawai‘i 1997:19).
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Cultural Practices Identified	<p>Background research and consultation for this study identified the following cultural practices within Waiāhole and Waikāne Ahupua‘a:</p> <ul style="list-style-type: none"> • Manufacturing stones tools* • Agricultural Practices[§] • <i>Loko i‘a</i> and fishing[§] • Plant gathering[§] • Religious activities[§] • <i>La‘au lapa‘au</i> (Healing practices)[§] • Canoe building[§] • Hunting[†] <p>* indicates a Traditional practice that is no longer practiced [§] indicates a Traditional practice that continues to be practiced [†] indicates a modern practice</p>
Results of Community Consultation	<p>CSH attempted to contact Native Hawaiian Organizations (NHO), agencies, and community members. Below is a list of individuals who shared their <i>mana‘o</i> (thought, opinions) and <i>‘ike</i> (knowledge) about the project area and the Waikāne and Waiāhole <i>ahupua‘a</i>.</p> <ol style="list-style-type: none"> 1. Keoki Fukumitsu, <i>kama‘āina</i> (native born) of Waiāhole and Waikāne, lineal descendent, and cultural practitioner 2. Keoni Fox, Ko‘olaupoko Hawaiian Civic Club member, cultural practitioner, and a steward of the Kukuianiani Heiau complex 3. Jan Becket, author, photographer, and retired teacher from Kamehameha Schools, Kona Moku Representative, Council of Hawaiian Civic Club’s Committee on the Preservation of Historic Sites and Cultural Properties 4. John Reppun, Community Development Coordinator with the Kualoa-He‘eia Ecumenical Youth (KEY) Project 5. Ryan Ringuette, Todd Melton, Justin Saito, and Lawrence Uyemura, farmers from Waiāhole and members of Waiāhole-Waikāne Community Association’s Hui Wai Ola (Water) Committee
Impacts and Recommendations	<p>Based on information gathered from the community consultation, participants voiced and framed their concerns in a cultural context.</p> <p><u>Impacts</u></p> <ol style="list-style-type: none"> 1. Community members expressed concern regarding potential impacts to aquatic life. Mr. Fukumitsu expressed concern that increased runoff and sedimentation from construction projects within Waikāne and Waiāhole, including the current project, could exacerbate conditions within Waiāhole <i>muliwai</i> (river mouth, delta), which he noted is a spawning

	<p>ground and sanctuary for fish and invertebrate species. He believes ongoing restoration of <i>lo ‘i kalo</i> (irrigated taro patch) and fishponds <i>makai</i> (toward the sea) of the project area will help mitigate impacts of potential construction runoff associated with the project.</p> <ol style="list-style-type: none"> 2. Mr. Reppun mentioned there were <i>lo ‘i</i> and <i>kuleana</i> (Native land rights) parcels located along the streams and into the valley. He asked, “How does this project impact the potential for restoring cultivation up into that area? Whether it’s taro or it’s <i>māmaki</i> [<i>Pipturus</i> spp.] for tea. All those kinds of things.” 3. Mr. Uyemura believes that the project, specifically pumping water from wells rather than obtaining water from the tunnel, could impact stream flows that cultural farming practices rely on. He expressed concern that using a pump system to pull up water from a depth lower than the river may cause the river to dry up. He also expressed concern that pumps may begin pulling up brackish or salt water. <p><u>Recommendations</u></p> <ol style="list-style-type: none"> 1. Community members preferred a different alternative. Mr. Fukumitsu, Mr. Reppun, and Mr. Uyemura suggested tapping development tunnels that feed the Waiāhole Tunnel and Ditch System, including the Uwao development tunnel, instead of pumping groundwater from the aquifer. Mr. Reppun and Mr. Uyemura also suggested using water from the development tunnels to generate hydroelectric power. 2. Mr. Fukumitsu recommends native plants be utilized whenever possible in reforestation efforts following clearing that occurs in the buffer zones of development projects, including the current project. He emphasized “foods that occur locally and naturally within the Hawaiian environment should be propagated and planted as they possess a district’s ‘cultural value.’” He also suggested establishing a seed bank that extends <i>mauka</i> to <i>makai</i> in order to retain access to native plant varieties. 3. Mr. Fukumitsu harvests the Albizia trees in Waiāhole and utilizes the wood for canoe construction. He harvests the Albizia wood directly within and surrounding the current project area. If the project results in the harvest of an Albizia tree that is of sufficient size, it could be offered to Mr. Fukumitsu for building a canoe. Mr. Reppun also suggested “cutting Albizia trees and managing the watershed would reduce the potential for impacts on that pump station” (note:
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	<p>this refers to the wells that will be removed during the proposed project).</p> <ol style="list-style-type: none"> 4. Mr. Fukumitsu requested that an area of bamboo patches <i>mauka</i> of the proposed reservoir be left intact. He stated the bamboo hedges are planted on top of ancient taro terraces, and the bamboo patches keep the soil in place, deterring further erosion of the ancient taro terraces. He stressed that “they leave the bamboo as a hedge to keep the soil in place. So whatever construction they do over here they have to leave the bamboo, they have to leave at least a good portion of the bamboo.” He also stated that “one terrace off the road that is a no-no, they cannot go in there. They just cannot go in the bamboo patch.” Based on current project plans, no bamboo patches will be disturbed. Any revisions to the plans should aim to avoid the bamboo patches. 5. Mr. Reppun stressed that the system being proposed has to be climate resilient. He stressed the importance of consulting Flood Insurance Rate Maps (FIRM), which were “drawn basically from the aerial photographs of those events that showed where flooding occurred.” He noted climate change intensifies the potential for and frequencies of these storms. 6. Mr. Reppun discussed the possibility of the community using portions of Lot 50 for purposes beyond the proposed wells and tank. He suggested Lot 50 could be a great location for “a cultural center, a <i>piko</i>, place where we could celebrate the ancient history.” He also suggested the possibility of building some housing or an emergency shelter. 7. Mr. Reppun shared several referrals of other community members who are very knowledgeable of the historic and cultural significance of Waiāhole and Waikāne. He suggested speaking with John and Martin Charlot, who lived in the vicinity of Lot 50; Liko Hoe, who runs the Waiāhole Poi Factory and is a professor at Windward Community College; Hawaiian Civic Clubs; Mahealani Cypher, Secretary of the Ko‘olau Foundation; Dr. Lilikalā Kame‘eleihiwa, Senior Professor at University of Hawai‘i at Mānoa’s Kamakakūokalani Center for Hawaiian Studies; Cy Bridges, <i>kuma hula</i> (dance teacher) and Cultural Director at the Polynesian Cultural Center; Mary Kupau, <i>kuma hula</i>; and <i>kama ‘āina</i> (native born) of Waiāhole Ryan Ringuette, Rainbow Uli‘i, and Kaua Fiola. 8. Project construction workers and all other personnel involved in the construction and related activities of the project should be informed of the possibility of inadvertent cultural finds, including human remains. In the event that any potential
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	historic properties are identified during construction activities, all activities will cease in that area and the SHPD will be notified pursuant to HAR §13-280-3. In the event that <i>iwi kūpuna</i> (ancestral remains) are identified, all earth moving activities in the area will stop, the area will be cordoned off, and the State Historic Preservation Division (SHPD), medical examiner, and Police Department will be notified pursuant to HAR §13-300-40. In addition, in the event of an inadvertent discovery of human remains, the completion of a burial treatment plan in compliance with HAR §13-300 and HRS §6E-43 is recommended.
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Table of Contents

Management Summary	i
Section 1 Introduction	1
1.1 Project Background	1
1.2 Document Purpose	5
1.3 Scope of Work	5
1.4 Environmental Setting	5
1.4.1 Natural Environment.....	5
1.4.2 <i>Nā Lepo</i> (Soils)	6
1.4.3 <i>Nā Makani</i> (Wind)	8
1.4.4 <i>Nā Ua</i> (Rain).....	9
1.4.5 <i>Loko I'a</i> (Fishpond) and Ocean Resources	10
1.4.6 Built Environment	12
Section 2 Methods	20
2.1 Archival Research.....	20
2.2 Community Consultation.....	20
2.2.1 Scoping for Participants.....	20
2.2.2 “Talk Story” Sessions	20
2.2.3 Interview Completion	21
Section 3 <i>Ka‘ao</i> and <i>Mo‘olelo</i> (Legends and Stories).....	22
3.1 <i>Mo‘olelo</i>	22
3.1.1 Waiāhole	22
3.1.2 Waikāne	23
3.1.3 The Kumulipo	23
3.1.4 Hard Taro of Waiāhole	24
3.1.5 Kuapunohu.....	24
3.1.6 Halemano	26
3.1.7 Kapunohu.....	26
3.1.8 Pele and Hi‘iaka.....	27
3.1.9 Hi‘iaka and Mokoli‘i	28
3.1.10 Lands Distributed by Kamapua‘a	31
3.2 <i>Wahi Pana</i> (Legendary Places).....	32
3.2.1 <i>Heiau</i> (Pre-Contact Place of Worship)	49
3.2.2 <i>Loko I'a</i>	49
3.2.3 Kapahu Hōlua	49
3.2.4 <i>Pu‘uhonua</i>	50
3.2.5 Adze Quarry.....	51
3.2.6 <i>Ala Hele</i> (Trails)	51
3.2.7 Ahu o Laka	52
3.3 <i>‘Ōlelo No‘eau</i> (Hawaiian Proverbs)	53
3.3.1 <i>‘Ōlelo No‘eau</i> #550	53
3.3.2 <i>‘Ōlelo No‘eau</i> #1385	53
3.3.3 <i>‘Ōlelo No‘eau</i> #1674	54
3.3.4 <i>‘Ōlelo No‘eau</i> #1735	54
3.3.5 <i>‘Ōlelo No‘eau</i> #2285	54

3.4 <i>Mele</i> (Songs).....	54
3.4.1 Waiāhole E.....	55
3.4.2 Kāne‘ohe.....	55
3.4.3 Pele and Hi‘iaka.....	55
3.4.4 Sweet Lady Of Waiāhole.....	56
Section 4 Historical Background	57
4.1 Pre-Contact to Early Post-Contact Period.....	57
4.2 Mid-Nineteenth Century	58
4.2.1 The Māhele	58
4.2.2 Rice Cultivation in Waikāne and Waiāhole.....	64
4.3 Twentieth Century to Present	66
4.3.1 Pineapple Cultivation.....	66
4.3.2 Waiāhole/Waikāne Tunnel Project	66
4.3.3 Waikane Valley Training Area	77
4.3.4 Waiāhole Agricultural Park	77
Section 5 Previous Archaeological Research	78
5.1.1 Kikuchi 1964	78
5.1.2 Barrera 1982	78
5.1.3 Tomonari-Tuggle 1983	78
5.1.4 Tomonari-Tuggle and Tuggle 1984.....	78
5.1.5 Dye et al. 1985	86
5.1.6 Hammatt et al. 1987.....	86
5.1.7 Kawachi 1990	86
5.1.8 Walsh et al. 1995	86
5.1.9 Perzinski et al. 2002.....	86
5.1.10 O’Leary et al. 2005	86
5.1.11 McElroy and Duhaylonsod 2015	86
Section 6 Community Consultation.....	88
6.1 Introduction.....	88
6.2 Community Contact Table.....	88
Section 7 Community Interviews.....	100
7.1 <i>Kama‘āina</i> Interviews.....	100
7.1.1 Summary of Keoki Fukumitsu Interview	100
7.1.2 Summary of Keoni Fox and Jan Becket Interview	108
7.1.3 Summary of John Reppun Interview	124
7.1.4 Summary of Ryan Ringuette, Todd Melton, Justin Saito, and Lawrence Uyemura Interview	132
Section 8 Traditional Cultural Practices.....	136
8.1 Fishing and Aquatic Resources.....	136
8.2 Freshwater Resources	138
8.3 Cultivation and Gathering.....	141
8.4 <i>Wahi Pana</i> and <i>Heiau</i>	146
Section 9 Summary and Recommendations	150

9.1 Results of Background Research	150
9.1.1 Summary of Traditional and Historical Background.....	150
9.1.2 Cultural Practices Identified	151
9.2 Results of Community Consultation.....	152
9.3 Impacts and Recommendations	152
9.3.1 Impacts.....	152
9.3.2 Recommendations.....	153
Section 10 References Cited	155
Appendix A Land and Water Deeds for Waikāne-Waiāhole	165
A.1 Royal Patent 464 Between Kamehameha III and E.O. Hall	165
A.2 Deed between Hall & Diamond to Elani & others 1862.....	166
A.3 Deed between Elizabeth Loy Marks and Windward Partners 1975	167
A.4 Deed Phoenix Limited Partnership and Pan-Pacific Development Inc 16 July 1987	187
A.5 Deed Between Azabu USA Corp and City and County of Honolulu 15 May 1998	196
A.6 Lease Between John M. Kamaka and Waiahole Water Company 1922 & 1934.....	201
Appendix B Community Outreach Letters	207
B.1 Community Outreach Letter	207
B.2 Revised Community Outreach Letter.....	209

List of Figures

Figure 1. Portion of the 1998 Kaneohe USGS 7.5-minute topographic quadrangle showing the two project options (BWS Compliant and Private) within the project area	2
Figure 2. Tax Map Key (TMK) [1] 4-8-012, showing the two project options (BWS Compliant and Private) within the project area (Hawai‘i TMK Service 2014).....	3
Figure 3. Aerial photograph showing the two project options (BWS Compliant and Private) within the project area (ESRI 2020)	4
Figure 4. 1998 USGS topographic map with an overlay of the USDA SSURGO database (2001) and soil survey gathered by Foote et al. (1972).....	7
Figure 5. Intersection of Waiāhole Valley Road and Kamehameha Highway, view to south; Waiāhole Poi Factory on right	13
Figure 6. Portion of the project area on Waiāhole Valley Road taken from the east (<i>makai</i>) end, view to west	13
Figure 7. Central portion of the project area on Waiāhole Valley Road, view to west	14
Figure 8. <i>Mauka</i> (west) portion of the project area on Waiāhole Valley Road, view to west; Waiahole Elementary School in right background	14
Figure 9. Intersection of Waiāhole Homestead Road and Kamehameha Highway, view to south	15
Figure 10. <i>Makai</i> (east) portion of the project area on Waiāhole Homestead Road, view to west	15
Figure 11. Central portion of the project area on Waiāhole Homestead Road, view to southwest	16
Figure 12. <i>Mauka</i> (west) end of the project area on Waiāhole Valley Road South Branch, view to southwest.....	16
Figure 13. Central portion of the project area on Waiāhole Valley Road North Branch, view to southeast.....	17
Figure 14. Southeast end of the undeveloped parcel adjacent to Waiāhole Valley Road North Branch, view to northwest	17
Figure 15. Northwest end of the undeveloped parcel adjacent to Waiāhole Valley Road North Branch, view to north.....	18
Figure 16. Access road near the northwest end of the undeveloped parcel adjacent to Waiāhole Valley Road North Branch, view to northwest; note recently (as of 2018) planted trees along the road’s edge (right)	18
Figure 17. Typical vegetation growth within the undeveloped parcel adjacent to Waiāhole Valley Road North Branch, view to south.....	19
Figure 18. Waikāne, courtesy of Hawai‘i State Archives.....	52
Figure 19. 1878 Brown map of Waiāhole (RM 312) showing the project area in relation to LCAs	61
Figure 20. 1897 Monsarrat Public Lands Map of Waiāhole (RM 2130) showing the project area in relation to LCAs.....	62
Figure 21. A portion of the 1998 Kaneohe USGS 7.5-minute topographic quadrangle with overlay of LCAs in the vicinity of the project area	63

Figure 22. Portion of the 1906 Donn Hawaii Territory Survey map of O'ahu with land use (RM 2374), showing the <i>makai</i> portions of the project area in wetland cultivation of taro and/or rice and the <i>mauka</i> portions within grazing lands	65
Figure 23. Portion of the 1919 U.S. Army War Department fire control map, Kaneohe quadrangle showing the project area; an early alignment of Kamehameha Highway is depicted along the coast; the other roads within the project area are depicted but appear to be unimproved (Waiāhole Homestead Road also appears to have a slightly different alignment); scattered buildings are indicated throughout the area, particularly along Waiāhole Valley Road and Kamehameha Highway	67
Figure 24. Portion of the 1936 U.S. Army War Department terrain map, Waikane quadrangle showing the project area; most of the project area roads are still unimproved, but Waiāhole Homestead Road appears more in line with its current alignment	68
Figure 25. Portion of the 1943 U.S. Army War Department terrain map, Waikane quadrangle showing the project area; no additional development is indicated since the previous map	69
Figure 26. Portion of the 1954 Kaneohe USGS topographic quadrangle showing the project area; Kamehameha Highway is called out as a major coastal route; development is still relatively sparse, although additional buildings are indicated along the coast, along Waiāhole Valley Road and Waiāhole Homestead Road, and in more <i>mauka</i> locations; Waiāhole Elementary School is also indicated	70
Figure 27. Portion of the 1968 Kaneohe USGS topographic quadrangle showing the project area; Waiāhole Valley Road and its north branch are depicted as improved; development continues to increase gradually, primarily along the coast and along Waiāhole Valley Road	71
Figure 28. 1978 Kaneohe USGS orthophotoquad aerial photograph showing the project area; the <i>mauka</i> areas are still situated in relatively undeveloped land	72
Figure 29. Waiāhole Water Tunnels, courtesy of Hawai'i State Archives	73
Figure 30. 1998 Kaneohe USGS topographic quadrangle, showing previous archaeological studies in the project area vicinity	81
Figure 31. 1998 Kaneohe USGS topographic quadrangle, showing previously identified historic properties in the project area vicinity	85
Figure 32. Cultural sites as described by Mr. Fukumitsu	107
Figure 33. <i>Kī</i> plants at Kukuianiani Heiau (CSH 2018)	113
Figure 34. <i>Ha'uo</i> i or <i>ōwī</i> plant at Kukuianiani Heiau (CSH 2018)	114
Figure 35. <i>Noni</i> tree at Kukuianiani Heiau (CSH 2018)	115
Figure 36. A burial site <i>makai</i> of the entrance to Kukuianiani Heiau (CSH 2018)	117
Figure 37. The indented stone at an entrance to Kukuianiani Heiau (CSH 2018)	118
Figure 38. Pu'u Pueo photographed from Kamehameha Highway in Waikāne (CSH 2018)	119
Figure 39. Paved rock terraces and walls of Kukuianiani Heiau (CSH 2018)	121
Figure 40. Branch coral seen within stone terracing (CSH 2018)	122
Figure 41. A trail that commences at the upper portions of Kukuianiani Heiau (CSH 2018)	123

List of Tables

Table 1. Place names of Waiāhole.....	33
Table 2. Place Names of Waikāne	44
Table 3. Land Commission Awards within the project area.....	59
Table 4. Previous archaeological studies in the vicinity of the project area.....	79
Table 5. Historic properties previously identified in the project area vicinity	82
Table 6. Results of Community Consultation.....	88

Section 1 Introduction

1.1 Project Background

At the request of Bills Engineering, Inc., on behalf of the Hawaii Housing Finance and Development Corporation (HHFDC), Cultural Surveys Hawai'i Inc. (CSH) has conducted a cultural impact assessment (CIA) for the Waiāhole Valley Water System Improvements and Reservoir project, Waikāne and Waiāhole Ahupua'a, Ko'olaupoko District, O'ahu, TMKs: (1) 4-8-007 through 012: various. The total project area is approximately 10 acres (4.05 hectares). The project area includes the length of Waiāhole Valley Road from its intersection with Kamehameha Highway to its division into the North and South Branch roads; portions of Waiāhole Valley Road North Branch and Waiāhole Valley Road South Branch; an HHFDC-owned land parcel at the *mauka* (inland, toward the mountains) terminus of Waiāhole Valley Road North Branch; a portion of Waiāhole Homestead Road; and portions of Kamehameha Highway north of Waiāhole Valley Road and south of Waiāhole Homestead Road. Most of the project area is within Waiāhole Ahupua'a, with a portion extending into Waikāne Ahupua'a. The project area is shown on a portion of the 1998 Kaneohe U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle (Figure 1), a tax map plat (Figure 2), and a 2020 aerial photograph (Figure 3).

The proposed project will pursue one of two options. Option 1, Board of Water Supply (BWS) Compliant System, involves the installation of new wells, a new tank, and complete replacement of the distribution system. This option would improve the water system to BWS standards and turn it over to BWS to own, operate, and maintain. Option 2, Private System, involves new wells, a new tank, and spot improvements to the distribution system. This option would improve the water system and turn it over to a private water system management company to operate and maintain; the ownership would continue to be HHFDC. If Option 1 is not feasible, Option 2 would be pursued. However, for either Option 1 or Option 2 to be feasible, a suitable well site at the 365-foot (ft) elevation reservoir site must be developed. The well site would be located on Lot 50 at the end of Waiāhole Valley Road North Branch. Development of the wells would include drilling, testing, and a transfer of the water use permit from the existing wells to the new wells.

Assuming successful well verification, the proposed project calls for the installation of a permanent access road, 0.5 MG reservoir, and well outfitting at Lot 50. This will include clearing, grubbing, and grading for the access road, 0.5 MG reservoir, and well site. The permanent access road will include paving, water line installation, drain line installation, and underground electric and telecommunications installation. Water line installation under Option 1 will include trenching, water line installation, and backfilling of the water line trench, with the final surface being asphaltic concrete paving.

Note Option 1 (BWS Compliant System) would involve substantially more ground disturbance than Option 2 (Private System).

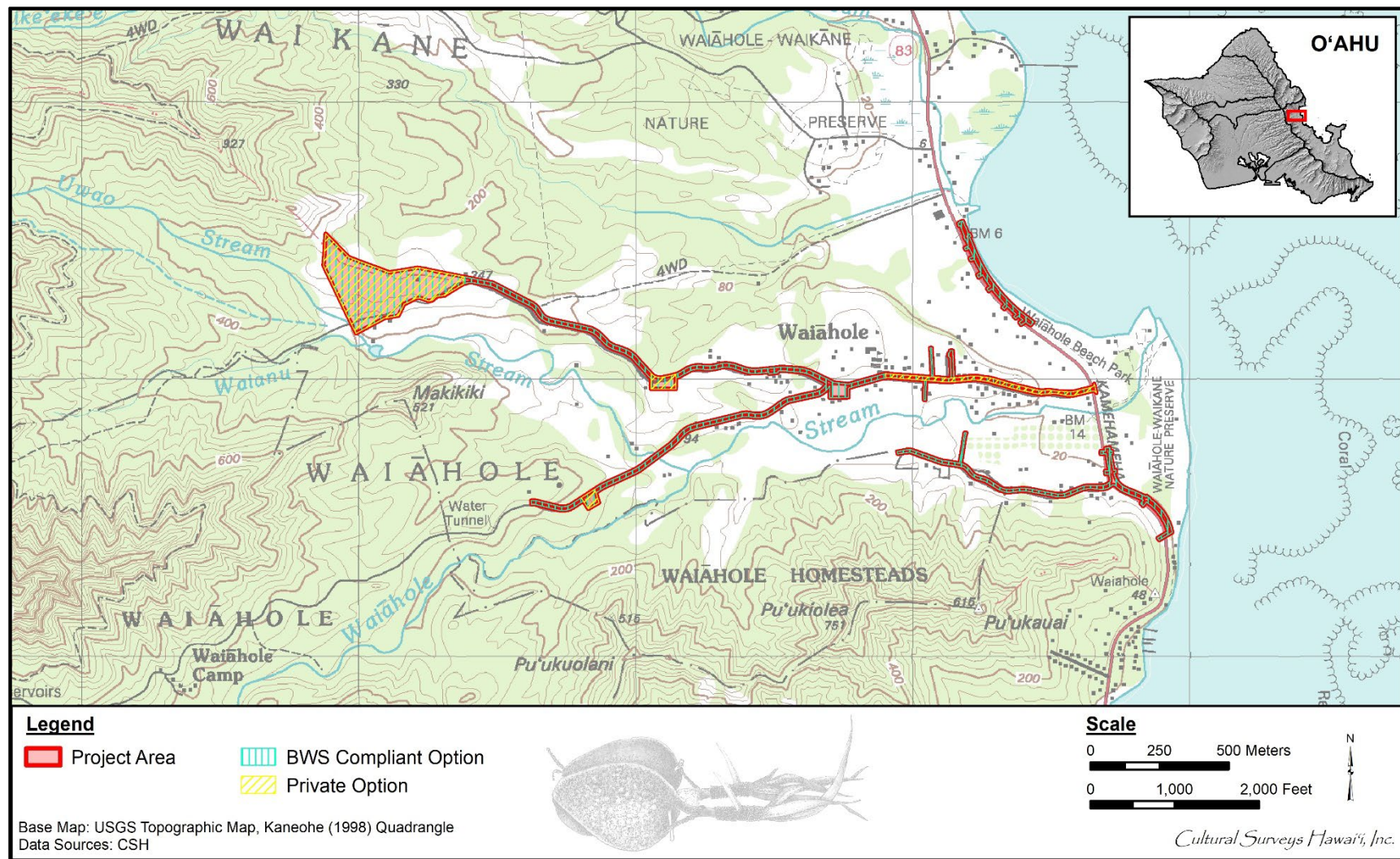


Figure 1. Portion of the 1998 Kaneohe USGS 7.5-minute topographic quadrangle showing the two project options (BWS Compliant and Private) within the project area

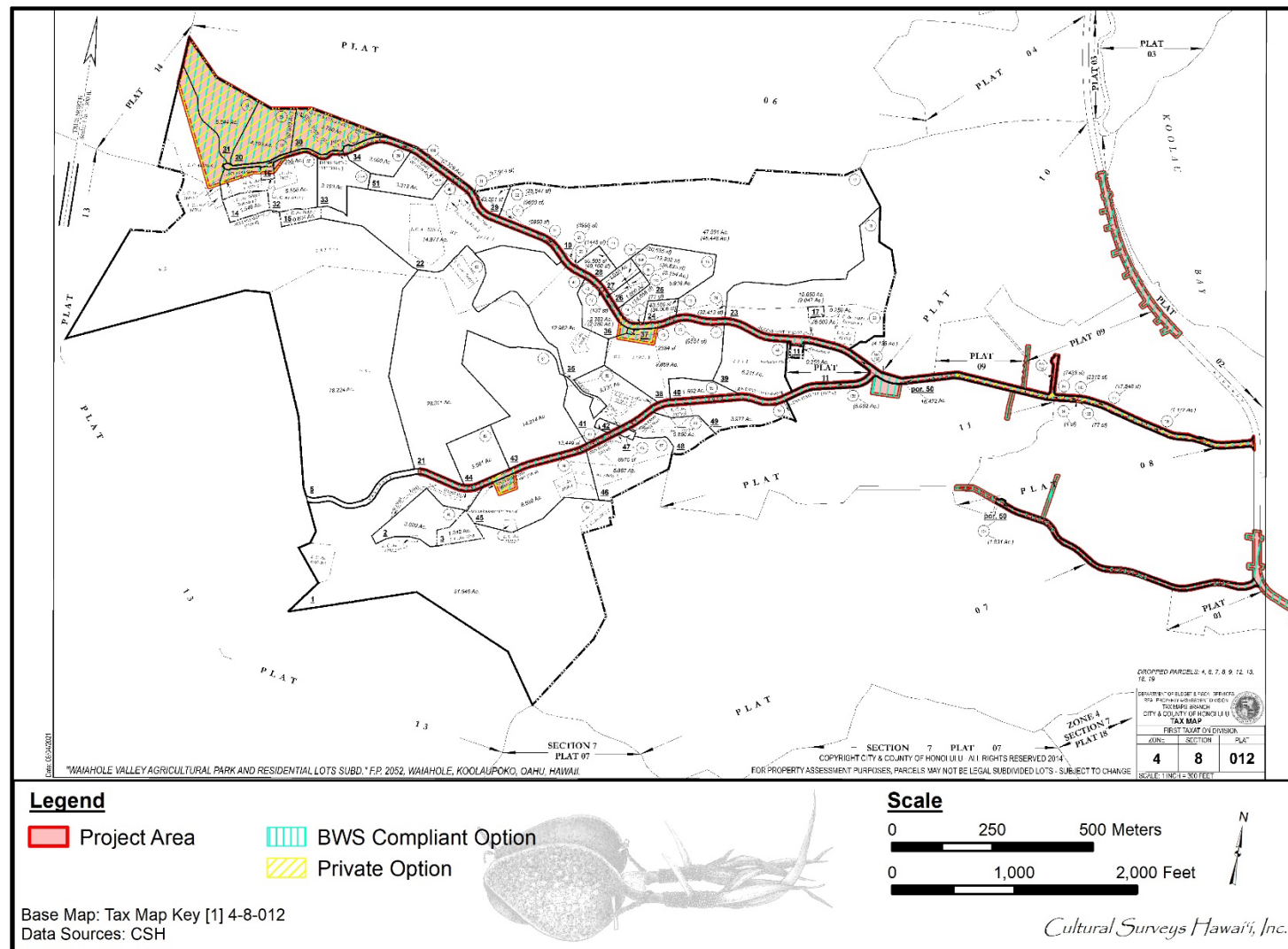


Figure 2. Tax Map Key (TMK) [1] 4-8-012, showing the two project options (BWS Compliant and Private) within the project area (Hawai'i TMK Service 2014)

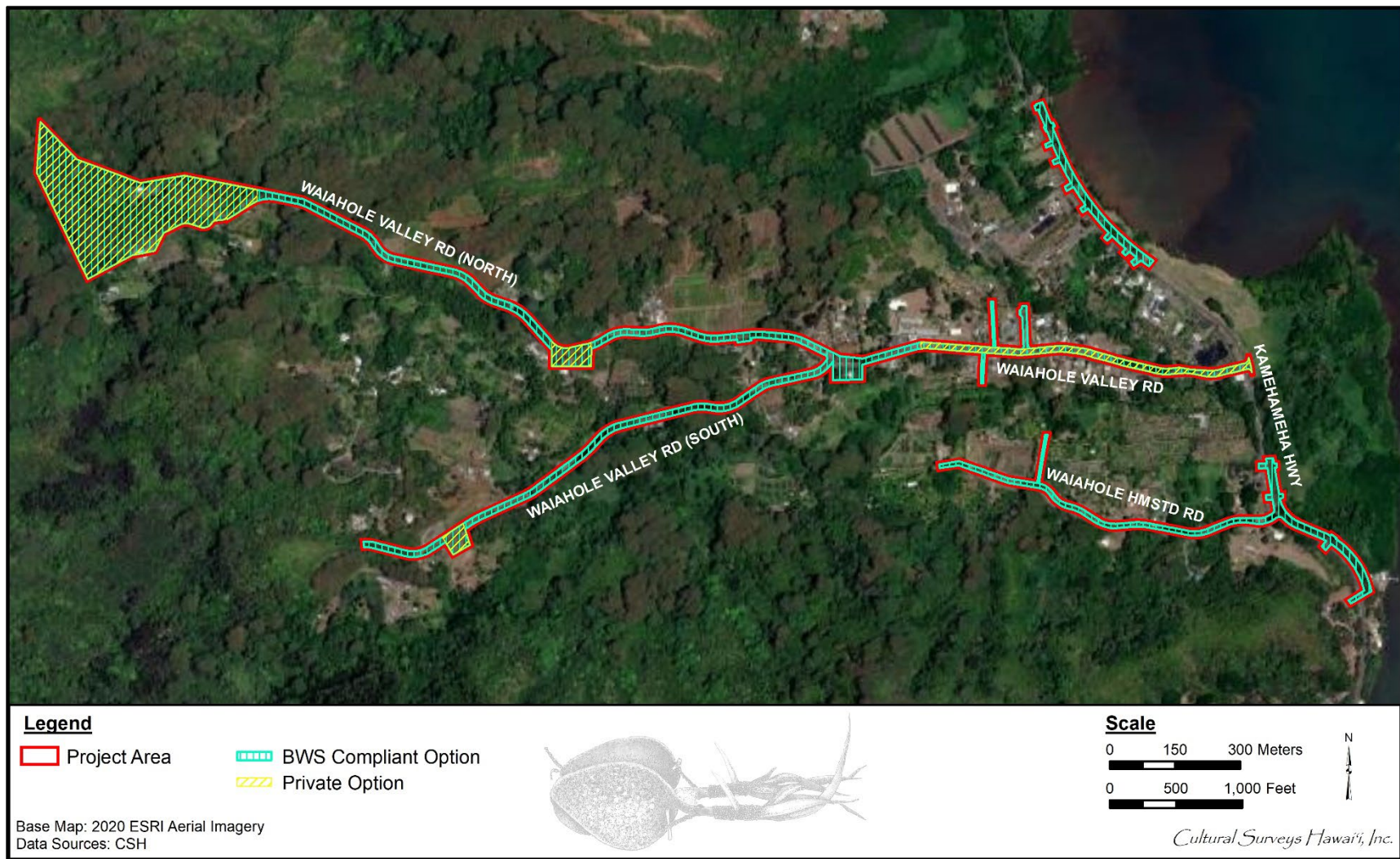


Figure 3. Aerial photograph showing the two project options (BWS Compliant and Private) within the project area (ESRI 2020)

1.2 Document Purpose

The purpose of this CIA is to comply with the State of Hawai‘i’s environmental review process under Hawai‘i Revised Statutes (HRS) §343, which requires consideration of the project’s potential effect on cultural beliefs, practices, and resources. Through document research and cultural consultation efforts, this report provides information compiled to date pertinent to the assessment of the proposed project’s potential impacts on cultural beliefs, practices, and resources (pursuant to the Office of Environmental Quality Control’s *Guidelines for Assessing Cultural Impacts*). These resources may be significant historic properties under State of Hawai‘i significance Criterion e, pursuant to Hawai‘i Administrative Rules (HAR) §13-275-6. Significance Criterion e refers to historic properties that “have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group’s history and cultural identity” (HAR §13-275-6). The document will likely also support the project’s historic preservation review under HRS §6E-8 and HAR §13-275.

1.3 Scope of Work

The scope of work for this CIA includes the following:

1. Examination of cultural and historical resources, including Land Commission documents, historic maps, and previous research reports with the specific purpose of identifying traditional Hawaiian activities including gathering of plant, animal, and other resources or agricultural pursuits as may be indicated in the historic record.
2. Review of previous archaeological work at and near the subject parcel that may be relevant to reconstructions of traditional land use activities; and to the identification and description of cultural resources, practices, and beliefs associated with the parcel.
3. Consultation and interviews with knowledgeable parties regarding cultural and natural resources and practices at or near the parcel; present and past uses of the parcel; and/or other practices, uses, or traditions associated with the parcel and environs.
4. Preparation of a report that summarizes the results of these research activities and provides recommendations based on findings.

1.4 Environmental Setting

1.4.1 Natural Environment

The project area is within Waikāne and Waiāhole Ahupua‘a on the Windward side of O‘ahu. Traditionally and historically, these two *ahupua‘a* are discussed together, due to their close relationship and reliance on one another, and are often referred to as “Waikāne-Waiāhole.” Geographically, they are virtually the same watershed and are culturally inseparable.

The project area ranges from approximately 50 m (0.03 miles) to 2.5 km (1.55 miles) inland of Kāne‘ohe Bay. Elevations range from 1 m (3.3 ft) above sea level near the coast to 96.5 m (316.7 ft) above sea level in the *mauka*-most area. The Waiāhole Valley Road North Branch portion of the project area is along a prominent ridge. Average temperatures in the project area range from 22.5–23.1° C (72.5–73.6° F) (Giambelluca et al. 2014).

Like all of the Windward valleys, Waikāne and Waiāhole valleys are affected by the prevailing winds in the island, which are the northeast trades that blow against the Koʻolau Mountains (Juvik and Juvik 1998:55). The mountains create an orographic effect that results in an annual rainfall of up to 160 inches (4,064 mm) per year in the *mauka* sections of the valley. Rainfall in the project area ranges from 1,503 mm (59 inches) in *makai* (seaward) areas to 2,639 mm (104 inches) at the *mauka*-most point (Giambelluca et al. 2013). This rainfall produces strong flowing perennial streams, including Waiāhole Stream, Waianu Stream, and Uwao Stream in the immediate vicinity of the project area. These streams would have provided plentiful waters for both domestic and agricultural needs.

1.4.2 *Nā Lepo* (Soils)

According to the U.S. Department of Agriculture (USDA) Soil Survey Geographic (SSURGO) database (2001) and soil survey data gathered by Foote et al. (1972) (Figure 4), the project area's soils consist almost entirely of silty clays, mainly from the Waikane Soil Series. In the *makai* portions of the project area, soils consist of silty clays from the Alaeloa, Hanalei, and Pearl Harbor Soil Series.

Soils of the Waikane Series are described as follows:

This series consists of well-drained soils on alluvial fans and terraces on the island of Oahu. These soils developed in alluvium and colluvium derived from basic igneous rock. They are nearly level to very steep. Elevations range from 200 to 1,000 feet. The annual rainfall amounts to 50 to 70 inches. It is well distributed throughout the year. The mean annual soil temperature is 71° F. Waikane soils are geographically associated with Alaeloa, Kaneohe, Lolekaa, and Paumalu soils.

These soils are used for pasture, truck crops, and homesites. The natural vegetation consists of Christmas berry, guava, hilograss, and ricegrass. [Foote et al. 1972:130]

Soils of the Alaeloa Series are described as follows:

This series consists of well-drained soils on uplands on the islands of Maui, Molokai, and Oahu. These soils developed in material weathered from basic igneous rock. They are gently sloping to very steep. Elevations range from 100 to 1,500 feet. The annual rainfall amounts to 35 to 60 inches, and it is well distributed throughout the year. The mean annual soil temperature is 72° F. Alaeloa soils are geographically associated with Kaneohe, Lolekaa, Papaa, Waikane, Honolua, and Kahana soils.

These soils are used for pineapple, pasture, wildlife habitat, homesites, and water supply. Small acreages are used for truck crops and orchards. The natural vegetation consists of guava, Java plum, Christmas berry, Japanese ten, and hilograss. [Foote et al. 1972:26]

Soils of the Hanalei Series are described as follows:

This series consists of somewhat poorly drained to poorly drained soils on bottom lands on the island of Kauai and Oahu. These soils developed in alluvium derived

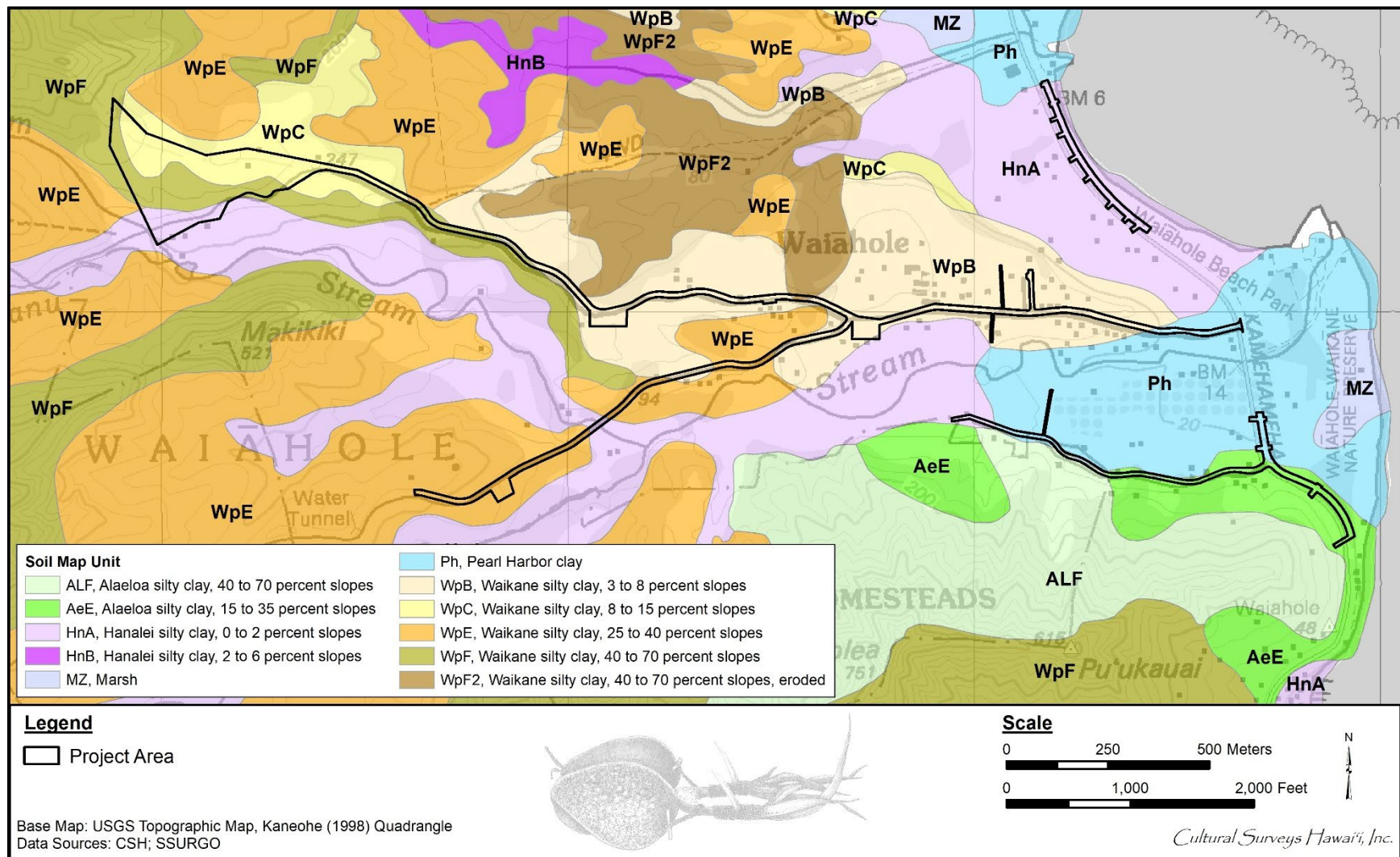


Figure 4. 1998 USGS topographic map with an overlay of the USDA SSURGO database (2001) and soil survey gathered by Foote et al. (1972)

from basic igneous rock. They are level to gently sloping. Elevations range from nearly sea level to 300 feet. The annual rainfall amounts to 20 to 120 inches. The mean annual soil temperature is 74° F. Hanalei soils are geographically associated with Haleiwa, Hihimanu, Mokuleia, and Pearl Harbor soils.

These soils are used for taro, pasture, sugarcane, and vegetables. The natural vegetation consists of paragrass, sensitiveplant, honohono, Java plum, and guava. [Foote et al. 1972:38]

Soils of the Pearl Harbor Series are described as follows:

This series consists of very poorly drained soils on nearly level coastal plains on the island of Oahu. These soils developed in alluvium overlying organic material. Elevations range from nearly sea level to 5 feet. The annual rainfall amounts to 18 to 40 inches. The mean annual soil temperature is 74° F. Pearl Harbor soils are geographically associated with Hanalei, Kaloko, and Keaau soils.

These soils are used for taro, sugarcane, and pasture. The natural vegetation consists of cattails, mangrove trees, californiagrass, and sedges. [Foote et al. 1972:112]

1.4.3 *Nā Makani* (Wind)

For Native Hawaiians, *makani* (wind) were named for various reasons such as describing the intensity or direction of the wind, relating the wind to a story, or even relating the wind to the landscape. David Malo, a Native Hawaiian historian, explains some general terms related to wind:

[...] There was the *kona*, a wind from the south, of great violence and of wide extent. It affected all sides of an island, east, west, north, and south, and continued for many days [...] The *kona* wind often brings rain, though sometimes it is rainless [...] The *hoolua*, a wind that blows from the north, sometimes brings rain and sometimes is rainless [...] The *hau* is a wind from the mountains, and they are thought to be the cause of it, because this wind invariably blows from the mountains outwards towards the circumference of the island. [Malo 1951:14]

The Wind Gourd of La'amaomao tells the story of Pāka'a and his son Kuāpāka'a, descendants of the wind goddess La'amaomao. With their possession of her special wind gourd, they had the ability to control and call forth the winds of all of Hawai'i. Pāka'a's chant traces the winds of O'ahu in the *moku* of Ko'olaupoko. Four distinct winds are identified in relation to the project area and nearby *ahupua'a*: Holopali, Kiliua, Mololani, and Ulumano (Nakuina 1992:51). Pāka'a's chant is listed below:

<i>He Holopali ko Kaaawa me Kualoa,</i>	Holopali is of Ka'a'awa and Kualoa,
<i>He Kiliua ko Waikane,</i>	Kiliua is of Waikāne,
<i>He Mololani ko Kuaohe,</i>	Mololani is of Kuaohe,
<i>He Ulumano ko Kaneohe,</i>	Ulumano is of Kāne'ohe,
<i>No Kaholokeāhole ka makani,</i>	The wind is for Kaholokeāhole
[Nakuina 1902:57]	[Nakuina 1992:51]

1.4.4 *Nā Ua* (Rain)

Precipitation is a major component of the water cycle, and is responsible for depositing *wai* (fresh water) on local flora. Pre-Contact *kānaka* (Native Hawaiians) recognized two distinct annual seasons. The first, known as *kau* (period of time, especially summer) lasts typically from May to October and is a season marked by a high-sun period corresponding to warmer temperatures and steady trade winds. The second season, *ho'oiho* (winter, rainy season) continues through the end of the year from November to April and is a much cooler period when trade winds are less frequent, and widespread storms and rainfall become more common (Giambelluca et al. 1986:17).

Each small geographic area on O'ahu had a Hawaiian name for its own rain. According to Akana and Gonzalez (2015):

Rain names are a precious legacy from our kūpuna who were keen observers of the world around them and who had a nuanced understanding of the forces of nature. They knew that one place could have several types of rain, each distinct from the other. They knew when a particular rain would fall, its color, its duration, its intensity, its path, its sound, its scent, and its effect on the land and their lives [...] Rain names are a treasure of cultural, historical, and environmental information. [Akana and Gonzalez 2015:xx]

Waikāne was no exception to this naming practice. Though there are many rains associated with Ko'olaupoko and other neighboring *ahupua'a* near Waikāne, the Hōli'o rain was most commonly known in Waikāne.

The Hōli'o rain was one associated with Waikāne and other *ahupua'a* around Hawai'i. References to this rain can be found in old chants and songs printed in Hawaiian language newspapers. The following *oli* (chant) was composed for Kamaakamahi'ai by his daughter Kahelekūlani from the legend of Kamaakamahi'ai (Akana and Gonzalez 2015:38).

Ua hānupa wale i ke aloha i ka 'ehu kai
I ka uaina maila, ka 'awale ka Malanai
Ka 'awale ke pili aloha me ka makua
He makua, he keiki na ka ua Hōli'o
I ho 'opumehana i ka poli o ka mau'u ē
Aloha kāua ē

Translation:

Swelling with love for the sea spray
 Pushed aside, the Malanai wind is separated
 Separated from the tender closeness with the parent
 A parent, a child of the Hōli'o rain
 Warming in the bosom of the grass
 Love to us both

[Akana and Gonzalez 2015:38]

1.4.5 *Loko I'a* (Fishpond) and Ocean Resources

The district of Ko'olaupoko was rich in many of the resources utilized by Hawaiians. The management of marine resources is evident by the multitude of fishponds around the coastal fringe of Kāne'ōhe Bay and by the existence of numerous fishing shrines. It has also been recognized that traditional land divisions within the district extended out into the sea, delineating discrete fishery areas.

The ocean resources typically observed and/or caught in the Waiāhole and Waikāne area include *āholehole* (young stage of *āhole*, Hawaiian flagtail, *Kuhlia sandvicensis*), *pāpio* (young stage of *ulua*, jack fish), *akule* (big-eyed or goggle-eyed scad fish, *Trachurops crumenophthalmus*), *kūmū* (goatfish, *Parupeneus porphyreus*), *weke* (certain species of the Mullidae, surmullets or goatfish), *awa* (milkfish, *Chanos chanos*), *'ama* (mullet, *Mugil cephalus*), *hīnālea* (wrasses, family Labridae), *manini* (common reef surgeonfish, *Acanthurus triostegus*), *palani* (surgeonfish, *Acanthurus dussumieri*), *uhu* (parrotfish, *Scarus perspicillatus*), *kala* (surgeonfish, *Naso hexacanthus*), *alalauā* (young red *āweoweo*, *Priacanthus*), *moi* (threadfish, *Polydactylus sexfilis*), *he'e* (squid), turtle, lobster, and shark. The area is also known to be rich in *'ōpae kai* (sea shrimp), a variety of crabs including *kūhonu* (white crab or *haole* crab, *Portunus sanguinolentus*) (Hoover 1998:276), *'ala'eke* (several species are combined under the general name of *'ala'eke* including *Portunus granulates*, *P. orbicularis*, *Charybdis orientalis*, *C. erythrodactyla*) (Titcomb 1979:363) and *mo'ala* (a rare crab, *Podophthalmus vigil*), Samoan crab, and the red or Hawaiian crab, a few species of edible marine snails such as the *kūpe'e* (edible marine snail, *Nerita polita*) and the *'ōlepe* (any kind of bivalve, as a mussel or oyster), and several species of *limu* (seaweed) such as *manauaea* (small red seaweed, *Gracilaria coronopifolia*), *'ele'ele* (long, filamentous, green, edible seaweeds, *Enteromorpha prolifera*), and *līpe'epe'e* (red seaweeds, *Laurencia parvipapillata*). Further offshore, *limu līpoa* (brown seaweeds, *Dictyopteris plagiogramma*) was collected (Bushnell et al. 2002:116–118)

Both *weke 'ula* (*Mulloidichthys vanicolensis*) and *kūmū* are found in shallow reefs and both are considered excellent eating fish (Hosaka 1973:126, 130). Kamakau (1976:60, 62, 80) recorded various traditional methods for catching *kūmū* including *'a'ei* nets (fine meshed bag nets with side sticks often used from canoes), dive fishing (with *melomelo* nets or dive nets, also used in fishing for *weke*), and torch fishing.

The *'ama* is famed in this area. At Kualoa and Hakipu'u, *'ama* and *awa* were cultivated in the fishponds of Moli'i and Koholalele:

[...] This land had been very rich in the olden days and even to the present, because of running schools of mullet from Kaihuopalaai, the *awa* fish and mullets that had been kept and fattened in ponds. These good things of the land are long past.
[Apuakehau 1919]

The waters of Kāne'ōhe Bay are the ideal habitat for the *'ama*, which typically inhabit bays, harbors, and estuaries or brackish water environments where they feed off the mud bottom and eat seaweed (Hosaka 1973:87). Traditionally, *'ama* was one of the most important estuary fishes and was enjoyed for its delicious white flesh with few bones. Several individuals of Waikāne and Waiāhole, particularly the older residents who grew up in the 1930s, recall large schools of mullet

in the bay and in near shore areas in the waters of Waiāhole and Waikāne (Bushnell et al. 2002:116–118).

Different types of fishing practices include net fishing such as *hukihuki* (to drag or pull by many people), *moe* (lie down), throw net, bag net, and 'ōpae net as well as diving, trapping, hooking, and *lama lama* fishing or torch fishing at night. Squidding seems to have been one of the most popular fishing practices amongst the residents of Waiāhole and Waikāne. Historic records suggest squid was once an abundant resource in the region. One document consisting of a king's list of Ko'olaupoko lands and their respective *kapu* (taboo) fish lists squid as a *kapu* fish for Waiāhole Ahupua'a in the mid-1800s (Devaney et al. 1982:136).

Traditional seasonal fishing practices that took place in the waters of Waiāhole and Waikāne are described the following passages:

[...] when *akule* and mullet are running, were, in old Hawaiian days, times when planters left their cultivating of taro, sweet potato, and banana, and feeding of livestock to join their relatives and neighbors along shore in their fishing operations. Each man received his share of the catch in proportion to his contribution in time and equipment. The canoes and nets belonged to families living along shore. [Handy and Handy 1972:438]

The running of *akule* and mullet began in March often signifying the change of the seasons. The spring months were known to be a time when fish entered the lagoons, bays, and stream mouths of the Ko'olaupoko District for spawning. The beginning of *kau* was often marked, in the waters of Waiāhole and Waikāne, as a time of deep sea fishing.

These months from May on were also the months for deep-sea fishing with line and net, for *opelu*, *aku*, *a'ahi*, *ulua*, mature now after the spring spawning. For the women this was the time for getting shellfish along shore and shrimps in the streams, and also guppies ('o'opu) in salt pools formed by streams at sea level. [Handy and Handy 1972:441]

Hosaka (1973:149) gives the following description of the *hīnālea*, “the flesh is rather soft and is tasteless. When caught the fish is usually thrown back into the sea. If saved for eating, the best way to prepare it is to cut it into large pieces and make fish chowder.” The written historic record, however, suggests *hīnālea* held more significance in traditional lifestyles. Malo lists the *hīnālea* as one of several excellent eating fish (Malo 1951:46). Fornander describes the *hīnālea* as a “choice fish” (Fornander 1919:5:112). In Fornander's account of the Legend of Kuapāka'a, Pāka'a teaches his son Kuapāka'a how to temper the bitter taste of 'awa (kava, *Piper methysticum*) with the *hīnālea* when serving a king:

After you have strained the awa into the cup, hand the cup to your master, then run as fast as you can to the pool where we keep the hinalea and catch two for your master, for he would want the fish to take away the bitter taste of the awa from his mouth. [Fornander 1919:5:114]

In legend, the *hīnālea* fish is derived from the pieces of two supernatural beings who were torn to bits by an 'e'epa (extraordinary, incomprehensible, as persons with miraculous powers) woman who discovered the two supernatural beings had been aiding her disloyal husband (Kamakau in

Titcomb 1972:78). Titcomb (1972:77–78) also discusses the use of the *hīnālea* as an offering in invoking Kū and Hina when pregnancy was desired.

1.4.6 Built Environment

Most of the project area is along asphalt-paved roads (Figure 5 through Figure 17). Kamehameha Highway is the main road along the coast, while the others are part of a residential development with an elementary school and one- and two-story single-family homes fronted by landscaped lawns. However, the area is not densely populated, and agricultural plots and large undeveloped tracts remain in the vicinity. The project area also includes a land parcel adjacent to the *mauka* terminus of Waiāhole Valley Road North Branch, which is overgrown with thick vegetation.



Figure 5. Intersection of Waiāhole Valley Road and Kamehameha Highway, view to south; Waiāhole Poi Factory on right



Figure 6. Portion of the project area on Waiāhole Valley Road taken from the east (*makai*) end, view to west



Figure 7. Central portion of the project area on Waiāhole Valley Road, view to west



Figure 8. *Mauka* (west) portion of the project area on Waiāhole Valley Road, view to west; Waiahole Elementary School in right background



Figure 9. Intersection of Waiāhole Homestead Road and Kamehameha Highway, view to south



Figure 10. *Makai* (east) portion of the project area on Waiāhole Homestead Road, view to west



Figure 11. Central portion of the project area on Waiāhole Homestead Road, view to southwest



Figure 12. *Mauka* (west) end of the project area on Waiāhole Valley Road South Branch, view to southwest



Figure 13. Central portion of the project area on Waiāhole Valley Road North Branch, view to southeast



Figure 14. Southeast end of the undeveloped parcel adjacent to Waiāhole Valley Road North Branch, view to northwest



Figure 15. Northwest end of the undeveloped parcel adjacent to Waiāhole Valley Road North Branch, view to north



Figure 16. Access road near the northwest end of the undeveloped parcel adjacent to Waiāhole Valley Road North Branch, view to northwest; note recently (as of 2018) planted trees along the road's edge (right)



Figure 17. Typical vegetation growth within the undeveloped parcel adjacent to Waiāhole Valley Road North Branch, view to south

Section 2 Methods

2.1 Archival Research

Research centers on Hawaiian activities including *ka'ao* (legends), *wahi pana* (storied places), *ōlelo no'eau* (proverbs), *oli* (chants), *mele* (songs), traditional *mo'olelo* (stories), traditional subsistence and gathering methods, ritual and ceremonial practices, and more. Background research focuses on land transformation, development, and population changes beginning with the early post-Contact era to the present day.

Cultural documents, primary and secondary cultural and historical sources, previous archaeological reports, historic maps, and photographs were reviewed for information pertaining to the study area. Research was primarily conducted at the CSH library. Other archives and libraries including the Hawai'i State Archives, the Bishop Museum archives, the University of Hawai'i at Mānoa's Hamilton Library, Ulukau, The Hawaiian Electronic Library (Ulukau.org 2014), the State Historic Preservation Division (SHPD) library, the State of Hawai'i Land Survey Division, the Hawaiian Historical Society, and the Hawaiian Mission Houses Historic Site and Archives are also repositories where CSH cultural researchers gather information. Information on Land Commission Awards (LCAs) were accessed via Waihona 'Aina Corporation's Māhele database (Waihona 'Aina 2022), the Office of Hawaiian Affairs (OHA) Papakilo Database (Office of Hawaiian Affairs 2015), and the Ava Konohiki Ancestral Visions of 'Āina website (Ava Konohiki 2015).

2.2 Community Consultation

2.2.1 Scoping for Participants

We begin our consultation efforts by utilizing our previous contact list to facilitate the interview process. We then review an in-house database of *kūpuna* (elders), *kama'āina*, cultural practitioners, lineal and cultural descendants, Native Hawaiian Organizations (NHOs; includes Hawaiian Civic Clubs and those listed on the Department of Interior's NHO list), and community groups. We also contact agencies such as SHPD, OHA, and the appropriate Island Burial Council where the proposed project is located for their response on the project and to identify lineal and cultural descendants, individuals and/or NHO with cultural expertise and/or knowledge of the study area. CSH is also open to referrals and new contacts.

2.2.2 "Talk Story" Sessions

Prior to the interview, CSH cultural researchers explain the role of a CIA, how the consent process works, the project purpose, the intent of the study, and how their *'ike* (insight) and *mana'o* (knowledge) will be used in the report. The interviewee is given an Authorization and Release Form to read and sign.

"Talk Story" sessions range from the formal (e.g., sit down and *kūkā* [consultation, discussion] in the participant's place of choice over set interview questions) to the informal (e.g., hiking to cultural sites near the study area and asking questions based on findings during the field outing). In some cases, interviews are recorded and transcribed later.

CSH also conducts group interviews, which range in size. Group interviews usually begin with set, formal questions. As the group interview progresses, questions are based on interviewees' answers. Group interviews are always transcribed and notes are taken. Recorded interviews assist the cultural researcher in 1) conveying accurate information for interview summaries, 2) reducing misinterpretation, and 3) adding missing details to *mo'olelo*.

CSH seeks *kōkua* (assistance) and guidance in identifying past and current traditional cultural practices of the study area. Those aspects include general history of the *ahupua'a*; past and present land use of the study area; knowledge of cultural sites (for example, *wahi pana*, archaeological sites, and burials); knowledge of traditional gathering practices (past and present) within the study area; cultural associations (*ka'ao* and *mo'olelo*); referrals; and any other cultural concerns the community might have related to Hawaiian cultural practices within or in the vicinity of the study area.

2.2.3 Interview Completion

After an interview, CSH cultural researchers transcribe and create an interview summary based on information provided by the interviewee. Cultural researchers give a copy of the transcription and interview summary to the interviewee for review and ask that they make any necessary edits. Once the interviewee has made those edits, we incorporate their *'ike* and *mana'o* into the report. When the draft report is submitted to the client, cultural researchers then prepare a finalized packet of the participant's transcription, interview summary, and any photos that were taken during the interview. We also include a thank you card and honoraria. This is for the interviewee's records.

It is important that CSH cultural researchers cultivate and maintain community relationships. The CIA report may be completed, but CSH researchers continuously keep in touch with the community and interviewees throughout the year—such as checking in to say hello via email or by phone, volunteering with past interviewees on community service projects, and sending holiday cards to them and their *'ohana* (family). CSH researchers feel this is an important component to building relationships and being part of an *'ohana* and community.

"I ulu no ka lālā i ke kumu—the branches grow because of the trunk," is an *'ōlelo no'eau* (#1261) shared by Mary Kawena Pukui with the simple explanation: "Without our ancestors we would not be here" (Pukui 1983:137). As cultural researchers, we often lose our *kūpuna* but we do not lose their wisdom and words. We routinely check obituaries and gather information from other informants if we have lost our *kūpuna*. CSH makes it a point to reach out to the *'ohana* of our fallen *kūpuna* and pay our respects including sending all past transcriptions, interview summaries, and photos for families to have on file for genealogical and historical reference.

Section 3 *Ka'ao and Mo'olelo (Legends and Stories)*

Hawaiian storytellers of old were greatly honored; they were a major source of entertainment and their stories contained teachings while interweaving elements of Hawaiian lifestyles, genealogy, history, relationships, arts, and the natural environment (Pukui and Green 1995:IX). According to Pukui and Green (1995), storytelling is better heard rather than read for much becomes lost in the transfer from the spoken to the written word and *ka'ao* are often full of *kaona* or double meanings.

Ka'ao are defined by Pukui and Elbert (1986:108) as a “legend, tale [...], romance, [and/or], fiction.” *Ka'ao* may be thought of as oral literature or legends, often fictional or mythic in origin, and have been “consciously composed to tickle the fancy rather than to inform the mind as to supposed events” (Beckwith 1970:1). Conversely, Pukui and Elbert (1986:254) define *mo'olelo* as a “story, tale, myth, history, [and/or] tradition.” The *mo'olelo* are generally traditional stories about the gods, historic figures or stories which cover historic events and locate the events with known places. *Mo'olelo* are often intimately connected to a tangible place or space.

In differentiating *ka'ao* and *mo'olelo* it may be useful to think of *ka'ao* as expressly delving into the *wao akua* (realm of the gods), discussing the exploits of *akua* (gods) in a primordial time. *Mo'olelo* on the otherhand, reference a host of characters from *ali'i* (royalty), to *akua* (gods) and *kupua* (supernatural beings), to finally *maka'āinana* (commoners), and discuss their varied and complex interactions within the *wao kānaka* (realm of man). Beckwith elaborates, “In reality, the distinction between *ka'ao* as fiction and *mo'olelo* as fact cannot be pressed too closely. It is rather in the intention than in the fact” (Beckwith 1970:1). Thus a so-called *mo'olelo*, which may be enlivened by fantastic adventures of *kupua*, “nevertheless corresponds with the Hawaiian view of the relation between nature and man” (Beckwith 1970:1).

Both *ka'ao* and *mo'olelo* provide important insight into a specific geographical area, adding to a rich fabric of traditional knowledge. The preservation and passing on of these stories through oration remains a highly valued tradition. Additionally, oral traditions associated with the study area communicate the intrinsic value and meaning of a place, specifically its meaning to both *kama'āina* (native born) as well as others who also value that place.

The following section presents traditional accounts of ancient Hawaiians living in the vicinity of the project area. Many relate an age of mythical characters whose epic adventures inadvertently lead to the Hawaiian race of *ali'i* (chiefs) and *maka'āinana* (commoners). The *ka'ao* in and around the project area shared below are some of the oldest Hawaiian stories that have survived; they still speak to the characteristics and environment of the area and its people.

3.1 *Mo'olelo*

3.1.1 Waiāhole

According to Pukui et al. (1974:219), the name Waiāhole was Wai-āhole and is literally translated as “mature *āhole* (a fish) water.” Pukui and Elbert (1986:8) note the *āhole* (*Kuhlia sandvicensis*) is

An endemic fish (*Kuhlia sandvicensis*) found in both fresh and salt water. The mature stage is *āhole*, the young stage *āholehole*. Because of the meaning of *hole*,

to strip away, this fish was used for magic, as to chase away evil spirits and for love magic. It was also called a 'sea pig' (pua'a kai) and used ceremonially as a substitute for pig. [Pukui and Elber 1986:8]

Traditions and legends focused on Waiāhole suggest Waiāhole Ahupua'a was well-established and well-known in the consciousness of the Hawaiian people in pre-Contact times. The *ahupua'a*'s taro cultivation is especially highlighted in the legends and traditions.

3.1.2 Waikāne

According to Pukui et al. (1974:223), the name Waikāne was Wai-a-Kane and is literally translated as "Kāne's water." It was here that Kāne first dug for water for the benefit of Paliuli. Paliuli literally translates as "green cliff" and is the equivalent of the Garden of Eden. Below Paliuli are the famous waters of Wai'ololi and Wai'olola (*Hoku o Hawaii*, 12 January 1926). There are many traditions connected with this *ahupua'a* including references to the Hawaiian *akua* (gods) Kāne and Hi'iaka, the Hawaiian demi-god Kamapua'a as well as the Kumulipo (Hawaiian origins chant). Hi'iaka mentions these traditions as she journeys past Waikāne on her way to Kaua'i. Waikāne was also the home of Laka, the chief born at 'Alae in Kīpahulu (Maui). Laka ruled at Ko'olaupoko, O'ahu, and his house was at Hale'ula in Waikāne (Henriques HEN [n.d.]:1:985).

3.1.3 The Kumulipo

These famous waters Wai'ololi and Wai'olola are a common refrain in the Kumulipo, the Hawaiian creation chant. "*O Kane ia Wai'ololi, o ka wahine ia Wai'olola*" speaks of Wai'ololi and Wai'olola, generally thought to symbolize the male and female procreative forces respectively. Martha Beckwith explains:

The words Wai'ololi and Wai'olola are applied in everyday speech to a narrow entrance through which water passes with force and a wide one which receives them without a struggle. Thus Pokini says the first term is given to a narrow bay along the coast where the water carries the fish in with a rush, the second to a large shoreline where the surf rolls in without breaking. [Beckwith 1951:51]

This tradition also appears in another early twentieth century Hawaiian language newspaper as follows:

At Waikane, Koolaupoko, is a land called Pali-uli. Also there in Waikane are two streams that surround this land of Paliuli, for both streams have the same source. In Waikane also are the names Waiolola and Waiololi, mentioned in the Kumulipo Chant. [*Hawai'i Holomua*, March 20, 1912]

Whether the Kumulipo actually refers to specific sites in Waikāne Valley is less than clear, although it does seem that certain sources have interpreted it this way since at least as early as 1912 and shows the importance of Waikāne in relation to Hawaiian world views. There are no streams or water bodies in the area known to have these names today. This cosmogonic, genealogical prayer chant, which is over two thousand lines in length, was used to trace the divine origins of *ali'i* through ruling chiefs, deified ancestors, and gods backward in time through the animals, plants, and elements to the beginning of the universe. The Kumulipo is one of a class of such cosmological chants, but no others of such length are preserved (Silva 2004:103). This chant, titled *He Pule Ho'ola'a Ali'i* (A prayer to consecrate [an] ali'i) (Silva 2004:98), was composed for

the Hawai'i Island *ali'i* Ka'ī'imamao, also known as Lonoikamakahiki, when several *kapu* rituals were performed that elevated him to the status of a god (Beckwith 1970:311), or divine king, in approximately AD 1600 (Kirch 2010:83). The text of the Kumulipo was first recorded by David Kalākaua in 1889 and translated by Queen Lili'uokalani in 1897, which was not available when folklorist Martha Beckwith completed her own translation and detailed study (1951).

Starting from "*O ke kumu o ka lipo*" (At the beginning of the deep darkness), the Kumulipo divides the genesis of the world into 16 *wā* (epochs, time periods) (Beckwith 1951). These 16 *wā* are categorized into two periods, *pō* (darkness, the realm of the gods) and *ao* (light). During the first period of *pō* there was a continuous birthing of the lower life forms to sea life, plants, and eventually mammals. During the second period of *ao* came the opening of light and the appearance of the first woman and man, La'ila'i and Ki'i, respectively, and the coming of the gods, including Kāne and Kanaloa, which resulted in over a thousand genealogical pairs (Beckwith 1970:310–311). Significantly, Hawaiian identity today is derived from origin genealogies such as the Kumulipo: "[...] every aspect of the Hawaiian conception of the world is related by birth, and as such, all parts of the Hawaiian world are one indivisible lineage" (Kame'eleihewa 1992:2).

3.1.4 Hard Taro of Waiāhole

Mary Kawena Pukui (1983:186) relates a poetical saying referring to the "hard taro of Waiāhole":

Ke kalo pa'a o Waiāhole.

The hard taro of Waiāhole. [Pukui 1983:186]

Pukui explains, probably drawing upon the 1865 account of Kaehuaea given below:

A reminder not to treat others badly. One day, a man went to Waiāhole, O'ahu, to visit his sister, whom he had not seen for many years. She was absent, and her husband neither asked the stranger in nor offered him any food. When hunger possessed the visitor he asked if he might have some taro to eat. His brother-in-law directed him to his taro patches and told him to get some from there. The man went to the patches and then continued on his way. When the woman returned she was told of the visitor, and by her husband's description she knew that it was her brother. She rebuked him for his lack of hospitality. When they went to their taro patches they found all the taro pulled up and hacked to pieces. [Pukui 1983:186]

The saying would appear to be a rebuke to the attitudes of the residents once living there who may have had a reputation as not being very accommodating and hospitable toward strangers.

3.1.5 Kuapunohu

Kaehuaea (1865) relates the following account in his "Na mea Kaulana o Waiahole" (The famous things of Waiahole):

Ma ka 'u mea i lohe ai, i na kama'āina o keia 'āina no na mea kaulana i hanaia i ka wā kahiko.

Ka mua o kahi i hānau ai o Kualī'i; ka hope o ki'i kalu-pa'a i Waiāhole

Ua haiia ma ka Papa Kuhikuhi makahiki o nā mea kaulana o Hawai'i nei. 'Helu 1., ma Kalapawai i Kailua kona wahi i hānau ai.' 'A'ole pela ka pololei, eia noia. O kona wahi i hānau ai, ma Waimuku i Waiāhole; a o kahi i hanai ia 'a o Mokoli'i; a o kahi i noho ai i ke kapu ali'i & ke kapu Heiau, 'oia o Kalapawai i Kailua; o kahi i ao ai i ke kukini ma Alele, he kula loa, a laula no hoi no ka mea, 'a'ole i ike pono ia kahi i hanau ai keia ali'i. Mamuli o ke mele i ho'omaopopoia'i, no ka mea, i nā ali'i a pau a 'ākoakoa ana ma Kalapawai i Kailua, maloko hoi o kekahi hale nui; a o Kūali'i pu kekahi e noho ana. Ho'oho like ae la ka leo o nā'li'i, penei: 'I hea kou wahi i hānau ai, nau-ā?' 'Elua a 'ekolu ho'oho ana pela, ekemu mai la o Kūali'i ma ka leo mele penei: 'I Waiomuku 'āina kahakai, nau-ā.' A lohe nā'li'i i ka leo o ke Ali'i, pilihua iho la lākou, me ka no'ono'o nui, me ka nīnau ana iho, 'Aia la i hea ia wahi?' Eia ka i Waiāhole nei. Nolaila ina paewaewa ka'u, e pane ma no mai ohumu. E hoi ae au e kama'ilio ia ki'i kalo-pa'a i Waiāhole.

Ua kaulana o ki'i kalo-pa'a i Waiāhole me ka mana'o paha o ka lehulehu, he paakiki maoli io no ke kalo. 'A'ole pēlā eia wale no, ua kaulana o ki'i kalo-pa'a i Waiāhole mamauli o ka hana kupanaha a kekahi kanaka, 'oia o Kuapunohu, he kanaka koaia, e hele huli hoa paio ana ia nona ma Ko'olaupoko; aia hoi e noho ana kona kaikuahine ilaila me kana kāne o Imaole. Ua hele nae kona kaikuahine i ka lawaia, a o ke kaikoeke wale no ko ka hale. Pane aku la ka malihini i ke kama'āina, "'A'ohe nae paha a oulua ai?' Kama'āina 'He ai no, aia la iwaena (kaika). No'ono'o iho la ka malihini, e pilikia ana ia no ka pololei, ninau hou aku la ka malihini i ke kama'āina 'Auhea i kou 'olua waena?' Kuhikuhi pololei aku la ke kama'āina, o ko ianei hele no ia a hiki ma kuauna o ka loi, o ko ianei uhaki ae la no ia i ka welau o ka ihe aia nei, a ho'olilo iho la ia mea i hea-a, lalau aku la ia elua kalo kolikoli a li'ili'i, ho'ouka mahuna o ke ahi. Pēlā kana hana ana a lilo i mea nui, a pau loa ka loi okoa & ka (Eka okoa) a pupuhi aku la kela i ke kai o Ukoa, akola, wahi a Kuapunohu, ke heo la kela.

'Oia iho la nā wahi mea kaulana ma Waiāhole ma ka'u ike & ko'u lohe. Pau aku la ka'u o ka 'oukou koe. Owau no me ka mahalo. B. Kaehuaea, Waiāhole.

The solid taro of Waiāhole, according to the opinion of the public, was a very hard taro. It was not so, it became famous because of the strange deeds of a man, Kuapunohu, a warrior. He went about Ko'olaupoko to find some one to challenge. His sister was living there with her husband Imaole. She went fishing while he remained at home. The stranger said to the native son, 'Have you two any food?' The native son answered, 'We have food but standing in the patch.' The stranger thought that he was going to have to suffer with hunger so he asked the native, 'Where is your patch?' The native gave him specific directions and he went 'til he came to the border of the taro patch. Here he broke off the tip of his spear and used it as a prod. He reached out for two taros, cut them into small pieces and laid them on the fire. He continued doing this until he made a big work, clearing up the whole patch of four acres and burning it up like the blowing away of the sea of 'Uko'a. 'Serves him right.' said Kuapunohu as he went off. [Kaehuaea 1865]

This myth describes land usage, and the attitude and values of the people previously living in the Waiāhole region. Waiāhole has fertile soil, and was renowned for the cultivation of taro.

3.1.6 Halemano

In the legend of Halemano (Fornander 1919:5[2]:228–263), Halemano (the romantic anti-hero of O'ahu) met up with the heroine of this tale, Kamalālāwalu (a fickle Puna, Hawai'i Island princess) in Wailua, O'ahu. There, they resumed living together but their living situation wasn't as harmonious as it was before. With her sad and unfulfilled heart, Kamalālāwalu set out and journeyed:

Holo mai la o Kamalālāwalu... a Kualoa. Loa'a o Waiāhole, he 'li'i no laila e noho ana, a'ohe ana wahine; lawe a'e la ia ia Kamalālāwalu i wahine nana, a noho iho la lāua ma laila. [Fornander 1919:5(2):261]

She journeyed to [...] Kualoa where she met Waiāhole, a chief of that place who was a single man. He took Kamalālāwalu as his wife and they resided there [near Kualoa] together. [Fornander 1919:5(2):260]

When Hua'a the King of Puna received word that Kamalālāwalu was residing on O'ahu with another chief he said,

Ae, ua lilo ka kaua waiwai ia ia no kona kino, aka, aole i loa ia kaua kona kino, nolaila, e holo kaua e kaua i kona wahi i noho ai. [Fornander 1919:5(2):261]

Yes, we have given her our properties with the idea of getting her to be our wife, but we did not succeed. Let us therefore go and make war on those with whom she is now living. [Fornander 1919:(2):260]

King Hua'a did just that. He sent a massive fleet of men in about eight thousand canoes (*he mau man wa'a*) to make war with chief Waiāhole's people. King Hua'a's men landed at Makapu'u.

[...] a makaukau lākou, hele mai la lākou mauka a hiki i Kāne'ohe. Ho'omaka ke kaua, ma ia kaua ana, ua he'e honua o O'ahu nei, a ua luku ia o Waiāhole. [Fornander 1919:5(2):263]

[...] they advanced overland, going by way of Kāne'ohe. At Kāne'ohe proper they met the enemy and the fighting began. Early in the battle O'ahu was routed and a great slaughter took place at Waiāhole. [Fornander 1919:5(2):262]

After the battle, Kamalālāwalu was found alive and taken by the Kings of Hawai'i, Hua'a, and Kulukulua, back to Hawai'i Island.

This tale presents the idea of a massive slaughtering of Hawaiians in the Waiāhole area (or of the forces of the chief Waiāhole) during a battle over possession of a princess, but the historical accuracy of this tale remains uncertain. If there was such a great slaughter of the forces of Waiāhole it could have been elsewhere at Luluku (Lit. "Destruction") in upland Kāne'ohe for example.

3.1.7 Kapunohu

Fornander (1919:5[1]:214–225) relates the legend of Kapunohu which has many motifs similar to both Kaehuaea's account of Kuapunohu (magic spear, strife with brother-in-law as a result of a perceived slight over food) and the legend of Halemano (a Big Island chief comes to visit an O'ahu

woman, lands at Makapu'u, and slays the forces of O'ahu) and explains the proverb of the hard taro of Waiāhole. In this legend the strife with a brother-in-law as a result of a perceived insult over food is clearly set in Kohala, Hawai'i Island. After many adventures, Kuapunohu visits his sister named Konahuanui in Ko'olaupoko, O'ahu and harvests fabulous quantities of taro to eat. For reasons unexplained,

[...] *a mai la ke ahi, pela no kana hana mau ana, a lilo iho la ke kalo i wahie no ke ahi. Nolaila, ma kēia hana ana a Kapunohu, ua kapaia "kalo pa'a o Waiāhole," he 'ōlelo kaulana loa ia mai Hawai'i a Ni'ihau.* [Fornander 1919:5(1):223]

When the fire lit, he took some of the taro and cut it up and threw the pieces into the fire and in this way used the taro for firewood. Because of this action of Kapunohu, the saying 'the hard taro of Waiāhole' is known from Hawai'i to Ni'ihau. [Fornander 1919:5(1):222]

In the legend of Kapunohu the hero's fabulous strength in pulling taro (presumably from Waiāhole) recommends him to his brother-in-law Olopana. Olopana makes Kapunohu his commander in battle ('*alihikaua*'); Kapunohu goes on to kill the ruling chief of O'ahu, Kākuhihewa; and Olopana rules all of O'ahu.

3.1.8 Pele and Hi'iaka

The *ahupua'a* of Waikāne is mentioned in the accounts of the travels of the goddess Hi'iaka up the Ko'olau Coast on her way to bring back her sister Pele's lover Lohiau. In this section of the *mo'olelo*, Hi'iaka has just departed from He'eia Kea after offering a remedy to a husband and wife to cure the husband of his illness. As they passed the '*āina* (land) of Waikāne she commented to her traveling companions about the sacred waters of the area.

[...] *i ko lākou hele ana a hō'ea i [...] Waikāne. I keia wahi huli hou mai la o Hi'iaka a kama'ilio hou mai la i kana 'aikane.*

'O ka inoa o keia 'āina la o Waikāne no ka mea, i anei i 'auwaha wai mua ai o Kāne i na wai e pono ai o Paliuli, He Paliuli no ko'onei, aia la i kela kaola Pali e waiho mai la, a malalo iho. A he mau wahi wai kaulana loa o onei, o Waiololi, a o Waiolola. He kāne a he wahine keia. O Waiololi ke kāne a o Waiolola ka wahine. He 'āina maika'i keia he 'āina piha momona, aka e hele loa aku nae i pahulu a ola lala ka. 'āina.' [Ka Na'i Aupuni, 26 January 1906 cited in Shideler and Hammatt 2007:III:51–54]

Translation:

Here Hi'iaka turned and spoke again to her friend:

'The name of this land is Waikāne because it was here that Kāne first channeled the water need for the land of Paliuli. This place has a Paliuli as well, there on that ridge of cliffs and just below. There are renowned waters here, Wai'ololī and Wai'ololā. One is male and the other female. Wai'olilī is the male and Wai'ololā, the female. This is a fine land, a place of abundance but the land shall come depleted and withered.' [Ho'oulumāhie 2008:150]

From Waikāne, Hi'iaka and her companions traveled on to Hakipu'u and Kualoa.

3.1.9 Hi'iaka and Mokoli'i

According to M.J. Kapihenui's 1862 version published in Hawaiian in *Ka Hōkū o ka Pākīpika*. As they approached Kualoa, the huge *mo'o*-dragon, Moko-li'i, reared himself up and, pluming and vaunting himself, sought to terrify them and prevent their passage. Hi'iaka did not flinch in her attack. When she had killed the monster, she set up his flukes as a landmark which now forms the rock known to this day as Moko-li'i. The body of the dragon she disposed of in such a way that it helped form the roadbed of the traveled highway. After the achievement she vented her feelings in an exultant song (Kapihenui's text is quoted and translated below):

[...] kō lāua nei hele akula nō ia a hala 'o Waiāhole, me Waikāne, a Hakipu'u lāua nei, 'ī aku 'o Hi'iakaikapoliopole iā Wahine'ōma'o, aia ke alanui o kāua lā ma uka o Kaikolu, he hula 'ana 'o kai.

E kama'ilio ana nō lāua nei, ho'olale mai ana 'o Mokoli'i i ka hakakā, i nānā aku ka hana o Hi'iaka i ka poli o Pele, e kā mai ana ka hi'u o ua mo'o nei i luna o Mokoli'i, kō lāua nei hakakā ihola nō ia me Mokoli'i, a make 'o Mokoli'i iā ia nei, e 'oki a'e ana k'ia i ka hi'u o ua mo'o nei, kūkulu 'ia a'e i luna, 'o ia nō k'lā pu'u e kū lā i loko o ke kai a hiki i k'ia wā, aia ma waena o ke kai o Kualoa kēlā pu'u i kapa 'ia kona inoa 'o Mokoli'i.

'O kona kino ho'i, ho'opili 'ia mai i uka, loa'a ai ka 'āina ma kai a me ke alanui, 'o ke kino nō o ua mo'o nei. A laila, kani aku ke oli a Hi'iakaikapoliopole, e uwē aku ana iā Kānehoalani ma ke mele penei:

Ki'eki'e Kānehoalani
'Au Mokoli'i i ke kai
I keiki, i makahiapo na Ko'olau
Lau Ko'olau kena wale i ka 'ino
He'ino loa nō — '.

Kō lāua nei hele akula nō ia, no ka mea, ua make ihola 'o Mokoli'i, ua lilo a'ela ke kino i alanui, kō lāua hele akula nō ia a hala 'o Ka'a'awa, [...]

[*Ka Hoku o ka Pakipika*, 13 Feberuari 1862 cited in Shideler and Hammatt 2007:III:3–5]

Translation:

[...] They [Hi'iakaikapoliopole and Wahine'ōma'o] went on and passed Waiāhole, Waikāne and as they passed Hakipu'u, Hi'iakaikapoliopole said to Wahine'ōma'o, 'There is our path inland of the "Triple Sea," where the sea beats against the cliff.'

As they were talking, Mokoli'i provoked a fight. When you consider the deed of Hi'iakaikapoliopole, [and] the tail of that mo'o rising above Mokoli'i, how those two fought with Mokoli'i until Mokoli'i was killed by her and she cut off its tail and set it there. It is that heap standing there in the sea to this day. It is there in the middle of the sea of Kualoa; that heap called by his name, Mokoli'i.

His body clings to the uplands becoming the seaward land and the road, that is indeed the body of that mo'o. Then, Hi'iakaikapoliopole sang this chant and wailed to Kānehoalani this verse as follows:

Majestic is Kānehoalani
 Mokoli'i swims in the sea
 As a child, as a first-born child of Ko'olau
 Ko'olau is laden with numerous misfortunes/evils* (DS: The tip of the tongue of Ko'olau commands a great misfortune)
 A great evil or wickedness

They went on as they had slain Mokoli'i whose body had become the path they trod and they passed Ka'a'awa [...]

[*ino: a poetic term for misfortunes, evil, chaos, storms, wildness, etc.]

[cited in Shideler and Hammatt 2007:III:3–5]

The verbatim Hawaiian language account in *Ka Hōkū o ka Pākīpika* (13 February 1862) quoted above is given in the handwritten Pele and Hi'iaka Manuscript (n.d.) of the Henriques Collection (Bernice Pauahi Bishop Museum). Kepā Maly tells a similar version of the story of Hi'iaka fighting with supernatural powers—her magic skirt or *pā'ū*, which he relates came from Tūtū Kawelo and other Hawaiian informants:

The people of Waikāne warned Hi'iaka that this mo'o, called Mokoli'i killed and ate people. Hi'iaka told them not to be afraid and that she could take care of herself.

So the people followed her into Hakipu'u valley. They listened. They heard a chant and then they waited and they could hear a fight. They saw the mo'o get ready to jump at Hi'iaka and as it jumped at her she hit it with her *pā'ū* [...] Hi'iaka's *pā'ū* was kupua also. Through the power of Pele and her family and the power of the volcanoes Hi'iaka fought with the mo'o and destroyed it. She cut off its tail and threw it in the ocean where it was turned to stone and it remains there to this day for people to see that the mo'o had been killed. This piece of tail turned to stone is Mokoli'i Island. It is called *Ka huelo 'o 'opa i koe o ka mo 'o nui*, the stubby remains of the lizard's tail.

Other pieces of his body were thrown up into the mountain area, the plains of 'Āpua and into Palikū. In a small cove in the island, Mokoli'i, there is a deep cut in the stone which is said to be one of the places Hi'iaka hit the *mo 'o* with her *pā'ū* as she was fighting him. You can still see the outline in the stone which looks like the scales of the *mo 'o*. [Maly et al. 1978:15–16]

The following account of Hi'iaka at Kualoa is mentioned in the Hawaiian language newspaper, *Ka Na 'i Aupuni*:

[...] Ha'alele lākou nei iā Waikāne, hele akula lākou nei a hiki i Hakipu'u, mai laila aku kā'alo 'ana lākou nei ma ke alo pono'i o ka pali o Kualoa; a 'ōlelo maila 'o Hi'iaka iā Wahine'ōma'o:

Eia ka pali o Kānehoalani ke kū mai nei, a 'o ka mo'okapu kēia o Hāloa. Eia ke holo nei kēia mo'okuahiwi a mo'o pali ho'i a komo i loko o Wai'anae. A aia ho'i kahi moku o Mokoli'i ke kū maila i ke kai. No laila, 'eā, e kau a'e au iā lāua nei:

Kau Kanaono kumamākahi o ka Mo'olelo o Hi'iaka

1. Ki'eki'e Kānehoalani
2. 'Au 'ana Mokoli'i i ke kai
3. I keiki i makahiapo nā Ko'olau
4. Lau ke one a Kāne, lau ke ko'a
5. Lau nā maka lae o Ko'olau
6. Ua hele wale Ko'olau a kena i ka 'ino*

Pau kēia kau 'ana a Hi'iaka, hele akula lākou nei a hō'ea i ka lae pono'i i ka palena e pale ai 'o Ko'olaupoko a me Ko'olauloa, ia wā huli maila 'o Hi'iaka a kama'ilio maila i ke 'aikāne [...]

'Pēlā kāua i hele ho'omanawanui mai nei ma ka 'āina a ma ke kai a hō'ea ihola i 'ane'i. Eia kāua lā i ka Laeoka'ō'io. A hele aku kāua mai kēia wahi aku, he kula mauka nei a 'o ke kai kumaluma'i ho'i makai, kahi nona ka 'ōlelo 'ia 'ana, moe mālīe i ke kai o kō haku.' [*Ka Na'i Aupuni*, 26 Ianuari 1906 cited in Shideler and Hammatt 2007:III:51–54]

Translation:

They left Waikāne and went on to Hakipu'u passing right by the face of the cliff [pali] of Kualoa; and Hi'iaka said to Wahine'ōma'o:

Here is the cliff of Kānehoalani standing before us and this is the sacred ridge [mo'okapu] of Hāloa. This series of mountains and cliff sections run all the way to Wai'anae. And here is the place where Mokoli'i Island stands there in the sea. So, I will offer a chant in honor of them:

Chant Sixty-one in the Story of Hi'iaka

Majestic is Kānehoalani
Mokoli'i swims in the sea
As a child, as a first-born child of Ko'olau
Numerous are the sands of Kāne,
Numerous are the fishing grounds
Numerous are the sea capes of Ko'olau
Ko'olau has become laden by storms.*

When Hi'iaka was finished chanting, they continued on until they reached the point where the boundary marks the division of Ko'olau Poko and Ko'olau Loa, at which time, Hi'iaka turned and said to her friend:

Thus, we have patiently traveled over land and sea and arrived here. Here we are at 'Ō'io Point. Let us go away from this place. On the mountain side here is the kula land and, indeed, the Kumaluma'i Sea is seaward, the place about which it is said,

'Sleep peacefully in the sea of your lord.' [cited in Shideler and Hammatt 2007:III:51–54]

All accounts discussed above (Kapihenui 1862, Henriques Collection n.d., and Ho'oulumāhie 1906) offer versions of the *kau* (sacred chant) chanted by Hi'iaka at Kualoa. In all cases the first three lines are essentially the same and relatively easily translated. The subsequent two or three lines notably differ among the Kapihenui grouping and the later Ho'oulumāhie newspaper accounts.

Kepā Maly shares a different version of the story told by Keapo'okalani, an old Hawaiian woman.

[...] the *mo'o* became so ashamed of being wounded so terribly by this young girl [Hi'iaka], whom he didn't recognize as a member of the Pele family, that he put his head into the ocean in shame. As he put his head in the water, his tail came up and that is when Hi'iaka cut it off. [Maly et al. 1978:16]

Fornander provides an account of the goddess slaying the large lizard, which created Mokoli'i:

From Hakipu'i, going *mauka* [inland], because the *pali* projected in the sea, Hi'iaka found and killed Mokoli'i, a *mo'o* [lizard], cut off his tail and threw it in the sea and hence the island of Mokoli'i, near Kualoa. His body formed the lowland *makai* [towards the sea], below the *pali* of Kualoa. [Fornander 1919:5:370]

3.1.10 Lands Distributed by Kamapua'a

Waiāhole was clearly considered a desirable and well-watered land. Samuel Kamakau relates that

I ka lilo ana o ke aupuni i ke au o ke aupuni ia Kamapua'a o O'ahu, ua lilo ka nui o na 'āina inoa wai i ke kahuna ia Lonoawohi, aka nae, mahope iho, ua ho'oponopono ia ka 'āina e Kahikiula a me na kaikua'ana o Kamapua'a, no ka pau loa o na 'āina inoa wai i ke kahuna, a no ka mana'o ia no hoi o pili pa'a loa ka 'āina pelā i ka papa kahuna, nolaila, ua ha'awi pa'a ia na 'āina o ka papa kahuna, oia o Waimea, Pūpūkea, Waiāhole a me Hakipu'u, a ua pili pa'a ia mau 'āina i ka papa kahuna mai kahiko loa mai a hiki i ke au o Kahahana. I ke ao hoi o Kehekili a me Kalanikūpule, ua ha'awi no i ka laua mau kahuna, a pelā no i ke au o Kamehameha I. - Ua lilo o Waimea i ka papa kahuna a Pa'ao, a o Pūpūkea, no ka papa kahuna a Kauai'i, a o Waiāhole, no ka papa kahuna a Lonoamaui [...]

When O'ahu came under the rule of Kama-pua'a, he gave the land containing the word wai to the kahuna Lono-a-wohi to distribute. Later the land was redistributed by Kahiki-'ula and the older brothers of Kama-pua'a because the kahunas had a monopoly of the well-watered lands, and the kahuna class were given the lands of Waimea, Pūpūkea, Waiāhole, and Hakipu'u in perpetuity, and these were held by them until the days of Kahahana. Kahekili and Kalanikūpule confirmed this gift to the kahunas, and so did Kamehameha [...] Waiāhole belonged to the priests of Lono-mauki. [*Ka Nupepa Ku'oko'a*, 16 November 1867]

During an ethnographic study of Kualoa, Ko'olaupoko, O'ahu, one of the interviewees, Thelma Parish, converses and writes extensively about the priesthood of Palikū and the Sacred Lands of O'ahu. Ms. Parish identifies the sacred lands of O'ahu as the *ahupua'a* of Kualoa, Hakipu'u, Waikāne, Waiāhole, and 'Āpua and writes they have been declared sacred by the gods Kū, Kāne, Lono and Kanaloa. She writes,

The sacredness of these lands was confirmed by the ancient *ali'i* Kamapua'a, the demi-god, who declared that all lands whose name contain the word *wai* were to be held sacred and become the property of the priesthood. It was found that this precept was not very practical for the *ali'i* and their people simply because so many land names contained *wai* that very few good land areas were actually available to the royalty and their people. The precept was modified. [cited in Shideler and Hammatt 2007:II:150]

3.2 *Wahi Pana* (Legendary Places)

Hawaiian place names convey a wide variety of information about the relationships among people, landscapes, and other natural and cultural resources. Place names may also express cultural, historical, and/or spiritual values and concepts important to Hawaiian world views. It is common for places and landscape features to have multiple names, some of which may only be known to certain *'ohana* (families) or even certain individuals within *'ohana*, and many of which have been lost, forgotten or kept secret through time. Place names may also convey *kaona* (hidden meanings) and *huna* (secret) information that may even have political or subversive undertones. Before the introduction of writing to the islands, when cultural information was exclusively preserved and perpetuated orally, Hawaiians gave names to literally everything in their environment, including individual garden plots and *'auwai* (ditches), house sites, intangible phenomena such as meteorological and atmospheric effects, *pōhaku* (stone), *pūnāwai* (springs), and many others.

A *wahi pana*, also referred to as a place name, “physically and poetically describes an area while revealing its historical or legendary significance” (Landgraf 1994:v). *Wahi pana* can refer to natural geographic locations, such as streams, peaks, rock formations, ridges, and offshore islands and reefs, or they can refer to Hawaiian divisions, such as *ahupua'a* and *'ili* (land section, next in importance to an *ahupua'a* and usually a subdivision of an *ahupua'a*), and man-made structures, such as fishponds. *Wahi pana* may also express cultural, historical, and/or spiritual values and concepts important to Hawaiian world views. All *wahi pana* meanings are cited from Pukui et al. (1974) unless otherwise noted.

Place names and *wahi pana* of Waiāhole and Waikāne are identified in Table 1 and Table 2.

Table 1. Place names of Waiāhole

Place Name	Meaning (Pukui and Elbert 1986 [PE] or Pukui et al. 1974 [PEM]) unless otherwise noted)	Description	Source
Alu	(no data)	<i>'Ili 'aina</i> . LCAw 11016 to Waipio: “Apana 1. 4 loi ma Alu, Waiahole, Koolaupoko, Oahu [...] 0.585 eka. Apana 2. Kula & pahale [...] 1/2 eka.”	Soehren 2010; IN 827; AB 6:544; TMK 4812:35
Apua	‘Āpua. PEM: fish basket.	<i>'Ili kū</i> . Returned by Kaapuiki at the Māhele, retained by the Gov. This is most likely the same land known elsewhere as Apuu (q.v.). The name “Apua” is found only in the Māhele Book.	Soehren 2010; MB 52,225
Apuu	‘Apu‘u. PE: 1. An endemic fern (<i>Sadleria squarrosa</i>). 2. Hill, mound.	<i>'Ili 'aina</i> . LCAw 8180 to Haole: “[...] ma Waiahole, Oahu. Apana 1. 6 loi kalo ma Apuu [...] 1.1 eka.” TMK 4801:por.10. Also LCAw 10438:3,4 to Naeole; claim no. 10973 by Wahahee. Also claim no. 7657 by Kaukulima. This is most likely the same land as Apua (q.v.).	Soehren 2010; IN 827; AB 4:460,869; NR 4:620, 5:425
Halii	Hāli‘i. PEM: strewn.	<i>'Ili 'aina</i> . Claim no. 7666 by Kaihe is “ma ke ahupuaa o Waiahole [...] 1 loi ai i pili aku ma ka ili aina o Halii.” Claim no. 7668 by Kamalo was not awarded.	Soehren 2010; NR 5:428,429

Place Name	Meaning (Pukui and Elbert 1986 [PE] or Pukui et al. 1974 [PEM]) unless otherwise noted)	Description	Source
Halona Stream	Hālonā. PEM: peering place.	Stream. The south fork of Waiahole Stream joins Waihi Stream, the north fork, at about 500 ft elevation.	Soehren 2010; TM 4813
Hanakea	Hana-kea. PE: white bay.	<i>'Ili kū</i> . Retained by Kaniau at the Māhele, LCAw 8603. Hanakea-uka is at N114,300, E543,000. Also LCAw 10442 to Nika: “7 loi & kula & pahale, Hanakea, Waiahole, Oahu... 2.22 eka.” Claim no. 7567 by Kalama.	Soehren 2010; MB 181; IN 827; AB 10:443, 6:613; NR 5:354; TM 4800, 4801.
Hihimanu	Hīhīmanu. PEM: beautiful.	<i>'Ili 'aina</i> . Claim no. 8235 by Inulama is for “ko'ū kuleana aina ma ka ili o Hihimanu, ahupuaa o Waiahole”. Also claim no. 7564 by Kauihou.	Soehren 2010; NR 5:354,511
Hopekea	(no data)	<i>'Ili kū</i> . Returned by I. Piikoi at the Māhele, retained by the Crown. Adjoins the south side of RPG 2703 in Uau. Coordinates approximate. Claim no. 7558 by Kaakau is for “1 loi ai ua pili aku i ka ili aina o Hopekea”. Also claim no. 8177 by Hoopio.	Soehren 2010; MB 16,224; NR 5:351,499; TM 4811
Ii	(no data)	<i>'Ili kū</i> . Returned by A. Lui at the Māhele, retained by the Gov.	Soehren 2010; MB 108,225

Place Name	Meaning (Pukui and Elbert 1986 [PE] or Pukui et al. 1974 [PEM]) unless otherwise noted)	Description	Source
Kaalae	Ka-‘alae. PE: 1. Mudhen. 2. Same as ‘iwa, a fern.	<i>‘Ili ‘aina</i> . Claim no. 10439 by Nahaina is “ma ka ili aina o Kaalae [...] Waiahole [...] 6 loi ai, 1 kahuahale, 2 mala awa.” Also claim no. 7661 by Kaukalii, no. 7665 by Kukuinui.	Soehren 2010; NR 4:553, 5:426,428
Kaaniu	(no data)	<i>‘Ili kū</i> . Returned by Kalama at the Māhele, retained by the Gov. LCAw 7566 to Keawe is “ma Kaaniu, Waiahole, Oahu. Apana 1. Loi & kula [...] 1.3 eka. Apana 2. Pahale [...] 1/4 eka.” Also LCAw 7558 to Kaakau, 7648 to Kapule, claim no. 7665 by Kukuinui.	Soehren 2010; MB 62,225; IN 827; AB 4:463,466,470; NR 5:428
Kaelele	Ka-‘elele. PE: the messenger, delegate, etc.	<i>‘Ili ‘aina</i> . Claim no. 5806 by Kaao is “ma ka ili aina o Kaelele ahupuaa o Waiahole”.	Soehren 2010; NR 5:142
Kakanilua	Kakani-lua.	<i>‘Ili ‘aina</i> . Claim no. 5806 by Kaao is “ma ka ili o Kakanilua elua loi ai”.	Soehren 2010; NR 5:142
Kalaipahoa	Kālaipāhoa. PE: name of three woods (kauila, nīoi, ‘ohe) believed to be the tree forms of two male gods (Kāne-i-kaulana-‘ula and Ka-huila-o-ka-lani) and one goddess (Kapo) [...]	<i>‘Ili ‘aina</i> . Claim no. 10759 by Palaukai is “ma ka ili aina o Kalaipahoa ma ke ahupuaa o Waiahole [...] 5 loi ai, 6 loi nahele, 1 kahuahale.” Also claim no. 7661 by Kaukalii, in “Kaleipahoa”.	Soehren 2010; NR 4:585, 5:426

Place Name	Meaning (Pukui and Elbert 1986 [PE] or Pukui et al. 1974 [PEM]) unless otherwise noted)	Description	Source
Kanakahipa	Perhaps kanaka-hipa. PE: imbecile.	<i>'Ili 'aina</i> . Claim no. 10227 by Moo 1 is “ma ke ahupuaa o Waiahole [...] 1 loi i pili aku ma ka ili aina o Kanakahipa”.	Soehren 2010; NR 4:527
Kaneloa	Kāne-loa. PEM: tall Kāne.	<i>'Ili 'aina</i> . Claim no. 7566 by Keawe is “ma ka ili aina o Kaneloa [...] Waiahole [...] 6 loi ai, 1 kula, 1 kahuahale.” Between Waianu 2 and Uau; includes RPG 4584 to L. McCandless. “Rice Land” on LCA 70.	Soehren 2010; NR 5:354; RPG 4584:2; LCA 70
Kaoio	(no data)	<i>'Ili 'aina</i> . LCAw 7568 to Koa: “[...] ma Kaoio, Waiahole, Oahu. Apana 1. 6 loi & kula & pahale [...] 1.3 eka.” TMK 4812:3.	Soehren 2010; IN 827; 4:463
Kapalai	ka-palai. PE: the native fern (<i>Microlepia setosa</i>).	<i>'Ili 'aina</i> . RPG 3939:2 to M. Phillips & Co. TMK 4809:16, por.33. Also claim no. 7664 by Koa for “1 kahuahale i pili aku ma ka ili aina o Kapalai.” Claim no. 7562 by Kamai “ma ka ili aina o Kapalai [...] Waiahole [...] 1 moo aina, 3 kula, 3 kahuahale” was not awarded. Coordinates approximate.	Soehren 2010; TM 4809; LCA 69; NR 5:353
Kapiikokau	(no data)	<i>'Ili 'aina</i> . LCAw 105 to Wm Walker: “[...] known by the name of ‘Kapikokau [sic]’...” TMK 4809:12,14 etc. Also LCAw 7657 to Kaukalima: “Ma Kapukokuu [sic], Waiahole, Oahu.” Written “Kapikookau” in NR 5:425.	Soehren 2010; IN 827; AB 1:244, 4:464; TM 4800

Place Name	Meaning (Pukui and Elbert 1986 [PE] or Pukui et al. 1974 [PEM]) unless otherwise noted)	Description	Source
		TMK 4809:3,5. A mauka section is at N115,000, E543,000 on TM 4800.	
Kapuakea	Ka-pua-kea. PE: the white flower.	<i>'Ili kū</i> . Returned by Kaleimamahu at the Māhele, retained by the Gov. Misspelt “Kauakea” on TM 4809. LCAw 8176 to Hokii: “Apana 2. Kula a me pahale ma Kapuakea [...] 1/2 eka.” Also LCAw 8177 to Hoopio, 8052 to Ehu, 8236 to Ia, 7666 to Kaihe. Claims no. 7658 by Kamohai, no. 8187 by Haupū were not awarded.	Soehren 2010;
Kauakea	(no data)	<i>'Ili kū</i> . Probably misspelling of Kapuakea (q.v.) on TMK 4809:31-35, LCA 69	Soehren 2010; TM 4809
Kaululua	Perhaps ka-‘ulu-loa. PE: the tall breadfruit tree.	<i>'Ili 'aina</i> . LCAw 7656 to Keakini: “Apana 1. 7 loi & kula & pahale ma Kaululua [...] 2.44 eka. Apana 2. Hookahi loi [...] 0.056 eka. Apana 3. Elima loi [...] 0.76 eka.” Also LCAw 10625 to Paikau.	Soehren 2010; IN 827; AB 9:482,505
Kaupokokuu	(no data)	<i>'Ili 'aina</i> . Misspelt. See Kapiikokau	Soehren 2010; IN 827
Kuaiokumu	(no data)	<i>'Ili 'aina</i> . Claim no. 10229 by Malule is “ma ka ili aina o Kuaiokumu ma ke ahupuaa o Waiahole [...] 5 loi ai, 1 kula, 1 kahuahale”.	Soehren 2010; NR 4:528, 5:356,424

Place Name	Meaning (Pukui and Elbert 1986 [PE] or Pukui et al. 1974 [PEM]) unless otherwise noted)	Description	Source
		Also claim no. 7654 by Kimo. Claim no. 7571 by Kuala was not awarded.	
Kuaiomoku	(no data)	<i>'Ili kū</i> . Returned by Kaapuiki at the Māhele, retained by the Gov. Written Kuaiomuku on p.225.	Soehren 2010; MB 52,225
Kuakaikoo	Perhaps kū-ā-kai-ko'o.	<i>'Ili 'aina</i> . Claim no. 10437 by Naaweawe is "ma ka ili aina o Kuakaikoo [...] Waiahole [...] 6 loi ai, 1 kula". Also claim no. 10973 by Wahahee, no. 7558 by Kaakau, no. 7648 by Kapule.	Soehren 2010; NR 4:553,620, 5:351,421
Kualele	Kua-lele. PE: flying god (short for akua lele).	<i>'Ili 'aina</i> . LCAw 10231 to Mahina: "[...] ma Kualele, Waiahole, Koolaupoko, Oahu. Apana 1. 6 loi a me kula [...] 0.92 eka. Apana 2. Pahale [...] 1/4 eka." TMK 4812:por.1,45. A point on the Waiahole FR boundary called "Kualele" is at N112,100 E546,100, elev. 515. ft.	Soehren 2010; IN 827; AB 4:467; TM 4813
Kumupali	Kumu-pali. PE: base [of] cliff.	<i>'Ili kū</i> . Returned by Kaunuohua at the Māhele, retained by the Gov. LCAw 7564 to Kauihou: "[...] ma Kumupali, Waiahole, Oahu. Apana 1. 9 loi [...] 2.70 eka."	Soehren 2010; MB 96,225; IN 828; AB 7564

Place Name	Meaning (Pukui and Elbert 1986 [PE] or Pukui et al. 1974 [PEM]) unless otherwise noted)	Description	Source
Kupapaulau	Kupapa'u-lau.	<i>'Ili kū</i> . Returned by Hueu at the Māhele, retained by the Gov. Claim no. 7665 by Kukuinui is for “1 loi ai i pili aku ma ka ili aina o Kupapaulau.” Also claim no. 8146 by Hueu.	Soehren 2010; MB 66,225; NR 5:428,491
Makanilua	Makani-lua. PE: two winds.	<i>'Ili kū</i> . Returned by Kanaina at the Māhele, retained by the Gov. Claim no. 7650 by Kaiwi 2 is “ma ka ili aina o Makanilua ma ke ahupuaa o Waihole [<i>sic</i>] [...] 3 loi ai, 1 kahuahale”. Also claim no. 7660 by Kekuinae.	Soehren 2010; MB 36,225; NR 5:422,426
Makawai	Maka-wai.	<i>'Ili kū</i> . Returned by Kaunuohua at the Māhele, retained by the Crown.	Soehren 2010; MB 96,224; TM 4800
Makikiki	(no data)	<i>Pu'u</i> . Elevation 521 ft.	Soehren 2010; USGS 1954
Nuole	(no data)	<i>'Ili 'aina</i> . Claim no. 7166 by Kaai is “ma ka ili aina o Nuole, 1 loi a wahi kula”.	Soehren 2010; NR 5:295
Oi	Perhaps oī: PE: variant of ōwī 1-3.	<i>'Ili 'aina</i> . LCAw 105 to Wm Walker: “Notes of survey of Kapiikokau (3 pieces) and Oi in Waiahole, Koolalu [...] of Oi (Oii) [...]” TMK 4809.	Soehren 2010; IN 828; AB 1:244; LCA 69

Place Name	Meaning (Pukui and Elbert 1986 [PE] or Pukui et al. 1974 [PEM]) unless otherwise noted)	Description	Source
Onouli	Ono-uli. PEM: dark ono fish.	<i>'Ili kū</i> . Retained by Kahoohanohano at the Māhele, LCAw 7137. 93 acres adjoining Waianu 2 on the north, Waikane on the south.	Soehren 2010; MB 139; IN 828; AB 10:321; TM 4810; LCA 70, 72
Opaea	(no data)	<i>'Ili 'aina</i> . Claim no. 7662 by Kaumaka is “ma ke ahupuaa o Waiahole [...] 1 loi i pili aku ma ka ili aina o Opaea [...]”	Soehren 2010; NR 5:426
Poahamai	(no data)	<i>'Ili kū</i> . 1/2 retained by Kamakakehau at the Māhele, LCAw 8830, 4 acres; 1/2 returned, retained by the Gov. Also LCAw 7649 to Kalei, 3.25 acres.	Soehren 2010; MB 178,179,225; IN 828; AB 10:657, 4:468
Poea	(no data)	<i>'Ili kū</i> . Portion returned by Kaunuohua, retained by the Gov.; portion retained by A. Lui at the Māhele, LCAw 3218:2, RP 5703. 33.9 acres. Also LCAw 9959 to Lumai. 5.40 acres.	Soehren 2010; MB 96,109,225; IN 828; AB 10:626, 4:472; TM 4800
Polaa	(no data)	<i>'Ili 'aina</i> . Claim no. 7561 by Kihakauli “ma ka ili aina o Polaa [...] Waiahole [...] 4 loi ai, 10 loi nahele, 1 kula, 1 kahuahale” was not awarded.	Soehren 2010; NR 5:352
Poopepe	Po'o-pepe. PE: flat head, a name for lesser gods.	<i>'Ili 'aina</i> . LCAw 8235 to Inulama: “Pahale ma Poopepe i Waiahole, Koolaupoko, Oahu... 5/10	Soehren 2010; IN 828; AB 9:365; NR 5:427

Place Name	Meaning (Pukui and Elbert 1986 [PE] or Pukui et al. 1974 [PEM]) unless otherwise noted)	Description	Source
		eka." Perhaps LCAw 8235:3, TMK 4812:por.23. Also claim no. 7664 by Koa.	
Uau	Ua'u. PE: to grate. 'ua'u. PE: petrel. Same as Uwau (q.v.)	'Ili kū. Returned by Kaleimamahu at the Māhele, retained by the Gov. RPG 2703 to Kekakeiki: "Apana 2. He aina kalo me kula. 12 eka." Misspelt "Uwa" on TM 4809. A mauka portion shown on TM 4800 is at N118,500, E538,000. See also "Uwau"	Soehren 2010; MB 182,225; IN 828; RPG 2703
Uwao	Uwao. PEM: peacemaking.	Stream. "Stream, Wai-āhole, O'ahu." Probably the same as Uwau Stream (q.v.).	Soehren 2010; PEM 215
Uwau	Uwa'u. PE: to grate. 'ūwa'u. PE: petrel. Same as Uau (q.v.).	'Ili kū. LCAw 7560 to Kekaulaau: "Apana 1. 5 loi & kula ma Uwau [...] 2-1/4 eka. Apana 2. 6 loi [...] 0.82 eka." Also LCAw 10973 to Wahahee. Claim no. 10231 by Mahina is for "1 mala awa i pili aku ma ka ili aina o Uwau". Also claims no. 7558 by Kaakau, 7563 by Kaopulupulu, 7566 by Keawe, 7576 by Kalaloa, 7657 by Kaukulima, 7661 by Kaukaliu. Written "Uau" (q.v.) in Māhele Book.	Soehren 2010; IN 828; AB 6:653,654; NR 4:529,620, 5:351,352,353,354,357,425,426; TM 4800, 4809

Place Name	Meaning (Pukui and Elbert 1986 [PE] or Pukui et al. 1974 [PEM]) unless otherwise noted)	Description	Source
Uwau Stream	Uwa'u. PE: to grate. 'ūwa'u. PE: petrel.	Stream. Rises at about 900 ft. elevation, joins Waianu Stream at about 195 ft. Cf. Uau, Uwao.	Soehren 2010; USGS 1954
Waiahole	Wai-āhole. PEM: mature āhole (a fish) water.	<i>Ahupua'a</i> . Not named in the Māhele Book although sixteen 'ili kūpono are named, 11 of which were retained by the Government and two by the Crown. The name is consistently written Waiohole in the Māhele Book. "[...] the kahuna class were given the lands of Waimea, Pupukea, Waiahole, and Hakipu'u in perpetuity [...] until the days of Ka-hahana." (Kamakau) See Sterling and Summers for stories.	Soehren 2010; GR 55,56; Kamakau 1961:231; Sterling and Summers 1978:188-190; USGS 1954
Waiahole Camp	Wai-āhole. PEM: mature āhole (a fish) water.	Place. Elevation about 440 ft.	Soehren 2010; USGS 1954
Waiahole Forest Reserve	Wai-āhole. PEM: mature āhole (a fish) water.	Forest reserve.	Soehren 2010; USGS 1954
Waiahole Hmstds	Wai-āhole. PEM: mature āhole (a fish) water.	Homestead.	Soehren 2010; USGS 1954
Waiahole Stream	Wai-āhole. PEM: mature āhole (a fish) water.	Stream. Formed by merger of Halona and Waihi Streams at about 500 ft. elevation; joined by Waianu Stream at about 70 feet elevation, flows to sea.	Soehren 2010; USGS 1954

Place Name	Meaning (Pukui and Elbert 1986 [PE] or Pukui et al. 1974 [PEM]) unless otherwise noted)	Description	Source
Waianu 1,2	Wai-anu. PEM: cold water.	<i>'Ili kū</i> . Retained by Puuki at the Māhele, LCAw 5936, RP 6987, 225 acres. Also LCAw 7659 to Kupihea, 8052:3 to Ehu in Waianu 2, 10881 to Poheke. Claim no. 7669 by Kuiki is for “10 loi ai, 1 mala awa i pili aku ma ka ili aina o Waianu I, 2 loi ai i pili aku ma ka ili aina o Waianu II.” Also claim no. 8176 by Hokii, no. 8235 by Inulama. Claims no. 7571 by Kuala and no. 7559 by Kamana were not awarded. RPG 3939:1 to Phillips & Co. in Waianu is part of LCA 69.	Soehren 2010; MB 73; IN 829; RP 6987; AB 4:471, 6:545,546, 10:632; NR 5:352,356,429,498,511; TM 4800; LCA 69, 70
Waianu Stream	Wai-anu. PEM: cold water.	Stream. Rises at about 600 ft. elevation, joins Waiahole Stream at about 70 ft.	Soehren 2010; USGS 1954
Waihi Stream	Wai-hī. PEM: trickling water.	Stream. The north fork of Waiahole Stream joins Halona Stream, the south fork, at about 500 feet elevation.	Soehren 2010; TM 4813

Table 2. Place Names of Waikāne

Place Name	Meaning (Pukui and Elbert 1986 [PE] or Pukui et al. 1974 [PEM]) unless otherwise noted)	Description	Source
Haleula	Hale-‘ula. PE: red house	Place. Laka was the chief that was born at Alae in Kipahulu (Maui). He ruled at Ko‘olaupoko, O‘ahu. His house site was at Haleula in Waikāne.	Soehren 2010; Sterling and Summers 1978:188
Kaaumakua	Ka-‘aumakua. PE: family or personal gods, deified ancestors	Place. Point where mountain ridge Kanehoalani, juts east, perpendicular to the main Koolau ridge. Personal reference by Thelma Parish.	Shideler and Hammatt 2007:149-161.
Kaawakoa	Ka-‘awa-koa	<i>Heiau</i> . Site 318: Ka‘awakoa Heiau, on an elevation a few hundred feet south of Kukuianiani (Site 317), which Thrum said was a companion structure. The stones have been removed and only a pig-pen and <i>hau</i> grove mark the site.” Coordinates approximate	Soehren 2010; McAllister 1933:170
Kamohailio	(no data)	<i>Pu‘u</i> (hill, peak). Claim no. 5716:4 by Kū “is breadfruit land in Kanuehu [...] bounded: Kailua by hill Kamohailio [...]” Not awarded	Soehren 2010; FT 11:63
Kamuliwai	Ka-muliwai. PE: the estuary	<i>Lo‘i</i> (irrigated taro patch). Claim no. 5615:2 by Kamai is 2 <i>lo‘i</i> in the ‘ <i>ili</i> of Kokowaleole. It is bounded: Ko‘olauloa by Hipo‘o’s <i>lo‘i</i> called Kamuliwai	Soehren 2010; FT 11:23

Place Name	Meaning (Pukui and Elbert 1986 [PE] or Pukui et al. 1974 [PEM]) unless otherwise noted)	Description	Source
Kapahu	Ka-pahu. PEM: the box, drum, coffin, or push. PE: stake, stick, pole	Place. “(Site 3) Where Lincoln McCandless’ house now stands was the resting place for the hōlua sledders. It was called Kapahu. The hōlua started on the hill back of the Catholic Church (TMK [1] 4-8-001:001)”	Soehren 2010; Sterling and Summers 1978:188
Kookai	Ko‘o-kai	<i>Lo‘i</i> . Claim no. 5711 by Koma: “No. 2 is one lo‘i in the mo‘o [Narrow strip of land, smaller than an ‘ili] of Makanui in the ‘ili o Kokowaleole. It is bounded: Kailua by Kookai, a lo‘i [...]” LCA 5711:1, TMK [1] 4-8-003:por.014	Soehren 2010; FT 11:39
Kuaikahala	(no data)	<i>Lo‘i</i> . Claim no. 5727:1 by Kauhoe for “4 lo‘i in Kaihuna [...] is bounded: Mauka by Kuaikahala, a lo‘i...”	Soehren 2010; FT 11:41
Kukuianiani	Kukui-aniani. PEM: flickering light	<i>Heiau</i> . “Site 317. Kukuianiani heiau, at the foot of Pu‘u Pueo, Waikāne. A small two-terraced structure.” Coordinates approximate	Soehren 2010; McAllister 1933:170
Makaohala	(no data)	<i>Pu‘u</i> . Claim no. 5716:3 by Ku “is an ape patch in Kanuehu [...] bounded: Ko‘olauloa by the hill called Makaohala [...] Kailua by hill of Makaohala [...]” Not awarded	Soehren 2010; FT 11:63

Place Name	Meaning (Pukui and Elbert 1986 [PE] or Pukui et al. 1974 [PEM]) unless otherwise noted)	Description	Source
Mookahi	Mo'o-kahi	<i>Lo'i</i> . Claim no. 8997 by Kaholoaanui for "a moo [...] known by the name of Kuehuhulumoa in the ili of Kahalaa [...] [which] is bounded: Makai by Kaiwi's lo'i Mo'okahi [...]" was not awarded	Soehren 2010; FT 11:31
Napuukoiele	Nā-pu'u-koiele. PEM: hills moving to and fro	<i>Pu'u</i> . "Hills, Wai-kāne qd., O'ahu." Same as Puu Koiele (q.v.)	Soehren 2010; PEM 163
Nuapuaa	Nu'a-pua'a. PE: many pigs	<i>Pu'u</i> . Claim no. 5716:5 by Ku "is a banana garden in Kanuehu...bounded: Mauka by the hill Nuapua'a [...] Kailua by the hill Nuapua'a [...]" This is a variant spelling of Luapua'a (q.v.)	Soehren 2010; FT 11:63
Palalauhala	Pala lau hala. PE: yellow as a pandanus leaf, said of the very old	<i>Pu'u</i> . Claim no. 5716:4 by Ku "is breadfruit land in Kanuehu [...] bounded: Ko'olauloa by hill Palalauhala [...]" Not awarded	Soehren 2010; FT 11:63
Paliuli	Pali-uli. PEM: green cliff	Place. "[...] a land section at Wai-Kāne [...] O'ahu [...]" Quad uncertain	Soehren 2010; PEM 178
Puu Kaaumakua	Pu'u ka-'aumakua. PEM: the family deity hill	Boundary point. Elevation 2681 ft. at the <i>mauka</i> corner of Waikāne on the Ko'olaupoko/Ko'olauloa boundary	Soehren 2010; USGS 1953

Place Name	Meaning (Pukui and Elbert 1986 [PE] or Pukui et al. 1974 [PEM]) unless otherwise noted)	Description	Source
Puu Koiele	Pu'u koiele. PE: moving to and fro restlessly, as the sea	Boundary point. Elevation 1683 ft. on the Ko'olauloa/Ko'olaupoko boundary and the Waikāne/Kahana boundary	Soehren 2010; USGS 1954
Puu Ohulehule	Pu'u 'ōhulehule. PEM: joining-of-waves hill	Boundary point. Elevation 2265 ft. on the Ko'olauloa/Ko'olaupoko boundary; the <i>mauka</i> corner of Waikāne and Hakipu'u on the Kahana boundary	Soehren 2010; USGS 1954
Puu Pueo	Pu'u pueo. PEM: owl hill	Boundary point. Elev. 880+ ft. on the Hakipu'u/Waikāne boundary	Soehren 2010; USGS 1954
Puu Puhi	Pu'u puhi	'Ili 'āina. LCAw 5954 to Moku: “‘āpana 1. 22 lo'i me ke kahuahale, Pu'upuhi, Waikāne, O'ahu.” TMK [1] 4-8-006:003x	Soehren 2010; IN 831; AB 2:959
Uaua	(no data)	'Ili 'āina. Claim no. 10880B by Makanui: “No. 3 is a house lot in the 'ili of Uaua [...] it is bounded: Makai by the pali of Uaua [...]” TMK [1] 4-8-003:019,054. [This parcel is placed in the 'ili of Ka'āpoko in AB 2:957.] Claim no. 5711:1 by Koma for “3 lo'i in the mo'o of Haunakiha [...] bounded: Mauka by the auwai of Uaua.” TMK [1] 4-8-003:por.007,008	Soehren 2010; FT 11:33,39

Place Name	Meaning (Pukui and Elbert 1986 [PE] or Pukui et al. 1974 [PEM]) unless otherwise noted)	Description	Source
Ulawini	(no data)	Spring. No data. Coordinates approximate. North 121,700. East 545,200	Soehren 2010; TM 4806
Ulunui	Perhaps 'ulu-nui. PE: large breadfruit tree	<i>Lo'i</i> . Claim no. 5954 by Moku: "No. 2 is one large lo'i in the mo'o of Kauponihoawa. It is bounded: Makai by 'Ulunui' a lo'i"	Soehren 2010; FT 11:24
Waikane	Wai-kāne. PEM: Kāne's water (old name was Wai-a-Kāne)	<i>Ahupua'a</i> . Returned by Konia at the Māhele, retained by the Gov.	Soehren 2010; MB 20,225; USGS 1954
Waikane Camp	Wai-kāne. PEM: Kāne's water (old name was Wai-a-Kāne)	Place. Elevation about 750 ft.	Soehren 2010; USGS 1954
Waikēkee Stream	Wai-ke'eke'e. PEM: crooked water	Stream. Rises at about 1500 ft. elevation, joins Waikāne Stream at 200 ft. elevation.	Soehren 2010; USGS 1954

3.2.1 Heiau (Pre-Contact Place of Worship)

Sites of religious and/or political significance include Kukuianiani Heiau (Site 317), located near the coast of Waikāne, Ka'awakoa Heiau which at one time stood in close proximity, and several upland sites interpreted as agricultural shrines. McAllister lists two *heiau* (pre-Christian place of worship) in the Waikāne, Waiāhole area (McAllister 1933:170–171):

Site 317. Kukuianiani *heiau*, at the foot of Puu Pueo, Waikane. A small two-terrace structure covered with *haole-koa* and lantana. The slope on the mountain-side is steep and was probably cut into, in locating the upper terrace, and the dirt removed used in building the face of this terrace. The most interesting feature is the large stone at the base of the lower terrace. The two artificial cavities in the surface of the stone appear to have been used as mortars for the pounding or grinding of some substance.

Site 318. Kaawakoa *heiau*, on an elevation a few hundred feet south of Kukuianiani (Site 317), which Thrum said was a companion structure. The stones have been removed and only a pigpen and *hau* grove marks the site.

3.2.2 Loko I'a

Two *loko i'a* were described in Waikāne, one named Kolowalu and unfortunately the name of the second fishpond is unknown. *Lo 'i kalo* in this area reverted to fishponds. This area where the fresh water meets the ocean is an important source of life and growth. The Waiāhole and Waikāne streams are an important feature for people who have lived and are living in the area, not only because of the food that results such as the *āholehole*, *ōpae* and *o'opu*, but also because they are seen as a main artery to the health of the valley being a source of recreation and a gathering place. Up until the 1950s, water from five *'auwai*, three in Waiāhole and two in Waikāne, was used for household consumption, drinking water, and in irrigation for the rural communities that live in the two *ahupua'a* (Bushnell et al. 2002:11).

3.2.3 Kapahu Hōlua

Hōlua sledding was a sport greatly admired by the chiefs and the people of Hawai'i. The courses usually started on a steep incline such as a hill then extended into a lower plain area (Malo 1951:294). The resting site for the Kapahu Hōlua is said to be where the Lincoln McCandless house now stands. The *hōlua* started on the hill in back of the Catholic Church. The *hōlua* sled was very famous; at this place the prominent people as well as the ordinary folk came to sled (*Ke Aloha 'Āina*, 8 February 1919).

In “Na Pana Kaulana o Nā Inoa o ka Mokupuni O'ahu,” George Po'olua relates,

Hō'ea kaua i Waikāne e kū mai ana ka hale pule o ke aupuni lani, makai o ke alanui. He nui no na hale nani e kil mai ana iluna o ka 'āina. He nui no ka u'i o ka waiho ana o ka 'āina ke nana aku.

Aia ma Kēia wahi ka home ho'omaha o ka 'Elele Linekona Eliwai, ka hale kipa ho'i o na loea kāl'aiana o ka ao 'ao Demokalaka, he nui na kanaka Hawai'i ma ke ia wahi, o kekahi olahou aia malalo o Linekona Eliwai.

E huli aku 'oe iuka o ia kuahiwi e 'ike ana oe i ka mō'ali ma nā awa 'awa a me nā mauna; 'oia ka wai o Waiāhole i 'eli ia iho nei maloko o nā kuahiwi a puka ma Waipi'o, no ka ho'olawa ana i ka wai no nā hui mahi-ko o Waipahu mā.

Aia ma ke kahua o ka hale e kū nei o ka 'Elele Linekona Eliwai 'oia ka palena ho 'omaha o ke kahua he 'eholua kaulana 'Kapahu.' E ho 'omaka ana keia kahua he 'eholua, ma ka pu 'u mahope aku o ka hale pule Kakolika.

He mo'olelo kaulana ko keia kahua, ma 'anei e ho 'ohala ai nā kānaka ko 'iko 'i o ka 'āina, i na wā i hala, a me nā maka 'āinana pū no keia hana he he 'eholua, a no kēia le 'ale 'a, pelā i kapa ia ai ka inoa o kēia wahi o Waikāne [...] [Ke Aloha Aina, 8 February 1919]

Translation:

Arriving at Waikāne there stands the church of the heavenly kingdom seaward of the road. There are many beautiful houses and the land lying before your gaze is lovely. In this place is the vacation home of Lincoln McCandless (called 'Elele Linekona Eliwai' 'Lincoln Water-Digger Envoy' in reference to his fame as an advocate of artesian well digging) the very hospitable friend of those skilled in politics of the Democratic Party. There are many Hawaiians at that place, some supported by Lincoln McCandless. Turning to the uplands one sees the furrows of the valleys in the mountain. There is the watercourse of Waiāhole excavated into the mountain emerging at Waipi'o to supply water to the sugar growing consortiums of Waipahu. Where Lincoln McCandless' house now stands was the resting place for the *hōlua* sleds. It was called Kapahu. The *hōlua* started on the hill back of the Catholic Church. The *hōlua* sled was very famous for at this place the prominent people as well as the ordinary folk came here to sled. That is why the place was called Waikāne. [Correa et al. 2012]

"Midday was the favorite time for the sport when the heat of the sun made the grass slippery and the sled could then attain terrific speed" (Kamakau 1992:243). The Kapahu Hōlua site was also indicated in Sterling and Summers (1978); the *hōlua* slide was close to the *mauka* side of Kamehameha Highway between Waikāne Stream on the south and Pu'u Pueo Ridge on the north.

3.2.4 Pu'uhonua

Pu'uhonua are places of refuge where *kapu*-breakers or non-combatants during times of war could find culturally sanctioned asylum and safety from which they might be allowed to leave at a later time and reintegrate within society. According to Kamakau, ruling chiefs were regarded as *pu'uhonua* incarnate. Their lands ('*āina pu'uhonua*'), as well as their consorts and deities, were also regarded as sacrosanct.

S.M. Kamakau lists Waikāne as one of three *pu'uhonua* (place of refuge) lands of Ko'olaupoko, O'ahu:

The *pu'uhonua* in ancient times was an *ahupua'a* portion of a district (*ahupua'a 'okana*), like Kailua and Waikane for Ko'oluapoko district on Oahu, and also Kualoa, which was a very sacred land and a true *pu'uhonua*, where persons marked

for death were saved if they entered it. There were such places all over Oahu.
[Kamakau 1964:18]

3.2.5 Adze Quarry

Adze quarries have been identified on the ridges between the valleys, and evidence of the manufacture of stone tools has been found in the valley floors. The quarry sites that comprise the Waiāhole Quarry Complex have been recommended for inclusion in the National and State Registers. In a 1964 report, Kikuchi found considerable evidence of the manufacture of stone tools within the valley, including a lithic scatter in a bulldozed field later designated as SIHP #50-80-10-02476, two adze quarries on one of the ridges along the edge of the valley (SIHP #s 50-80-10-02472 and -02475).

3.2.6 Ala Hele (Trails)

Throughout history chiefs have built roads to provide a better life for the common people. Fifteen generations prior to the time of Kamakau, Kiha the son of Pi'ilani paved "with rocks and straightened the roads of Molokai and Maui and these roads are still preserved today" (Kamakau 1992:429). Ancient chiefs who constructed roads as far back as twenty centuries ago have been documented. Samuel M. Kamakau relates that:

Ua olelo ia o Maui a Kalana kekahi ali 'i kahiko loa i hana i na alanui i ka wa he iwakalua a keu keneturia mamua, aka, ma kona ano mo 'olelo, ua hanaia na alanui a pololei loa. Ua maa na kanaka i ka hele ma ka pololei o ke alanui, aka i ke alualu ana o kekahi po 'e e pepehi ia Maui, ua hele kikeekee oia i ke alanui, a ua kapaia o 'ke alanui kike'eke'e a Maui,' aia ma Waikane me Waiahole ma Koaolaupoko i Oahu [...] [Ke Au 'Okō 'a, 14 October 1869]

Translation:

Maui, son of Kalana, was one of the ancient chiefs of Maui who made roads twenty centuries ago. The roads in his day were straight, and the people were accustomed to running along straight roads; so when certain persons ran after Maui to kill him he made the road go zigzag and it was called 'the zigzag road of Maui.' (ke alanui kike'eke'e a Maui). One is at Waikane and Waiahole in Ko'olaupoko on O'ahu [...]

The road documented here that relates to Waiāhole and Waikāne is called the zig-zag road of Māui and was built for defensive purposes. This trail is also referred to by Puku'i and relates a poetical saying referring to the demi-god Maui at Waiāhole, "*Ke ala kike'eke'e a Maui*," which translates as the "winding trails of Maui." "Trails made by Maui when he was pursued by those who wished to destroy him. One trail was at Waiāhole, O'ahu, one at Keka'a between Lahaina and Ka'anapali, and the third at Kealahakaha, Kahakuloa, Maui" (Puku'i 1983:180).

This myth may account for some of the winding roads in Waiāhole. It might be the explanation of why the path is in a certain location or has a certain configuration such as switchbacks. Alternatively this may be a traditional explanation associated with the stream named Wai-ke'eke'e (crooked water) in Waikāne.

3.2.7 Ahu o Laka

Ahu o Laka (altar of Laka), a 3-acre patch of sand in Kāne‘ohe Bay known as the Kāne‘ohe Sandbar, has been a popular recreational area accessible at low tide by boat (Pukui et al. 1974:6). An alternate name, Ahua-a-Laka (sand bank of Laka), is suggested in a portion of a chant relating to the Maui chief, Laka, born in Kīpahulu, Maui (other suggestions have been Hilo, Hawai‘i) and from the Ulu genealogy:

*He hu‘ena na ‘Ulu iā Laka-a-
Wahieloa
Ha‘ule i Kualoa
I Mokoli‘i i Mokuahukele
I kai lo‘ilo‘i i ‘Āpua i kai malino;
I Makami la i Waiāhole,
I Hale‘ula la i Waikāne,
I Hakipu‘u, i Kualoa,
I kai, i ‘ō Ahua-a-Laka,
‘O Laka ho‘i a Wahieloa;
Nāna ho‘i ‘o Lu‘anu‘u.*

There was a flowing (descent) from ‘Ulu
to Laka-a-Wahieloa.
He [Laka] died at Kualoa.
To Mokoli‘i, Mokuahukele,
To the pooled sea at ‘Āpua, the calm sea;
To Makami there in Waiāhole,
To Haleula there in Waikāne,
To Hakipu‘u, to Kualoa,
To sea, to Ahua-a-Laka
Laka-a-Wahieloa was taken;
Taken by Luanu‘u.
[Kamakau 1991:145–146]



Figure 18. Waikāne, courtesy of Hawai‘i State Archives

3.3 'Ōlelo No 'eau (Hawaiian Proverbs)

Hawaiian knowledge was shared by way of oral histories. Indeed, one's *leo* (voice) is oftentimes presented as *ho 'okupu* ("to cause growth," a gift given to convey appreciation, to strengthen bonds); the high valuation of the spoken word underscores the importance of the oral tradition (in this case, Hawaiian sayings or expressions), and its ability to impart traditional Hawaiian "aesthetic, historic, and educational values" (Pukui 1983:vii). Thus, in many ways these expressions may be understood as inspiring growth within reader or between speaker and listener:

They reveal with each new reading ever deeper layers of meaning, giving understanding not only of Hawai'i and its people but of all humanity. Since the sayings carry the immediacy of the spoken word, considered to be the highest form of cultural expression in old Hawai'i, they bring us closer to the everyday thoughts and lives of the Hawaiians who created them. Taken together, the sayings offer a basis for an understanding of the essence and origins of traditional Hawaiian values. The sayings may be categorized, in Western terms, as proverbs, aphorisms, didactic adages, jokes, riddles, epithets, lines from chants, etc., and they present a variety of literary techniques such as metaphor, analogy, allegory, personification, irony, pun, and repetition. It is worth noting, however, that the sayings were spoken, and that their meanings and purposes should not be assessed by the Western concepts of literary types and techniques. [Pukui 1983:vii]

Simply, *'ōlelo no 'eau* may be understood as proverbs. The Webster dictionary notes it as "a phrase which is often repeated; especially, a sentence which briefly and forcibly expresses some practical truth, or the result of experience and observation." It is a pithy or short form of folk wisdom. Pukui equates proverbs as a treasury of Hawaiian expressions (Pukui 1995:xii). Oftentimes within these Hawaiian expressions or proverbs are references to places. This section draws from the collection of author and historian Mary Kawena Pukui and her knowledge of Hawaiian proverbs describing *'āina*, chiefs, plants, and places. The following proverbs concerning Waiāhole and Waikāne come from Mary Kawena Pukui's *'Ōlelo No 'eau* (Pukui 1983).

3.3.1 'Ōlelo No 'eau #550

He au Ko 'olau aku ia.

That is Ko 'olau weather.

The Ko 'olau, or windward, side of an island is often storm-beaten. This expression was first used in a chant to Hi 'iaka by Wahine 'oma 'o, who pleaded with her not to let her wrath lead to destruction. Later used as a warning that headstrong wilfulness leads to distress. [Pukui 1983:64]

3.3.2 'Ōlelo No 'eau #1385

Ka i 'a wale nui o ke Ko 'olau.

The slimy fish of the windward side [of O 'ahu].

An octopus. Before it is ready to eat, it must be pounded and rubbed with salt to remove the slime and make ti tender. [Pukui 1983:150]

3.3.3 'Ōlelo No'eau #1674

Ke ala kīke 'eke 'e a Māui.

The winding trails of Māui.

Trails made by Māui when he was pursued by those who wished to destroy him. One trail was at Waiahole, O'ahu, one at Keka'a between Lahaina and Kā'anapali, and the third at Kealahakaha, Kahakuloa, Maui. [Pukui 1983:180]

3.3.4 'Ōlelo No'eau #1735

Ke kalo pa 'a o Waiahole.

The hard taro of Waiahole.

A reminder not to treat others badly. One day, a man went to Waiahole, O'ahu, to visit his sister, whom he had not seen for many years. She was absent, and her husband neither asked the stranger in nor offered him any food. When hunger possessed the visitor he asked if he might have some taro to eat. His brother-in-law directed him to his taro patches and told him to get some from there. The man went to the patches and then continued on his way. When the woman returned she was told of the visitor, and by her husband's description she knew that it was her brother. She rebuked him for his lack of hospitality. When they went to their taro patches they found all the taro pulled up and hacked to pieces. [Pukui 1983:186]

3.3.5 'Ōlelo No'eau #2285

Na pali hāuliuli o ke Ko'olau.

The dark hills of Ko'olau.

The hills and cliffs of the windward side of O'ahu are always dark and beautiful with trees and shrubs. [Pukui 1983:249]

3.4 Mele (Songs)

A number of late nineteenth, twentieth, and twenty-first century *mele* concern or mention Waikāne and Waiāhole Ahupua'a. These particular *mele* may also be classified as *mele wahi pana* (songs for legendary or historic places). *Mele wahi pana* such as those presented here may or may not be accompanied by *hula* (dance) or *hula wahi pana* (dance for legendary or historic places). As the Hula Preservation Society notes,

Hula Wahi Pana comprise a large class of dances that honor places of such emotional, spiritual, historical, or cultural significance that chants were composed for them. Only the composers of the chants could know the deepest meanings, as they would be reflections of their feelings and experiences [...] Since the subjects of Wahi Pana compositions are extremely varied, their implementation through hula are as well. Coupled with the differences from one hula style and tradition to the next, Hula Wahi Pana can be exceptionally diverse. They can be done sitting or standing, with limited body movement or wide free movement; with or without the use of implements or instruments; with the dancers themselves chanting and/or playing an implement or being accompanied by the *ho'opa'a* [drummer and *hula*

chanter (memorizer)]. Beyond the particular hula tradition, what ultimately determines the manner in which a Hula Wahi Pana is performed are the specific place involved, why it is significant, the story being shared about it, and its importance in the composer's view. [Hula Preservation Society 2014]

3.4.1 Waiāhole E

Composed by Albert Woodward, this song starts in Ko'olaupoko at Waiāhole and ends in Ko'olaupoko at Hau'ula. Each verse tells a famed feature of each Ahupua'a with a poetic twist.

<i>Waiāhole e wai o ka lepolepo e,</i>	Waiāhole is of the muddy waters,
<i>'Oni'oni nui kino e i kou kīkala e.</i>	Your entire being moves to your hips.
<i>I Kahana e 'ala o ka hala e,</i>	At Kahana is the fragrance of hala,
<i>Hala kou puka 'ili e ka lae o ka pipi</i>	Your leather lasso will pass the brow of
<i>ohi e.</i>	the young cow.
<i>Maliko e i Punalu'u</i>	Maliko is in Punalu'u,
<i>Wahi o ka tako e pipili mai ala e.</i>	Place of the squid clinging on all over.
<i>Hau'ula e wahi o ke kahawai e,</i>	Hau'ula places of the water,
<i>Malela aku 'oe e palaha aku 'oe e.</i>	You get lazy then collapse.
<i>Ha'ina e mai ka puana e,</i>	Tell the story,
<i>'Oni'oni nui kino e i kou kīkala e.</i>	Your entire being moves to your hips.
	[Chan 2003]

3.4.2 Kāne'ohe

Composed by Abbie Kong Wilson and Johnny Noble, this *mele*, written in the 1930s, commemorates the installation of electricity in Kāne'ohe.

<i>'Olapa ka uila i Kāne'ohe,</i>	Light flashes at Kāne'ohe
<i>Ka hui laulima hi'olani wai.</i>	Cooperative society of Laniwai.
<i>Me ka ua 'Āpuakea ka la'i a'o</i>	The 'Āpuakea rain the peace of
<i>Mololani,</i>	Mololani,
<i>Me ke anu o ke Ko'olau.</i>	The coolness of the Ko'olau.
<i>Hanohano Mōkapu i ka 'ehu kai,</i>	The glory of Mōkapu is the sea spray,
<i>Te tua motumotu a'o He'eia.</i>	And the jagged ridge of He'eia.
<i>Ho'okahi mea hou ma He'eia,</i>	The news at He'eia,
<i>Ka uwea kelekalapa leo nahenahe.</i>	Sweet-voiced telegraph wire.
<i>Ha'ina 'ia mai ana ka puana,</i>	Tell the refrain,
<i>Ua 'ā ka uila a i Kāne'ohe.</i>	The light goes on at Kāne'ohe.
	[Huapala, n.d.]

3.4.3 Pele and Hi'iaka

This song is taken from the story of Pele and Hi'iaka as Hi'iaka is on her way to retrieve Lohiau. The Ko'olau mentioned belows refers to the windward side of O'ahu.

<i>A Koolau wau, ike i ka ua,</i>	'Twas in Koolau I met with the rain:
<i>E ko-kolo la-lepo ana ka ua,</i>	It comes with lifting and tossing of dust,
<i>E ka 'i ku ana, ka 'i mai ana ka ua,</i>	Advancing in columns, dashing along.

*E nu mai ana ka ua i ke kuahiwi,
 E po 'i ana ka ua me he nalu la.
 E puka, a puka mai ka ua la.
 Waliwali ke one i ka hehi 'a e ka ua;
 Ua holo-wai na kaha-wai;
 Ua ko-ke wale na pali.
 Aia ka wai la i ka ilina, he ilio,
 He ili hae, ke nahu nei e puka.*

The rain, it sighs in the forest;
 The rain, it beats and whelms, like the surf;
 It smites, it smites now the land.
 Past the earth from the stamping rain;
 Full run the stream, a rushing flood;
 The mountain walls leap with rain.
 See the water chafing its bounds like a dog.
 A raging dog, gnawing its way to pass out.
 [Emerson 1909:59]

3.4.4 Sweet Lady Of Waiāhole

Sweet Lady Of Waiāhole was written by Gordon Broad and performed by Braddah Waltah & Island Afternoon. The song was inspired by Fujiko Shimabukuro. Fujiko's husband, Koji Matayoshi, and his father leased a 10-acre plot of land in Waiāhole where they grew sweet potato, papaya, banana, mango, watermelon, and cucumber. Following the death of her husband, Fujiko gathered her fruit in a wheelbarrow to sell down on Kamehameha Highway to provide for her eight children (FLUX Hawai'i n.d.).

Early in the morning, she would gather all her island fruits
 And pack them as she starts another day
 Carefully she makes her way beside the mountain stream
 As she sings an island chant of long ago

Sweet lady of Waiahole,
 (sweet sweet lady, sweet lady)
 She's sitting by the highway
 (by the highway, sitting by the highway, by the highway)
 Selling her papaya
 (papaya pa pa paya a papaya pa pa paya)
 And green and ripe banana
 (and bananas)

Walking down her damp and rocky road her humble wagon stops
 She watched the sun creep through the valley sky
 Smiles and wipes the sweat off from her brow
 Continues on and starts her journey through the highway rising sun

Later in the evening, she would gather all her island fruits
 And pack them as she ends another day
 Carefully she makes her way beside the mountain stream
 As she sings an island chant of long ago

Selling her papaya
 (papaya pa pa paya a papaya pa pa paya)
 And green and ripe banana
 (and bananas)

[SongLyrics 2023]

Section 4 Historical Background

4.1 Pre-Contact to Early Post-Contact Period

The *ahupua'a* of Waikāne and Waiāhole are in the Ko'olaupoko District on the Windward side of O'ahu. The district of Ko'olaupoko was rich in many of the resources utilized by traditional Hawaiians. The exploitation of marine resources is evidenced by the many fishponds around the coastal fringe of Kāne'ohe Bay and by the presence of numerous fishing shrines. Inland from the coast, rich alluvial soils, an equable climate, and abundant water supply allowed the extensive cultivation of traditional crops, especially wetland taro. Handy and Handy (1972) characterized the *ahupua'a* in the region as being extremely productive and capable of accommodating a significant population. The coastal plains were converted "into an almost continuous expanse of *lo'i* irrigated with water from large streams flowing out of the deep valleys" along the Ko'olau range (Handy and Handy 1972:452).

This sentiment was reiterated by early visitors to the region. The valleys were described as being in a high state of cultivation, with evidence of traditional *lo'i* and *'auwai* found throughout the valley floors. The upland forests and ridges that divide the valleys undoubtedly contained a wide variety of valuable resources as well, one of which is known to have been high-quality basalt that was quarried and used in the manufacture of stone tools.

Dating analyses from archaeological studies suggest occupation of Waiāhole Valley may have begun around AD 1200 (Tomonari-Tuggle and Tuggle 1984:1-16), while the bulk of activities probably occurred in the late pre-Contact and early post-Contact periods (Shapiro et al. 1988:36).

Many researchers believe the Hawaiian population reached its maximum at around the time of Western Contact, although by the 1830s, the Native Hawaiian population had already been severely diminished by contact with western diseases. Diseases including influenza, measles, whooping cough, and small pox devastated the population. Also, many of the native inhabitants from these outlying districts had begun moving to the newly burgeoning population centers, such as Honolulu. The 1831 to 1832 census, the first to be conducted on O'ahu, reports a total of 419 people in the Waikāne/Waiāhole *Ahupua'a*, consisting of 352 adults and 67 children (Schmitt 1973:19). By the 1835-1836 census, the totals are given individually for Waikāne and Waiāhole *Ahupua'a*. At that time, Waikāne had an adult population of 164 and 29 children for a total of 193 (Schmitt 1973:33). These numbers decreased in the 1849 census to 99 adults and 18 children for a total of 117. The rate of population decline slowed after 1849 and the population began to increase in parts of O'ahu in 1853, but the population of Ko'olaupoko continued to decline until 1872 (Kittelton in Devaney et al. 1982:13).

With the steady decline in the native population, an increasing amount of land was left fallow or was converted to pasture for cattle grazing (Devaney et al. 1982:12). Despite the population decline, individuals claiming land within the project area had resided on the lands for many years with their families. During Queen Emma's O'ahu Island tour in 1875, she and her entourage visited Waikāne (Girvin 1910:78). The group was feted by Kamealoha, who had "two large thatch houses and a large school house at his command for sleeping quarters, and had erected an immense lanai for the luau. He was a well-to-do citizen" (Girvin 1910:78). "Leis of hala fruit and others" were

provided for the event, along with “fish prepared in many styles, both raw, dried and cooked, the hogs, poultry and delicious comestibles.”

4.2 Mid-Nineteenth Century

4.2.1 The Māhele

The Māhele was a division of rights to lands established by Kamehameha III in 1848. Although this was a new system of land tenure in Hawai'i, the foundation for these concepts is rooted in Hawaiian understandings and traditions of reciprocal relationships with *‘āina*, including *kālai ‘āina* (redistribution of land), and *mālama ‘āina* (caring for the land).

The impetus for these “land law[s] and subsequent division (*māhele*) of rights in land for the people of Hawai'i” began with the Declaration of Rights of 1839 and the subsequent Laws of 1839 (Preza 2010:77). The first written constitution in 1840 expounded on the principles of the land laws in Article 14 which states, “Kamehameha I, was the founder of the kingdom and to him belonged all the land from one end of the Islands to the other, though it was not his own private property. It belonged to the chiefs and people in common, of whom Kamehameha I was the head, and had the management of the landed property” (Preza 2010:80). Although the ruler did not have sole ownership of the land, land was conveyed only by the consent of the ruler of the Kingdom.

In order for this new system to function, the Organic Act of 1845 created the Board of Commissioners to Quiet Land Titles, otherwise known as the Land Commission. This board was created “for the investigations and final ascertainment or rejection of all claims of private individuals, whether native or foreigners, to any landed property acquired anterior to the passage of this act” (Principles of the Land Commission, 1846). Through the methodical process established by this board they were able to determine the rights held by people within the existing structure in order for the Māhele to take form. In 1848, the Crown and the *ali'i* received their land titles as *konohiki* (land manager) Awards. *Kuleana* awards to commoners for individual parcels within the *ahupua'a* were subsequently granted in 1850, and thereafter.

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. Claims had to be made within the specified time period of February 1846 and 14 February 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 (Chinen 1958:31).

During the Māhele, the *ahupua'a* of Waikāne was relinquished by L. Konia, and the *‘ili* of Kahala'a and Kai'iki were relinquished by Kaihiwa and N. Namau'u, respectively, to Kamehameha III. These lands were retained by the Government (i.e., Kingdom of Hawaii). According to Waihona 'Āina land database (Waihona 'Āina 2022), 42 claims for *kuleana* parcels were made in Waikāne. In Waiāhole, two *‘ili* (Hopeka and Makawai) were kept as “Crown Lands,” and five *‘ili* (Apua I, Makanilua, Poahamai, Poeha, and Uau) were taken as “Government Lands.” Fifty-three small Land Commission Awards (LCAs) comprising 106.89 acres were granted in Waiāhole. The average size of these awards was 2.02 acres, ranging between 0.47 and 5.6 acres. In addition, four larger awards (LCA 105 to William Walker [81.6 acres], LCA 5936 to Pu'uiki

[225 acres], LCA 7137 to Kaho‘ohanohano [93 acres], and LCA 8603 to Kaniau [57.2 acres]) were also granted. Subsequently, three large areas of land were granted: Land Grants 702 and 703 (total 264.68 acres) to Kekakeiki in 1860 and Land Grant 874 (113.33 acres) to Kaopulupulu in 1862. Land Commission Awards within and in the vicinity of the project area are depicted on Figure 19 through Figure 21. Land Commission Awards, Land Grants, and Royal Patents within the project area are summarized in Table 3. The claims within the project area are for taro *lo‘i*, *kula* (pastureland), *māla* (garden, patch) for ‘*awa* (*kawa*), and house lots.

Table 3. Land Commission Awards within the project area

LCA #	Awardee	Area (acres)	<i>Ili/Ahupua‘a</i>	Land Use
105	William Walker (Huaka)	11.66	Oii, Waiāhole	–
7558:1, 2	Kaakau, Kahunoku (heir)	3.3	Waiāhole	Two <i>lo‘i</i> , one <i>kula</i> , one house lot
7560:1	Kekaulaau, Kaleihohia (grandson; heir)	0.47	U‘wau, Waiāhole	Three <i>lo‘i</i>
7566:1, 2	Keawe, Kaleikohea	1.55	Kaneloa, Waiāhole	Six <i>lo‘i</i> , one <i>kula</i> , one house lot, one <i>māla</i> of ‘ <i>awa</i>
7572:1	Kupoepoe	4.85	Waiāhole	Twelve <i>lo‘i</i> , one <i>kula</i> ,
7576:1, 2	Kalaloa	1.17	Hopekea, Waiāhole	Six <i>lo‘i</i> , one house lot, one <i>māla</i> of ‘ <i>awa</i>
7654:2	Kimo	0.25	Kuaiokumu, Waiāhole	House lot
7657	Kaukulima, Kaumuloa (daughter; heir)	2.0	Kapiko‘okau, Waiāhole	Three <i>lo‘i</i>
7662:1	Kaumaka	0.8	Waiāhole	Three <i>lo‘i</i>
7669:1, 2	Kuiki	1.35	Waianu, Waiāhole	Six <i>lo‘i</i> , one <i>kula</i> , one house lot
8052:1	Ehu	0.25	Waiāhole	House lot
8176:2	Hokii	0.5	Waiāhole	One <i>kula</i> , one house lot
8177:2	Hoopio	0.4	Hopekea, Waiāhole	House lot
8180	Haole, Lotona, Kiailuakini (grandson; heir)	1.1	Apau, Waiāhole	Four <i>lo‘i</i>
8235:2	Inulama	0.16	Waiāhole	Three <i>lo‘i</i>
9959:2	Lumai/Luna‘ai/Lumae	3.3	Poea, Waiāhole	Six <i>lo‘i</i>

10227	Moo I	0.98	Kanakahipa, Waiāhole	Ten <i>lo 'i</i> , two <i>kula</i> , one house lot
10228:1	Moo 2	1.55	Kaululua, Waiāhole	<i>Kula</i>
10229:2	Malule	0.25	Kaululua, Waiāhole	House lot
10437	Naaweawe	1.5	Kukaikoo, Waiāhole	Six <i>lo 'i</i> , one <i>kula</i>
10440	Nika	2.22	Hanakea, Waiāhole	Seven <i>lo 'i</i> , one <i>kula</i>
10973:1	Wahahee	0.25	Waiāhole	House lot
11016:2	Waipio	0.5	Waiāhole	One <i>kula</i> , one house lot

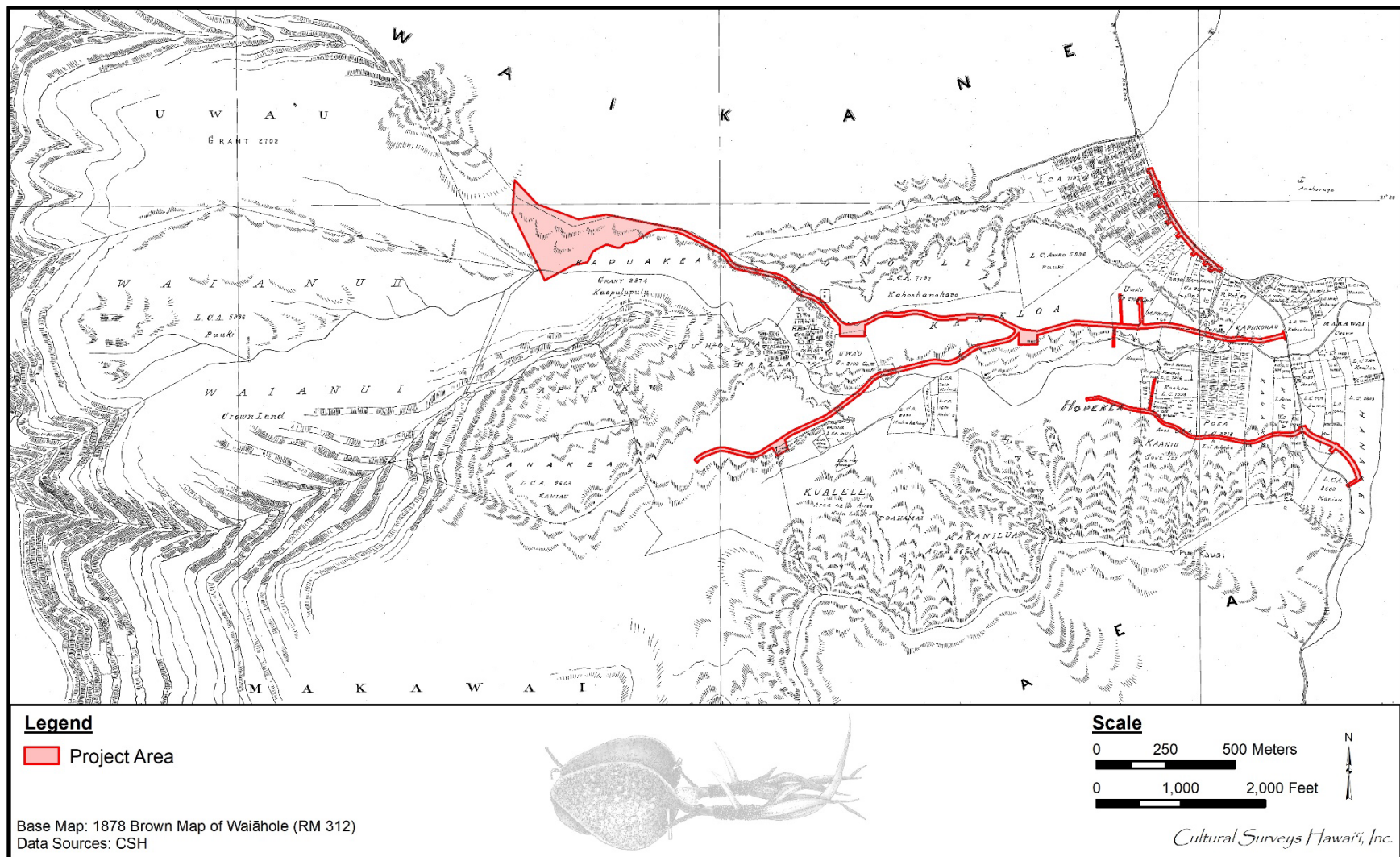


Figure 19. 1878 Brown map of Waiāhole (RM 312) showing the project area in relation to LCAs

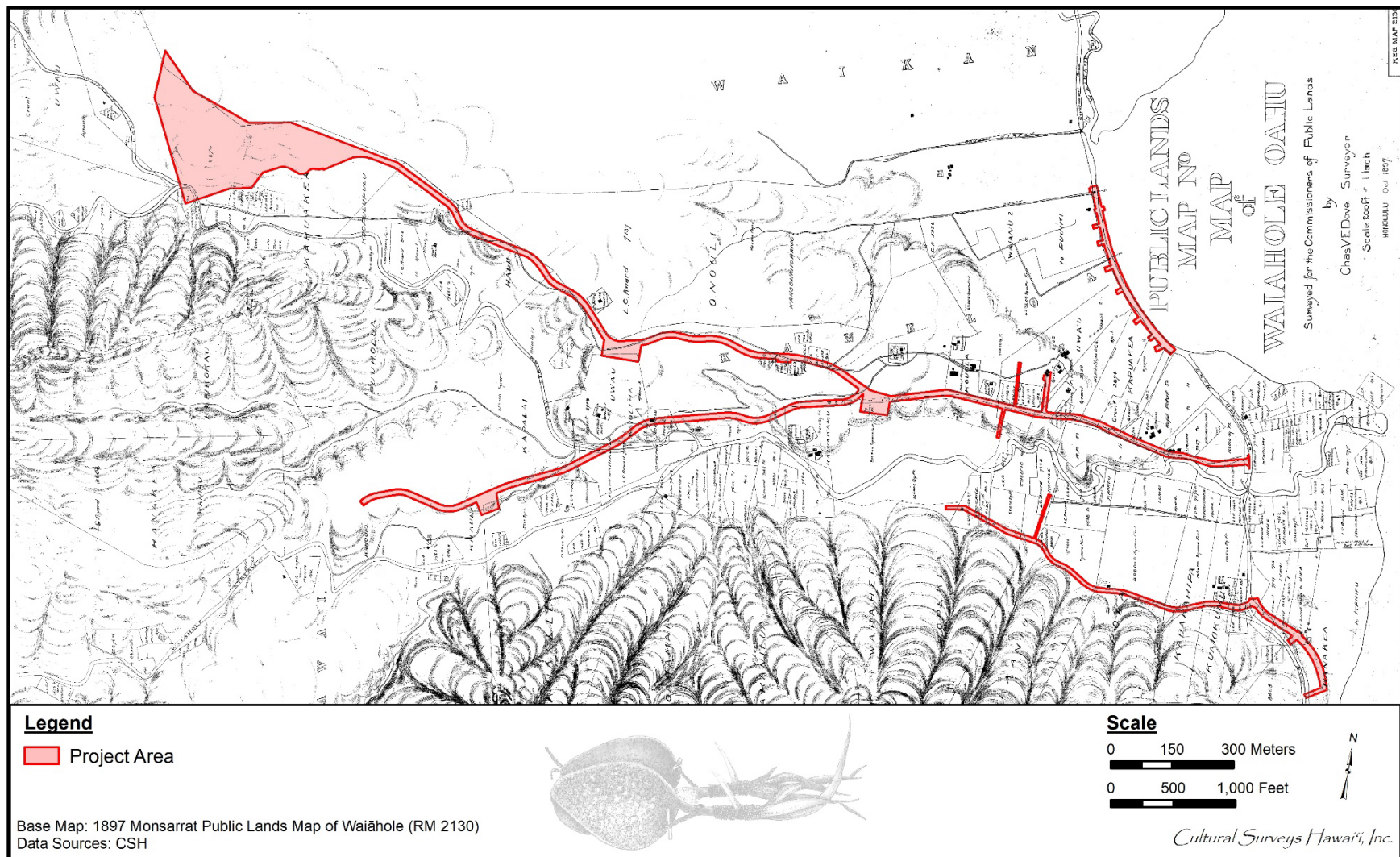


Figure 20. 1897 Monsarrat Public Lands Map of Waiāhole (RM 2130) showing the project area in relation to LCAs

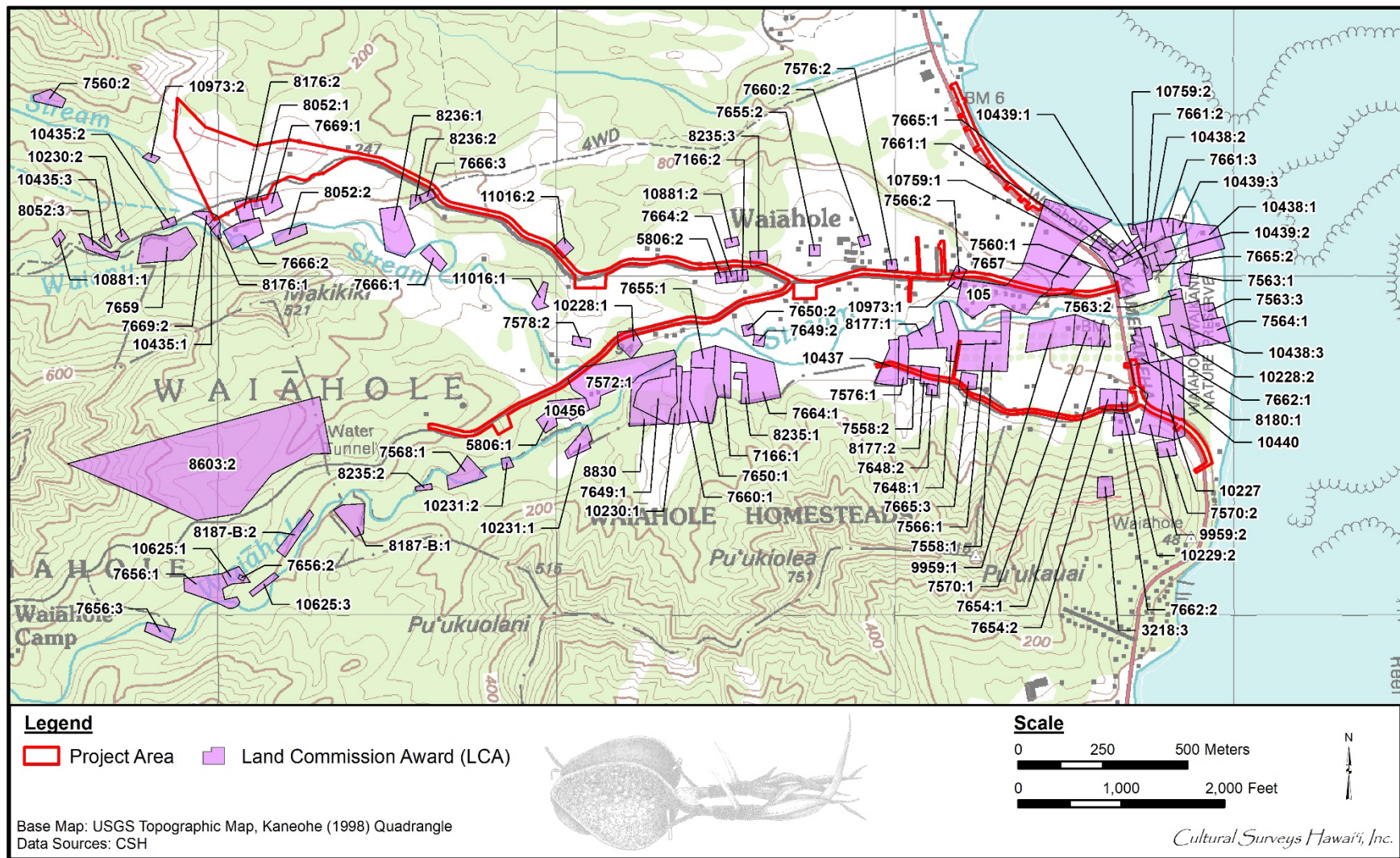


Figure 21. A portion of the 1998 Kaneohe USGS 7.5-minute topographic quadrangle with overlay of LCAs in the vicinity of the project area

4.2.2 Rice Cultivation in Waikāne and Waiāhole

As indicated by Māhele documentation, the valleys of Ko'olaupoko, including Waiāhole and Waikāne, were known for extensive cultivation of traditional Hawaiian crops, particularly wetland taro. However, an increasing amount of land was left fallow as the population steadily declined post-Contact. A 1906 map (Figure 22) shows the *mauka* portions of the project area within “grazing lands,” while the *makai* portions are within wetland areas utilized for the cultivation of taro and/or rice.

Population increase in Ko'olaupoko began in the 1870s, and seems to have been directly related to the development of a rice-growing industry in the region which began in the late 1860s or early 1870s. Rice production throughout the Islands was attributed primarily to the Chinese:

Having first been brought to the islands to serve as sugar plantation laborers, many remained in the Islands following the completion of their contracts. Their accumulation of capital enabled them to rent land and turn to rice cultivation utilizing their traditional knowledge of methods of production which they had brought from China. [Miyagi 1963:106]

There were three rice plantations in Waikāne in 1880 (Bowser 1880:484 cited in Devaney 1982:51), and 200 acres of land were under rice cultivation in 1892 (Coulter and Chun 1937:72 in Miyagi 1963:108).

The Rice Mill is in the *'ili* of Kamoā and is identified as the Waikane Rice Mill in an 1897 directory (Bureau of American Republics 1897:980). The buildings shown adjacent to the rice mill and just *mauka* of the project area correspond with locations described by Young (1975) as a Chinese School that began instruction in 1912 and another as a gathering place or hang out. Lum Pui Young (1975) was born in Waikāne in 1900 and produced a memoir of his early years in the Chinese community in Waiāhole, Waikāne, and Hakipu'u ca. 1906-1926. Young (1975:4) refers to the rice mill as Wing Wo Tai rice mill; a Honolulu company with the same name owned the mill in Waikāne (Young 1975:3-4). Waikāne Store was also established in the late nineteenth century by Hyung Thom as Wah Chan Store. The store is within the project area at 48-377 Kamehameha Highway, just south of Waikāne Valley Road.

Waikāne continued to be rural and primarily dependent on agriculture through the twentieth century. Rice cultivation eventually subsided in importance when a variety of crops were grown in Ko'olaupoko. Mr. Lum Pui Young's memoirs (1975) of his childhood in Waikāne relate that rice cultivation in the period ca. 1906-1926 amounted to some 250 acres with approximately 150 of those acres grown by Sing Tai Wai. Sing Tai Wai employed 20-25 year-round workers and another 15 to 25 itinerant laborers during planting and harvesting time. Young notes the major transportation link to Honolulu during this time was a daily round-trip by stagecoach owned by Chinese living in Ka'alaea with a terminus at the Wing Wo Tai Mill in Waikāne, likely due to most of the activities in the region being centered in Waikāne. Later transportation was served by a passenger truck owned by Hung Yew Yuen of Waikāne.

Young (1975) relates that during the period from 1913 to 1917 a contingent of 50 to 60 Chinese males were recruited to work on the Waiāhole Tunnel project. The men were hired to construct the railroad bed and trails from the seashore *mauka* to the tunnel site. All of the tunneling work

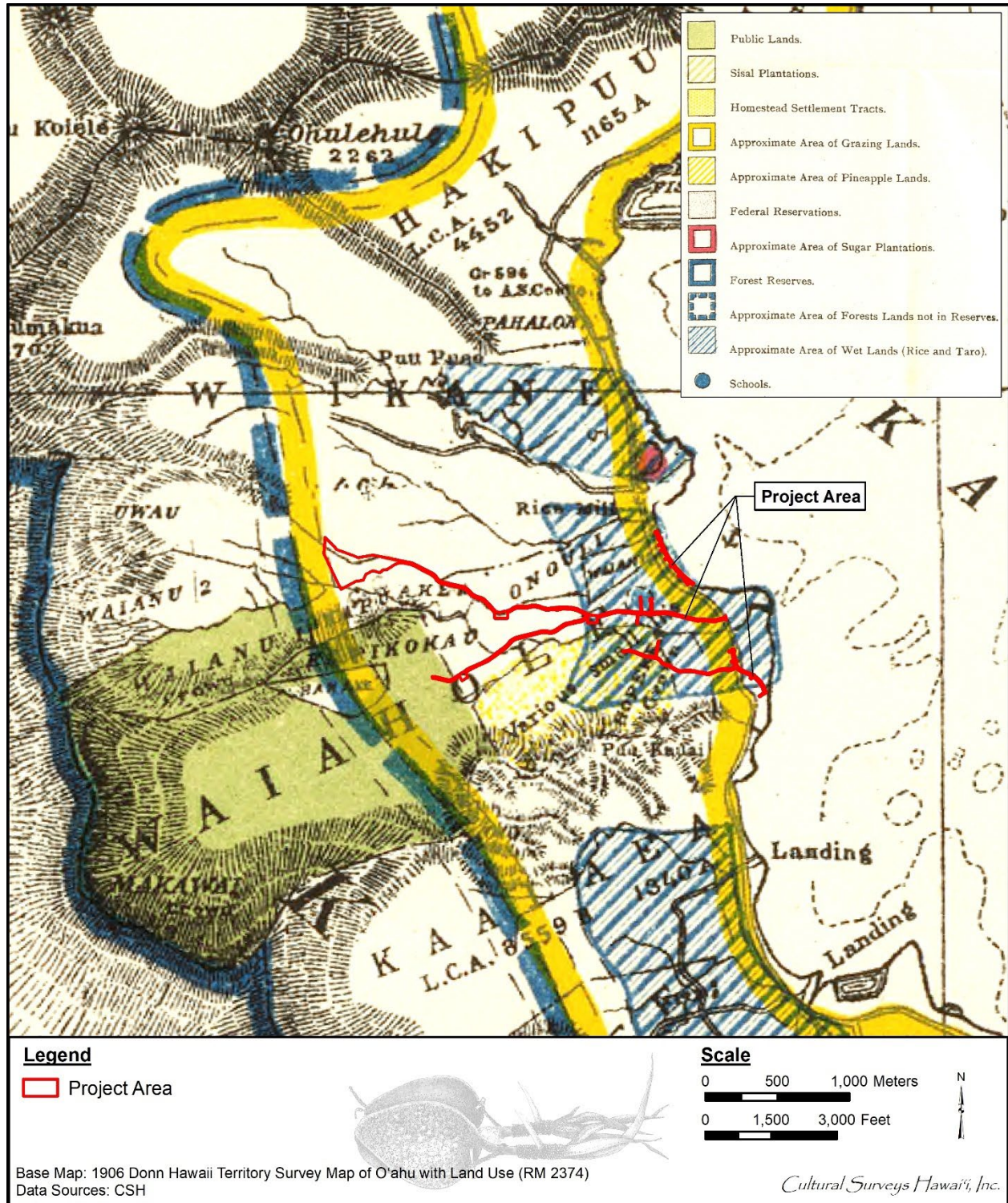


Figure 22. Portion of the 1906 Donn Hawaii Territory Survey map of O'ahu with land use (RM 2374), showing the *makai* portions of the project area in wetland cultivation of taro and/or rice and the *mauka* portions within grazing lands

was conducted by Japanese. Young (1975) notes there were as many Chinese as Native Hawaiians living in the region during this period.

Following the rice industry's peak in Hawai'i about 1910, it rapidly declined. By 1925, most rice fields were abandoned when the former Chinese residents moved to Honolulu or back to China (Young 1975:5). While rice cultivation came to dominate the landscape at Waikāne and Waiāhole, taro cultivation remained common although rice appears to have been the preferred crop within the project area and its vicinity. Other crops such as introduced vegetables and fruits were grown. These included cabbage, radishes, onions, turnips, beans, lotus root, litchi, mango, lungan, pomelo, and banana (Devaney et al. 1982:53). Miyagi (1963:108) notes "the farmers of the valley sent their taro and other products to Honolulu by way of the Pali Road as late as 1910."

4.3 Twentieth Century to Present

The Waikāne-Waiāhole area continued to be rural and primarily dependent on agriculture throughout the twentieth century. A series of maps and aerial photographs (Figure 23 through Figure 28) reflect the slow development of the project area and surrounding lands throughout the twentieth century.

4.3.1 Pineapple Cultivation

Pineapple cultivation also occurred for a brief time "by individual Chinese and Japanese farmers on moderately sloped hill land where rice and taro could not be grown" (Miyagi 1963:115).

The pineapples were hauled from Waiahole to the Waikane landing by train, and from Waikane were sent by boat to the Libby Cannery at Wailau [...] there are still railroad tracks under the heavy brush at Waiahole. [Ferreira 1940:9 in Miyagi 1963: 115]

The train track used to transport pineapples is likely the same that was constructed by the Waiāhole Water Company in 1913. Condé and Best (1973:337) wrote that "ten miles of railroad were built, including an ocean pier. One portion of the railroad was laid at the landing at Waikane [...]" The railroad was built to transport supplies during the construction of "an engineering feat of epic proportions," the Waiāhole Tunnel project through the Ko'olau Mountains that supplied water to the O'ahu Sugar plantations on the leeward side of the island. Once the tunnel system was complete and operational in 1916, the railroad was removed (Condé and Best 1973:337).

4.3.2 Waiāhole/Waikāne Tunnel Project

Between 1913-1916, the Waiāhole ditch and tunnel system was constructed. The system began at Kahana Valley and includes a series of tunnels dug through the Ko'olau Mountains. The Waiāhole Ditch system consists of "dike-water development tunnels, surface water intakes, open ditches, gates, flumes, siphons, roads, trails, camps" and other facilities and was designed to channel water from the Waiāhole/Waikāne watershed to irrigate Central and Leeward O'ahu sugarcane fields (State of Hawai'i 1997:6) (Figure 29).

The Oahu Sugar Company was founded in 1897 and flourished because of the use of large ground water aquifers in the Pu'uloa area; water from the Waiawa and Waikele streams was also used. However, as the company continued to expand, these sources were becoming too costly to

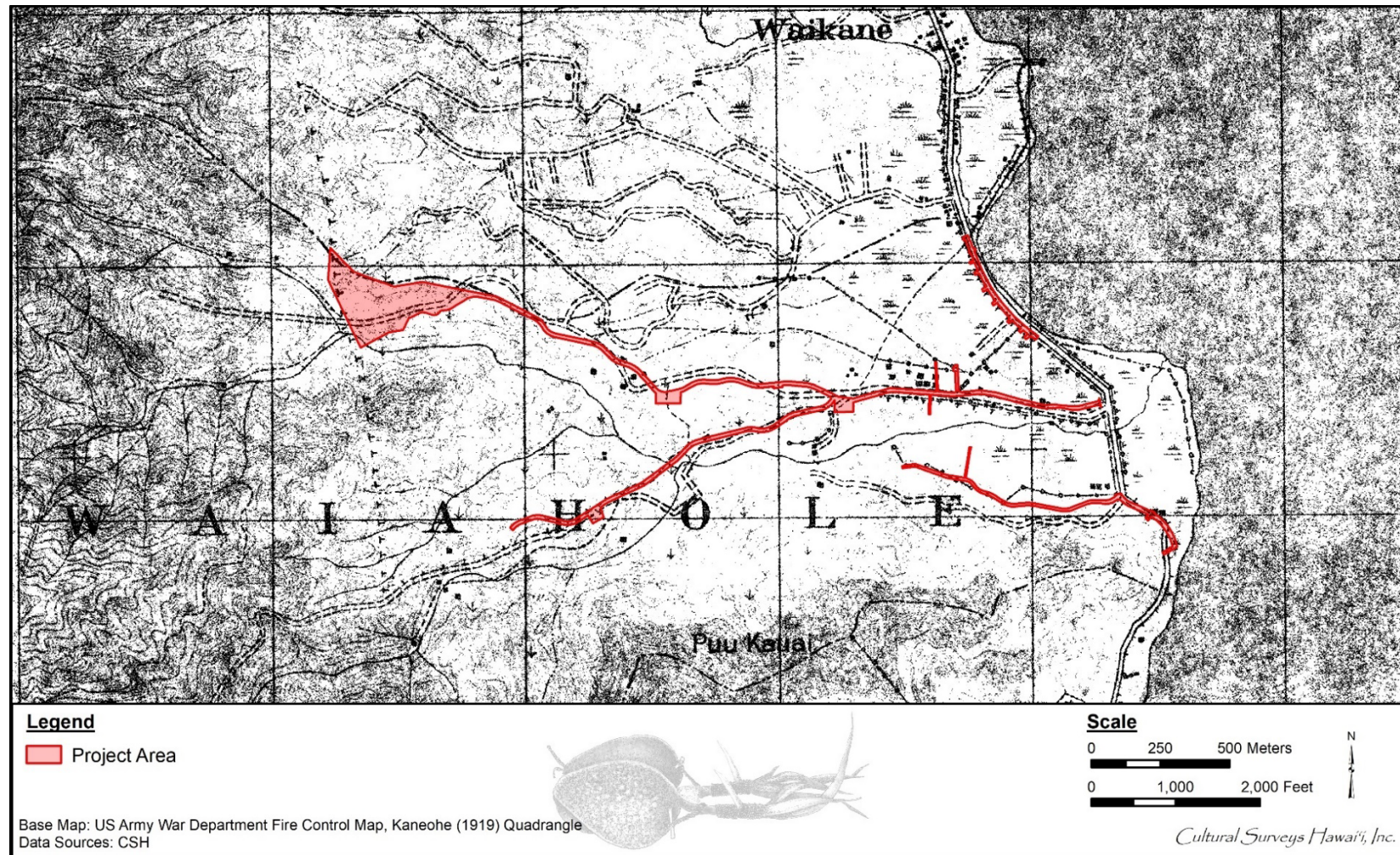


Figure 23. Portion of the 1919 U.S. Army War Department fire control map, Kaneohe quadrangle showing the project area; an early alignment of Kamehameha Highway is depicted along the coast; the other roads within the project area are depicted but appear to be unimproved (Waiāhole Homestead Road also appears to have a slightly different alignment); scattered buildings are indicated throughout the area, particularly along Waiāhole Valley Road and Kamehameha Highway

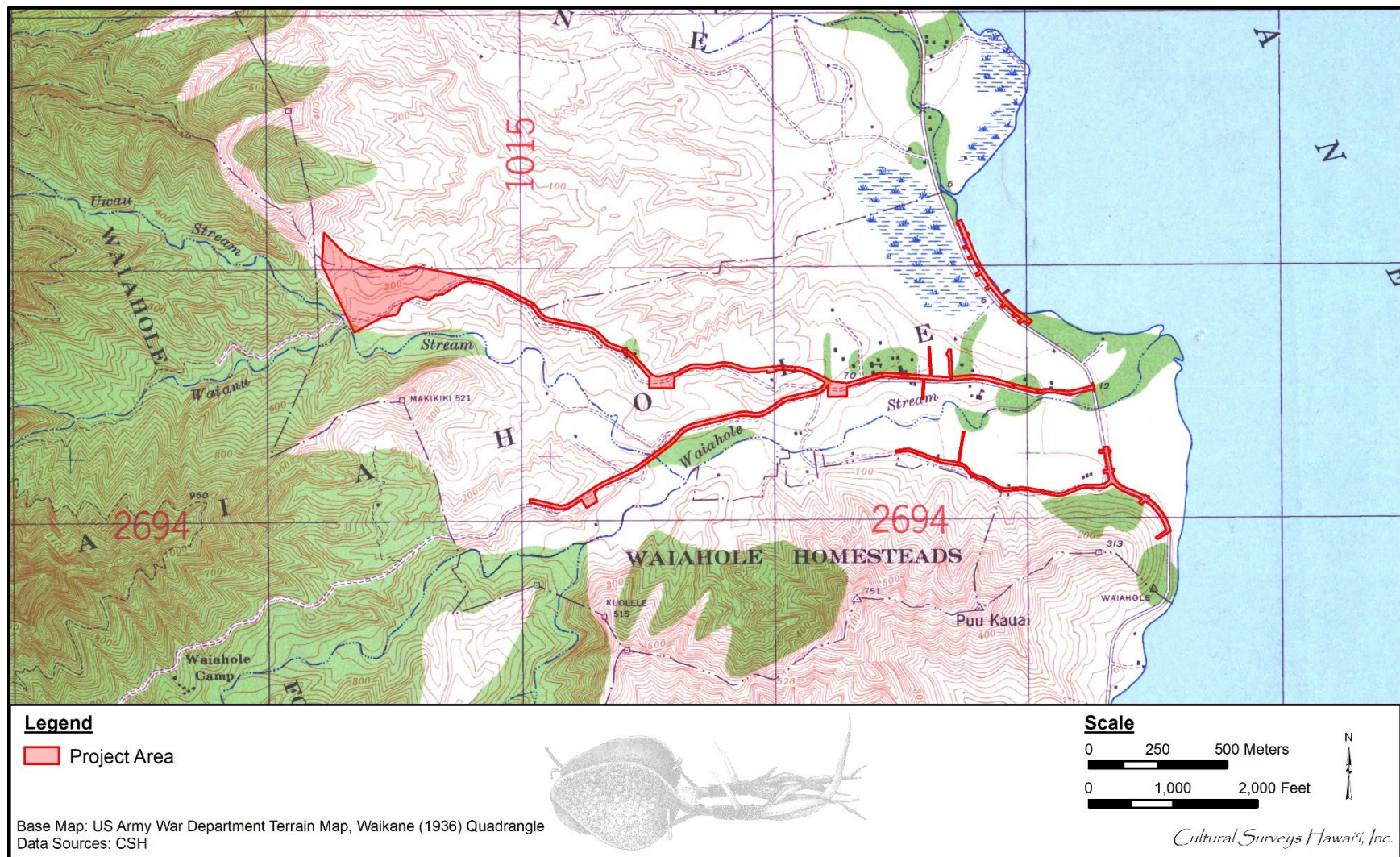


Figure 24. Portion of the 1936 U.S. Army War Department terrain map, Waikane quadrangle showing the project area; most of the project area roads are still unimproved, but Waiāhole Homestead Road appears more in line with its current alignment

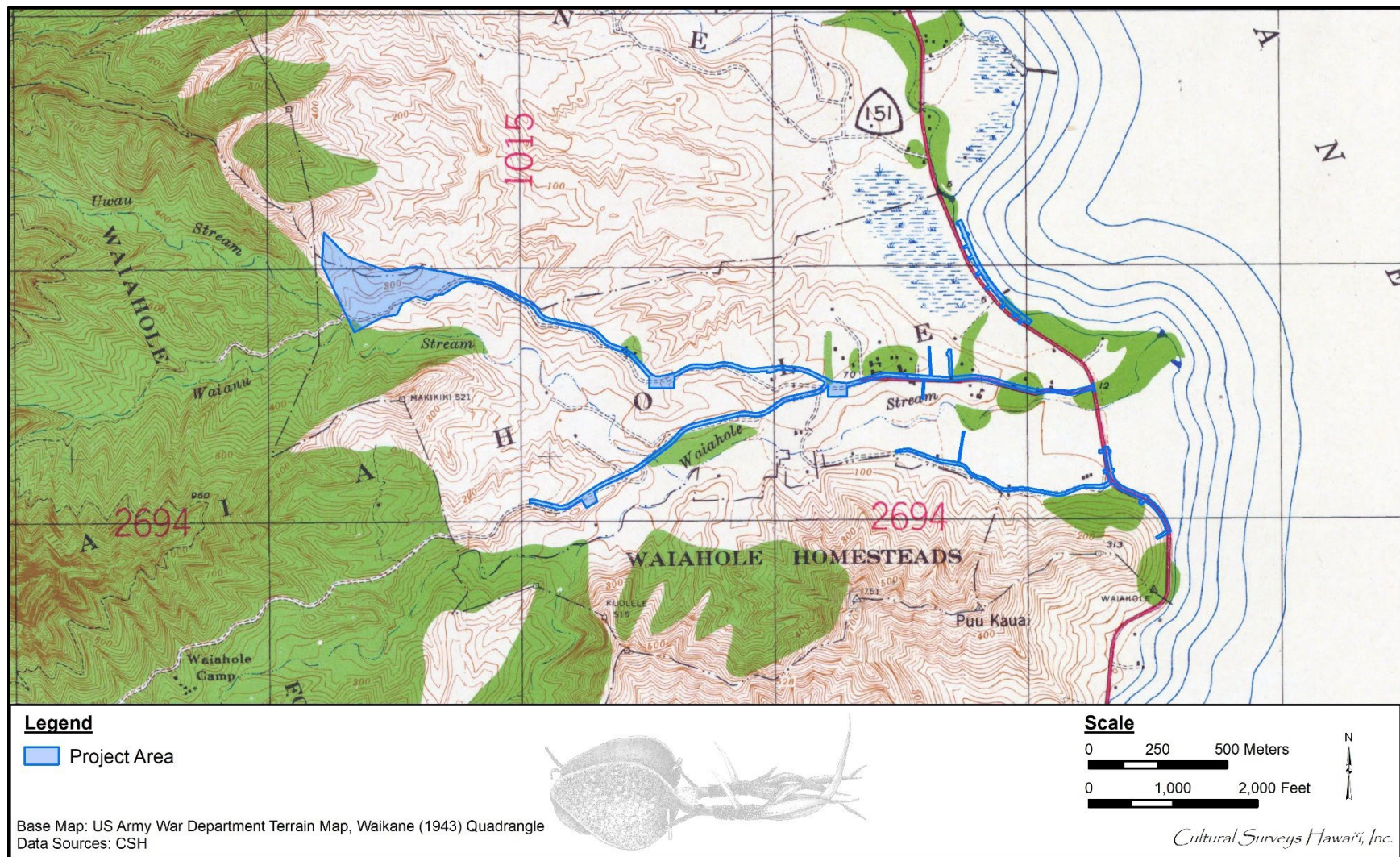


Figure 25. Portion of the 1943 U.S. Army War Department terrain map, Waikane quadrangle showing the project area; no additional development is indicated since the previous map

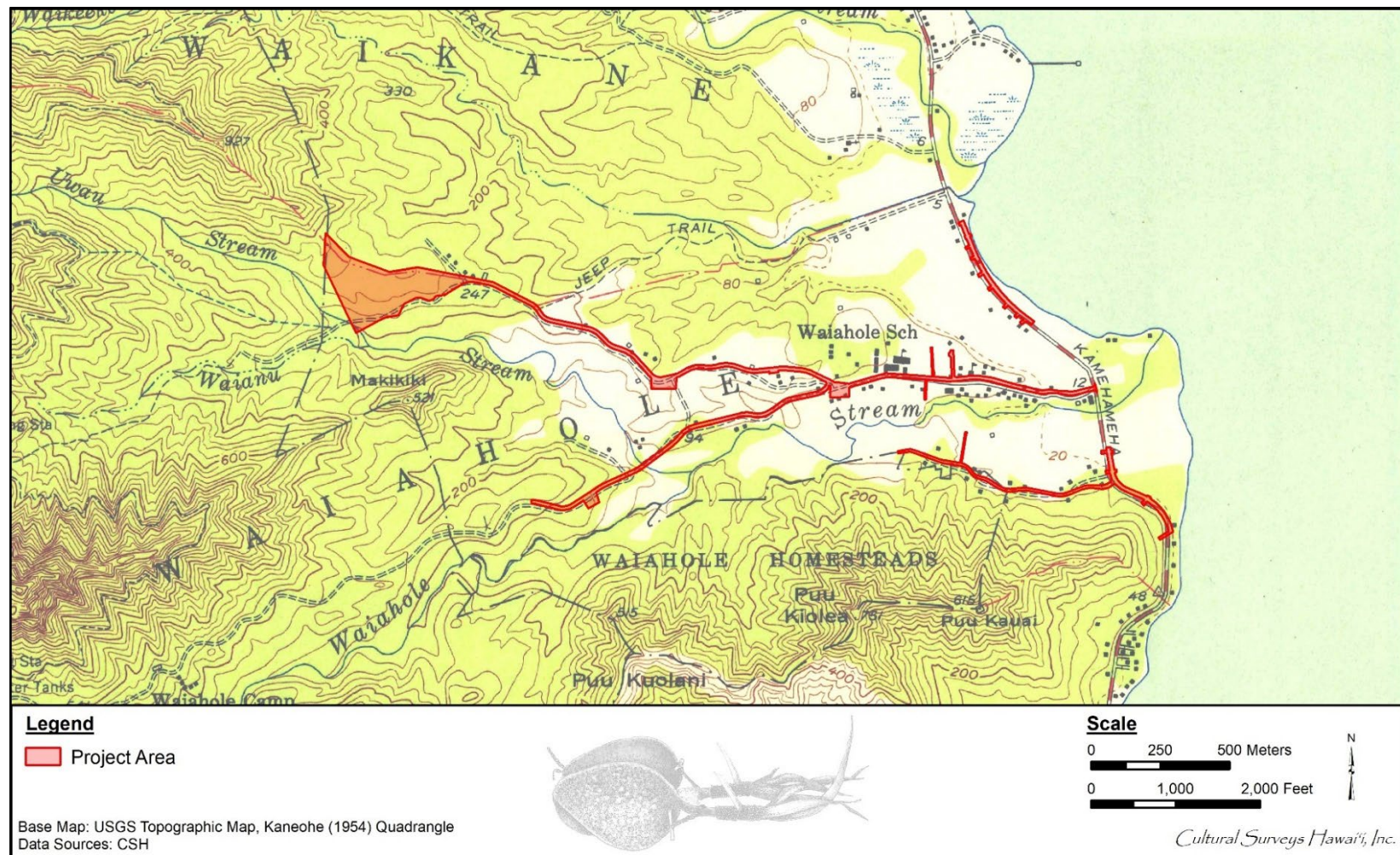


Figure 26. Portion of the 1954 Kaneohe USGS topographic quadrangle showing the project area; Kamehameha Highway is called out as a major coastal route; development is still relatively sparse, although additional buildings are indicated along the coast, along Waiāhole Valley Road and Waiāhole Homestead Road, and in more *mauka* locations; Waiahole Elementary School is also indicated

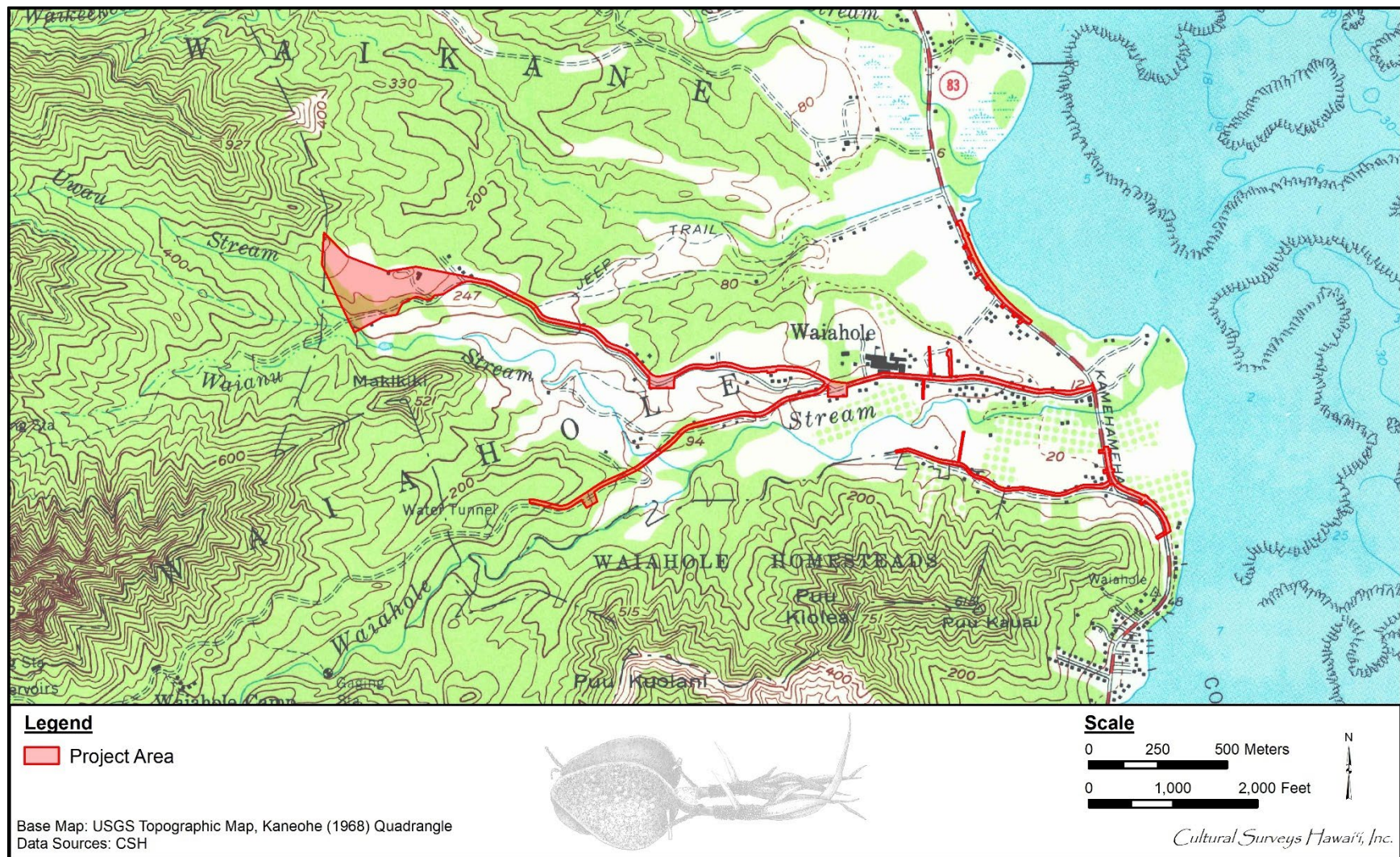


Figure 27. Portion of the 1968 Kaneohe USGS topographic quadrangle showing the project area; Waiāhole Valley Road and its north branch are depicted as improved; development continues to increase gradually, primarily along the coast and along Waiāhole Valley Road

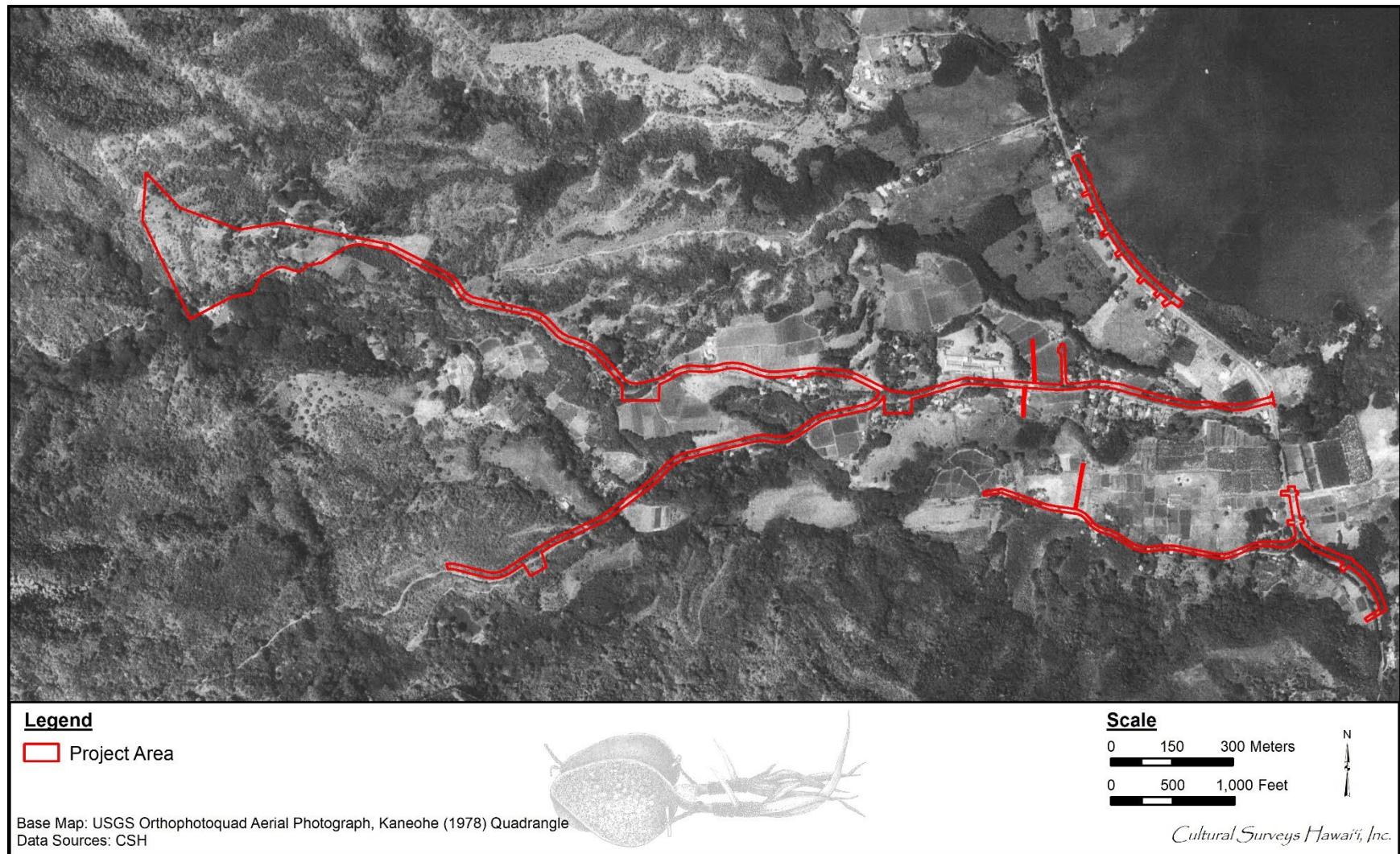


Figure 28. 1978 Kaneohe USGS orthophotoquad aerial photograph showing the project area; the *mauka* areas are still situated in relatively undeveloped land



Figure 29. Waiāhole Water Tunnels, courtesy of Hawai'i State Archives

be pumped to the plateau (Hood 2004). Lincoln McCandless and his brother had financial interests in the Oahu Sugar Company in Waipahu and expansion of the plantation required additional sources of water that could be provided with the construction of the Waiāhole Tunnel. The civil engineer H.K. Bishop started to design and construct the tunnel and Jorgen Jorgensen was brought in to replace him and saw the job to its completion. According to a study conducted of the Waiāhole, Waikāne, Kahana, and Punalu'u areas by G.K. Lassison in 1916, these streams produced at least three million gallons daily during dry weather seasons (at elevations of 500 ft or more above sea level) which no other streams on O'ahu produced (Hood 2004:31). McCandless sub-leased water rights above the 600 ft elevation for the Waiāhole Tunnel project but maintained water rights within the lower elevations of Waikāne and Waiāhole (Griffin and Pyle 1974:12). The farmers in the area were concerned about the effects this development would have on the water flow to their crops and lands which is evident in an exchange between a Waiāhole farmer, H. Harrison and the Governor of the Territory prior to the construction in 1912. H. Harrison states the amount of water that flows to the ocean approximates 25 mgd (million gallons per day) which is more than ample for the community at the current moment but would like to know what kind of rights they have to ensure this development will not affect their livelihood or survival.

1419 Punchbowl Street
Honolulu, T.H.

October 26, 1912

To the Honorable,
The Governor of the Territory of Hawai'i.

As I am a land owner at various places along the stream which it is now proposed to sell, and at the outlet thereof, would like to know what are the conditions of sale and what arrangements will be made with the land owners in this locality to insure them a plentiful supply of water both for irrigation and domestic purposes, this being the only water we are able now to use.

Thanking you in anticipation of an early reply, I am, sir,

Respectfully yours,
H. Harrison

October 28, 1912

Mr. H. Harrison,
1419 Punchbowl Street,
Honolulu, T.H.

I have your letter of the 26th inst., inquiring in regard to the sale of water at Waiahole. The Waiahole stream increases rapidly in the quantity of water from its source at 820 feet elevation to the sea. It is expected that after the license of the water has taken what it is entitled to at the higher elevations there will be ample left for all persons below. The license was drawn only after taking measurements of the stream at different points for a considerable period, including some of the driest weather.

Respectfully yours,
Governor of Hawai'i

[*Environment Hawaii*, October 1994: Volume 5 Number 4]

H. Harrison is not convinced their livelihood will be protected and would like the Governor of Hawai'i to assure the people there will be ample water flow to this region. The Governor refers to the excess water as being wasted by flowing into the ocean without any consideration for the natural ecosystem that is dependent on this flow and assures H. Harrison that only 10 million gpd will be diverted from their water sources leaving the residents with more than enough water for their sustenance and there should be no cause for their worry.

Honolulu, T.H.

October 29, 1912

To the Honorable,

The Governor of the Territory of Hawai'i,

I am in receipt of your note of the 28th inst., for which I thank you; but as I don't quite understand what you consider an ample supply of Water, will you kindly explain to me more fully regarding quantity as herewith stated below:

There is at present a flow of 7,000,000 gallons per 24 hours in a ditch which supplies some of my patches on the Ka'alaea side of the river. Again at Waikane side of river, or the ditch that runs through Judge Aikue's property has been supplying from 3,000,000 to 5,000,000 gallons per 24 hours as required for patches further down.

As to our supply of water for domestic purposes, this we obtain from the Waiahole stream at the outlet which at present has an overflow of 25,000,000 gallons per 24 hours. Will you kindly state to me what quantity will continue to flow in said ditches and stream after the Assignees' plant is fully established and running to its fullest capacity.

Awaiting your favorable reply and thanking you in anticipation, I am, Sir,

Yours respectfully,

H. Harrison

October 31, 1912

Mr. H. Harrison,

1419 Punchbowl St.,

Honolulu, T.H.

I have your letter of the 29th inst., replying to mine in regard to the Waiahole water. The proposed water license expressly provides that it is made subject to all rights of others, and if you have any rights in the water of the Waiahole stream, they cannot be affected in the least. But that is not all. As you state, 25,000,000 gallons a day are running to waste into the ocean after supplying all the rice and taro patches and other land above. As it is not probable that the licensees will take more than 10,000,000 gallons a day of the water now flowing in Waiahole stream, it follows that there will still be practically 15,000,000 gallons running to waste after supplying the rice and taro patches and other lands, which also are supplied in part by the other branch of the stream which comes from Uwau and Waianu II, the water of which has been sold by Mr. McCandless to the same people. It will be impossible to say now definitely how much water will continue to flow in the ditches and in the stream when the licensees' plant is completed and running to its

fullest capacity, nor is it necessary to say that. Some of the ditches at present are taking much more water than they need to. The water from some of them runs mostly back into the stream instead of into the rice and taro patches. I do not think you have any cause for worry.

Respectfully yours,
Governor of Hawai'i

[*Environment Hawaii*, October 1994: Volume 5 Number 4]

On 27 May 1916, the tunnel was fully operational and the waters were diverted from Waiāhole, Waikāne, and Kahana valleys to the 'Ewa plains (see Figure 29). "From the mid-1916 to 1994, it is estimated that Oahu Sugar Company used an average flow of about 35-40 mgd to irrigate their fields and that most of this water came from the dyke compartments within the mountains" (Hood 2004:50). The tunnel ran for 2.7 miles and was the longest transmountain tunnel in Hawai'i until the completion of the Molokai tunnel" (Hood 2004:7). There are two development tunnels at Waikāne. Waikāne One produces approximately 4.2 mgd and Waikāne Two, 1.1 mgd. The total system, however, produced 24.8 mgd (State of Hawai'i 1997:7). In regards to water rights in Waikāne, one share of the waters owned by the Hui Aina of Waikane through Royal Patent Grant 464 was leased to Waiahole Water Company on 3 May 1922 for a term of 20 years, expiring in 1942 (see Appendix A).

"In May of 1992 the Commission designated the five aquifer systems of windward Oahu as ground-water management areas" (State of Hawai'i 1997:3). As the Oahu Sugar Company began shutting down in the mid-1990s, three Windward O'ahu community organizations, the Waiāhole-Waikāne Community Association, the Hakipu'u Ohana, and the Kahalu'u Neighborhood Board, as well as the Office of Hawaiian Affairs, Kamehameha Schools Bishop Estate, and the Department of Hawaiian Homelands petitioned the Water Commission to restore flows to Ko'olaupoko streams, including Waikāne and Waiāhole streams and their tributaries. However, these organizations were up against some major economic powerhouses including the Campbell Estate, the Robinson Trusts, Dole Foods, Del Monte, and the state departments of Land and Natural Resources and Agriculture, which wanted to continue water diversion to the 'Ewa plains. Then in December 1994, the Water Commission directed that 8 mgd would flow through the tunnels to Leeward O'ahu and the rest would flow to the windward streams (State of Hawai'i 1997:4).

Since that 1994 Water Commission decision, further commission actions and court cases have focused on the allocation of water between the windward and leeward sides of the island. However, at present, significantly more water flows daily in Waiāhole Stream than had been the case until the mid-1990s. While studies on the effects of the restored flow on stream life are ongoing, the likely benefits were summarized by an expert witness in testimony before the Commission on Water Resource Management: "In general, it is my opinion that restoration, partial or whole, will have beneficial effects on (1) the stream ecosystem [...] (2) the vegetation of the basins and sub-basins (watersheds) [...] (3) the estuary and marine waters [...] and (4) specifically, the stream ecosystems, vegetation, estuary and marine waters affected by the restoration" (Robert J. Livingston cited in *Environment Hawai'i*, vol. 7 no. 3 September 1996).

A survey was done after the water had been returned to the Waiāhole Stream for approximately six months and the Waianu Stream about one month and both habitats had shown a promising re-

establishment of native populations of ‘o‘opu, ‘opae, and *hīhīwai*. Both adult and juvenile species of two types of ‘o‘opu were observed, which is “an indication that these species are recruiting or returning from the ocean to the stream” (State of Hawai‘i 1997:19).

4.3.3 Waikane Valley Training Area

The Department of the Army entered into a lease with Lincoln McCandless’ heirs and the Waiāhole Water Company in 1942 for 1,061 acres, establishing the Waikane Valley Training Area (north of the current project area). The Army used this training area until 1953, when the Marine Corps was substituted as the lessee. The land was “utilized for advanced training in offensive warfare and air-to-ground practice bombing” during World War II, and the Marine Corps continued this type of training after assuming the lease in 1953. The U.S. Marines abandoned a plan to use this training area in 2003 because the unexploded ordinance on site was too dense (Cole 2011).

4.3.4 Waiāhole Agricultural Park

In 1977, the State of Hawai‘i purchased 600 acres of land from the heir to the McCandless Estate, Elizabeth Marks. The state paid \$6 million to acquire this land in hopes of developing what was to be called the Waiāhole Agricultural Park. They began “negotiating long term leases with the Waiāhole-Waikāne Community Association, which represents most of the farmers in the valley” and were looking at ways to develop the necessary infrastructure to support the farm and house lots. Of the 600 acres, “365 are to be leased for agricultural use, 52 acres leased for residential, and almost all the remainder (including steep sloped land) will be open space” (*Environment Hawaii* 1994).

Section 5 Previous Archaeological Research

Previous archaeological studies in the vicinity of the project area are summarized in Table 4 and depicted in Figure 30. Historical studies in the vicinity of the project area are summarized in Table 5 and depicted in Figure 31.

5.1.1 Kikuchi 1964

During his survey of Waiāhole Valley, Kikuchi (1964) observed that the valley was once extensively terraced into taro patches and was irrigated by a network of ditches (of which only *makai* portions were still maintained). Traces of abandoned taro plots and ditches could be readily distinguished along the paths and inland trails (Kikuchi 1964:1). Kikuchi also found considerable evidence of the manufacture of stone tools within the valley, including a lithic scatter in a bulldozed field (later designated State Inventory of Historic Places [SIHP] # 50-80-10-2476) and two adze quarries on one of the ridges along the edge of the valley (later designated SIHP #s 50-80-10-2472 and -2475). Within the seaward portion of the *ahupua'a*, he identified two house sites within several large *hau* tree groves (later designated SIHP # 50-80-10-1086).

5.1.2 Barrera 1982

Barrera (1982) presented the results of a brief reconnaissance and literature review in support of the Waiāhole Valley Agricultural Park project; this survey included the present project area. He noted an abandoned system of taro terraces in the vicinity of LCA 10230. He concluded “the entire valley of Waiāhole is probably eligible to the State and National Registers of Historic Places as an archaeological district” (Barrera 1982:3).

5.1.3 Tomonari-Tuggle 1983

Tomonari-Tuggle (1983) reported on a more in-depth archaeological reconnaissance survey in support of the Waiāhole Valley Agricultural Park project studied previously by Barrera (1982, see above). This consisted of five discrete survey areas in the central portion of Waiāhole Valley; it included a portion of the present project area along Waiāhole Valley Road and a parcel immediately adjacent to the current project area along Waiāhole Valley Road North Branch. Tomonari-Tuggle (1983) documented 28 historic properties, 19 of which are in the area of the juncture of Waiāhole and Waianu streams. The historic properties included habitation areas, stone tool manufacturing workshops, and agricultural features related to both traditional taro cultivation and historical rice cultivation.

5.1.4 Tomonari-Tuggle and Tuggle 1984

In 1984, Tomonari-Tuggle and Tuggle documented excavation and mapping work at SIHP #s 50-80-10-3509 through -3513 and -3526, all near the confluence of Waiāhole and Waianu streams and previously described in an earlier work (Tomonari-Tuggle 1983, see above). Tomonari-Tuggle and Tuggle (1984) reported six radiocarbon dates from SIHP # -3512 (the locus of most of their research) and concluded the site was used for both agriculture and habitation from the late pre-Contact period into the post-Contact period.

Table 4. Previous archaeological studies in the vicinity of the project area

Reference	Type of Study	Location	Results (SIHP # 50-80-10-)
Kikuchi 1964	Archaeological reconnaissance survey	Waiāhole Valley	Three historic properties identified in current project area vicinity: SIHP #s -02472 and -02475 (adze quarries) and -02476 (lithic scatter)
Barrera 1982	Archaeological reconnaissance survey	Waiāhole Valley Agricultural Park	Notes abandoned system of taro terraces in vicinity of LCA 10230
Tomonari-Tuggle 1983	Archaeological reconnaissance survey	Waiāhole Valley Agricultural Park	Identified 28 historic properties, including habitation areas, lithic workshops, and traditional and historical agricultural sites
Tomonari-Tuggle and Tuggle 1984	Mapping and excavation report	Waiāhole Valley Agricultural Park	Documentation of work at SIHP #s -03509 through -03513 and -03526
Dye et al. 1985	Adze quarry study	Pu'u Kuolani, Waiāhole	Studied Waiāhole quarry complex that includes SIHP #s -02472, -02475, and -02476 (identified by Kikuchi 1964, see above)
Hammatt et al. 1987	Archaeological testing	SIHP # -03512, central Waiāhole Valley	Archaeological testing at SIHP # -03512 (lithic workshop, previously studied by Tomonari-Tuggle and Tuggle 1984, see above); habitation and flaking activity documented
Kawachi 1990	Field check	SIHP # -04246, central Waiāhole Valley	Documented numerous agricultural terraces
Walsh et al. 1995	Archaeological literature review and field inspection	Coastal areas of Waikāne and Waiāhole	Identified fields with <i>lo'i</i> type soils and possible <i>'auwai</i> at Waiāhole and historical structures or features in Waikāne
Perzinski et al. 2002	Archaeological inventory survey	Coastal Waiāhole	Two historic properties, SIHP #s -01086 (human burials) and -06396 (<i>Pōhaku O Kāne</i>), recommended for preservation
O'Leary et al. 2005	Archaeological inventory survey	Coastal Waiāhole	Identified three historic properties: SIHP #s -06756 (subsurface structural remnant), -06757 (historical road segment), and -06758 (agricultural complex)

Reference	Type of Study	Location	Results (SIHP # 50-80-10-)
McElroy and Duhaylonsod 2015	Archaeological inventory survey	Waiāhole, TMK: (1) 4-8-008:003	No historic properties identified

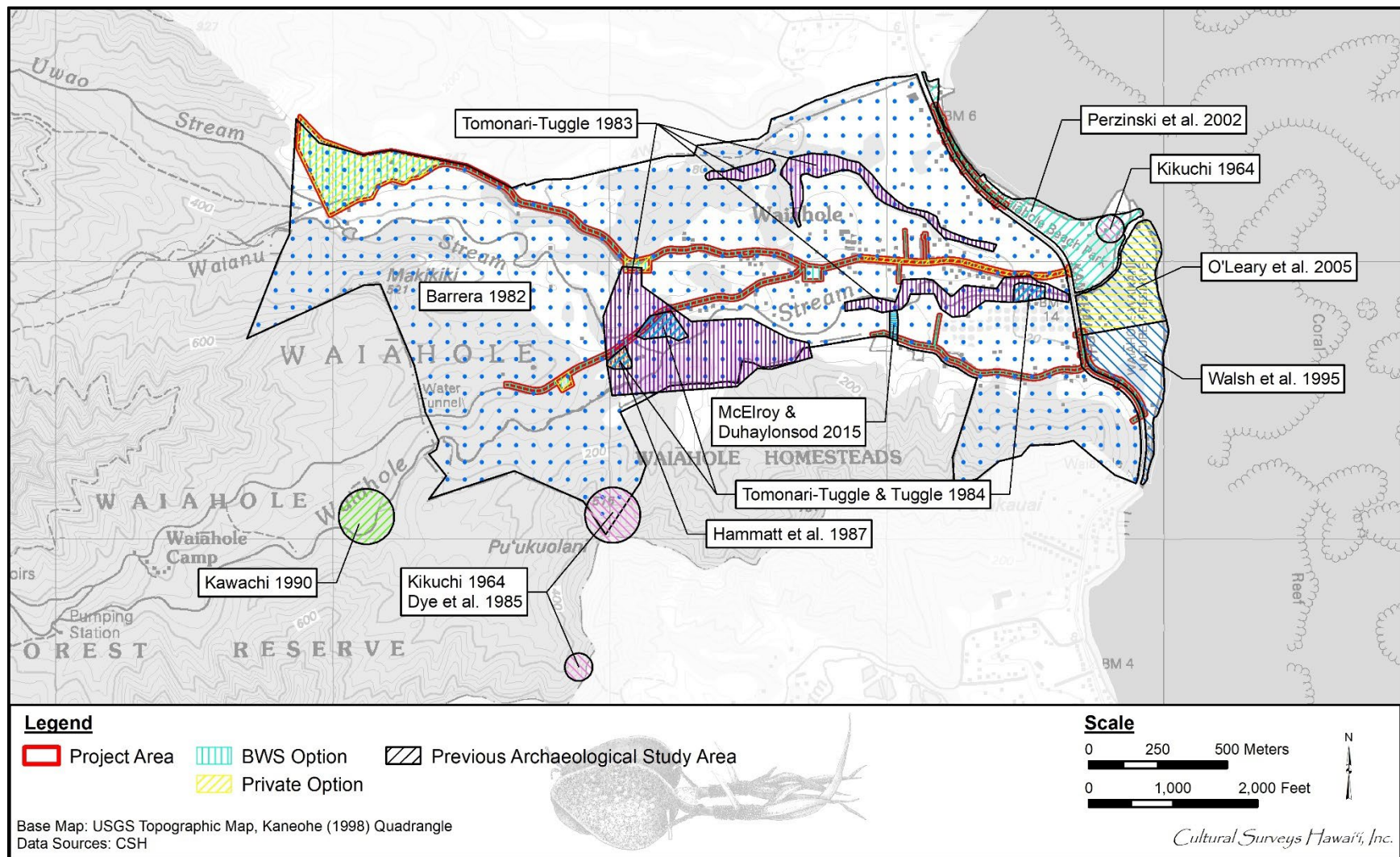


Figure 30. 1998 Kaneohe USGS topographic quadrangle, showing previous archaeological studies in the project area vicinity

Table 5. Historic properties previously identified in the project area vicinity

SIHP # (50-80-10-)	Type/Name	Description	Reference
-01086	Human burials	Six individuals	Perzinski et al. 2002
-02472	Adze quarry	Pre-Contact	Kikuchi 1964
-02475	Adze quarry	Pre-Contact	Kikuchi 1964; Dye et al. 1985
-02476	Lithic scatter	Pre-Contact	Kikuchi 1964; Dye et al. 1985
-03500	Irrigation ditch	Shallow, unfaced ditch	Tomonari-Tuggle 1983
-03501	Platform	Constructed of rounded boulders with cobble fill; in poor condition	Tomonari-Tuggle 1983
-03502	Terrace	Moderate to good condition, but “has little excavation potential [...] [and] little public or cultural value” (Tomonari-Tuggle 1983:58)	Tomonari-Tuggle 1983
-03503	Terrace	Remnant; fair condition	Tomonari-Tuggle 1983
-03504	Irrigation ditch	Excellent condition; generally unfaced, although some large boulders may be a remnant facing	Tomonari-Tuggle 1983
-03505	Basalt flake deposit	Layer of in situ flakes in upper 20–30 cm of exposure, overlying flakes in an eroded slump deposit	Tomonari-Tuggle 1983
-03506	Irrigation ditch	Well-formed channel with an iron or concrete pipe	Tomonari-Tuggle 1983
-03507	Mounded wall	Possible levee to protect adjacent field from flood waters	Tomonari-Tuggle 1983
-03508	Agricultural complex	Remnant terrace facings and a possible irrigation channel	Tomonari-Tuggle 1983
-03509	Bridge foundation	Post-Contact; concrete and stone	Tomonari-Tuggle 1983; Tomonari-Tuggle and Tuggle 1984
-03510	Agricultural field deposits	—	Tomonari-Tuggle 1983; Tomonari-Tuggle and Tuggle 1984
-03511	Irrigation-related structure	Post-Contact; poorly preserved canal and adjacent embankment	Tomonari-Tuggle 1983; Tomonari-Tuggle and Tuggle 1984

SIHP # (50-80-10-)	Type/Name	Description	Reference
-03512	Habitation complex	Pre- and post-Contact; buried occupation deposit with lithics, firepits, and scattered charcoal	Tomonari-Tuggle 1983; Tomonari-Tuggle and Tuggle 1984; Hammatt et al. 1987
-03513	Irrigation ditches	Post-Contact; consists of two dirt-faced channels cut across the knoll separating Waianu and Waiāhole streams	Tomonari-Tuggle 1983; Tomonari-Tuggle and Tuggle 1984
-03514	Artifact scatter	Pre- and post-Contact; consists of lithic material, crockery, bottle glass, and volcanic glass flakes	Tomonari-Tuggle 1983
-03515	Road or irrigation ditch	Level, linear area on a slope	Tomonari-Tuggle 1983
-03516	Irrigation ditch	—	Tomonari-Tuggle 1983
-03517	Historic house site	Post-Contact; abandoned wood frame house and trash pit	Tomonari-Tuggle 1983
-03518	Historic house site	Post-Contact; abandoned, three-room wood frame house	Tomonari-Tuggle 1983
-03519	Ka Loko Manu Pond	First identified on 1897 map	Tomonari-Tuggle 1983
-03520	Irrigation ditch	Narrow ledge on the face of an escarpment; fair condition	Tomonari-Tuggle 1983
-03521	Embankment	Resembles a railroad berm	Tomonari-Tuggle 1983
-03522	Road bed	Wide, level bench at the base of an escarpment	Tomonari-Tuggle 1983
-03523	McCandless Rice Mill	Constructed in late 19th century	Tomonari-Tuggle 1983
-03524	Agricultural complex	Irrigation canal and rice fields	Tomonari-Tuggle 1983
-03525	Artifact scatter	Lithics and a porcelain sherd	Tomonari-Tuggle 1983
-03526	Agricultural deposits	—	Tomonari-Tuggle 1983; Tomonari-Tuggle and Tuggle 1984
-03527	Irrigation ditch	Feeds off Waiāhole Stream	Tomonari-Tuggle 1983
-04246	Agricultural complex	—	Kawachi 1990
-06396	<i>Pōhaku O Kāne</i>	God stone; pre-Contact	Perzinski et al. 2002
-06756	Subsurface structure foundation	Pre- and post-Contact	O'Leary et al. 2005
-06757	Historic road	Post-Contact	O'Leary et al. 2005

SIHP # (50-80-10-)	Type/Name	Description	Reference
-06758	<i>Lo'i</i> complex	Subsurface <i>lo'i</i> soils; pre- and post-Contact	O'Leary et al. 2005
-06758B	Earthen berm	Associated with <i>lo'i</i> complex; pre- and post-Contact	O'Leary et al. 2005
-06758C	<i>'Auwai</i>	Associated with <i>lo'i</i> complex; pre- and post-Contact	O'Leary et al. 2005

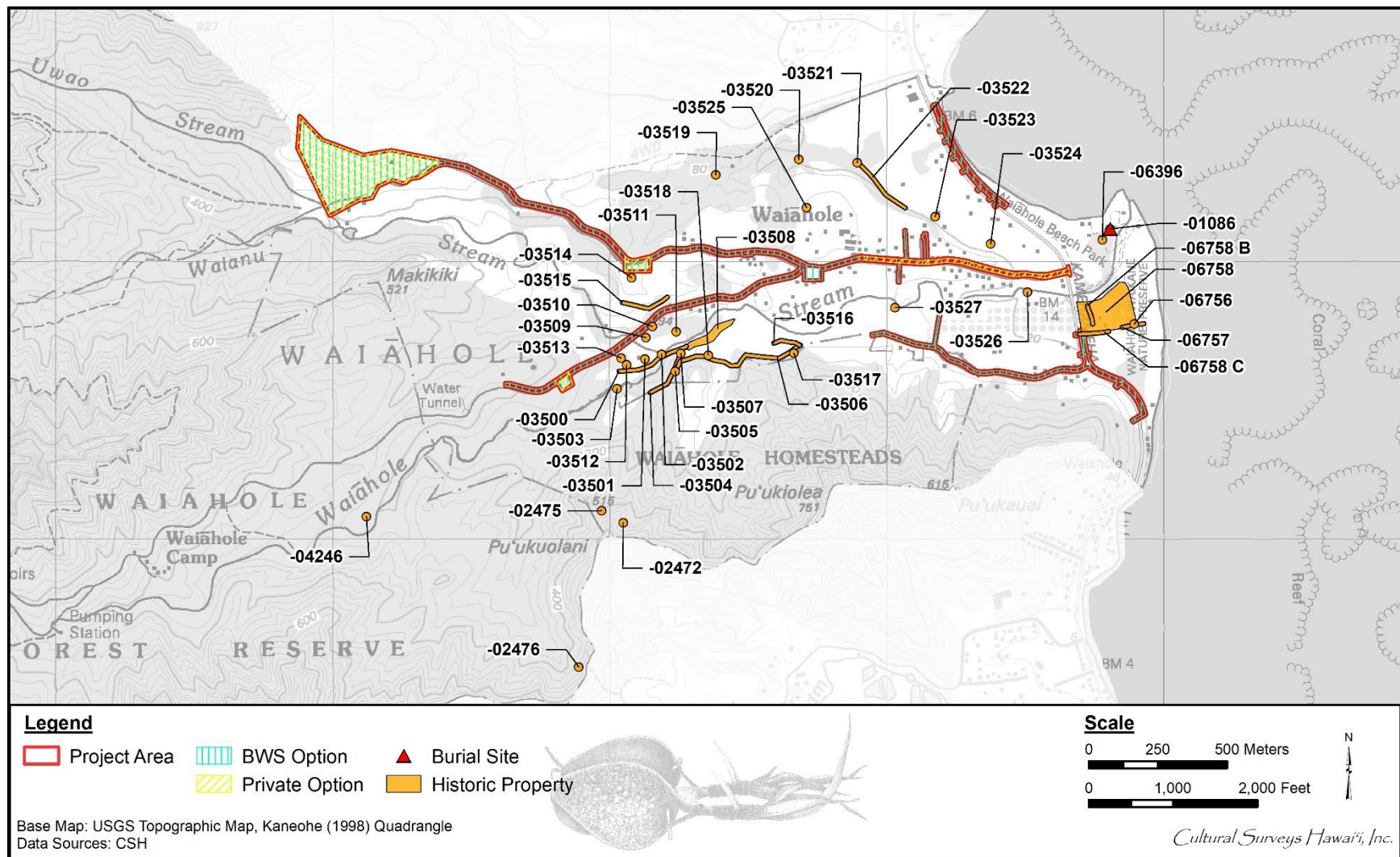


Figure 31. 1998 Kaneohe USGS topographic quadrangle, showing previously identified historic properties in the project area vicinity

5.1.5 Dye et al. 1985

Dye et al. (1985) studied a Waiāhole quarry complex located on opposite slopes of a small ridge that trends north into Waiāhole Valley from Pu'u Kuolani. Kikuchi (1964, see above) had previously reported quarrying activity in the area. This complex includes SIHP #s 50-80-10-02472, -02475, and -02476. Dye et al. (1985) recommended SIHP #s -02472 and -02475 as eligible for listing in the State and National Registers of Historic Places.

5.1.6 Hammatt et al. 1987

CSH (Hammatt et al. 1987) conducted archaeological testing of a lithic workshop (SIHP # 50-80-10-03512, previously documented by Tomonari-Tuggle 1983 and Tomonari-Tuggle and Tuggle 1984; see above) on a low knoll overlooking the confluence of Waianu and Waiāhole streams. Both habitation and flaking activity were documented by Hammatt et al. (1987). Final stage flaking of adzes is suggested to have been the single most important economic activity at the site. The one radiocarbon date recovered, AD 1655–1950, was regarded as consistent with six of the dates reported by Tomonari-Tuggle. The earliest Tomonari-Tuggle dates are questioned due to their apparent shared stratigraphic context with later dates (Hammatt et al. 1987:41).

5.1.7 Kawachi 1990

The SHPD conducted a field check (Kawachi 1990) documenting several terraces in central Waiāhole Valley designated as SIHP # 50-80-10-04246.

5.1.8 Walsh et al. 1995

CSH (Walsh et al. 1995) carried out a literature review and filed inspection of coastal areas of Waiāhole and Waikāne. The study notes vaguely defined fields with *lo'i* type soils, a possible *'auwai*, and a buried cultural layer with possible waterworn basalt flakes and charcoal. However, no SIHP numbers were assigned.

5.1.9 Perzinski et al. 2002

CSH (Perzinski et al. 2002) conducted an archaeological inventory survey (AIS) of a 21-acre parcel at coastal Waiāhole. Two historic properties were identified, SIHP #s 50-80-14-01086 (historical grave plots) and -06396 (the probable Pōhaku O Kāne). Kamakau (1961:32, in Perzinski et al. 2002) describes the Pōhaku O Kāne as a “place of refuge, a *pu'u honua*, for each family from generation to generation. It was not a *heiau*; it was a single stone monument (*he wahi 'eo'eo pōhaku ho'okahi*), and a *kuahu* (altar) with ti and other greenery planted about.” Both historic properties were recommended for preservation.

5.1.10 O'Leary et al. 2005

CSH (O'Leary et al. 2005) conducted an AIS of a 9-acre parcel at coastal Waiāhole. Three historic properties were identified: SIHP #s 50-80-10-06756 (subsurface structural remnant), -06757 (historical road segment), and -06758 (agricultural complex).

5.1.11 McElroy and Duhaylonsod 2015

Keala Pono (McElroy and Duhaylonsod 2015) conducted an AIS (reported as an archaeological assessment) of TMK: (1) 4-8-008:003 in Waiāhole. The archaeological work included a pedestrian survey and five test excavations. Although SIHP # 50-80-10-03506, a ditch, was thought to run

through the subject property, it was not encountered. The entire property appeared to have been disturbed, and no historic properties were identified.

Section 6 Community Consultation

6.1 Introduction

Throughout the course of this assessment, an effort was made to contact and consult with NHOs, agencies, and community members including descendants of the area, in order to identify individuals with cultural expertise/and or knowledge of the *ahupua'a* where the project areas are located. CHS initiated its outreach effort in May and June 2018 through letters, email, telephone calls, and in-person contact (Appendix B). Due to changes to the project, in April 2022, CSH initiated a second outreach effort in July and August 2022 indicating the updated project area (see Appendix B). In most cases, two or three attempts were made to contact individuals, organizations, and agencies. CSH completed the community consultation in January 2023.

6.2 Community Contact Table

Table 6 contains names, affiliations, dates of contact, and comments from NHOs, individuals, organizations, and agencies contacted for this project. Results are presented below in alphabetical order.

Table 6. Results of Community Consultation

Name	Affiliation	Comments
Ailā, William	Deputy to the Chair, Department of Hawaiian Home Lands	Letter and figures sent via United States Postal Service (USPS) on 15 May 2018 Letter and figures sent via USPS on 24 May 2018 Letter and figures sent via email on 13 June 2018 Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via email 18 July 2022 Revised letter and figures sent via email 25 August 2022
Amaral, Beverly	Former Ko'olaupoko District Representative, O'ahu Island Burial Council (OIBC)	Letter and figures sent via USPS on 15 May 2018 Letter and figures sent via USPS on 24 May 2018 Letter and figures sent via email on 13 June 2018 Email returned to sender 14 June 2018 Revised letter and figures sent via email 18 July 2022 Revised letter and figures sent via email 25 August 2022 Ms. Amaral replied via email 25 August 2022 stating that she is no longer with OIBC. She forwarded letter to Mana Caceres, 'Ewa District Representative, OIBC CSH replied via email 25 August 2022 thanking her for her response
Balauro, Kim	Administrative Assistant, Waiāhole-Waikāne Community Association	Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via USPS 25 August 2022 Revised letter and figures sent via USPS 14 September 2022

Becket, Jan	Author, photographer, retired teacher from Kamehameha Schools, Kona Moku Representative for the Committee on the Preservation of Historic Sites and Cultural Properties	Letter and figures sent via USPS on 24 May 2018 Letter and figures sent via email on 13 June 2018 Mr. Becket responded via email on 19 June 2018. He stated that he knows of “several cultural sites that may be near the project area” and expressed interest in “re-visiting and photographing them, if we can arrange access.” CSH responded on 20 June 2018 to arrange a meeting time. Correspondence between Mr. Becket and CSH resulted in a scheduled meeting on 10 July 2018 Mr. Becket and CSH met on 10 July 2018 Revised letter and figures sent via email 15 July 2022 Interview summary sent via email 15 July 2022 Interview summary sent via email 25 August 2022 Summary approved 9 December 2022
Bender, Daniel	Parks and Recreation Committee Chair, Kahalu‘u Neighborhood Board	Letter and figures sent via USPS on 15 May 2018 Letter and figures sent via USPS on 24 May 2018 Letter and figures sent via USPS on 13 June 2018 Mail returned to sender 17 June 2018 Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via email 25 August 2022
Bishop, Daniel	President of Kalo Pa‘a	Letter and figures sent via email on 15 May 2018 Letter and figures sent via email on 24 May 2018 Letter and figures sent via email on 13 June 2018 Updated contact information provided by Mr. Cashman on 19 June 2018 Letter and figures sent via email on 20 June 2018 Revised letter and figures sent via email 18 July 2022 Revised letter and figures sent via email 25 August 2022
Bridges, Cy	Hawaiian Cultural Advisor at the Polynesian Cultural Center; <i>Kumu Hula</i> ; Lineal descendent	Letter and figures sent via USPS on 15 May 2018 Letter and figures sent via USPS on 24 May 2018 Letter and figures sent via email on 13 June 2018 Email returned to sender on 13 June 2018 Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via USPS 24 August 2022
Cashman, Makahiapo	Ka Papa Lo‘i o Kānewai at UH Mānoa	Referred by Ms. Solis on 24 May 2018 Letter and figures sent via email 25 May 2018 Letter and figures sent via email on 13 June 2018 Mr. Cashman responded via email on 19 June 2018. He suggested contacting Danny Bishop and the Hoe ‘Ohana Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via email 18 July 2022 Mr. Cashman replied via email 19 July 2022 recommending consulting with “Calvin Hoe and his family, The Reppun Family, and the Waiāhole Poi Factory

		people.” He also requested consideration if “any Kupuna Iwi are discovered in the area and be recognized as a ‘Cultural Descendant’ by the Oahu Burial Council.” CSH replied via email 21 July 2022 thanking him for his response
Cano, Toni	<i>Kama ‘āina</i> ; Waiāhole-Waikāne Community Association member	Ms. Cano meet with CSH on 23 July 2018 at the residence of Mr. Uyemura Ms. Cano emailed CSH on 1 August 2018 to approve her <i>mana ‘o</i> Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via USPS 25 August 2022 Revised letter and figures sent via USPS 14 September 2022 Revised letter and figures sent via email 15 September 2022
Cayan, Phyllis “Coochie”	Intake Specialist, SHPD	Letter and figures sent via USPS on 15 May 2018 Letter and figures sent via USPS on 24 May 2018 Letter and figures sent via email on 13 June 2018 Revised letter and figures sent via email 18 July 2022 Ms. Cayan replied via email 19 July 2022 notifying CSH she is no longer in the History & Culture Branch CSH replied via email 19 July 2022 thanking her for her response
Chang, Dawn N.S.	Chair, Ho‘okano Family Land Trust	Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via email 18 July 2022 Revised letter and figures sent via email 25 August 2022
Collins, Mahoe	Council Member, Waiāhole-Waikāne Community Association	Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via email 18 July 2022 Revised letter and figures sent via email 25 August 2022
Costa, David	Sgt. Of Arm, Waiāhole-Waikāne Community Association	Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via USPS 25 August 2022 Revised letter and figures sent via USPS 14 September 2022
Crabbe, Kamana‘opono	Former Director, Office of Hawaiian Affairs	Letter and figures sent via USPS on 24 May 2018 Letter and figures sent via email on 13 June 2018
Crouch, Tai	Retired teacher from Punahou School; Former Caretaker of Kualoa Regional Park	Revised letter and figures sent via email 18 July 2022 Mr. Crouch replied via 21 July 2022 recommending speaking with Helene and Lawrence Uyemura CSH replied via email 21 July 2022 thanking him for his response

Cypher, Mahealani	Ko'olau Foundation; George K. Cypher Ohana	Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via email 18 July 2022 Ms. Cypher replied via email 18 July 2022 stating that she has "limited knowledge" of the area but "could possibly pass on names of people from these areas." She also offered to "talk story" with CSH CSH replied via email 18 July 2022 thanking her for her response and offered to "talk story" with her. CSH also granted permission to Ms. Cypher to share letter and figures with community members from the area who may be interested in participating
DeCosta, Denise	George K. Cypher Ohana	Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via email 18 July 2022 Revised letter and figures sent via email 25 August 2022
Farden, Hailama	President, Association of Hawaiian Civic Clubs	Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via email 18 July 2022 Revised letter and figures sent via email 25 August 2022
Fox, William Keoni	Member, Ko'olaupoko Hawaiian Civic Club; Cultural practitioner; Steward of the Kukuianiani Heiau complex; Raised in Kau; Kukuianiani Farms, LLC	Referred by Mr. Jan Becket on 21 June 2018 Letter and figures sent via email on 27 June 2018 Mr. Fox responded on 28 June 2018 via email suggesting a visit to Kukuianiani Heiau with Jan Becket in July CSH responded on 2 July 2018 to schedule a date for a site visit to Mr. Fox's property. Correspondence between Mr. Fox and CSH resulted in a scheduled meeting for 10 July 2018 Mr. Fox and CSH met on 10 July 2018 Revised letter and figures sent via USPS 15 July 2022 Interview summary sent via USPS 15 July 2022 Interview summary approved 24 August 2022
Fukumitsu, Keoki	Community Leader; <i>kama'āina</i> of Hakipu'u/Waikāne; Taro farmer	Letter and figures sent via USPS on 15 May 2018 Letter and figures sent via USPS on 24 May 2018 Mr. Fukumitsu responded via telephone on 29 May 2018 and left a voice mail for CSH. An interview with Mr. Fukumitsu was scheduled for 8 June 2018. CSH met with Mr. Fukumitsu and completed an interview on 8 June 2018. On 14 June 2018 Mr. Fukumitsu emailed CSH providing two documents: a Department of Land and Natural Resources, Commission on Water Resources Management decision from 1997 titled <i>In the Matter of Water Use Permit Applications, Petitions for Interim Instream Flow Standard Amendments, and Petitions for Water</i>

		<p><i>Reservations for the Waiahole Ditch Combined Contested Case Hearing</i> and a 1977 Hawai'i Land Use Commission decision titled <i>In the Matter of the Petition of Windward Partners, For the Reclassification of Certain Lands Situated at Waikane, Koolaupoko, Island of Oahu</i></p> <p>Revised letter and figures sent via email 15 July 2022</p> <p>Interview summary sent via email 15 July 2022</p> <p>Mr. Fukumitsu replied via email 19 July 2022 stating he will review the letter and figures</p> <p>CSH replied via email 19 July 2022 thanking him for his response</p> <p>Mr. Fukumitsu replied via email 18 August 2022 apologizing for late response and expressed interest in meeting with CSH</p> <p>CSH replied via email 18 August 2022 thanking him for his response and offered to meet with him</p> <p>CSH followed up via email 9 December 2022</p> <p>Mr. Fukumitsu replied via email 10 December 2022 offering to meet with CSH over the phone or in person</p> <p>CSH replied via email 12 December 2022 asking Mr. Fukumitsu's availability</p> <p>Mr. Fukumitsu replied via email 12 December 2022 stating he will let CSH know when he is available</p> <p>CSH followed up with Mr. Fukumitsu 4 January 2023</p> <p>CSH followed up with Mr. Fukumitsu 18 January 2023</p> <p>CSH met with Mr. Fukumitsu 19 February 2023</p> <p>Interview summary sent for review 16 March 2023</p> <p>Interview summary sent for review 22 March 2023</p> <p>Summary approved 30 March 2023</p>
Galicinao, Lilia	Council Member, Waiāhole-Waikāne Community Association	<p>Letter and figures sent via USPS 15 July 2022</p> <p>Letter and figures sent via USPS 25 August 2022</p> <p>Revised letter and figures sent via USPS 14 September 2022</p>
Galuteria, Brickwood	Ko'olaupoko Rep., OIBC	Revised letter and figures sent via USPS 25 August 2022
Gunness, Jo Lynn	UH Department of Anthropology, Archaeology Labs Manager; Previous archaeologist at Kualoa Beach Park	<p>Revised letter and figures sent via email 18 July 2022</p> <p>Revised letter and figures sent via email 25 August 2022</p>
Hazama, Miles	City & County of Honolulu, Department of	<p>Letter and figures sent via email on 15 May 2018</p> <p>Letter and figures sent via email on 24 May 2018</p>

	Parks and Recreation, Windward District Manager	Mr. Hazama responded via email on 24 May 2018 providing referrals and stated the project area is “Presently, undeveloped park land, nature preserve.” He stated he is “unsure of past history.” In response to whether traditional gathering practices occurred or occur in the project area Mr. Hazama responded, “unknown, there is <i>kuleana</i> property with this area.” Revised letter and figures sent via email 18 July 2022 Revised letter and figures sent via email 25 August 2022
Hilo, Regina	Burial Sites Specialist, SHPD (O‘ahu)	Letter and figures sent via email on 15 May 2018 Letter and figures sent via email on 24 May 2018 Ms. Hilo responded via email on 24 May 2018. She forwarded letter and figures to “Ms. Kealohi Reppun, Mr. Kihei Nahale-a, Mr. Keoni Fox, Ms. Beverly Amaral (OIBC - Koolaupoko representative), and Dr. Kali Fermantez (OIBC - Koolauloa representative).” She also recommended speaking with Calvin Hoe and his ‘ohana CSH responded via email on 25 May 2018 thanking Ms. Hilo for her guidance. Revised letter and figures sent via email 18 July 2022
Hoe, Calvin	Co-owner, Waiāhole Poi Factory	Letter and figures sent via USPS on 15 May 2018 Letter and figures sent via USPS on 24 May 2018 Letter and figures sent via email on 13 June 2018 Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via email 18 July 2022 Revised letter and figures sent via email 25 August 2022
Hoe, Charleen		Referred by Mr. Cashman on 19 June 2018 Letter and figures sent via email on 20 June 2018 Revised letter and figures sent via email 18 July 2022 Revised letter and figures sent via email 25 August 2022
Hoe, Liko	Windward Community College Hawaiian Studies Lecturer	Letter and figures sent via USPS on 15 May 2018 Letter and figures sent via USPS on 24 May 2018 Letter and figures sent via email on 13 June 2018 Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via USPS 24 August 2022
Hopkins, Cynthia	Council Member, Waiāhole-Waikāne Community Association	Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via USPS 25 August 2022 Revised letter and figures sent via USPS 14 September 2022
Hussey, Sylvia	Ka Pouhana, OHA	Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via USPS 24 August 2022

Kahue, Michael	President, Menehune Foundation	Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via email 18 July 2022 Revised letter and figures sent via email 25 August 2022
Kaluhiwa, Leialoha “Rocky”	<i>Po‘o</i> , Aha Moku Council; <i>Kama‘āina</i> of He‘eia; President, Ko‘olaupoko Hawaiian Civic Club	Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via email 18 July 2022 Revised letter and figures sent via email 25 August 2022
Kamalani, Llewellyn	<i>Kama‘āina</i>	Letter and figures sent via USPS on 24 May 2018 Letter and figures sent via USPS on 13 June 2018 Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via USPS 24 August 2022
Kia, Ewa and Gene	<i>Kama‘āina</i>	Letter and figures sent via USPS on 15 May 2018 Letter and figures sent via USPS on 24 May 2018 Letter and figures sent via USPS on 13 June 2018 Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via USPS 24 August 2022
Ko‘olaupoko Hawaiian Civic Club	Native Hawaiian Organization	Letter and figures sent via USPS on 15 May 2018 Letter and figures sent via USPS on 24 May 2018 Letter and figures sent via email on 13 June 2018
Kukea-Shultz, Kanekoa	Executive Director, Kā‘ko‘o ‘Oiwī	Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via email 18 July 2022 Revised letter and figures sent via email 25 August 2022
Lagapa, Cookie	<i>Kama‘āina</i>	Letter and figures sent via USPS on 15 May 2018 Letter and figures sent via USPS on 24 May 2018 Letter and figures sent via USPS on 13 June 2018 Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via USPS 24 August 2022
Loo, Clifford	Kahalu‘u Neighborhood Board; Koolaupoko Hawaiian Civic Club	Letter and figures sent via USPS on 15 May 2018 Letter and figures sent via USPS on 24 May 2018 Letter and figures sent via USPS on 13 June 2018 Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via email 18 July 2022 Revised letter and figures sent via email 25 August 2022
Mahi, Aaron D.	Former O‘ahu Island Burial Council Ko‘olaupoko Representative	Letter and figures sent via USPS on 15 May 2018 Letter and figures sent via USPS on 24 May 2018 Letter and figures sent via email on 13 June 2018 Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via email 18 July 2022 Revised letter and figures sent via email 25 August 2022

Meinecke, Fred Kalani	Windward Community College Hawaiian Language Professor	Letter and figures sent via USPS on 15 May 2018 Letter and figures sent via USPS on 24 May 2018 Letter and figures sent via email on 13 June 2018 Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via email 18 July 2022 Revised letter and figures sent via email 25 August 2022
Morgan, John	Kualoa Ranch	Letter and figures sent via USPS 15 July 2022 Letter and figures sent via email 18 July 2022 Mr. Morgan replied via email 19 July 2022 offering to meet with CSH CSH replied via email 19 July 2022 thanking him for his response and offered to set up meeting at Mr. Morgan's convenience
Moriwaki 'Ohana	Owners of Waikane Store	Letter and figures sent via USPS on 15 May 2018 Letter and figures sent via USPS on 24 May 2018 Letter and figures sent via USPS on 13 June 2018 Revised letter and figures sent via USPS 15 July 2022
Mossman, John	<i>Kama 'āina</i>	Letter and figures sent via USPS on 15 May 2018 Letter and figures sent via USPS on 24 May 2018 Mail returned to sender on 24 May 2018.
Nagai, Walter	Environmental Engineer at U.S. Army Corps of Engineers	Letter and figures sent via email on 15 May 2018 Mr. Nagai responded via email on 15 May 2018 notifying CSH that he is "no longer involved with the Waikane Valley area." He recommended "going through the FOIA [Freedom Of Information Act] process for information." CSH responded on 17 May 2018 thanking him for his response Revised letter and figures sent via email 18 July 2022 Revised letter and figures sent via email 25 August 2022
Obayashi, Flora	Chair of Kahalu'u Neighborhood Board	Letter and figures sent via USPS on 24 May 2018 Letter and figures sent via email on 13 June 2018 Ms. Obayashi responded on 13 June 2018 via email. She stated she will share letter and figures with Kahalu'u Neighborhood Board members and Waiahole-Waikane Community Association CSH responded via email on 14 June 2018 to thank Ms. Obayashi for her referrals and to offer to answer any questions that may arise regarding the project. Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via email 18 July 2022 Revised letter and figures sent via email 25 August 2022
Plunkett, Dustan	Council Member, Waiāhole-Waikāne	Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via USPS 25 August 2022

	Community Association	Revised letter and figures sent via USPS 14 September 2022
Rapoza, Penny	Council Member, Waiāhole-Waikāne Community Association	Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via USPS 25 August 2022 Revised letter and figures sent via USPS 14 September 2022
Reppun, John	Community Resource Development and Executive Director, KEY Project	Letter and figures sent via USPS on 15 May 2018 Letter and figures sent via USPS on 24 May 2018 Letter and figures sent via email on 13 June 2018 Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via email 18 July 2022 Revised letter and figures sent via email 25 August 2022 Mr. Reppun replied via email 25 August 2022 and offered to meet with CSH at KEY Project CSH replied via email 25 August 2022 to schedule meeting CSH met with Mr. Reppun 1 September 2022 Summary sent for review via email 19 October 2022 Comments received 6 December 2022 Revised draft sent for review 9 December 2022 Revised summary approved 13 December 2022
Reppun, Paul	Onipa'a Nā Hui Kalo; Waianu Farm of Waiāhole	Letter and figures sent via USPS on 15 May 2018 Letter and figures sent via USPS on 24 May 2018 Letter and figures sent via USPS on 13 June 2018 Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via USPS 24 August 2022
Ringuette, Ryan	Council Member, Waiāhole-Waikāne Community Association	Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via USPS 25 August 2022 Revised letter and figures sent via email 15 September 2022 Mr. Ringuette replied via email 5 October 2022 inviting CSH to Waiahole-Waikane Community Association's Hui Wai Ola (water) committee meeting CSH replied via email 6 October 2022 thanking him for his response and accepting invitation Mr. Ringuette replied via email 7 October 2022 confirming meeting date and time CSH met with Mr. Ringuette, Todd Melton, Justin Saito, and Lawrence Uyemura on 13 October 2022 Summary sent for review via USPS and email 17 January 2023 CSH met with Mr. Uyemura 26 January 2023 Revised summary sent via USPS and email 16 March 2023 CSH spoke with Mr. Uyemura via phone 27 March 2023 Mr. Uyemura approved revised summary 27 March 2023

		Revised summary sent to Mr. Ringuette and Mr. Saito via email 27 March 2023 CSH did not receive approval from Mr. Ringuette and Mr. Saito in the time allotted. Their comments were removed.
Royce, Joe and Pat	Residents	Letter and figures sent via USPS on 15 May 2018 Letter and figures sent via USPS on 24 May 2018 Letter and figures sent via USPS on 13 June 2018 Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via USPS 24 August 2022
Sadoyama, Norman	Council Member, Waiāhole-Waikāne Community Association	Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via USPS 25 August 2022 Revised letter and figures sent via USPS 14 September 2022
Saito, Justin	Council Member, Waiāhole-Waikāne Community Association	Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via USPS 25 August 2022 Revised letter and figures sent via USPS 14 September 2022
Salas, Hannah	<i>Kama 'āina</i>	Letter and figures sent via USPS on 15 May 2018 Letter and figures sent via USPS on 24 May 2018 Letter and figures sent via USPS on 13 June 2018 Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via USPS 24 August 2022
Salas, Lucy	President, Waiāhole-Waikāne Community Association	Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via USPS 25 August 2022 Revised letter and figures sent via USPS 14 September 2022
Smith, Tammy	Hale Kealoha Ai Pono; Waiāhole Poi Factory; Resident of Hakipuu	Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via USPS 24 August 2022
Solis, Sheleigh Christina Ka'āhiki	Cultural Historian, SHPD (O'ahu)	Letter and figures sent via email on 15 May 2018 Letter and figures sent via email on 24 May 2018 Ms. Solis responded via email on 24 May 2018 suggesting several community members to contact including Charlie and Paul Reppun, Hawaiian Civic Clubs, Makahiapo Cashman, and Daniela Elliot. She also suggested researching the <i>mo 'olelo</i> of Kamapua'a and OHA databases for information regarding the <i>'āina</i> . She also suggested attending neighborhood board meetings. CSH responded via email on 25 May 2018 thanking Ms. Solis for her guidance Revised letter and figures sent via email 18 July 2022

Sutton, John and Donna Pico	<i>Kama 'āina</i>	Letter and figures sent via USPS on 24 May 2018 Letter and figures sent via USPS on 13 June 2018 Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via USPS 24 August 2022
Uli'i, Rainbow	Secretary, Waiāhole-Waikāne Community Association	Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via USPS 25 August 2022 Revised letter and figures sent via USPS 14 September 2022
Uyemura, Lawrence	<i>Kama 'āina</i> ; Waiāhole-Waikāne Community Association President	Mr. Uyemura contacted CSH via phone on 18 July 2018 CSH spoke with Mr. Uyemura on 19 July 2018 and scheduled a time to meet for 23 July 2018 CSH and Mr. Uyemura met on 23 July 2018. Mr. Uyemura called CSH via telephone on 31 July 2018 to approve his interview summary. Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via email 15 July 2022 Interview summary sent via email 15 July 2022 Revised letter and figures sent via USPS 25 August 2022 Interview summary sent via email 25 August 2022
Wada, Susan	<i>Kama 'āina</i>	Letter and figures sent via USPS on 15 May 2018 Letter and figures sent via USPS on 24 May 2018 Revised letter and figures sent via USPS 15 July 2022
Walk, Kaanoi	Chair, Kahalu'u Neighborhood Board	Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via email 18 July 2022 Revised letter and figures sent via email 25 August 2022
Wasson, Dawn	<i>Kupuna</i> ; community leader	Letter and figures sent via email on 15 May 2018 Letter and figures sent via email on 24 May 2018 Letter and figures sent via email on 13 June 2018
Zweng, Paul	Founder of Ōhulehule Forest Conservancy; Member of Ko'olau Mountains Watershed Partnership	Letter and figures sent via USPS on 15 May 2018 Letter and figures sent via USPS on 24 May 2018 Letter and figures sent via USPS on 13 June 2018 Revised letter and figures sent via USPS 15 July 2022 Revised letter and figures sent via USPS 25 August 2022 Revised letter and figures sent via USPS 14 September 2022 Mr. Zweng replied via email 19 September 2022 thanking CSH for the information offered to provide "names of some Waiāhole residents who would have a better understanding of the cultural practices and knowledge of the area" CSH replied via email 19 September 2022 thanking him for his response and offer to provide referrals. CSH also granted permission to Mr. Zweng to share the letter and

		figures with community members who may be interested in participating
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Section 7 Community Interviews

7.1 *Kama'āina* Interviews

The authors and researchers of this report extend our deep appreciation to everyone who took time to speak and share their *mana'o* and *'ike* with CSH whether in the interviews or brief consultations. We request that if these interviews are used in future documents, the words of contributors are reproduced accurately and in no way altered, and that if large excerpts from interviews are used, report preparers obtain the express written consent of the interviewee/s.

Interviews were conducted in accordance with federal and state laws and guidelines with individuals knowledgeable of the general history, present and past land use, traditional gathering practices (both past and ongoing), and cultural sites of the project area and Waiāhole and Waikāne *ahupua'a*. The following analysis of *kama'āina* interviews is intended to facilitate the identification of potential impacts to cultural resources, ongoing cultural practices, and/or cultural sites within the project area or its immediate vicinity.

7.1.1 Summary of Keoki Fukumitsu Interview

On 8 June 2018, CSH interviewed Mr. Keoki Fukumitsu at Da Cove Health Bar and Café located on Monsarrat Avenue in the Diamond Head neighborhood of Honolulu. Mr. Fukumitsu is *kama'āina* of Ko'olaupoko, O'ahu and can trace his family's lineage seven generations back to the Waiāhole area. As a child, Mr. Fukumitsu attended Waiāhole School followed by Castle High School in Kāne'ohe. Mr. Fukumitsu is a cultivator of *kalo* (taro; *Colocasia esculenta*), engendering a practice that his *'ohana* has followed for generations. Mr. Fukumitsu is also a *kumu* (teacher) sharing his knowledge of traditional farming practices with scores of students, community members, and visitors to his taro fields. Mr. Fukumitsu also identifies himself as a lineal descendent of Waiāhole and Waikāne, as a cultural practitioner, and as a native tenant.

Mr. Fukumitsu explained to CSH aspects of *mauka-makai* (upland-lowland) relationships, the special cultural significance of the area, and shared his *mana'o* on the proposed Waiāhole Valley Water System Improvements and 0.2 MG Reservoir project. Additionally, Mr. Fukumitsu submitted two supporting documents to CSH which detail two important decisions that have impacted the character of modern-day Waiāhole and Waikāne. The first document is a Department of Land and Natural Resources, Commission on Water Resources Management decision from 1997 titled *In the Matter of Water Use Permit Applications, Petitions for Interim Instream Flow Standard Amendments, and Petitions for Water Reservations for the Waiahole Ditch Combined Contested Case Hearing*. The second supporting document is a 1977 Hawai'i Land Use Commission decision titled *In the Matter of the Petition of Windward Partners, For the Reclassification of Certain Lands Situated at Waikane, Koolaupoko, Island of Oahu*.

Mr. Fukumitsu revealed his intimate connection with the lands of Waiāhole and Waikāne, sharing the history of his family's presence in these *ahupua'a*.

All these places is where my history goes back 200 years. I'm from the top of Waiāhole water reserve my family migrated all the way down, right across Waiāhole-Waikāne in the forestry and they come right down into both valleys—Waiāhole and Waikāne, right down to the coastline. All taro. And so it's *kuleana*

[land holding of the tenant residing in the *ahupua'a* awarded, in fee, by the Hawaiian monarchy] lands, [there are] plots here and there, here and there.

The *kuleana* lands Mr. Fukumitsu's family tended were once extensively cultivated with taro. He recalled that "[...] my grandmother, from her great-great grandparents, used to come up the valley, Waikāne, plant taro in one house site, then come back up Waiāhole *makai* right across Waiāhole Valley Road and plant taro [there] also."

His family's tenure on the lands of Ko'olaupoko was further described in relation to early migration patterns and the Māhele period:

So these are the lands of the high priest that the king, from Kamehameha the first to Kamehameha the third, had award[ed] to the high priest and the high chief lines. From Kualoa, where the double hull canoes first landed, and then they reverted back into these valleys [pointing on a map to the valleys of Waiāhole and Waikāne]. These were the hidden valleys, sort of like how *kahiki*, lost lands, and this was their original migration pattern. They came in through the valleys. And of course, the sacredness of being the *kahuna* [priest], so my family line is all of *kahuna* line, the *konohiki* line, and the chief line from the Waiāhole ridge—the Waiāhole Forest Reserve.

There was a sense of both an emotional and physical connection to these lands, as evidenced by the personal *mo'olelo* shared by Mr. Fukumitsu, "These are the same plots of land that I am working from my grandmother, to my great grandmother, to my great-great grandmother and then her mother. Seven generations. So, 200 years we have been on this land."

The significance of multi-generational agricultural practice has been previously expounded upon by Hawaiian historian George Kanahele. Kanahele states, "To have roots in a place meant to have roots in the soil of permanence and continuity" (Kanahele 1986:181). A Hawaiian sense of place, or ancestral continuity within a place (also identified as a "Hawaiian Geography" by Carlos Andrade [2014]) is alluded to by Kanahele as a physical rootedness in the soil, a rootedness made manifest through the physical cultivation of the land.

The close relationship between identity and place, as understood in traditional Hawaiian thought, was fostered through the cultivation of various life-giving resources. Reigning supreme amongst these resources was *kalo*. *Kalo* was revered as a staple food, believed to have derived from the first-born son of Wākea and Papa. Taro, or *kalo*, was perhaps the most distinguished plant within traditional Hawaiian horticulture and society. Handy and Handy (1972) describe the role taro played in the pre-Contact period and its significance in the socio-cultural order:

The function and nature of the taro plant, its cultivation and use, were responsible not only for its primal place in mythology but for the fact that the cult associated with it, namely that of the male god Kane (= Wakea) as first procreator, and of *Ka-wai-ola-a-Kane* or 'The-life-giving-water-of Kane,' although less elaborated than that of the rain-father Lono, was more fundamental, not only in Hawaii but throughout Polynesia. It was, in fact, the basic cult of the primal procreator of nature and man, out of the union of Sky and Earth.

Actually, the course of fresh-water streams and ditches patterned the entire subsistence economy, and through this, the whole round and cycle of individual

and social activity. The streams and ditches were the regulators, the law givers, in communal relationship; not directly, but because upon their water depended the taro, and upon the taro depended man.

The requirements of labor, in connection with building and maintenance of dams, ditches, terraces, and embankments, and the planting, tending, and harvesting of the taro, determined the ordering of cooperative work and relationships between individuals and families within the community. This cooperation in turn was responsible for the obligations in the matter of work required of individuals and the right of individuals and families to a share in the products.

Finally, taro in its habit of growth established a biological prototype of the form in which heredity and relationship were conceived. The taro growth supplied one of the terms in which the family system of the civilization was framed: *'ohana*, meaning the dispersed biological family group as a whole. *'Oha* means a shoot or sucker from the base of a plant, but essentially and primarily was applied to the buds from the corm of the taro that were broken off and replanted by the gardener. With the substantive suffix added, *'oha-na* literally means 'offshoots,' or 'that which is composed of offshoots.' The family stock, then, budding and branching from parent stocks, was conceived of in terms of the habit of reproduction of the taro. [Handy and Handy 1972:76]

Waiāhole and Waikāne have a particularly rich history of taro cultivation, which is illustrated in Mr. Fukumitsu's testimony. The cultivation of taro is often complimented or accompanied by a host of other agricultural and infrastructural ventures. Taro *lo 'i* (irrigated taro patches or terraces) were fed by carefully engineered *'auwai*, or irrigation ditches. Additionally, methods of taro cultivation are at times partnered with fish farming and/or animal husbandry. Mr. Fukumitsu described taro cultivation in Waiāhole Valley by his great grandfather which involved extensive *'auwai* infrastructure and the use of buffaloes as plow animals.

Beachfront is where all the taro farmers used to have their buffaloes. Buffaloes to plow the fields. So my great grandfather would come over to Waiāhole, Waiāhole Valley, Waiāhole coastline, and walk the buffalo along the road back down to two valleys down in Hakipu'u to plow the fields and then walk the buffalo back. When I was young all over here had taro patches. There were ditches that came around Waiāhole School. The McCandless ditch and the ditch used to run around the school and then come back into the river. But it watered all the fields below. Right below the school [...] then another ditch below, right above the [Waiāhole] *poi* factory, that used to come along the road, two ditches used to feed the taro patches right here [...] All taro over here by the coastline.

Mr. Fukumitsu remains dedicated to reestablishing taro as not only a subsistence crop, but as a tool for education and sustainability. The Hawaiian Renaissance of the 1970s served to strengthen a sense of Hawaiian pride and reinvigorated all things Hawaiian, a trend that Mr. Fukumitsu has observed in the present. He chronicled taro's comeback in Hawai'i, elaborating on the tangible values associated with its cultivation:

Of course, taro has a long history [...] as time moves on it goes into sweet potato, then banana, then papayas, and so forth. And then tropicals. And now it's going back to taro because of the trends that's happening. The young people want to pound *poi* and they want to do taro. They want *aloha 'āina* [love of the land] and *mālama 'āina* [land stewardship].

Concepts such as *aloha 'āina* and *mālama 'āina* have been adapted into modern curriculum as educational tools for student learning. Beamer (2014) describes the aspects of an *aloha 'āina* curriculum saying:

The 'ike that can be transmitted by the 'āina is boundless [...] In these [*aloha 'āina*] programs, learners have the opportunity to practice servant leadership, service to community, and reconnection to 'āina in holistic ways that unify the physical, emotional, and spiritual aspects of being 'Ōiwi [native]. I believe that this reconnection of our people to the 'āina is powerful. [Beamer 2014:60]

In response to the increased interest and involvement of Hawai'i's youth in activities related to *aloha 'āina* and *malama 'āina*, Mr. Fukumitsu noted, "That's the great trends that is starting to drive the kids back to school, or stay in school, or there's more to school than just the classroom. It's a great encouragement."

"Our curriculum needs to be educating people about land, water, ocean," Mr. Fukumitsu said. This focus on the relationship among land, fresh water, and ocean (*'āina*, *wai*, and *kai*) was a sentiment repeated and emphasized by Mr. Fukumitsu. The holistic understanding of the synergy among land, water, and ocean is reflective of the Hawaiian cultural landscape. Maly (2001) elaborates on the significance of land, water, and ocean as well as sky within the Hawaiian consciousness.

In a traditional Hawaiian context, nature and culture are one and the same, there is no division between the two. The wealth and limitations of the land and ocean resources gave birth to, and shaped the Hawaiian world view. The *'āina* (land), *wai* (water), *kai* (ocean), and *lewa* (sky) were the foundation of life and the source of the spiritual relationship between people and their environs. [Maly 2001:1]

Mr. Fukumitsu recommended that the restoration of ancient taro fields in Waikāne be studied as a tool for overall health of the *ahupua'a*. Mr. Fukumitsu has spearheaded a project which would restore 26 acres of taro in Waikāne Nature Park. *Lo'i* can act as sedimentation ponds, cleaning water as it circulates through the *lo'i* and then back out into streams. Mr. Fukumitsu added that taro fields can aid in the revitalization of reef systems and capture silt runoff entering the Waiāhole *muliwai* (river mouth; delta). Mr. Fukumitsu explained that the currents at Waiāhole *muliwai* operate in a circular flow due to the reef's position. He related that these cyclical currents trap silt offshore "building a silt mound over the reef—suffocating the reef" and leading to a green or brown discoloration of the water. Mr. Fukumitsu expressed concern that increased runoff and sedimentation from potential development projects within Waikāne and Waiāhole could exacerbate conditions within Waiāhole *muliwai*. Mr. Fukumitsu believes ongoing restoration of *lo'i kalo makai* of the project area will help mitigate impacts of potential construction runoff associated with the project.

Mr. Fukumitsu discussed with CSH stories and naming practices associated with Waikāne and Waiāhole Ahupua'a.

This is the water of Kāne. [Symbolic] of Kāne himself. The ridge on top here Kānehoalani, [signifies] Kāne himself. So Kāne in general [is important to this area] [...] Kāne our icon [...] the mythical, [the] legends, and [the] history of Kāne himself, so this is the waters of Kāne. This is the resource Waiāhole, of the āholehole [*Kuhlia sandvicensis*] fish, of the generations of naming the place and they got names in this place [...]

Mr. Fukumitsu's account of the water of Kāne and the naming practices within Waikāne and Waiāhole are echoed in other accounts related to the *mo'olelo* of the area. Handy and Handy (1972) comment on the naming of Waiāhole and the history of the *ahupua'a*.

The ahupua'a of Waiāhole was named for the schools of āholehole [Young stage of the *āhole*, Hawaiian flagtail (*Kuhlia sandvicensis*)] that can be found in the brackish water where Waiāhole stream meets the sea.

When Kamapua'a, the pig demigod, ruled O'ahu, he gave all the lands whose names began with the word wai, meaning water, to a special group of kahuna known as the Lonoawohi. This gave the group a monopoly of the well-watered lands on O'ahu, so later Kahiki'ula and Kamapua'a's older brothers redistributed these lands. In the redistribution, the Lonoawohi kahuna were given the lands of Hakipu'u [...] and Waiāhole as well as the lands of Waimea and Pūpūkea in Ko'olau Loa. Kahekili, Kalanikūpule, and Kamehameha also confirmed these land titles (Kamakau 1961:231). [Handy and Handy 1972:453]

The waters of Kāne are also invoked in traditional accounts for Waikāne. According to Handy and Handy (1972), the *kahawai* (streams) of Waikāne Ahupua'a fed several *lo'i kalo*:

The ahupua'a of Waiakāne was named for the god Kāne because he dug for water here to benefit the people of Paliuli. Below the cliffs of Paliuli are the famous waters of Wai'oiolī and Wai'ololā [...]

An ali'i named Laka lived at Waiakāne. He was born in Kīpahulu, Maui, but ruled in Ko'olau Poko. His house was located at Hale'ula, Waiakāne. The famous Kapahu hōlua slide was situated behind Our Lady of Mt. Carmel Catholic Church.

Taro terraces were built along the Waiakāne stream. On the southern side of Waiakāne were more terraces, which were fed by the Waikē'eke'e stream. [Handy and Handy 1972:442]

Mr. Fukumitsu and CSH discussed the terrestrial and aquatic resources within Waikāne and Waiāhole Ahupua'a. Mr. Fukumitsu stated, "the northern portion of Kāne'ohe Bay is important for its coastline, fishery, and marine life." It was here that "Queen Kalama had two fisheries [...] From Kualoa park down to Waikāne pier," said Mr. Fukumitsu. The waters of northern Kāne'ohe Bay are known for an abundance of aquatic resources. Mr. Fukumitsu listed these resources in his testimony:

This is the brackish water where the 'ōpae [shrimp] and 'o'opu [Hawaiian freshwater goby], the mountain 'ōpae and 'o'opu come down and they spawn over

here. All the coastline fish spawn in these two places—these two rivers [pointing to the inlets where Waiāhole and Waikāne streams enter the ocean] [...] Everything spawns over here your *male* [young *uhu*; *Scaridae*], your *moi* [threadfish; *Polydactylus sexfilis*], *awa* [milkfish; *Chanos chanos*], your *pāpio* [infant stage of *ulua* or crevalle, jack, or pompano], the *‘ō‘io* [bonefish; *Albula vulpes*] [...] This is where their habitation is because the water is what draws them and keeps them here. If not, they will go down the coastline and look for the next sanctuary [...] there were a lot of ponds over here [...] That would be all stock ponds so like the baby *pua* [*i‘a*] [fish fry or spawn], the hatchlings would be—they could come in the ponds and hide from the predators—the tilapia [*Tilapia*], the *pāpio* and so forth. And at least have a chance to grow out and then head back into the ocean.

The area where Waiāhole and Waikāne streams discharge into Waiāhole *muliwai*, is an area of importance for rare aquatic species. Mr. Fukumitsu noted, “This is one of the rare places that has the *‘ōpae lōlō* (*Penaeus marginatus*) that you don’t find any place.” Mr. Fukumitsu says that at one time a thick expanse of vegetation, primarily *hau* (*Hibiscus tiliaceus*), used to serve as a hiding place for marine wildlife along the Waiāhole shoreline. Mr. Fukumitsu recalled gathering Samoan crab (*Scylla serrata*), oysters, and clams in the tidal zones of Northern Kāne‘ohe Bay. The word *‘ōlepe* is used in Hawaiian to describe many species of clams. *Pipi*, the Hawaiian name for oysters, and the Samoan crab were both introduced to Kāne‘ohe Bay as food resources in modern times. Mr. Fukumitsu believes restoration efforts directed at restoring the fishponds could help preserve this area as spawning grounds and a sanctuary for fish and invertebrate species.

Mr. Fukumitsu detailed the gathering practices he and his *‘ohana* employed in the *mauka* portions of Waikāne and Waiāhole. He described two rare *‘ōpae* species that dwell in the *mauka* streams of Waikāne and Waiāhole. “This *‘ōpae lōlō* you don’t find anyplace. It’s a long skinny *‘ōpae* of the most tastiest shrimp ever.” Additionally, “*Mauka* gets the cockroach *‘ōpae*,—the *‘ōpae kuahiwi* [...] This is one of the only place for that too.” Mr. Fukumitsu recalled his *‘ohana* once caught *‘o‘opu* by the ton, “like one-two ton a weekend.” *‘O‘opu* was eaten fried, raw, dried, grilled, or in soup. *‘Ōpae* was often fried, and usually eaten alongside *poi*. The shoots of bamboo and *hō‘i‘o* (a large native fern; *Diplazium* [*Athyrium*] *arnottii*) would be gathered and fashioned with vinegar, tomato, and onions served alongside the *‘ōpae* and *poi*. Mountain apples or *‘ōhi‘a ‘ai* (*Syzygium malaccense*), guava (*Psidium guajava*), *wī* (*Spondias dulcis*), and *māmaki* (*Pipturus albidus*) were collected from alongside the streams in the Waikāne and Waiāhole area.

Mr. Fukumitsu also partakes in the cultural practice of canoe building. Canoe building and the practice of voyaging were intimately linked to religious and cultural tradition as Hiroa (1964) explains:

Canoe building (*‘oihana wa‘a*) was conducted by skilled craftsmen (*kahuna kalai wa‘a*) who, in addition to being expert in designing and shaping the vessels, possessed a knowledge of the religious ceremonies to be observed at various stages of the work. The religious ritual consisted of offerings and chanted prayers addressed to the tutelary deities of the craft. The gods of the craft, as listed by Kamakau, were Kupulupulu and five other forms of Ku. [Hiroa 1964:254]

Mr. Fukumitsu uses the ancient practice of canoe building as a means to combat the proliferation of the invasive *Albizia* (*Falcataria moluccana*) trees. Mr. Fukumitsu harvests the

fast-growing, and notoriously unstable Albizia trees in Waiāhole, utilizing the wood for canoe construction. The harvesting of the Albizia wood by Mr. Fukumitsu has taken place in the area directly within and surrounding the current project area. He stated, “We cut the Albizia tree, haul them down the road and then carve them out at Waiāhole Beach park.”

Mr. Fukumitsu recommends that native plants be utilized whenever possible in reforestation efforts following clear cutting that occurs in the buffer zones of development projects. “[We] should be planting more *ulu* [breadfruit; *Artocarpus altilis*] after cutting down the Albizia. The popularity of *ulu* is on the rise, just as taro demand is,” Mr. Fukumitsu commented. He informed CSH that foods that occur locally and naturally within the Hawaiian environment should be propagated and planted as they possess a district’s “cultural value.” He also suggested establishing a seed bank that extends *mauka* to *makai* in order to retain access to native plant varieties.

Mr. Fukumitsu also made an explicit request that an area of bamboo patches *mauka* of the proposed location for the 0.2 MG Water Reservoir be left intact (Figure 32).

The significant part about this [area] is the bamboo. That they leave the bamboo as a hedge to keep the soil in place. So whatever construction they do over here they have to leave the bamboo, they have to leave at least a good portion of the bamboo [...] That one terrace off the road that is a no-no, they cannot go in there. They just cannot go in the bamboo patch.

The bamboo hedges, explained Mr. Fukumitsu, are planted on top of ancient taro terraces. These bamboo patches keep the soil in place and deter further erosion of the ancient taro terraces.

The notion of “stewardship” was touched upon throughout the interview. As a steward of the land, Mr. Fukumitsu is also an advocate for a holistic approach to conservation, one that preserves the intricate relationship among *‘āina*, *wai*, and *kai*. In describing himself as “a vessel to the heart of the land,” Mr. Fukumitsu concluded the interview by emphasizing the need to be ever mindful of how present actions may impact future generations.

On 19 February 2023, CSH met Mr. Fukumitsu at a community work day at the Waikāne Valley Nature Preserve on Waikāne Valley Road. Mr. Fukumitsu and other volunteers from the community meet once a month to restore and reestablish the *lo‘i* that were abundant in the area during traditional times. They also clean and clear the area of trash and invasive plants in preparation for their future plans which include reforesting the area with native trees and cultivating other food crops, as well as medicinal plants like aloe. Mr. Fukumitsu stated their master plan is to establish a nursery of diverse crops including different varieties of *kalo* which farmers could take with them and cultivate on their own farms. He pointed out that farmers in Waiāhole Valley must cultivate crops to qualify to lease their lots which are zoned for agricultural use. He noted some Waiāhole farmers have resorted to cultivating flowers so they can remain on their lots.

Mr. Fukumitsu noted water is an essential resource for farmers cultivating crops such as *kalo*. He noted the *lo‘i* receives water from the nearby river, as well as springs that spout from the ground during the rainy season when water is abundant. During the dry season, these springs disappear and it is a struggle to maintain the amounts of water for the *lo‘i*. He also pointed out that the *lo‘i* also help regulate flooding by receiving water coming down from *mauka* to *makai* on its way to Kāne‘ohe Bay.

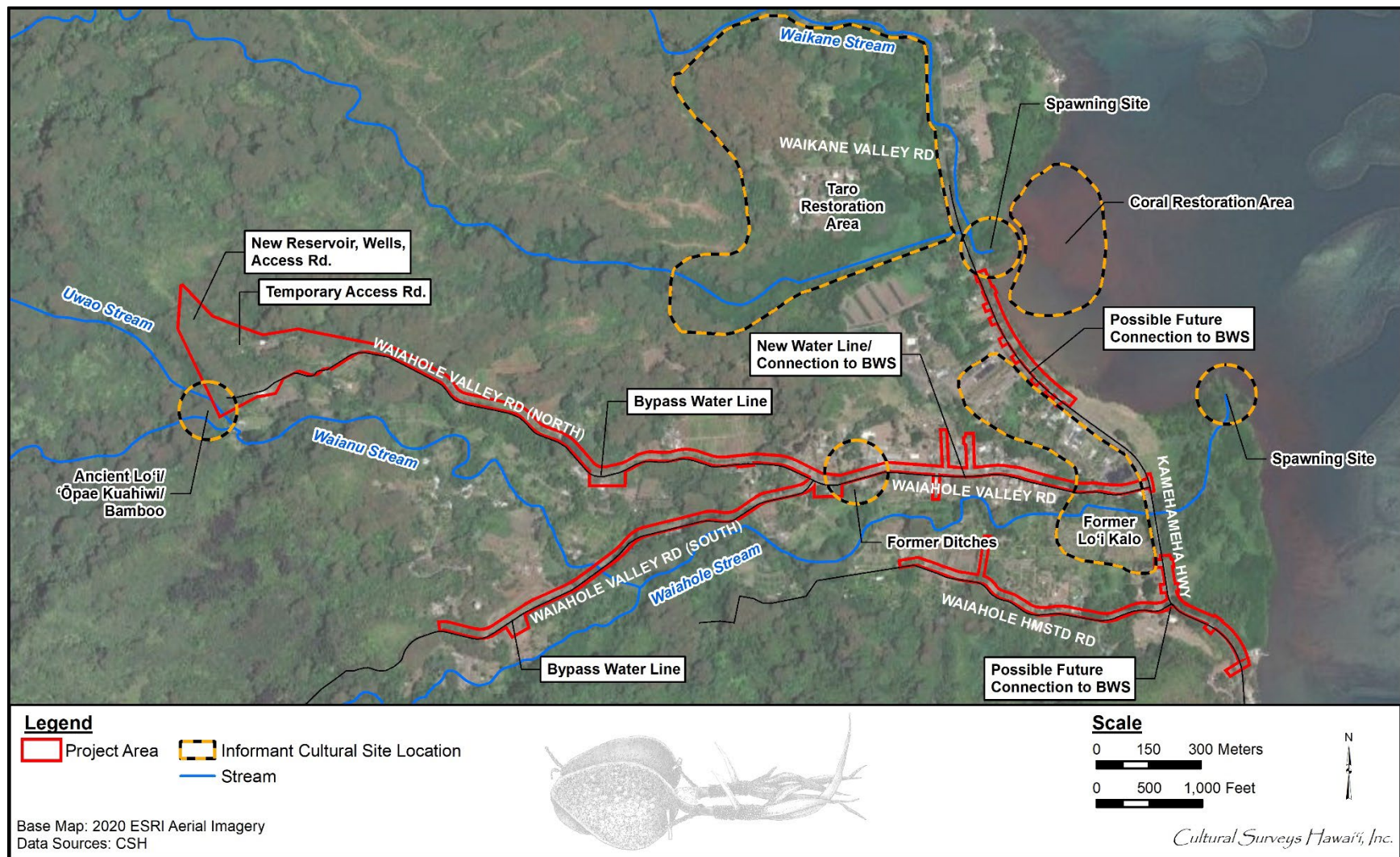


Figure 32. Cultural sites as described by Mr. Fukumitsu

Mr. Fukumitsu mentioned how the area has changed over the years including impacts to aquatic life he observed. He recalled that Kāneʻohe Bay and the nearby rivers were full of aquatic life. The coastline along Kāneʻohe Bay was full of fishermen and farmers, however, he noted that today, he does not see much fishing or farming along the coastline.

Mr. Fukumitsu also discussed the importance of proper land management. He mentioned the State of Hawai'i is the steward of 1.8 million acres of the King's land. He noted the state researched various forms of land management and determined the best system to manage those lands is the Ahupua'a and Konohiki system. He also mentioned the City and County of Honolulu purchased Kualoa and has been promoting conservation, preservation, and diversified agriculture.

Mr. Fukumitsu stated the two priorities of the government are providing affordable housing and promoting agriculture. He stressed the importance of balancing the needs of smaller local farmers who cultivate diverse crops for both food and economic reasons, against the needs of larger corporate farmers and the Agribusiness Development Corporation (ADC).

Mr. Fukumitsu opposes what is currently going on regarding water management. He stated he would like the BWS and the Planning Commission to reassess and reevaluate the amount of water that is available and the amount of water that is needed to provide for local communities and future developments on O'ahu. He wondered how much water will be needed to provide for future developments including the Kaka'ako Waterfront in Honolulu and a large subdivision in Kunia.

He believes there is not enough water. He stated that O'ahu is already experiencing impacts to its groundwater supply from contaminations following fuel releases at the Red Hill Bulk Fuel Storage Facility in Moanalua and Hālawā Ahupua'a. He noted the petroleum from those releases is leaching into the aquifer and contaminated water has been moving east, all the way to Hawai'i Kai.

He asked, "How much impact do they need before reassessment?" He emphasized that he does not want the BWS to touch the water until there is a reassessment. He would also like the Governor, Mayor, and the Planning Commission to get "back to the table" to discuss better ways they could regulate the water. He would like to see water prioritized more than profits. He would also like to see long-term solutions that will benefit future generations.

Mr. Fukumitsu pointed out there is "plenty freshwater" in the Waiāhole Tunnel that could be tapped to provide water for the communities of Waiāhole and Waikāne. He noted 35 mgd of water flows in the tunnel and 17 mgd of water flows into Waiāhole River. He suggested tapping the Waiāhole Tunnel instead of drilling wells to pump up groundwater from the aquifer. He noted that over time the wells will need to be drilled deeper and may eventually begin pumping up brackish and salt water. He asked, "Why destroy the aquifer?" He also asked, "Why do we need new tanks?" noting there is already a water tank in Kahana Ahupua'a.

7.1.2 Summary of Keoni Fox and Jan Becket Interview

On 10 July 2018 Mr. Jan Becket and Mr. Keoni Fox led CSH on a *huaka'i* (field trip) to cultural sites near and within the Kukuianiani Heiau complex. The *huaka'i* began at the residence of Mr. Keoni Fox off Kamehameha Highway in the *ahupua'a* of Waikāne.

Jan Becket, a retired Kamehameha Schools teacher, is a specialist in regards to knowledge of cultural sites throughout the island of O'ahu. As a photographer and author, Mr. Becket is well

recognized for his black-and-white photographic documentation of sacred sites. He has conducted extensive archival research on sites of cultural significance, learned from *kūpuna*, and photographed many undocumented sites on O'ahu, which resulted in a co-written book, *Pana O'ahu* (Becket and Singer 1999). He is a member of the Committee for the Preservation of Historic Sites and Properties under the O'ahu Council of Hawaiian Civic Clubs, and reports back to the chair of the committee (Shad Kāne) on issues concerning cultural sites in the Kona District of O'ahu.

Mr. Fox is a member of the Ko'olaupoko Hawaiian Civic Club, a cultural practitioner, and a steward of the Kukuianiani Heiau complex. Mr. Fox is recognized as a cultural descendent with familial ties to Kahana Valley of O'ahu and the Ka'ū District of Hawai'i Island. Mr. Fox inherited a parcel of land at the foot of the Kukuianiani Heiau complex in Waikāne Ahupua'a from his grandmother.

Kukuianiani Heiau is located just *mauka* of Mr. Fox's property and is positioned upon Pu'u Pueo. When Mr. Fox surveyed his land prior to constructing his home, he became aware of the state of disarray that Kukuianiani Heiau had fallen into. Mr. Fox began a journey of contacting numerous government agencies and community organizations in an effort to restore and protect the *heiau*, which is situated on a Honolulu County land parcel. After nearly ten years of negotiation and bureaucratic processes, Mr. Fox developed a preservation plan for Kukuianiani Heiau through the Adopt-A-Park program—an initiative of the Honolulu Department of Parks and Recreation. In partnership with Waikāne community groups, Mr. Fox feels it is part of his *kuleana* (responsibility) to *mālama* (take care of) and protect Kukuianiani Heiau. Mr. Becket recalled the first time he had visited Kukuianiani Heiau prior to early 2000s restoration efforts.

The first time I came here I went and spoke to Nephert next door. The old man Nephert because there was no one living here and we were trying to find out where the *heiau* was located and he led us to it. He said he had talked to an old man years ago and had been told that the *heiau* worked with a *heiau* down the coast—that the two worked together. And I have heard that before *heiau* working together. Like being paired with more distant structures and having a kind of ceremonial relationship.

The relationship between *heiau* that Mr. Becket speaks of is an idea further elaborated on by Valeri (1985) who writes about an interactive system in which temples and other sacred structures in old Hawai'i interact with one another, often contributing to a social hierarchy. Additionally, the association of multiple gods within a *heiau* complex is not uncommon, Mr. Becket commented.

It should also be recalled that the same function can be connected with different gods. For example, medical temples connected with Lono (Lonopuhā) or Kū (coupled with Hina) exist. In the same vein, Kāne and even Kū can be relevant to agriculture. Conversely, several functions may be linked to the same god. But a hierarchy of attributes exists for each god, and in my model I have considered only the principal functions of the major gods.

I must also mention that the lists of temples compiled by Thrum, Stokes, Bennett (concerning Kaua'i), and McAllister (concerning O'ahu) give the impression that another complicating factor is involved in the temple system. Some temples or

altars are linked both with a territorial segment and with the ali'i or priest who controls it. Control of an area thus seems to be exercised through control of the temple connected with it. This would, moreover, represent an extension to lower levels of the principle operative at the top of society, since, as we have seen, the king controls a district of an island by controlling its principal *luakini* [temple]. [Valeri 1985:186–187]

When asked by CSH if Mr. Fox's grandmother was aware of Kukuianiani Heiau's proximity when she bought the property he replied, "No, I don't think so." However, Mr. Fox added that when his grandmother did become aware of the *heiau*'s presence, she became concerned for the health and vitality of the sacred place, a sentiment he also shares stating, "living in such a sacred place comes with a lot of responsibility." Mr. Fox demonstrates a palpable devotion to Hawaiian culture and the preservation of cultural landscapes. Perhaps this is a result of his upbringing, which he described in the following terms:

My dad and mom were both raised by their grandparents so they were both raised in this old Hawaiian way. And both in very rural areas, Kahana Valley and Naalehu in Ka'u and they had very interesting experiences they tried to share with my sister and I growing up.

Mr. Fox recognizes the Kamaka 'ohana of Waikāne as one of the original landowners in Waikāne Valley, following the Māhele and the distribution of *kuleana* awards. Mr. Fox consulted the late Raymond Kamaka for guidance relating to taking care of the *heiau* and its origin.

I asked what the *heiau* was for and Uncle Raymond said it was a healing *heiau*. He did say that it was dedicated to Kū. Which I always thought was odd because we all get taught that Kū was this warrior god and this and that. But he said that Kū had a benevolent healing side as well and there's a lot of versions of Kū. Kūka'ilimoku is of course the war god everyone thinks of when they think of Kū but I think a lot of the *lā'au lapa'au* [herbal medicine], the healing, was a Kū entity as well. (3:38)

The multifaceted character of Kū, both deity of war and healing, is described by Valeri (1985) who writes:

We have seen, however, that Kū and his temples are not associated exclusively with war and that they also function to ensure the prosperity and fertility of the kingdom. In reality, war-for reasons I noted while studying the political system-is the necessary condition for all other activities. Consequently Kū, precisely because of his privileged relationship to war, contains *in potentia* all peaceful activities that are made possible by conquest and victory. Thus he can be invoked to ensure the fertility of women and the land, to 'stabilize' the kingdom and give it peace, to ward off disease, and so forth.

The correlation between war and the creative results that emerge from victory explains why Kū appears in two main forms, Kūka'ilimoku (or the equivalents, Kūho'one'enu'u, Kūkeolo'ewa, etc.) and Kūnuiākea. The first form is more properly associated with war, the second with its transcendence following victory (see below, part 3). Correlatively, there are temples associated primarily with

Kūkā'ilimoku (*hale o Kā'ili*) and those predominantly associated with Kūnuiākea (see the demonstration of this thesis in Valeri 1982b).[Valeri 1985:184]

Mr. Fox goes on to say, “One of their [the Kamaka] family members was the last *kahuna* [priest] of the *heiau*. And they have a picture of him and some history about him as well. He actually lived in Haikipu‘u so we are actually really close to the *ahupua‘a* boundary.” Because of the Kamaka’s deep and enduring relationship with the *‘ānia* (land) of Waikāne, Mr. Fox emphasized, “It was really important to have their [the Kamaka’s] blessing. And more importantly I wanted them to feel like they were always welcome to come to and practice their cultural up there. I always hoped to reconnect their family with the place [...]”

The practice of traditional Hawaiian activity is something that still occurs at Kukuianiani Heiau. Flowers and ti (*Cordyline fruticosa*) leaves are gathered at and around the *heiau* and displayed as offerings. Handy and Handy (1972) write that the ti leaf was used ceremonially including in the protection of persons and places from evil. When community or school groups come to visit Kukuianiani Heiau a series of rituals take place, Mr. Fox explained to CSH.

We *puli* [pray] down here we do an *oli* [chant] and then usually we have a certain project we want to do. Like we clear brush off the *heiau* or just pull weeds [...] We usually go up there for about two hours and then we usually feed them [...] We believe that the fellowship part of the stewardship is just as important as the actual physical work itself.

The fellowship gained through the sharing of food is an ancient Hawaiian notion Mary Pukui et al described saying, “Man felt closer to his fellow man when the *‘ōpū* (belly) was being filled” (Pukui et al. 1972:1). In Chun’s (2011) book *No Na Mamo*, the action of feasting following labor is also highlighted as a widespread and integral part of Hawaiian community relations.

[...] there is a common element that I find extremely intriguing about traditional communal labor, the sharing of food by feasting [...] As an act of gratitude, and perhaps of the sharing of one’s wealth, we find that community efforts in labor management often result in feasting. Feasting itself is a community event [...] [Chun 2001:268–269]

The practice of place naming in ancient Hawai‘i often came with stories or connotative values associated with Hawaiian etymology. The significance of the name Kukuianiani is described by Mr. Fox.

This name Kukuianiani means ‘shinning glimmering light’. It might have something to be with—there’s a big *pōhaku* [stone] that we will see and Jan [Becket] has photographed it, it has got these indentations I guess . . . that look like they were there to collect water. Other ones [people] that we brought up there thought that the water, since it doesn’t touch the ground, is really pure and that’s what they used for ceremony.

Pukui et al. (1976:122) list the literal translation of Kukuianiani as “flickering light.” The name of this *heiau* is also speculated to have to do with Kukuianiani’s “very commanding view” over most of the *makai* portion of the Ko‘olaupoko District and the glimmering light seen reflecting off the ocean water positioned below. Light has traditionally been associated with healing and

“because this was a place of glimmering light it was a place of very deep healing. A lot of people would come here for all types of healing,” added Mr. Fox.

Kukuianiani Heiau is believed to be a *heiau lapa'au* (healing temple). Kanahele (1986) describes the medical advances early Hawaiians achieved in association with the *heiau lapa'au*.

In general, Hawaiians had advanced higher in medical training and pharmacology than any other Polynesians. In 1951 Sir Peter Buck stated that ‘the Hawaiians were the only branch of the Polynesians who built special temples of healing termed *heiau lapa'au*.’ [...] ‘Again the Hawaiians were the only Polynesians who specialized in seeking the medicinal virtues of plants.’[...] In his opinion, by 1778 Hawaiians were so advanced in this subject that they were ‘on the threshold of the scientific investigation of disease.’ [Kanehele 1986:302]

Mr. Fox recognizes this legacy and expresses his interest in the use of native herbs for healing and medicine around the *heiau*: “A lot of times these healing *heiau* had an area where they grew those medicinal herbs and plants called a *māla* [garden]. That was kind of what the concept was with a lot of the plants growing around here was to allow them to have that purpose.”

While a portion of the knowledge related to traditional healing and the *māla lā'au lapa'au* (medicinal plant garden) has been lost, a revered part of this tradition continues today (Handy et al. 1976). Mr. Fox identifies noni (*Morinda citrifolia*), *kī* (ti), and *ha'uoi* or *ōwī* (*Stachytarpheta urticifolia*; vervain; purple porterweed) as plants he leaves in place because of their significance in healing practices (Figure 33, Figure 34, and Figure 35). Both *noni* and *kī* are listed by Abbott (1992) as two of the 12 plants most frequently listed in Hawaiian healing literature. *Noni* is associated with a certain type of *heiau* Mr. Becket added, “You don’t see it everywhere.” The healing traditions connected to *noni* are described by Abbott (1992) as follows:

Crushed or singed leaves were applied to bruises, boils, sores, and wounds. Bark of the stem was considered good for cuts, while juice extracted from the roots was recommended for skin eruptions. Immature fruit were mashed, mixed with salt, and applied as a counterirritant over bone breaks. Green fruit were also mashed and applied to the head in instances of concussion. A half-ripe fruit cut in half and laid upon a boil is reported to be effective in bringing the boil to a head. [Abbott 1992:99–100]

Likewise, the commonly recognized and endeared *kī* plant was cited to have been used in the following healing practices by Look et al. (2013):

In psychological and spiritual healing the *Kī* plant plays an important role [...] Treatment for shortness of breath/asthma (*nae, nae'oiku, nae hokale 'ano ohaohao*), *kī* flowers and leaf buds are mixed with other *lā'au*. For the illness *wela hou 'ole o ke kino* (absence of perspiration), *kī* leaves are wrapped about the head and chest (Abbott, 1992). [Look et al. 2013:7]

The introduced *ha'uoi* or *ōwī* plant is known by the name *haowi* by Mr. Fox and was used for broken bones, Mr. Becket added. The healing properties of *ha'uoi* or *ōwī* are described in the following terms, “In Hawai'i, vervain has been used to help heal infections such as staphylococcus:



Figure 33. *Kī* plants at Kukuianiani Heiau (CSH 2018)



Figure 34. *Ha'uoi* or *ōwī* plant at Kukuianiani Heiau (CSH 2018)



Figure 35. *Noni* tree at Kukuianiani Heiau (CSH 2018)

both teas and poultices were used in former times. The leaves have been used for cuts, bruises, and other uses” (Fahs 2015:51).

Mr. Fox discussed with CSH the current character of Kukuianiani Heiau. Mr. Fox said, “I don’t know if no one is hunting anymore or what but we have had a big problem with pig infestation lately, and they are not very scared. But anyway, they love hanging out back here.” When further questioned by CSH about what Mr. Fox planned to do regarding the pig infestation, he shared that this area has strong ties to Kamapua’a and that perhaps that is why the pigs are so drawn to this location saying, “maybe it is best to leave them alone.” Windward O’ahu is famous for *mo’olelo* of Kamapua’a—the half man, half pig demigod renowned for mischievous acts and masterful escapes for his thievery. *Mo’olelo* tell that Kamapua’a is the child of Hina and ‘Olopana (Kalākaua 1990:142). ‘Olopana rejected the child and named him Kamapua’a to signify it was a “hog child” or “child of a hog” (Kalākaua 1990:143). In the Hawaiian language newspaper *Ka Nūpepa Ku’oko’a*, an 1867 ethnographic study revealed that all lands containing the word *wai*, including Waikāne and Waiāhole, were given by Kamapua’a to the *kahuna* (*Ka Nūpepa Ku’oko’a*, 16 November 1867). This account signifies the strong tie Kamapua’a has to the Waikāne and Waiāhole area.

Mr. Fox led CSH on a guided tour of Kukuianiani Heiau. During this tour Mr. Fox related to CSH that a number of burials are located within and around the *heiau* complex. Mr. Fox recalled one instance when *iwi* (bones) became exposed necessitating himself and the Kamaka family to reintern the *iwi*. “We didn’t even know if they were human but we treated them as if they were. . . I think it was just from erosion,” Mr. Fox commented. The first feature identified as a burial during CSH’s tour of the *heiau* complex was covered by mounds of stone with a large stone set in the center of the feature (Figure 36). Mr. Fox noted, “We always thought this was a burial so we just gave it that kind of respect.”

The next feature Mr. Fox pointed out to CSH was a stone at a *makai* entrance point to the *heiau* (Figure 37). This stone has two distinct indented holes hypothesized by Mr. Fox to have held sacred water used to cleanse those entering the *heiau*. “It almost looks like an owl head,” Mr. Fox remarked. “That really does look like an owl face,” Mr. Becket added. During Mr. Becket’s first visit to Kukuianiani Heiau he had been informed about a *pueo* stone whose location was unknown. “There is a *pueo* stone around here that Nephert mentioned also and he wasn’t too sure where it was—this one stone—not here, but in the neighborhood.”

The *pueo* (owl) holds a district significance in Waikāne as the *wahi pana* (storied place) known as Pu’u Pueo is the very hill upon which Kukuianiani Heiau is constructed (Figure 38). Pu’u Pueo is the boundary point separating Waikāne Ahupua’a from Hakipu’u Ahupua’a and is translated by Pukui et al. (1976:205) to mean “owl hill.” The importance of boundary markers that delineated the limits of an *ahupua’a* is highlighted in the following text:

No person could cross the boundaries of the his ahupua’a to take anything. This being the case, it was important that the boundaries be well known [...]

Frequently the boundary was a ridge or a depression or a stream. But it might be the line of growth of a certain tree or herb or grass, or the home of a certain bird [...] Certain people were trained in knowledge of the different boundaries. This knowledge was passed on from generation to generation. In every community were



Figure 36. A burial site *makai* of the entrance to Kukuianiani Heiau (CSH 2018)



Figure 37. The indented stone at an entrance to Kukuianiani Heiau (CSH 2018)



Figure 38. Pu'u Pueo photographed from Kamehameha Highway in Waikāne (CSH 2018)

experts in the subject of the boundaries. When disputes arose, *or when a man was accused of trespass*, these experts were called in to settle the question. [Apple 1973:22]

Mr. Fox, Mr. Becket, and CSH observed the stones used in the construction of Kukuianiani Heiau prompting Mr. Fox to share, “The rocks are supposed to direct the energy toward a bigger purpose. A lot of people who were not raised that way don’t have the knowledge and think that the *heiau* is just the rocks—the area with the rocks.” Mr. Fox shared that the top terrace is all rock, but the middle terrace is dirt suggesting the possibility that rocks may have been taken from this area for development projects. “I wouldn’t be surprised,” Mr. Becket commented. Mr. Becket went on to suggest that stones from Kukuianiani Heiau could have been disassembled in the construction of Kamehameha Highway.

Another possibility is that there were bigger stones here and that they were taken in the 19th century or in the 1900s for road building [...] If there were stones here they would have taken them. Because their building a road and its right near the road so I think it’s a possibility.

Interspersed in the paved rock terraces and walls of Kukuianiani Heiau were pieces of branch coral (*Acropora florida*) (Figure 39 and Figure 40). “That’s branch coral,” Mr. Becket commented, possibly indicating “Kāne is some *heiau*.” Mr. Fox responded adding, “You don’t always see that in *heiau* but it definitely solidifies the fact that this was a religious site.” “Yeah, yeah, totally,” Mr. Becket concurred. Clues about the relationship between Kāne and coral can be studied through the Hawaiian lexicology. One word for coral in Hawaiian is *ko ‘a*. According to Valeri (1985), “*ko ‘a* shrines are under the tutelage of Kāneko‘a, a form of Kāne, a god of farming rather than that of Kū” (Valeri 1985:175). It is thus possible that the coral deposits observed in Kukuianiani Heiau are relics dedicated to a form of Kāne.

When Mr. Fox, Mr. Becket, and CSH reached the upper terrace of the *heiau*, a well-defined trail was pointed out by Mr. Fox (Figure 41). “At the top there is a trail. The trail kind of goes along the hillside here and it turns and wraps back into the valley. And at the end of this trail is another road called Haupoa Road and before the trail turns there’s an old cemetery over there—like a historic cemetery.” Mr. Fox elaborated on the *mauka-makai* relationship in the *ahupua‘a* and the role the trail would have played in allowing *mauka* populations to access the *heiau*. “The people in the back of the valley would probably come over here and pray. That is where all of the *lo‘i* are in the back of the valley. So that Waikāne stream is what fed the *lo‘is*.” Trails played an important role in traditional times allowing residents of an *ahupua‘a* to access resources *mauka* to *makai*. Maly (2001) explains,

The *ahupua‘a* within which the native Hawaiians lived, represented land divisions that were complete ecological and economic production systems [...] The natural cycles within the *ahupua‘a* were also the foundation of the Hawaiian family, social, political and religious structure, and it can be said that the Hawaiian culture itself, is rooted in the land. This concept is demonstrated in the Hawaiian saying—‘*He kalo kanu o ka ‘āina*,’ which translates literally as ‘A taro planted on the land.’

The saying has been used for generations, to describe someone who was a native of a particular land (Pukui 1983:1447).



Figure 39. Paved rock terraces and walls of Kukuianiani Heiau (CSH 2018)



Figure 40. Branch coral seen within stone terracing (CSH 2018)



Figure 41. A trail that commences at the upper portions of Kukuianiani Heiau (CSH 2018)

[...] In each *ahupua'a*—from mountain slopes to the ocean—the common people were generally allowed access to all of the various natural resources within a given *ahupua'a* (cf. Kamakau 1961, Boundary Commission Testimonies 1873-1890, and Handy, Handy, and Pukui 1972). [Maly 2001:4]

In Mr. Fox's discussion with CSH regarding his work as a steward of Kukuianiani Heiau, he made a point to add, "We try to respect his place in any way we can. We were really careful about where we built the house and what we do in the yard. We actually think of the property in the front as just an extension of the *heiau* and we give it that same level of respect."

In email correspondence with Mr. Becket he recalled the following piece of information pertaining to Waiāhole Ahupua'a during his childhood.

I did remember one piece of random information about Waiāhole, by the way. I used to go there with my parents for picnics when I was little, and I remember my father pointing out a chaulmoogra tree where we used to picnic. Those were planted in the 19th century for treating leprosy.

The oil of the chaulmoogra tree (*Hydnocarpus anthelmintica*) fruit was harvested for use as leprosy treatment in the nineteenth century. The following excerpt cites Waiāhole as a location utilized by the state for chaulmoogra propagation.

For the purpose of supplying chaulmoogra oil for the treatment of leprosy in the Territory of Hawaii, the Board of Agriculture and Forestry has recently established a plantation of three species of chaulmoogra oil producing trees on government land in the Waiahole Forest Reserve in the District of Koolaupoko, Oahu.

The planting out of the trees, with a spacing of 20 by 20 feet apart, was begun in December, 1921, and up to the end of March, 1922, 2,360 trees had been set out on an area of 22 acres. There are still on hand 640 trees which will cover an additional area of 6 acres, making the whole plantation 28 acres in area with a total stand of 3,000 trees. [Judd 1922:65]

7.1.3 Summary of John Reppun Interview

On 1 September 2022, CSH met with John L. Reppun, a Community Development Coordinator with the Kualoa-He'eia Ecumenical Youth (KEY) Project to discuss the CIA for the Waiāhole Valley Water System Improvements and Reservoir project and his *'ike* of the history of the *ahupua'a* of Waiāhole and Waikāne. Founded in 1968, the KEY Project's mission is to "nurture and promote the cultural, environmental, social, economic, and recreational well-being of the Kualoa-He'eia area by providing a vital grassroots civic resource that effectively serves the needs of our diverse multicultural community" (KEY Project 2021). The KEY Project serves "Ko'olau-He'eia families, from keiki [child] to kupuna [elder], through a variety of programs and services that we support in collaboration with our community" (KEY Project 2021).

Mr. Reppun was born on the island of Moloka'i where his father was a doctor. Originally from Latvia, his grandfather (also a doctor) was on assignment in the Ural Mountains in Russia when his family migrated to Hawai'i after the Russian revolution "over 100 years ago." After escaping across "Siberia to Vladivostok to Japan to Hawai'i," his grandmother "laid down the law and said, 'I'm never leaving firm ground again.'"

Mr. Reppun grew up in Kahalu'u and attended public school at Benjamin Parker in Kāne'ohe before going to Punahou School and heading off to college. While growing up, he saw all the changes that came at Hawai'i "like a freight train," following Statehood. He recalled "the sweeps of development" that occurred once Hawai'i became a state and investors came in and began developing subdivisions.

Mr. Reppun discussed the history of land ownership in Waiāhole and Waikāne. He noted Waiāhole is under the jurisdiction of the State of Hawai'i's HHFDC. Mr. Reppun shared that during the Waiāhole-Waikāne struggle when "evictions and other communities were being displaced by development," Governor George Ariyoshi "reached into the dwelling unit revolving fund, the primary source of funding for the housing branch of the State" and acquired the 600 acres in the valley. Mr. Reppun believes the original intent was probably to pass off management of Waiāhole to either Department of Agriculture (DOA), the Department of Land and Natural Resources (DLNR), or another entity "better suited to manage an ecosystem, an *ahupua'a* based community;" however, that "never came to pass."

Over the next 20 years, the community set about "redeveloping Waiāhole's infrastructure, trying to fashion long-term leases which are way more suitable for small rural family farming." These long-term leases "encourage people to plant trees and not just fast crops with pesticides and herbicides." The community is currently in the process of lease-rent renegotiations with HHFDC, however, Mr. Reppun pointed out that

HHFDC's mission is housing but it's not the valley's mission. The valley's mission is agricultural, cultural, environmental integrity. The valley's mission is about sustainability. The valley's mission is not captured with leasehold terminology. The valley's mission is about being here in perpetuity.

He emphasized that "we want to extend the ability of people to survive in these islands." He pointed out that "we are still 85-95% dependent on outside food."

Mr. Reppun stated he would "love to see us migrate from being under the housing branch." He believes "the housing branch could manage a portion of it," but he wants "to stretch what the housing branch thinks of in terms of housing." He stated,

While there is a need for certain kinds of housing in a place like Waiāhole-Waikāne, we don't need just one more tenant. There are some vacant lots that they (HHFDC) haven't given out yet. We don't just need one more residential tenant on a residential lot or one more ag[ricultural] tenant on an ag lot. Planning for use of any vacant lots should take into consideration the broader vision that should come from completion of a Strategic Plan for these valleys.

Mr. Reppun stated, "There's been all kinds of issues with the existing water system." He noted the "original reservoir was built at too low an elevation and does not adequately serve all of the valley without having to rely on booster pumps to push water up to highest elevations that leases exist on."

Mr. Reppun shared his thoughts regarding Option 1 (a BWS Compliant System) which involves the installation of a new water system that meets BWS standards. He said this option brings up fears that go back to the 1970s and 1980s when the community was battling against the BWS which was "taking water from one watershed to another into their island-wide system." Back then,

BWS was “sticking their straw wherever they possibly could to develop water to feed the system to meet their mandate to develop municipal water.”

Mr. Reppun stated that the BWS of today, led by Ernie Lau, Manager and Chief Engineer, and Barry Usagawa, Program Administrator for Water Resources, is more forward thinking. He noted “their planners today are looking at the whole island-wide system, whole ecosystems, the watersheds, the collection, everything.” Therefore, for Mr. Reppun, his “fear of the BWS managing a system like this” has “dissipated tremendously.” He added,

[...] I think that their whole approach to planning today is so far advanced, they’re one of the most advanced planning firms on O‘ahu or in the State or that matter. Where else do you get to have the head of a County water system, former head of the State Commission on Water Resource Management [CWRM] who understands allocation, collection, everything?

However, Mr. Reppun believes that “could change depending on who the Chief Engineer is.” He added, “I’m not afraid of building this to the BWS standards. In some ways that’s the smartest move because we may very well need to have that system be available to the BWS, especially in a pinch.”

Mr. Reppun noted Option 1 involves the construction of a “new reservoir, pumps, and all that,” as well as “replacing pipelines everywhere.” He stated that if he were HHFDC, he would “veer away from that, just because of the cost,” however, he also noted that “maybe now is the best time to redo the infrastructure system” and bring the system up to BWS standards, as well as City and County of Honolulu, State of Hawai‘i, and Federal Environmental Protection Agency (EPA) standards. He asked, “What better time to do it than when there’s infrastructure money (federal) out there?” If you have the means to “pull in the funds to do this,” you should “do it right away.” He imagined,

[...] 50 years from now, we’re going to be going, ‘Wow, thank goodness we took advantage of the availability of funds, the focus on the whole environment, and the ability to sort of set Waiāhole, Waikāne somewhat free to be more productive, more helpful, a better example of a sustainable *ahupua‘a*.’ We need these *ahupua‘a* all-around.

Mr. Reppun would like to see “planning that totally respects how an *ahupua‘a* works.” He would like to see a “whole system” which maintains optimal stream flows to feed *lo‘i* along the stream, as well as into the estuary to feed the fishery and fishponds.

Mr. Reppun stated that HHFDC is “not attuned to promoting *ahupua‘a* restoration and what comes with it” including “more of a reverence for food, food security, [and] the environment.” He also noted that HHFDC is not doing anything to manage the “sizeable area across the top of this agricultural and residential lot subdivision that is in the conservation area.”

He pointed out that portions of the project area are located in the critical interface between the agriculturally zoned lands and the conservation zoned lands. He emphasized that the community “live[s] around the arteries that feed the ecosystem” and “their very existence needs to be accomplished without negative impacts on those arteries, without negative impacts on the estuaries.”

Mr. Reppun discussed the importance of watershed management. He explained how the watershed system consists of “sponges” and “filters.” He stated,

The Ko‘olaus are the sponges. Collecting water. Water trickling down, maybe takes 20 years, 40 years before it reaches down to the aquifer below but it’s an amazing collection system. This mountain range that is riddled with dykes of hard rock with porous rock storage compartments in between. Water percolates down, filters down. Best water anywhere, filters down, comes out as waterfalls. *Pukas* [comes] out as springs, comes out through groundwater flow, ends up in the estuaries, feeds the estuaries where you got a mixing of freshwater and salt water – the brackish environment where fish breed, protected. That’s why there’s so many fishponds here, so many fishponds in embayments like Pearl Harbor – (of course polluted like anything in Pearl Harbor) fishponds around places like Kaiaka Bay, Kahana Bay, Class AA waters that the Department of Health is partially responsible for, therefore they sit on the State water commission.

He emphasized that these “incredible systems and sets of rules and regulations” including environmental laws are really trying to “preserve the culture of environment, the culture that goes along with a well stewarded ecosystem. That’s where culture begins.”

Mr. Reppun stressed that HHFDC cannot be the “only entity that has a say in Waiāhole.” He believes “it’s a cultural problem when you don’t have everybody at the table.” He wondered why HHFDC is “taking on the entire burden” and why they are not asking how other stakeholders such as the Department of Hawaiian Home Lands (DHHL), Division of Forestry and Wildlife (DOFAW) of DLNR, Agribusiness Development Corporation (ADC), and the Department of Education (DOE) can help.

Mr. Reppun suggested that rather than building a whole new system, they should tap into the development tunnels that feed the Waiāhole Ditch. Located at the “700-800 foot elevation,” the Waiāhole Ditch brings water “from Kahana all the way through the Ko‘olaus and then goes to Waiawa.” He pointed out that, “no matter which way water is allocated there is water flowing in the ditch all the time [...] and either it goes right, or it goes left, either it goes Leeward, it goes Windward, or both, but it’s always flowing from Kahana to the Waiāhole end of the tunnel system.” He noted they (the community) have been “wildly successful in bringing water back to the Windward side.”

Mr. Reppun and his brothers have also discussed this approach with HHFDC as well as ADC and the State’s Energy Division, all of which are housed within the Department of Business, Economic Development, Tourism (DBEDT).

Mr. Reppun believes “we have to look at these 100-plus-year-old systems with a different perspective.” He reiterated that they would “like to look at the water system from a very different point of view. They would like a system that is far more sustainable and not electrically dependent, however, if electrical dependence is required or needed, the electricity should be generated locally.” He believes the state must also look at distributed energy. He suggested a combination of tapping water from upper elevations to get the right pressure and to fill up a reservoir, but also using the water to produce hydroelectric power.

Mr. Reppun also stated the proposed project needs to be looked at with “an eye to climate change adaptation.” He recalled observing the impacts of severe flooding while growing up in nearby Kahalu‘u during the 1960s. He stated,

Everything you see here (reference to site of the interview – KEY Project/Kahalu‘u-Waihe‘e-Ka‘alaea) was under water. Hygienic Store, like 5-6 feet under water. And I remember that as a kid, I was like somewhere between 13-16 years old, up on the hill over there (Mā‘eli‘eli Ridge/Lulani Street) watching it as the flooding happened. Waters came up, went over top bridges, house came down the river, cows, cars floating in Kāne‘ohe Bay; people getting rescued out of cars floating in the intersection of Kamehameha Highway by Hygienic Store.

That event had a tremendous influence on him. He stated that “what we saw happening is what can happen,” noting, “that kind of flooding that could happen anytime, anywhere with the right cloud burst, [and] more so with climate change.” He stressed the importance of consulting Flood Insurance Rate Maps (FIRM) which were “drawn basically from the aerial photographs of those events that showed where flooding occurred.” In his capacity at KEY and on the Neighborhood Board, he has fought to keep development out of these very environmentally sensitive areas and is “still battling developments that are down in the flood plains.”

He noted climate change intensifies the potential for and frequencies of these storms. He stated,

[We’ve] been through so many storms in Waiāhole in my 40 years of living there, 50 years, 40 years, we’ve kind of seen it all. We’ve seen the river come up and down, we’ve seen trees come down send the stream this way, that way. We’ve cut our way in, we’ve cut our way out, and we’re still there.

Mr. Reppun stressed that the system HHFDC might install has to be climate resilient. He stated,

We have to look at what happens when we become isolated from one another, we have to look at our beautiful, sunny, calm valleys as if we got hit by a hurricane like Puerto Rico got hit. All systems are down. Where is our energy going to come from? Where is our water going to come from? Where is our food going to come from? How are we going to store it? What kind of refrigeration? And power to run it? All of that.

Mr. Reppun stated that “if the system (as currently built) is not working, it impacts us.” He pointed out that sometimes the system “will go down for days if they can’t figure out the problem.” He explained the existing pumps are powered through aerial lines coming from Ka‘alaea and when an Albizia limb falls on a line or a line bursts, the power goes out. He also recalled a major flooding event in 2019 or 2020 when “the river way up *mauka* jumped out of its banks and boulders, everything, smashed through the pump system, [and] destroyed the road that had access to the pump system.” This cost HHFDC “2-3 million dollars.”

He suggested “cutting Albizia trees and managing the watershed would reduce the potential for impacts on that pump station.” He also wondered if “hydroelectric power could run that pump station instead of aerial lines.” He believes that if hydroelectric power can be developed, it could “power all of the valley, maybe even beyond.” One person told him “it could power everything from Kahalu‘u to Kualoa.”

On their farm in Waiāhole, Mr. Reppun and his brothers, Paul and Charlie, use distributed energy sources including hydroelectric power and photovoltaics to ensure they still have power when there is an outage in the area. He also shared he

[...] installed a little tank up the hill, 500 gallon tank up the hill, so when I have water pressure, I can pump up into the tank. and then I have a downhill run that feeds my house, so if I flush a toilet, turn on a sink, I take a shower, I'm dropping the tank, a toilet flow valve opens and so the tank is constantly flushing, high pressure coming in, low pressure coming down to my house.

He also recommended that “we could reduce our footprint in so many ways. Whether it's water, electricity, what not.”

Every house could be catching water on their roof and put it into one of those totes that the BWS is offering out to the community for non-potable use, to flush a toilet. Even though we've got abundant water in Waiāhole, nonetheless, we could be operating off of less.

He also stated, “Every farm should not only be producing food for the community, for sale, but for their families. That's a part of the culture too. Abundance starts with feeding your family and then sharing and trading and what not, bartering, whatever.”

He also pointed out that during the pandemic, the community has been “getting back to a more culturally appropriate food growing and distribution system.” With funding from the CARES Act, non-profits have been able to purchase food from small farmers which they distribute to the community through food hubs. Mr. Reppun believes “ancient Hawai'i would be kind of proud of how resilient the communities were during this time.”

Mr. Reppun mentioned “there's been a real movement to get people back in the *lo'i*.” He recalled during the Waiāhole-Waikāne “water battles” in the late '90s and early 2000s, “there was this real hunger from the next generation wanting to get out and learn about taro growing.”

For the last 40 years, Mr. Reppun and his brothers have been cultivating wetland taro at their farm among other crops. They are “three *haole* (foreign) guys farming taro” that grew up “in the community surrounded by these other ethnicities, Hawaiian, Okinawan, Chinese, and what not,” and went to battle with “BWS here in Waihe'e with those other ethnicities and succeeding somewhat.”

Mr. Reppun would like to see a celebration of all “the cultures that have met in the *lo'i*.” He emphasized “there's a whole mix of ethnicities that have been in the *lo'i*.” After the turn of the last century, when the pineapple and sugar industries swept through the communities on the Windward side of O'ahu, from Waimānalo to Kahuku, and Hawaiian families were stepping into the “fast lane” and leaving their *lo'i* behind, it was Asian workers, especially Okinawan families, who came to Hawai'i to work on the plantations that continued farming taro in places like Waihe'e, Hakipu'u, Waikāne, and Waiāhole. He recalled that during the “Waiāhole-Waikāne water struggle,” the late Marion Kelly, former professor of Ethnic Studies at the University of Hawai'i, said to him, “Why are you looking for your expertise in the water case in the Hawaiians families? They left the *lo'i* behind.” She let them know of wetland cultivation of taro as an agricultural practice in Okinawa.

He emphasized that this intersection of cultures connected through their rural agrarian roots only deepens the history of Hawai'i by adding layers and augmenting "what was understood in ancient times."

Mr. Reppun emphasized that farming taro is a "great cultural practice. That's where it begins. Right there at the food level." He and his brothers started a *poi* (the Hawaiian staff of life, made from cooked taro corms) factory on their farm where they make *poi* every week. Initially, they started off pounding *poi* by hand before using an old taro grinder that his brother David fixed up. It ran off the power take-off on the farm tractor. He recalled learning that before corporate companies began making *poi*, there "used to be *poi* factories all over the place." There were "little *poi* factories," similar to the way that "little beer breweries" existed prior to the war when people "gathered up all the metal to be made it into bombs and what not."

He mentioned taro farming and *poi* production is returning to "small operations that are driven more by the communities, the families in those communities." He stressed that "good business for a taro farmer is the person who buys *poi* every week. Steady. It's a part of their diet. It's a part of their culture."

He also discussed the work of Kāko'o 'Ōiwi, located on "the *mauka* side of the bridge in He'eia."

Kāko'o 'Ōiwi is a community-based non-profit organization based in the *ahupua'a* of He'eia, moku of Ko'olaupoko, island of O'ahu. With the support of the local community, Kāko'o 'Ōiwi continues to implement Māhūahua 'Ai o Hoi (Regrowing the Fruit of Hoi), a long-range project to restore agricultural and ecological productivity to nearly 405 acres within the wetlands of He'eia. Through our cultural, educational and ecosystem restoration programs, Kāko'o 'Ōiwi is promoting the social and economic advancement of the local community. [Kāko'o 'Ōiwi 2022]

Following a land battle "to push Bishop Estate and development and golf courses back," they managed to get the land "back into the hands of the state." Since being established in 2006, Kāko'o 'Ōiwi has "produced over 50,000 pounds of kalo and poi" and in 2020, they established a "Poi Mill" (Kāko'o 'Ōiwi 2022).

Mr. Reppun noted that "in ancient times, an *ahupua'a* was pretty much self-sufficient." He added, "[...] an *ahupua'a* was a unit, *mauka* to *makai* [toward the sea], and in Kāne'ohe Bay area, including Waiāhole, Waikāne, Hakipu'u, Kualoa, from the summit, not just to the shoreline, but out to the edge of the bay, therefore bordering on the deep sea."

He stated that their goal as a community is to "reestablish a system like that." He stated, "whatever we do here needs to not just accomplish an infrastructure improvement. It needs to also help us to celebrate the resurgence of [a] culturally based approach to living in an *ahupua'a*."

Traditionally, Waiāhole and Waikāne *ahupua'a* were "very sacred lands." This area was "the training ground for the *kahuna* [priest] class. The intelligentsia, the masters." Mr. Reppun noted, "if it was today, it would be the Master's programs, Ph.D. programs in any culture." This is also the area where the *ali'i* (royalty) were trained. These lands were rich and productive. "They're rich in water. They're rich in forest resources. Coming down, descending down to an estuary, the north end of Kāne'ohe Bay, part of that estuary, the fishponds, the *lo'i*, very productive area."

He mentioned there were *lo 'i* and *kuleana* (Native land rights) parcels located along the streams and into the valley. He asked, "How does this project impact the potential for restoring cultivation up into that area? Whether it's taro or it's *māmaki* (*Pipturus* spp.) for tea. All those kinds of things."

This area is also "where some of the first navigators arrived." He pointed out "this is why the Hōkūle'a launched from Kualoa" and "why it returns to Kualoa."

He also asked,

How do we make sure that in addition to cultivating food products, we're going back to the real tradition of the '*wai*' lands? That intelligentsia. We're going back to the knowledge of the *kahuna* class. We're cultivating those that are educated in those fields that ensure that our community will be resilient forever.

Mr. Reppun asked if the proposed project is "the best use of this land?" He pointed out that the site for the proposed 365 Reservoir (Lot 50) is located on the ridge bordering the Waiāhole and Waikāne *ahupua'a*. He shared that it's an area that has "some of the most cultural relevance." He noted *heiau* have been built on areas with "vantage points for being able to see the ecosystem." He believes this could potentially be "one of those sites."

He suggested Lot 50 could be a great location for "a cultural center, a *piko* [center], place where we could celebrate the ancient history." The site could also serve as an emergency shelter.

In reference to vacant, undeveloped lots such as this, he insists "we need uses of those spaces that contribute to the bigger community picture." For example, he stated,

[...] say they took one of those vacant residential lots and maybe it's close to the school, there's a 10-acre parcel right behind the school that'd be kind of ideal for that, an ag lot, but also residential lots there, say we built some housing for students, I'm talking about interns who would come from say School of Business, College of Tropical Agriculture and Human Resources, Department of Urban and Regional Planning, and the interns be cycling through forever. So, they would come out, maybe they're doing their fieldwork, maybe it's the medical field and we're talking about blue zones, healthier approach to living. But cycling through education. So the kids coming up through Waiāhole School and going to UH [University of Hawai'i] system and coming back.

He added, "[...] if we have places for students to stay, places for planners to reside, teachers, professors to do their sabbaticals. So that's constantly cycling through the community. The community will be enriched ten-fold."

He continued, "Let's not just build a solution to the water supply. Let's build a classroom. Let's build an outpost. Let's build a satellite. That's what's needed." He also stated "any kid growing up and going to Waiāhole School should be well rounded in watershed stewardship, sustainability, food security 101. Every kid from kindergarten on up should know 'Where did your food come from today? Where did your water come from today? Where did your power come from today?'" He stressed, "if we're not educating kids to survive in this world, doesn't matter if they become doctors, lawyers, if they don't understand the system by which we live, which is the *ahupua'a*, which is the culture, we're not doing our job." He pointed out that "if [Waiāhole] school itself is

an emergency shelter, it's going to stop bemoaning the fact that they're a small school and the weighted school formula isn't enough to keep the school going."

He also discussed one of their projects on an open space lot, Lot 79, in Waiāhole. He recalled,

We got permission from the guy who had previously had that lot and we went up there and we dug up Albizia trees whole, we cleared back the *hau* [*Hibiscus tiliaceus*] jungle that had encroached on that area. It's a common area for all lessees in the valley and we put those *lo 'i* back into production. Ten years that went on and it was a tremendous program. [...] That was one of the best unfunded programs. The organization would simply just show up every Wednesday, dive into the *lo 'i*, work, if there's taro to be harvested, weigh it from the scale hanging from the *hau* bush, take some home, divvy it up amongst everybody. It was amazing. People who came through there were classes from Waiāhole, classes from all over the island, people who were wanting to know more about culture, people who were wanting to relearn what it's like to be in an *'āina* [land]-based education. Judges, visiting professors from North Vietnam, who knows.

He emphasized,

Culture is based on how you live. You can try to go back and look for the remnants of the artifacts, the adze here, the stone there, the pile of rocks there, that's not culture, culture is actually going back and living that way and so that was what was happening. Practicing it and relearning it. It's a lexicon that so many cultures have lost over time. By relearning, by getting in there and you know, don't have the benefit of 1,000 years of observation but maybe ten years helps. It's a start. So that was kind of the theory.

Mr. Reppun also shared several referrals to other community members who are very knowledgeable of the historic and cultural significance of Waiāhole and Waikāne. He suggested speaking with John and Martin Charlot who lived in the vicinity of Lot 50; Liko Hoe who runs the Waiāhole Poi Factory and is a professor at Windward Community College; Hawaiian Civic Clubs including Mahealani Cypher, Secretary of the Ko'olau Foundation; Dr. Lilikalā Kame'eleihiwa, Senior Professor at University of Hawai'i at Mānoa's Kamakakūokalani Center for Hawaiian Studies; Cy Bridges, *kuma hula* (dance teacher) and Cultural Director at Polynesian Cultural Center; Mary Kupau, *kuma hula*; and *kama 'āina* of Waiāhole, Ryan Ringuette, Rainbow Uli'i, and Kaua Fiola.

7.1.4 Summary of Ryan Ringuette, Todd Melton, Justin Saito, and Lawrence Uyemura Interview

On 13 October 2022, CSH met with Ryan Ringuette, Todd Melton, Justin Saito, and Lawrence Uyemura, farmers from Waiāhole Valley and members of the Waiāhole-Waikāne Community Association's Hui Wai Ola (Water) Committee. The meeting was held at Mr. Uyemura's home in Waiāhole to discuss the CIA for the Waiāhole Valley Water System Improvements and Reservoir project and to acknowledge and discuss their concerns relating to the availability of water in the *ahupua'a* of Waiāhole and Waikāne. CSH was unable to attain authorization to include Mr. Ringuette and Mr. Saito's comments in the time allotted.

Mr. Uyemura described the importance of water to Hawaiians in traditional times. He stated that water was used for drinking and irrigating their *lo'i* where they grew *kalo*, one of their main sources of food. This water came from springs and rivers which fed the numerous *'auwai* that distributed water to the people. He noted that Hawaiians living in the vicinity of the North Fork of Waiāhole Valley Road received water from springs while Hawaiians living near Waiāhole Homestead Road received water from *'auwai*.

Mr. Uyemura also discussed the importance of water to Hawai'i's economy when the main industries were growing sugar and pineapple. He pointed out that sugar and pineapple were not ideal crops for valleys like Waiāhole and Waikāne. They grew best in flat lands like areas on the leeward side of O'ahu. To provide water to these areas, Lincoln McCandless created the Waiāhole Water Company and Waikāne Water Company to develop the Waiāhole Ditch and Tunnel system which was located at the 700 ft elevation and spanned from Kahana to Waiāhole. Every day, the tunnel system sent 120 mgd of water through the Ko'olau mountains to a large reservoir located in Kunia on the leeward side of O'ahu. The Waiāhole Ditch and Tunnel system was originally managed by the Waiāhole Water Company until the Oahu Sugar Company took over management. It is currently managed by the ADC which is a part of the State Department of Agriculture.

Mr. Uyemura stated that "everything disappeared" after the construction of the Waiāhole Ditch and Tunnel System. He recalled observing springs disappear and water levels in rivers decrease drastically noting that water levels in rivers used to be deep enough that people could jump off bridges into the water.

Mr. Uyemura stated that McCandless was concerned he had violated the law by taking the water so he created the McCandless Water System to provide water for the farmers and residents of Waiāhole. McCandless signed a resolution stating that water belongs to the people and promised to give back no less than 500,000 gd of water for the residents and farmers of Waiāhole. McCandless also assisted Waiāhole's farmers by taking their crops to sell in Honolulu.

However, Mr. Uyemura also discussed how McCandless acquired his land by leasing it from the Hawaiians who lived there and then claimed the land after paying the land taxes. After claiming the land, McCandless began leasing the land to immigrant farmers forcing Hawaiians to move to Hakipu'u. Mr. Uyemura noted that many Hawaiian families from Waiāhole and Waikāne also moved to Hakipu'u following the construction of the Waiāhole Ditch and Tunnel system due to the lack of water.

Mr. Uyemura mentioned that in the 1950s, the State BWS provided potable water for Waiāhole residents from Kamehameha Highway to Waiāhole Elementary School. Mr. Uyemura noted BWS has also been sending potable water from windward O'ahu areas such as Punalu'u, Kahana, and Ka'alaea to other communities as far away as Waimānalo, Hawai'i Kai, and Kapahulu.

Mr. Uyemura noted that in the 1970s, as the sugar industry was in decline and companies were leaving Hawai'i for places like Mexico due to the cheaper labor costs, construction and development, as well as tourism, became more important to Hawai'i's economy. He recalled developers had attempted to rezone the agricultural lands in Waiāhole and Waikāne and planned to construct 3,000 homes.

In the 1980s, HHFDC purchased large amounts of land in Waiāhole from the McCandless Estate and began leasing it to farmers. HHFDC also constructed a 1-million-gallon reservoir in

Waiāhole, however, the reservoir was constructed of metal and had a number of issues including leaks.

Mr. Uyemura stated that following a court case, a judge ruled that of the 27 mgd of water that is sent to the leeward side, about half, 12 mgd, would be diverted to the windward side to be divided among Waiāhole, Waikāne, Kahana, and Hakipu'u and 13 mgd would continue to go to the leeward side to be managed by the ADC.

In 2017, HHFDC proposed building a new reservoir and pump system in the lot at the top of Waiahole Valley Road North Fork. Mr. Uyemura supports the construction of a new reservoir if it is not made of metal, however, he strongly disagrees with using a pump system to pull up water from underground. He noted that if the pumps are pulling up water from a depth lower than the river, it may cause the river to dry up. He also discussed the possibility that pumps may begin pulling up brackish or salt water.

Mr. Uyemura suggests tapping the water from the Uwao development tunnel and using gravity flow to send the water from the tunnel to the new reservoir. He believes tapping the water from the tunnel would be a "benefit for everybody." He would like this new water system to be owned and managed by the HHFDC. He noted the Waiāhole-Uwao tunnel produces 3 mgd of water every day and if the community only uses 1 mgd there is an excess of 2 mgd which HHFDC could sell to the BWS. He also mentioned that the tunnel may produce up to 11 mgd which would mean an excess of 10 mgd which could be sold to BWS. He stated, "Hook it up for the reservoir they want to put, [the water] goes into our system or just put one bigger line they can run it to the Board of Water Supply, [and] sell it to them."

He believes other communities could also benefit from water tapped from the tunnel. He noted the water management system in the Salt Lake and Pearl Harbor area is bad. He stated, "They can reverse [the water] from Honolulu. Reverse the water going towards Salt Lake, Pearl Harbor way and then this water would supply the Honolulu area."

He also suggests using the water that is flowing from the tunnel to the new reservoir to generate hydroelectric power which could be used by the community or sold to other communities. He also suggested HHFDC build a road that goes "all the way up to the tunnel." He noted that although it "may cost plenty money" to fix the road, the HHFDC could make the money back by selling the excess water from the tunnel to the BWS.

The McCandless System is still heavily relied on by many farmers, as well as residential owners in the valley. Mr. Uyemura stated that the McCandless System provides free non-potable water to farmers and residents of the valley while potable water is provided by the HHFDC for a fee. He noted the farmers have been maintaining the McCandless System since before he moved to Waiāhole in the 1960s. He recalled that every time it rained, the water coming out of the pipes would be dirty. After the rain stopped, he would go up and clear the debris that piled up on the intake because if he did not clean the system, the next morning they would not have water.

Mr. Uyemura also mentioned that when he went up to clean the intake after it rained, he would also catch 'o 'opu and prawns in Waianu Stream. He recalled,

[...] we used to make traps when the water flows a lot and then when it gets summertime it goes down, we go with the flashlight and the spear, and we used to

catch them. But now because they get the three million gallons flowing out of the tunnel, we only can use the trap, hard to see, the water is flowing plenty now.

Mr. Uyemura also mentioned there were *lo'i* and banana trees in the area near Waianu and Uwao streams past the end of the north branch of Waiāhole Valley Road. He noted, "The banana trees that they had up there is what they call Bluefield bananas, and they were like big bunches."

The home of the Charlot family is located near the top of the north branch of Waiāhole Valley Road in the vicinity of the proposed reservoir. Mr. Uyemura pointed out, "When you go where the overflow box stay, you go up that hill, the first house right there, that's Martin Charlot, then the next house, little bit more in, that's the brother, John Charlot."

Mr. Uyemura noted that Martin Charlot is also a famous artist. He painted a mural in the McDonalds in Kāne'ohe which featured *kama'āina* from Waiāhole, including Mr. Uyemura.

Mr. Uyemura also recalled hunting in the mountains between Waiāhole and Kahana. He mentioned there were several trails in the area. He described one trail that crossed over Waianu Stream and went to the end of the south branch of Waiāhole Valley Road before continuing to Ka'alaea. He also mentioned another trail that goes from Uwao Stream to Waikāne and continues into Kahana. This trail continues over Kahana and over the top of the Ko'olau Mountain Range to Wahiawa. He noted, "The trail that goes up from Waikāne can go all the way down to Kahuku side, it goes out on the top of Punalu'u, it can go down, we used go on the top of that part." He noted the trails were also used by the military, so they were well maintained.

Mr. Uyemura noted that traditionally, the area from Waiāhole to Hakipu'u was a spiritual place. He noted that Hawaiians believed in 'Io which is God, the creator. He also pointed out his interpretation of the spiritual nature of the names Waiāhole and Waikāne. He explained that Waiāhole is also known as "Waiholo," a combination of the words "*wai* (water)" and "holo." He explained, "*Wai* is the water. Holy is something that is good [...] *Wai* is good. Good water." Therefore, the name "Waiholo" means "holy water." He also explained the name Waikāne is a combination of the words "*wai*" and "Kāne." He explained, "Kāne is God and the water is God. Waikāne. That's the pure water."

Mr. Uyemura explained that Waiāhole is named after the *āholehole* (young stage of the *āhole*, Hawaiian flagtail, *Kuhlia sandvicensis*) which swims up stream into the mountain. He added,

[...] it's not only that fish that goes up there. The mullets go up there, they have other different kinds. They even said that some of the *weke* [certain species of the *Mullidae*, surmullets or goatfish] go up in the valley. They have a couple of different kinds of fish that go up into the valley. But right now, it's mostly the *āholehole* and the mullets.

Mr. Uyemura expressed concern regarding the decreasing number of freshwater springs that seep into the ocean where it mixes with saltwater to create brackish water. He stated the '*auwai* that provided water to many of the lots in the valley were fed with water from freshwater springs.

Section 8 Traditional Cultural Practices

Timothy R. Pauketat succinctly describes the importance of traditions, especially in regards to the active manifestation of one's culture or aspects thereof. According to Pauketat,

People have always had traditions, practiced traditions, resisted traditions, or created traditions [...] Power, plurality, and human agency are all a part of how traditions come about. Traditions do not simply exist without people and their struggles involved every step of the way. [Pauketat 2001:1]

It is understood that traditional practices are developed within the group, in this case, within the Hawaiian culture. These traditions are meant to mark or represent aspects of Hawaiian culture that have been practiced since ancient times. As with most human constructs, traditions are evolving and prone to change, resulting from multiple influences including modernization as well as other cultures. It is well known that within Hawai'i, a "broader 'local' multicultural perspective exists" (Kawelu 2015:3). While this "local" multicultural culture is deservedly celebrated, it must be noted that it often comes into contact with "traditional Hawaiian culture." This contact between cultures and traditions has undoubtedly resulted in numerous cultural entanglements. These cultural entanglements have prompted questions regarding the legitimacy of newly evolved traditional practices. The influences of "local" culture are well noted throughout this section, and understood to represent survival or "the active sense of presence, the continuance of native stories, not a mere reaction, or a survivable name. Native survivance stories are renunciations of dominance, tragedy and victimry" (Vizenor 1999:vii). Acknowledgement of these "local" influences helps to inform nuanced understandings of entanglement and of a "living [Hawaiian] contemporary culture" (Kawelu 2015:3). This section strives to articulate traditional Hawaiian cultural practices practiced within the *ahupua'a* in ancient times, and the aspects of these traditional practices that continue to be practiced today; however, this section also challenges "tropes of authenticity" (Cipolla 2013) and acknowledges the multicultural influences and entanglements that may "change" or "create" a tradition.

This section integrates information from Sections 3–5 in examining cultural resources and practices identified within or in proximity of the project area and in the broader context of the encompassing Waikāne and Waiāhole landscape.

8.1 Fishing and Aquatic Resources

The waters surrounding the study area were once a spectacularly rich fishing ground and presently continue to be a good fishing area according to traditional accounts, literature, and community interviews. Traditional seasonal fishing practices that took place in the waters of Waiāhole and Waikāne are described the following passages:

[...] when *akule* and mullet are running, were, in old Hawaiian days, times when planters left their cultivating of taro, sweet potato, and banana, and feeding of livestock to join their relatives and neighbors along shore in their fishing operations. Each man received his share of the catch in proportion to his contribution in time and equipment. The canoes and nets belonged to families living along shore. [Handy and Handy 1972:438]

The running of *akule* and mullet began in March often signifying the change of the seasons. The spring months were known to be a time when fish entered the lagoons, bays, and stream mouths of the Ko'olaupoko District for spawning. The beginning of *kau* was often marked, in the waters of Waiāhole and Waikāne, as a time of deep sea fishing.

These months from May on were also the months for deep-sea fishing with line and net, for *opelu*, *aku*, *a'ahi*, *ulua*, mature now after the spring spawning. For the women this was the time for getting shellfish along shore and shrimps in the streams, and also guppies (*'o'opu*) in salt pools formed by streams at sea level. [Handy and Handy 1972:441]

Different types of fishing practices include net fishing such as *hukihuki* net, *moe* net, throw net, bag net, and *ōpae* net as well as diving, trapping, hooking, *lama lama* fishing at night. *Ōpae* and *'o'opu* were popular freshwater species collected and/or fished in the springs of Waiāhole and Waikāne.

Squidding seems to have been one of the most popular fishing practices amongst the residents of Waiāhole and Waikāne. Historic records suggest squid was once an abundant resource in the region. One document consisting of a king's list of Ko'olaupoko lands and their respective *kapu* fish lists squid as a *kapu* fish for Waiāhole Ahupua'a in the mid-1800s (Devaney et al. 1982:136).

Kūmū and *weke* are mentioned as popular fish caught in the waters near Waiāhole and Waikāne. In addition to *āhole*, *'ama'ama*, *'anae*, *humuhumunukunukuapua'a* (varieties of *humuhumu Rhinecanthus aculeatus*, *R. rectangulus*), and *pualu* (species of surgeonfish, *Acanthurus xanthopterus* and *A. mata*), the *kūmū* was considered a *pua'a kai* or sea pig, used as a substitute for a pig when a *kahuna* (priest) required an offering (Pukui and Elbert 1986:345). In the past, certain species of *weke* are linked to having caused nightmares, visions and even delirium:

The flesh of the head of some *weke* has a poisonous quality. Those who eat it have restless sleep or nightmare in which the sensation is one of having lost balance, and especially one of feeling that the head is lower than the feet and it is impossible to get it back to level as one is lying down. [Titcomb 1972:161]

These strange symptoms seem to be associated particularly with the *weke pahulu* (*Upeneus arge*). In the legend of Pahulu, the chief of ghosts, Pahulu was apparently a human chief who was killed and lives on "in the itching caused by certain fish" (Titcomb 1972:162).

Considered by some one of the best eating Hawaiian fishes, *āholehole*, called *āhole* in its mature stage, can be found in many different habitats such as on the reef, in bays and harbors and in the deep ocean (Hosaka 1973:121). Traditionally, *āhole* was ceremoniously used to ward off evil or to induce love (Pukui and Elbert 1986:8). It was one of several *pua'a kai* also used as an offering instead of pig.

The waters of northern Kāne'ohe Bay are known for an abundance of aquatic resources. Mr. Fukumitsu stated, "the northern portion of Kāne'ohe Bay is important for its coastline, fishery, and marine life." He noted "Queen Kalama had two fisheries [...] From Kualoa park down to Waikāne pier." He also pointed out that due to the brackish water the area is the spawning ground for several species of marine life including *male*, *moi*, *awa*, *pāpio*, and *ō'io*. The *ōpae* and *'o'opu* also spawn in this area where Waiāhole and Waikāne streams enter the ocean.

Mr. Fukumitsu also noted the Waiāhole *muliwai* is an important habitat for rare aquatic species such as ‘ōpae lōlō. He recalled gathering ‘ōpae lōlō in the *mauka* streams of Waikāne and Waiāhole. He stated, “This ‘ōpae lōlō you don’t find anyplace. It’s a long skinny ‘ōpae of the most tastiest shrimp ever.” He also mentioned, “*Mauka* gets the cockroach ‘ōpae,—the ‘ōpae *kuahiwi* [...] This is one of the only place for that too.” He also recalled his ‘ohana once caught ‘o‘opu by the ton, “like one-two ton a weekend.”

Mr. Uyemura also mentioned catching ‘o‘opu and prawns in Waianu Stream. He mentioned that species of fish such as *aholehole*, mullet, and some *weke* swim upstream into the mountains.

Mr. Fukumitsu added that *lo‘i* can aid in the revitalization of reef systems and capture silt runoff entering the Waiāhole *muliwai*. *Lo‘i* can act as sediment ponds, cleaning water as it circulates through the *lo‘i* and then back out into streams. He explained that due to the reef’s position, the currents at Waiāhole *muliwai* operate in a circular flow trapping silt offshore “building a silt mound over the reef—suffocating the reef” and leading to a green or brown discoloration of the water.

Mr. Fukumitsu expressed concern that increased runoff and sedimentation from potential development projects within Waikāne and Waiāhole could exacerbate conditions within Waiāhole *muliwai*. He believes ongoing restoration of *lo‘i kalo makai* of the project area will help mitigate impacts of potential construction runoff associated with the project.

Mr. Fukumitsu also mentioned there were many “stock ponds” in the area where young fish would come and hide from predators. He also recalled that at one time a thick expanse of vegetation, primarily *hau*, served as a hiding place for marine wildlife along the Waiāhole shoreline. Mr. Fukumitsu recalled gathering Samoan crab, oysters, and clams in the tidal zones of Northern Kāne‘ohe Bay.

Mr. Fukumitsu believes restoration efforts directed at restoring the fishponds could help preserve this area as spawning grounds and a sanctuary for fish and invertebrate species.

Mr. Uyemura also expressed concern regarding the decreasing number of freshwater springs that seep into the ocean where it mixes with saltwater creating brackish water where fish spawn.

Mr. Fukumitsu discussed the impacts to aquatic life he observed over the years. He recalled that Kāne‘ohe Bay and the nearby rivers were full of aquatic life. The coastline along Kāne‘ohe Bay was full of fishermen and farmers, however, he noted that today, he does not see much fishing or farming along the coastline.

8.2 Freshwater Resources

Waiāhole and Waikāne streams are important features for people living in the area, being main arteries to the health of the valley and a source of recreation and gathering.

Mr. Uyemura stated that in traditional times, water from springs and rivers was used for drinking and to feed the numerous ‘auwai that irrigated *lo‘i* that grew *kalo*. He noted Hawaiians living in the vicinity of the North Fork of Waiāhole Valley Road received water from springs while Hawaiians living near Waiāhole Homestead Road received water from ‘auwai.

Mr. Uyemura also discussed the importance of water to Hawai‘i’s economy when the main industries were growing sugar and pineapple. He pointed out that sugar and pineapple were not

ideal crops for valleys like Waiāhole and Waikāne since they grew best in flat lands like areas on the leeward side of O'ahu.

To provide water to these areas, the Waiāhole Ditch and Tunnel System was constructed to divert the water sources in Waikāne, Waiāhole, and Kahana to the 'Ewa side of the island to meet the economic demands of the sugar industry (see Section 4.3.2).

Mr. Uyemura stated that “everything disappeared” after the construction of the Waiāhole Ditch and Tunnel System. He recalled that springs disappeared and water levels in rivers decreased drastically. He noted that water levels in rivers used to be deep enough that people could jump off bridges into the water. He also noted that many Hawaiian families from Waiāhole and Waikāne moved to Hakipu'u following the construction of the Waiāhole Ditch and Tunnel system due to the lack of water.

Mr. Uyemura stated that McCandless was concerned he had violated the law by taking the water so he created the McCandless Water System to provide water for the farmers and residents of Waiāhole. The McCandless Water System is still heavily relied on by many farmers, as well as residential owners in the Waiāhole Valley. Mr. Uyemura mentioned the McCandless Water System provides free non-potable water to farmers and residents of the valley while potable water is provided by the HHFDC for a fee. He also noted the farmers have been maintaining the McCandless System since before he moved to Waiāhole in the 1960s. He recalled that if he did not clean the system after it rained, they would not have water the next morning.

Up until the 1950s, water from five *'auwai*, three in Waiāhole and two in Waikāne, were used for household consumption, drinking water and in irrigation for the rural communities that live in the two *ahupua'a* (Bushnell et al. 2002:11).

Mr. Uyemura stated the *'auwai* that provided water to many of the lots in the valley were fed with water from freshwater springs.

As the Oahu Sugar Company began shutting down in the mid-1990s, three Windward O'ahu community organizations—the Waiāhole-Waikāne Community Association, the Hakipu'u Ohana, and the Kahalu'u Neighborhood Board—as well as OHA, KSBE, and DHHL petitioned the Water Commission to restore flows to Ko'olaupoko streams, including Waikāne and Waiāhole streams and their tributaries (see Section 4.3.2).

Mr. Reppun discussed the importance of watershed management. He explained that the Ko'olau Mountains are “sponges” that collect water which “filters” down over years before reaching the aquifer below and eventually coming out as waterfalls and springs. This freshwater ends up in estuaries that mix with salt water creating brackish water environments where fish breed. Mr. Reppun noted that is why there are so many fishponds in embayments like Pearl Harbor, Kaiaka Bay, and Kahana Bay.

Mr. Reppun stated, “There's been all kinds of issues with the existing water system.” He noted the “original reservoir was built at too low an elevation and does not adequately serve all of the valley without having to rely on booster pumps to push water up to highest elevations that leases exist on.” He noted “if the system (as currently built) is not working, it impacts us.” He pointed out that sometimes the system “will go down for days if they can't figure out the problem.” He explained the existing pumps are powered through aerial lines coming from Ka'alaea and when an *Albizia* limb falls on a line or a line bursts, the power goes out. He also recalled a major flooding

event in 2019 or 2020 when “the river way up *mauka* jumped out of its banks and boulders, everything, smashed through the pump system, [and] destroyed the road that had access to the pump system.”

Mr. Reppun suggested “cutting Albizia trees and managing the watershed would reduce the potential for impacts on that pump station.”

On their farm in Waiāhole, Mr. Reppun and his brothers, Paul and Charlie, use distributed energy sources including hydroelectric power and photovoltaics to ensure they still have power when there is an outage in the area. Mr. Reppun also wondered if “hydroelectric power could run that pump station instead of aerial lines.” He believes if hydroelectric power can be developed, it could “power all of the valley, maybe even beyond.”

He also recommended that “we could reduce our footprint in so many ways. Whether it’s water, electricity, what not.”

Mr. Fukumitsu opposes what is currently going on regarding water management. He stated he would like the BWS and the Planning Commission to reassess and reevaluate the amount of water that is available and the amount of water that is needed to provide for local communities and future developments on O‘ahu.

He believes there is not enough water. He pointed out that O‘ahu is already experiencing impacts to its groundwater supply from contaminations following fuel releases at the Red Hill Bulk Fuel Storage Facility in Moanalua and Hālawā Ahupua‘a. He noted the petroleum from those releases is leaching into the aquifer and contaminated water has been moving east, all the way to Hawai‘i Kai.

He asked, “How much impact do they need before reassessment?” He emphasized that he does not want the BWS to touch the water until there is a reassessment. He would also like the Governor, Mayor, and the Planning Commission to get “back to the table” to discuss better ways that they could regulate the water. He would like to see water prioritized more than profits. He would also like to see long-term solutions that will benefit future generations.

Mr. Fukumitsu pointed out there is “plenty freshwater” in the Waiāhole Tunnel that could be tapped to provide water for the communities of Waiāhole and Waikāne. He noted 35 mgd of water flows in the tunnel and 17 mgd of water flows into Waiāhole River. He suggested tapping the Waiāhole Tunnel instead of drilling wells to pump up groundwater from the aquifer. He noted that over time the wells will need to be drilled deeper and may eventually begin pumping up brackish and salt water. He asked, “Why destroy the aquifer?” He also asked, “Why do we need new tanks?” noting there is already a water tank in Kahana Ahupua‘a.

Mr. Uyemura supports the construction of a new reservoir if it is not made of metal, however, he strongly disagrees with using a pump system to pull up water from underground. He noted that if the pumps are pulling up water from a depth lower than the river, it may cause the river to dry up. He also expressed concern that pumps may begin pulling up brackish or salt water.

Mr. Uyemura also suggests tapping the water from the Uwao development tunnel and using gravity flow to send the water from the tunnel to the new reservoir. He believes tapping the water from the tunnel would be a “benefit for everybody.” He would like this new water system to be owned and managed by the HHFDC. He noted the Waiāhole-Uwao tunnel produces 3 mgd of

water every day and if the community only uses 1 mgd there is an excess of 2 mgd which HHFDC could sell to the BWS. He also mentioned the tunnel may produce up to 11 mgd which would mean an excess of 10 mgd which could be sold to BWS.

He believes other communities could also benefit from water tapped from the tunnel. He noted the water management system in the Salt Lake and Pearl Harbor area is bad. He stated, “They can reverse [the water] from Honolulu. Reverse the water going towards Salt Lake, Pearl Harbor way and then this water would supply the Honolulu area.”

Mr. Uyemura suggests using the water that is flowing from the tunnel to the new reservoir to generate hydroelectric power which could be used by the community or sold to other communities. He also suggested HHFDC build a road that goes “all the way up to the tunnel.” He noted that although it “may cost plenty money” to fix the road, the HHFDC could make the money back by selling the excess water from the tunnel to the BWS.

8.3 Cultivation and Gathering

Traditionally, the production (and consumption) of *kalo* (taro; *Colocasia esculenta*) was vitally important to Waikāne and Waiāhole *ahupua'a*. Historic documents attest to the extensive taro *lo'i* in the study area in the past. The Native Register of Mahele records shows numerous claims to lands in the study area to have been cultivated with *lo'i kalo*.

Captain James King (1779) noted, “the natives of these islands are, in general, above the middle size and well made; they walk very gracefully, run nimbly and are capable of bearing great fatigue” (Shintani 1993:10). Accordingly, the high level of physical activity and physical fitness described by Captain King was a normal part of Hawaiian life, and largely attributable to the availability of plant and food resources such as *kalo*, *'uala* (sweet potato; *Ipomoea batatas*), *mai'a* (banana; *Musa acuminata*), *limu*, and *i'a* (fish). Besides the observed contributions to stamina and health, *kalo* was also a revered staple food, believed to have derived from the first-born son of Wakea and Papa.

[...] the supreme god Kane in the form of Wakea (a form associated with the earth) produced two sequential offspring: the first became *kalo* (taro) plant, the second became Hāloa, the ancestor of man [...] thus, in kinship terms, the taro is the elder brother and the senior branch of the family tree, mankind belongs to the junior branch, stemming from the younger brother.’ [Trask 2012:75]

Kalo was perhaps the most distinguished plant within traditional Hawaiian horticultural and society. This is echoed in pre-Contact and historic descriptions of agricultural cultivation in Waiāhole and Waikāne which are dominated by passages illustrating the prominence of taro. Handy and Handy (1972) describe the multifaceted role taro played in the pre-Contact era and its significance in the socio-cultural order:

The function and nature of the taro plant, its cultivation and use, were responsible not only for its primal place in mythology but for the fact that the cult associated with it, namely that of the male god Kane (= Wakea) as first procreator, and of *Ka-wai-ola-a-Kane* or ‘The-life-giving-water-of Kane,’ although less elaborated than that of the rain-father Lono, was more fundamental, not only in Hawaii but

throughout Polynesia. It was, in fact, the basic cult of the primal procreator of nature and man, out of the union of Sky and Earth.

Actually the course of fresh-water streams and ditches patterned the entire subsistence economy, and through this, the whole round and cycle of individual and social activity. The streams and ditches were the regulators, the law givers, in communal relationship; not directly, but because upon their water depended the taro, and upon the taro depended man.

The requirements of labor, in connection with building and maintenance of dams, ditches, terraces, and embankments, and the planting, tending, and harvesting of the taro, determined the ordering of cooperative work and relationships between individuals and families within the community. This cooperation in turn was responsible for the obligations in the matter of work required of individuals and the right of individuals and families to a share in the products.

Finally, taro in its habit of growth established a biological prototype of the form in which heredity and relationship were conceived. The taro growth supplied one of the terms in which the family system of the civilization was framed: *'ohana*, meaning the dispersed biological family group as a whole. *'Oha* means a shoot or sucker from the base of a plant, but essentially and primarily was applied to the buds from the corm of the taro that were broken off and replanted by the gardener. With the substantive suffix added, *'oha-na* literally means 'offshoots,' or 'that which is composed of offshoots.' The family stock, then, budding and branching from parent stocks, was conceived of in terms of the habit of reproduction of the taro. [Handy and Handy 1972:76]

The well watered and broad valleys of Waikāne and Waiāhole were extensively cultivated in taro *lo 'i*. The following account demonstrates the prolific nature of taro in Waiāhole and Waikāne Ahupua'a.

There were formerly *lo 'i* throughout the seaward lowlands of Waiahole. Some were in swampy lands, but most of them were irrigated by the stream from which the *ahupua'a* takes its name. Groups of *lo 'i* adjoining Waikane were planted up into recent times. The land south of the stream, *mauka* of the highway, has reverted to swamp. Some *kuleana* a short way up the main stream, beyond its junction with Waianu, were still cultivated by Hawaiians living in the lower valley in 1935; and small terraces once went well up into what is now forest reserve. There was also a sizable *lo 'i* section about half a mile up Waianu stream, with evidence of its having extended at least a mile farther inland along both the north and south branches of Waianu. [Handy and Handy 1972:453]

Community members in Waiāhole and Waikāne remembered taro being cultivated in an abounding manner up until the 1950s and 1960s. Most of this taro was sold commercially. The taro operations in the 1920s and 1930s were largely run by two people, one named Murakami and the other Sakai. Murakami worked under Lincoln McCandless, property owner of much land in Waiāhole and Waikāne. Sakai was a Japanese businessman who owned and operated a store in Waiāhole, below the Waiāhole School (Bushnell et al. 2002).

Mr. Fukumitsu's *'ohana* connection with the lands of Waiāhole and Waikāne "goes back 200 years." His *'ohana's kuleana* lands were once extensively cultivated with *kalo*. He recalled that "[...] my grandmother, from her great-great grandparents, used to come up the valley, Waikāne, plant taro in one house site, then come back up Waiāhole *makai* right across Waiāhole Valley Road and plant taro [there] also." Mr. Fukumitsu continues to cultivate *kalo*, engendering a practice that his *'ohana* has followed for generations. He pointed out, "These are the same plots of land that I am working from my grandmother, to my great grandmother, to my great-great grandmother and then her mother. Seven generations. So, 200 years we have been on this land."

Mr. Fukumitsu described *kalo* cultivation in Waiāhole Valley during his great grandfather's time. He recalled an extensive system of *'auwai* that provided water to the *lo'i* in the area. He also recalled farmers along the coastline used buffaloes to plow their fields.

Mr. Fukumitsu and other volunteers from the community meet once a month at a community work day at the Waikāne Valley Nature Preserve on Waikāne Valley Road to restore and reestablish the *lo'i* that were abundant in the area during traditional times. They also clean and clear the area of trash and invasive plants in preparation for their future plans which include reforesting the area with native trees and cultivating other food crops, as well as medicinal plants like aloe.

Mr. Fukumitsu stated their master plan is to establish a nursery of diverse crops including different varieties of *kalo* which farmers could take with them and cultivate on their own farms. He pointed out that farmers in Waiāhole Valley must cultivate crops to qualify to lease their lots which are zoned for agricultural use. He noted some Waiāhole farmers have resorted to cultivating flowers so they can remain on their lots.

Mr. Fukumitsu recommended the restoration of ancient *lo'i* in Waikāne be studied as a tool for overall health of the *ahupua'a*. He believes reestablishing taro can be a tool for education and sustainability. He noted, "That's the great trends that is starting to drive the kids back to school, or stay in school, or there's more to school than just the classroom. It's a great encouragement." He added, "Our curriculum needs to be educating people about land, water, ocean."

Mr. Reppun and his brothers have been cultivating wetland taro and other crops at their farm for the last 40 years. He noted, "there's a whole mix of ethnicities that have been in the *lo'i*." He recalled that when Hawaiian families were stepping into the "fast lane" and leaving their *lo'i* behind, Asian farmers, especially Okinawan families, continued farming taro in places like Waihe'e, Hakipu'u, Waikāne, and Waiāhole. He emphasized that this intersection of cultures connected through their rural agrarian roots only deepens the history of Hawai'i by adding layers and augmenting "what was understood in ancient times."

Mr. Reppun also mentioned "there's been a real movement to get people back in the *lo'i*." He recalled that during the Waiāhole-Waikāne "water battles" in the late '90s and early 2000s, there was a "real hunger" from the next generation to learn about growing taro.

Mr. Reppun also discussed one of their projects on an open space lot, Lot 79, in Waiāhole. After obtaining permission from the previous tenant of the lot and digging up Albizia trees and clearing the *hau* jungle that encroached on the area, they put the *lo'i* back into production. Every Wednesday, they would show up and dive into the *lo'i*, harvest the taro, weigh it from the scale hanging from the *hau* bush, and divide it amongst everybody. He recalled people came from all

over the island including classes from Waiāhole, people who wanted to know more about culture, and people who wanted to relearn what it's like to be in an *'āina*-based education.

Mr. Reppun emphasized that farming taro is a “great cultural practice.” He stated, “That’s where it begins. Right there at the food level.” He and his brothers started a *poi* factory on their farm where they make *poi* every week. He mentioned that taro farming and *poi* production is returning to “small operations that are driven more by the communities, the families in those communities.” He also recalled learning that before corporate companies began making *poi* and prior to the war when people “gathered up all the metal to be made it into bombs and what not,” there “used to be *poi* factories all over the place.”

Mr. Reppun mentioned there were *lo‘i* and *kuleana* parcels located along the streams and into the valley. He asked, “How does this project impact the potential for restoring cultivation up into that area? Whether it’s taro or it’s *māmaki* (*Pipturus* spp.) for tea. All those kinds of things.”

Mr. Reppun stated the Waiāhole community’s mission is focused on “agricultural, cultural, environmental integrity.” Their mission is also “about sustainability” and “about being here in perpetuity.” He noted that since Waiāhole has been under the jurisdiction of HHFDC, the community has set about redeveloping Waiāhole’s infrastructure to fashion long-term leases encouraging people to plant trees and not just “fast crops with pesticides and herbicides.”

He noted, “in ancient times, an *ahupua‘a* was pretty much self-sufficient. [...] an *ahupua‘a* was a unit, *mauka* to *makai*, and in Kāne‘ohe Bay area, including Waiāhole, Waikāne, Hakipu‘u, Kualoa, from the summit, not just to the shoreline, but out to the edge of the bay, therefore bordering on the deep sea.”

He stated their goal as a community is to “reestablish a system like that.” He stated, “whatever we do here needs to not just accomplish an infrastructure improvement. It needs to also help us to celebrate the resurgence of [a] culturally based approach to living in an *ahupua‘a*.”

Mr. Reppun would like to see “planning that totally respects how an *ahupua‘a* works.” He would like to see a “whole system” that maintains optimal stream flows to feed *lo‘i* along the stream, as well as into the estuary to feed the fishery and fishponds.

Mr. Reppun stated that HHFDC is “not attuned to promoting *ahupua‘a* restoration and what comes with it” including “more of a reverence for food, food security, [and] the environment.” He also noted HHFDC is not doing anything to manage the “sizeable area across the top of this agricultural and residential lot subdivision that is in the conservation area.”

He also stated, “Every farm should not only be producing food for the community, for sale, but for their families. That’s a part of the culture too. Abundance starts with feeding your family and then sharing and trading and what not, bartering, whatever.”

He also pointed out that during the pandemic, the community has been “getting back to a more culturally appropriate food growing and distribution system.” With funding from the CARES Act, non-profits have been able to purchase food from small farmers which they distribute to the community through food hubs.

Mr. Reppun asked if the proposed project is “the best use of this land?” He emphasized that “Planning for use of any vacant lots should take into consideration the broader vision that should come from completion of a Strategic Plan for these valleys.”

He pointed out that portions of the project area are located in the critical interface between the agriculturally zoned lands and the conservation zoned lands. He emphasized that the community “live[s] around the arteries that feed the ecosystem” and “their very existence needs to be accomplished without negative impacts on those arteries, without negative impacts on the estuaries.”

Mr. Fukumitsu also discussed the importance of proper land management. He mentioned the State of Hawai'i is the steward of 1.8 million acres of the King's land. He noted the state researched various forms of land management and determined the best system to manage those lands is the Ahupua'a and Konohiki system. He also mentioned the City and County of Honolulu purchased Kualoa and has been promoting conservation, preservation, and diversified agriculture.

Mr. Fukumitsu stated the two priorities of the government are providing affordable housing and promoting agriculture. He stressed the importance of balancing the needs of smaller local farmers who cultivate diverse crops for both food and economic reasons, against the needs of larger corporate farmers and the ADC.

Mr. Fukumitsu is an advocate for a holistic approach to conservation, one that preserves the intricate relationship among *'āina*, *wai*, and *kai*. He emphasized the need to be ever mindful of how present actions may impact future generations.

Mr. Fukumitsu noted water is an essential resource for farmers cultivating crops such as *kalo*. He noted the *lo'i* receives water from the nearby river, as well as springs that spout from the ground during the rainy season when water is abundant. During the dry season, these springs disappear and it is a struggle to maintain the amounts of water for the *lo'i*. He pointed out that the *lo'i* also help regulate flooding by receiving water coming down from *mauka* to *makai* on its way to Kāne'ohe Bay.

Mr. Uyemura mentioned there were *lo'i* and banana trees in the area past the end of the north branch of Waiāhole Valley Road near Waianu and Uwao streams.

Mr. Fox also noted there were *lo'i* located in the back of Waikane Valley. He noted the *lo'i* were fed with water from Waikāne Stream.

Mr. Fukumitsu mentioned *'ōhi'a 'ai*, guava, *wī*, and *māmaki* were collected from alongside the streams in the Waikāne and Waiāhole area. He also stated the shoots of bamboo and *hō'i'o* would be gathered and combined with vinegar, tomato, and onions and served alongside the *'ōpae* and *poi*.

Mr. Fukumitsu harvests the Albizia trees in Waiāhole and utilizes the wood for canoe construction. He harvests the Albizia wood directly within and surrounding the current project area. He stated, “We cut the Albizia tree, haul them down the road and then carve them out at Waiāhole Beach park.” He pointed out that the Albizia is invasive and harvesting them helps combat their proliferation.

Mr. Fukumitsu recommends native plants be utilized whenever possible in reforestation efforts following clear cutting that occurs in the buffer zones of development projects. He emphasized “foods that occur locally and naturally within the Hawaiian environment should be propagated and planted as they possess a district's ‘cultural value.’” He also suggested establishing a seed bank that extends *mauka* to *makai* in order to retain access to native plant varieties.

Mr. Fukumitsu requested an area of bamboo patches *mauka* of the proposed reservoir be left intact. He stated the bamboo hedges are planted on top of ancient taro terraces and the bamboo patches keep the soil in place, deterring further erosion of the ancient taro terraces. He stressed that “they leave the bamboo as a hedge to keep the soil in place. So whatever construction they do over here they have to leave the bamboo, they have to leave at least a good portion of the bamboo.” He also stated that “one terrace off the road that is a no-no, they cannot go in there. They just cannot go in the bamboo patch.”

Mr. Becket mentioned visiting Waiāhole with his parents during his childhood. He recalled his father pointing out a chaulmoogra tree where they used to picnic. Chaulmoogra trees were planted in Waiāhole Forest Reserve during the nineteenth century by the Territory of Hawaii, the Board of Agriculture and Forestry (Judd 1922:65). Oil from the chaulmoogra tree was harvested and used for the treatment of leprosy.

Mr. Uyemura also recalled hunting in the mountains between Waiāhole and Kahana.

8.4 *Wahi Pana and Heiau*

Cultural sites, or Hawaiian *wahi pana* effectively contribute to the ways in which *kama 'āina* remember and identify, and thus continue to manifest and perpetuate culture (Basso 1996; Holtorf and Williams 2006). As Cipolla (2008) makes clear,

[...] people inherit the places that they inhabit (from the past), connections between memory, identity and landscape are usually quite strong. In this sense, space, as configured in the past (which could be the recent past) by either natural or cultural processes, ties reflexively to social relations in the present (see Bourdieu 1977; Lefebvre 1991) and, in turn, to social memories. [Cipolla 2008:199]

These social memories, in turn, work to inform world views and everyday practices. Counted among these practices, and largely subsumed under a “living contemporary culture” (Kawelu 2015:3), is the care or management of natural resources including cultural sites. There exist a myriad of cultural sites or *wahi pana* of particular importance for Waiāhole and Waikāne.

The *wahi pana* of Pu'u Kahea is a hill separating Ka'alaea Ahupua'a from Waiāhole. The name Pu'u Kahea is translated to mean “hill of calling” which could be related to the site's significance as a signal point or related to the chanting that is said to have occurred here by Hi'iaka (Sterling and Summers 1978:191).

Signal points and lookouts, or *wahi nānā* were understood to be important places for observation and communication. Paglinawan (1964) describes the function of fish lookouts in Waiāhole.

Pu'u Kahea was used as a lookout for the head fisherman or signal man used by the fishermen. The signal man would climb this hill on a vantage point so that he could get a clear view of the fishing party in their canoes off Waiahole or Kahalu'u areas. 'Ama'ama (mullet) and 'awa (milk fish) were sought when the fish schools swam in the area.

The signal man would use his hands, stick, or paddle, or even a piece of rag as a signal. The signals were prearranged and understood by the fishermen. [Paglinawan 1964:5]

Mr. Fox, steward of the Kukuianiani Heiau, mentioned Kukuianiani Heiau has been speculated to have been a signal point or *wahi nānā*. The commanding view from this *heiau*, prior to the infiltration of non-native vegetation, would have allowed observers to examine large swaths of the Ko'olaupoko coastline. Here observers could signal to boats or in the case of a fire Mr. Fox suggested.

Kukuianiani Heiau is located on Pu'u Pueo, just *mauka* of Mr. Fox's property, which is situated on a Honolulu County land parcel. When surveying his land prior to constructing his home, he became aware of the disarray Kukuianiani Heiau had fallen into. He contacted numerous government agencies and community organizations to restore and protect the *heiau*. After nearly ten years of negotiation and bureaucratic processes, Mr. Fox developed a preservation plan for Kukuianiani Heiau through the Adopt-A-Park program.

Mr. Fox stated that "living in such a sacred place comes with a lot of responsibility." He emphasized, "We try to respect his place in any way we can. We were really careful about where we built the house and what we do in the yard. We actually think of the property in the front as just an extension of the *heiau* and we give it that same level of respect."

When Mr. Becket first visited Kukuianiani Heiau prior to early 2000s restoration efforts, he spoke with Mr. Fox's neighbor, Nephert, who led him to the *heiau*. Nephert also mentioned to Mr. Becket that he "had been told that the *heiau* worked with a *heiau* down the coast – that the two worked together."

Mr. Fox consulted with the late Uncle Raymond Kamaka regarding the origin of the *heiau* and for guidance relating to taking care of the *heiau*. The Kamaka 'ohana was one of the original landowners in Waikāne Valley, following the Māhele and the distribution of *kuleana* awards. Mr. Fox also mentioned the last *kahuna* of the *heiau* was a member of the Kamaka 'ohana. Uncle Raymond stated that Kukuianiani Heiau was a *heiau lapa'au* which was dedicated to the god Kū. Mr. Fox noted Kū is known as the "war god," however, Kū also had "a Benvolent healing side."

Mr. Fox also mentioned *heiau lapa'au* often had *māla lā'au lapa'au* where medicinal herbs and plants were grown. He noted the significance of *noni*, *kī*, and *ha'uoī* or *ōwī* to healing practices. Abbott (1992:99-100) noted the many healing traditions connected to *noni* including treating bruises, boils, sores, wounds, cuts, skin eruptions, bone breaks, and concussions. Mr. Becket also noted *noni* is associated with a certain type of *heiau*, pointing out that, "You don't see it everywhere." The *kī* plant plays an important role in psychological and spiritual healing practices, as well as the treatment of shortness of/asthma and the absence of perspiration (Look et al. 2013:7). Teas and poultices made from *ha'uoī* or *ōwī* have been used to treat infections such as staphylococcus (Fahs 2015:51). *Ha'uoī* or *ōwī* leaves have also been used to treat "cuts, bruises, and other uses" (Fahs 2015:51).

Mr. Fox also discussed the significance of the name Kukuianiani which means "shinning glimmering light." He pointed out that light has traditionally been associated with healing and "because this was a place of glimmering light it was a place of very deep healing. A lot of people would come here for all types of healing."

Cultural practices occurring at Kukuianiani Heiau include the gathering of flowers and *ti* leaves which are displayed as offering. *Ti* leaves were often used ceremonially for the protection of persons and places from evil. Mr. Fox also noted that when community or school groups visit the *heiau*, a series of rituals including *pule* and *oli* are conducted before beginning any projects like clearing off brush or pulling weeds. After completing their work, they often feed the groups who came to help. Mr. Fox emphasized that “the fellowship part of the stewardship is just as important as the actual physical work itself.”

Mr. Fox discussed the current state of Kukuianiani Heiau. He mentioned they have “a big problem with pig infestation,” however, he stated, “maybe it is best to leave them alone” since the area has a strong connection to the half man, half pig demigod Kamapua‘a. Mr. Fox wondered if that is why the pigs are drawn to the location. According to *mo‘olelo*, which appeared in the Hawaiian language newspaper *Ka Nūpepa Ku‘oko‘a*, Kamapua‘a gave all lands containing the word *wai*, including Waikāne and Waiāhole, to the *kahuna* (*Ka Nūpepa Ku‘oko‘a*, 16 November 1867).

Trails were and continue to be valuable resources for Native Hawaiian culture and life ways. In the past, trails were well-used for travel within the *ahupua‘a* between *mauka* and *makai* and laterally between *ahupua‘a*. A historical trail system known as the “zig-zag road of Māui” is recounted in literature and oral accounts to have passed through Waikāne and Waiāhole. Mr. Fox made note of the trail system that connected to the Kukuianiani Heiau complex. This trail was probably used as a passage for *mauka* populations coming to the *heiau* for healing or ceremony Mr. Fox suggested.

Mr. Uyemura described several trails in the area. He mentioned one trail that crossed over Waianu Stream and went to the end of the south branch of Waiāhole Valley Road before continuing to Ka‘alaia. He also mentioned another trail that goes from Uwao Stream to Waikāne and continues into Kahana over the top of the Ko‘olau Mountain Range to Wahiawa. He noted, “the trail that goes up from Waikāne can go all the way down to Kahuku side, it goes out on the top of Punalu‘u, it can go down, we used go on the top of that part.” He pointed out that the trails were well maintained because they were also used by the military.

Community members discussed the cultural significance of the area. Mr. Uyemura noted the area from Waiāhole to Hakipu‘u was a spiritual place. He noted that Hawaiians believed in ‘Io which is God, the creator. He shared his interpretation of the spiritual nature of the names Waiāhole and Waikāne. He explained that Waiāhole is also known as “Waiholly,” a combination of the words “*wai* (water)” and “*holy*.” He explained, “*Wai* is the water. Holy is something that is good [...] *Wai* is good. Good water.” Therefore, the name “Waiholly” means “holy water.” He also explained that the name Waikāne is a combination of the words “*wai*” and “*Kāne*,” noting that, “*Kāne* is God and the water is God. Waikāne. That’s the pure water.”

Mr. Fukumitsu also discussed Kāne’s significance to the area. He pointed out the name Waikāne means “the water of Kāne.” According to Pukui et al. (1974:223), the name Waikāne was Wai-a-Kane and is literally translated as “Kāne’s water.” It was here that Kane first dug for water for the benefit of Paliuli. Below Paliuli are the famous waters of Waiololi and Waiolola (*Hoku o Hawaii*, 12 January 1926). These famous waters are a common refrain in the Kumulipo (a Hawaiian origins chant). “O Kane ia Wai‘ololi, o ka wahine ia Wai‘olola” speaks of Waiololi and Waiolola,

generally thought to symbolize the male and female procreative forces respectively. Martha Beckwith explains:

The words Wai'ololi and Wai'olola are applied in everyday speech to a narrow entrance through which water passes with force and a wide one which receives them without a struggle. Thus Pokini says the first term is given to a narrow bay along the coast where the water carries the fish in with a rush, the second to a large shoreline where the surf rolls in without breaking. [Beckwith 1951:51]

Whether the Kumulipo actually refers to specific sites in Waikāne Valley is less than clear although it does seem clear that certain sources have interpreted it this way since at least as early as 1912 and this shows the importance of Waikāne in relation to Hawaiian world views. Hi'iaka also mentions these sacred waters as she journeys past Waikāne on her way to Kaua'i.

Mr. Uyemura also explained that Waiāhole is named after the *āholehole* which swims up stream into the mountain. Mr. Fukumitsu also mentioned Waiāhole is named for the *āholehole*.

Mr. Reppun also mentioned that traditionally, Waiāhole and Waikāne *ahupua'a* were "very sacred lands." He noted this area was "the training ground for the *kahuna* class. The intelligentsia, the masters." He believes that "if it was today, it would be the Master's programs, Ph.D. programs in any culture." This area is also where the *ali'i* were trained. The lands were rich and productive. "They're rich in water. They're rich in forest resources. Coming down, descending down to an estuary, the north end of Kāne'ohe Bay, part of that estuary, the fishponds, the *lo'i*, very productive area." This area is also "where some of the first navigators arrived." He pointed out that "this is why the Hōkūle'a launched from Kualoa" and "why it returns to Kualoa."

Mr. Fukumitsu mentioned that the first settlers of O'ahu landed at Kualoa and migrated into Waiāhole and Waikāne valleys. He noted that from the time of Kamehameha I to Kamehameha III, these lands were awarded to the high priest of the King.

Mr. Reppun pointed out that the site for the proposed 365 Reservoir (Lot 50) is located on the ridge bordering the Waiāhole and Waikāne *ahupua'a* which is an area that has "some of the most cultural relevance." He noted *heiau* have been built on areas with "vantage points for being able to see the ecosystem." He believes this could potentially be "one of those sites."

Mr. Reppun suggested Lot 50 could be a great location for "a cultural center, a *piko*, place where we could celebrate the ancient history." He continued, "Let's not just build a solution to the water supply. Let's build a classroom. Let's build an outpost. Let's build a satellite. That's what's needed." He insists "we need uses of those spaces that contribute to the bigger community picture." He suggested the possibility of building some housing for "students to stay, places for planners to reside, teachers, professors to do their sabbaticals." The site could also serve as an emergency shelter.

Section 9 Summary and Recommendations

9.1 Results of Background Research

9.1.1 Summary of Traditional and Historical Background

Background research for this study yielded the following results which are presented in approximate chronological order:

1. The *ahupua'a* of Waiāhole and Waikāne are in the Ko'olaupoko District on the Windward side of O'ahu. According to Pukui et al. (1974:219), the name Waiāhole was Wai-āhole and is literally translated as “mature *āhole* (a fish) water.” Pukui et al. (1974:223) also note the name Waikāne was Wai-a-Kane and is literally translated as “Kāne's water.” “The name of this land is Waikāne because it was here that Kāne first dug for water for the benefit of Paliuli.”
2. Like all of the Windward valleys, Waikāne and Waiāhole valleys are affected by the prevailing winds in the island, which are the northeast trades that blow against the Ko'olau Mountains (Juvik and Juvik 1998:55). The mountains create an orographic effect that results in an annual rainfall of up to 160 inches (4,064 mm) per year in the *mauka* sections of the valley. This rainfall produces strong flowing perennial streams, including Waiāhole Stream, Waianu Stream, and Uwao Stream in the immediate vicinity of the project area. These streams would have provided plentiful waters for both domestic and agricultural needs.
3. The management of marine sources in the *moku* of Ko'olaupoko is evident by the multitude of fishponds and by the existence of numerous fishing shrines. Two notable *loko i'a* were in Waikāne; though one name has been forgotten, the name of the other *loko i'a* was Kolowalu. Squid was an abundant resource and most popular amongst the residents of Waiāhole and Waikāne. In the mid-1800s, the squid was listed as *kapu* by the King (Devaney et al. 1982:136).
4. Two *heiau* in Waikāne were noted by McAllister, Kukuianiani Heiau and Ka'awakoa Heiau (McAllister 1933:170–171). Kukuianiani Heiau was located at the foot of Pu'u Pueo and Ka'awakoa Heiau, believed to be a companion structure, was a few hundred feet south of Kukuianiani.
5. Waikāne was one of the three *pu'uhonua* in Ko'olaupoko (Kamakau 1964:18). If a person broke any law or was a non-combatant during times of war, they could find safety and shelter within a *pu'uhonua*.
6. Adze quarries have been identified on the ridges between the valleys, and evidence of the manufacture of stone tools has been found in the valley floors. In a 1964 report, Kikuchi found considerable evidence of the manufacture of stone tools within the valley, including a lithic scatter in a bulldozed field (Kikuchi 1964).
7. The first census conducted on O'ahu from 1831 to 1832 reported 419 people in the Waikāne and Waiāhole Ahupua'a (Schmitt 1973:19).
8. While rice cultivation came to dominate the landscape at Waikāne and Waiāhole, taro cultivation remained common although rice appears to have been the preferred crop within the project area and its vicinity. Other crops such as introduced vegetables and

- fruits were grown. These included cabbage, radishes, onions, turnips, beans, lotus root, litchi, mango, lungan, pomelo, and banana (Devaney et al. 1982:53).
9. Pineapple cultivation also occurred for a brief time and a train track was used to transport pineapples, likely the same track constructed by the Waiāhole Water Company in 1913. Condé and Best (1973:337) wrote that “ten miles of railroad were built, including an ocean pier. One portion of the railroad was laid at the landing at Waikane [...]”
 10. Between 1913-1916 the Waiāhole ditch and tunnel system was constructed. The system began at Kahana Valley and included a series of tunnels dug through the Ko‘olau Mountains. The Waiāhole Ditch system and other facilities were designed to channel water from the Waiāhole/Waikāne watershed to irrigate Central and Leeward O‘ahu sugarcane fields (State of Hawai‘i 1997:6).
 11. According to a study conducted of the Waiāhole, Waikāne, Kahana, and Punalu‘u areas by G.K. Lassison in 1916, these streams produced at least three million gallons daily during dry weather season (at elevations of 500 ft or more above sea level) which no other streams on O‘ahu produced (Hood 2004:31).
 12. On 27 May 1916, the tunnel was fully operational and the waters were diverted from Waiāhole, Waikāne, and Kahana valleys to the ‘Ewa plains. The tunnel ran for 2.7 miles and was the longest transmountain tunnel in Hawai‘i until the completion of the Molokai tunnel (Hood 2004:7).
 13. One share of the waters in Waikāne is owned by the Hui Aina of Waikane through Royal Patent Grant 464; this was leased to Waiahole Water Company on 3 May 1922 for a term of 20 years, expiring in 1942.
 14. In December 1994, the Water Commission directed that 8 million gallons per day (mgd) would flow through the tunnels to Leeward O‘ahu and the rest would flow to the windward streams (State of Hawai‘i 1997:4).
 15. A survey done after the water had been returned to the Waiāhole Stream for approximately six months and the Waianu Stream about one month and both habitats had shown a promising re-establishment of native populations of ‘o‘opu, ‘opae, and hīhīwai indicated the species were returning from the ocean to the streams (State of Hawai‘i 1997:19).

9.1.2 Cultural Practices Identified

Background research and consultation for this study identified the following cultural practices within Waiāhole and Waikāne Ahupua‘a:

- Manufacturing stones tools*
- Agricultural practices[§]
- *Loko i‘a* and fishing[§]
- Plant gathering[§]
- Religious activities[§]
- *La‘au lapa‘au* (healing practices)[§]
- Canoe building[§]
- Hunting[†]

* indicates a Traditional practice that is no longer practiced

§ indicates a Traditional practice that continues to be practiced

† indicates a modern practice

9.2 Results of Community Consultation

CSH attempted to contact NHOs, agencies, and community members. Below is a list of individuals who shared their *mana* 'o and 'ike about the project area and Waiāhole and Waikāne Ahupua'a.

1. Mr. Keoki Fukumitsu, *kama* 'āina of Waikāne and Waiāhole, lineal descendent, and cultural practitioner
2. Mr. Keoni Fox, Ko'olaupoko Hawaiian Civic Club member, cultural practitioner, and a steward of the Kukuianiani Heiau complex
3. Mr. Jan Becket, author, photographer, and retired teacher from Kamehameha Schools. Kona Moku Representative, Council of Hawaiian Civic Club's Committee on the Preservation of Historic Sites and Cultural Properties
4. John Reppun, Community Development Coordinator with the Kualoa-He'eia Ecumenical Youth (KEY) Project
5. Ryan Ringuette, Todd Melton, Justin Saito, and Lawrence Uyemura, farmers from Waiāhole and members of Waiāhole-Waikāne Community Association's Hui Wai Ola (Water) Committee

9.3 Impacts and Recommendations

Based on information gathered from the community consultation, participants voiced and framed their concerns in a cultural context.

9.3.1 Impacts

1. Community members expressed concern regarding potential impacts to aquatic life. Mr. Fukumitsu expressed concern that increased runoff and sedimentation from construction projects within Waikāne and Waiāhole, including the current project, could exacerbate conditions within Waiāhole *muliwai*, which he noted is a spawning ground and sanctuary for fish and invertebrate species. He believes ongoing restoration of *lo* 'i *kalo* and fishponds *makai* of the project area will help mitigate impacts of potential construction runoff associated with the project.
2. Mr. Reppun mentioned there were *lo* 'i and *kuleana* parcels located along the streams and into the valley. He asked, "How does this project impact the potential for restoring cultivation up into that area? Whether it's taro or it's *māmaki* for tea. All those kinds of things."
3. Mr. Uyemura believes that the project, specifically pumping water from wells rather than obtaining water from the tunnel, could impact stream flows that cultural farming practices rely on. He expressed concern that using a pump system to pull up water from a depth lower than the river may cause the river to dry up. He also expressed concern that pumps may begin pulling up brackish or salt water.

9.3.2 Recommendations

1. Community members preferred a different alternative. Mr. Fukumitsu, Mr. Reppun, and Mr. Uyemura suggested tapping development tunnels that feed the Waiāhole Tunnel and Ditch System, including the Uwao development tunnel, instead of pumping groundwater from the aquifer. Mr. Reppun and Mr. Uyemura also suggested using water from the development tunnels to generate hydroelectric power.
2. Mr. Fukumitsu recommends native plants be utilized whenever possible in reforestation efforts following clearing that occurs in the buffer zones of development projects, including the current project. He emphasized “foods that occur locally and naturally within the Hawaiian environment should be propagated and planted as they possess a district’s ‘cultural value.’” He also suggested establishing a seed bank that extends *mauka* to *makai* in order to retain access to native plant varieties.
3. Mr. Fukumitsu harvests the Albizia trees in Waiāhole and utilizes the wood for canoe construction. He harvests the Albizia wood directly within and surrounding the current project area. If the project results in the harvest of an Albizia tree that is of sufficient size, it could be offered to Mr. Fukumitsu for building a canoe. Mr. Reppun also suggested “cutting Albizia trees and managing the watershed would reduce the potential for impacts on that pump station” (note: this refers to the wells that will be removed during the current project).
4. Mr. Fukumitsu requested that an area of bamboo patches *mauka* of the proposed reservoir be left intact. He stated the bamboo hedges are planted on top of ancient taro terraces, and the bamboo patches keep the soil in place, deterring further erosion of the ancient taro terraces. He stressed that “they leave the bamboo as a hedge to keep the soil in place. So whatever construction they do over here they have to leave the bamboo, they have to leave at least a good portion of the bamboo.” He also stated that “one terrace off the road that is a no-no, they cannot go in there. They just cannot go in the bamboo patch.” Based on current project plans, no bamboo patches will be disturbed. Any revisions to the plans should aim to avoid the bamboo patches.
5. Mr. Reppun stressed that the system being proposed has to be climate resilient. He stressed the importance of consulting FIRM, which were “drawn basically from the aerial photographs of those events that showed where flooding occurred.” He noted climate change intensifies the potential for and frequencies of these storms.
6. Mr. Reppun discussed the possibility of the community using portions of Lot 50 for purposes beyond the proposed wells and tank. He suggested Lot 50 could be a great location for “a cultural center, a *piko*, place where we could celebrate the ancient history.” He also suggested the possibility of building some housing or an emergency shelter.
7. Mr. Reppun shared several referrals of other community members who are very knowledgeable of the historic and cultural significance of Waiāhole and Waikāne. He suggested speaking with John and Martin Charlot, who lived in the vicinity of Lot 50; Liko Hoe, who runs the Waiāhole Poi Factory and is a professor at Windward Community College; Hawaiian Civic Clubs; Mahealani Cypher, Secretary of the Ko‘olau Foundation; Dr. Lilikalā Kame‘eleihiwa, Senior Professor at University of Hawai‘i at Mānoa’s Kamakakūokalani Center for Hawaiian Studies; Cy Bridges, *kuma*

hula and Cultural Director at Polynesian Cultural Center; Mary Kupau, *kuma hula*; and *kama 'āina* of Waiāhole Ryan Ringuette, Rainbow Uli'i, and Kaua Fiola.

8. Project construction workers and all other personnel involved in the construction and related activities of the project should be informed of the possibility of inadvertent cultural finds, including human remains. In the event that any potential historic properties are identified during construction activities, all activities will cease in that area and the SHPD will be notified pursuant to HAR §13-280-3. In the event that *iwi kūpuna* are identified, all earth moving activities in the area will stop, the area will be cordoned off, and the SHPD, medical examiner, and Police Department will be notified pursuant to HAR §13-300-40. In addition, in the event of an inadvertent discovery of human remains, the completion of a burial treatment plan, in compliance with HAR §13-300 and HRS §6E-43, is recommended.

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Appendix A Land and Water Deeds for Waikāne-Waiāhole

A.1 Royal Patent 464 Between Kamehameha III and E.O. Hall

Lib. 3 Pg. 135

Royal Patent of Waikane

Number 464
Deed of
Kamehameha III
to
E.O Hall & Henry Damon

By this Royal Patent Kamehameha III, By the Grace of God, king of the Hawaiian Islands, makes known to all men that this day, for himself and his successors in dynasty.
He has given and granted absolutely if Fee Simple unto E.O Hall and Henry Damon, his faithful subjects, all of that parcel of land situate at Waikane, Koolaupoko, an ahupuaa in the island of Oahu, bounded as follows:

Beginning at the boardwalk at the mouth of Waiahole river at seashore and running inland along the west edge of the river between this and Waiahole in the bushes to the hala tree marked near the stream, thence run inland along Waiahole to the top of the high mountain at a place called Waikēkee.

As follows: 65.W. 5.74 ch. going up to 7 1/4 W. 3.54 ch. going up on top of the ridge facing the Kalawa.

Mauka of a certain hill to a roadway which has been dug 77 30' W. 4.89 ch. to the kukui tree marked B. 60 W. 6.59 ch. to the junction of the roadway near the "Aumeume-wai a na Elemakule" ridge N. 73 80 W. 9 ch. along the road to stake at edge of road E. 89 15' W. 13.85 ch. ascending to the stake at the back of the house Kuiki S. 74 15' W. 5.13 ch. to the downward slope of the road in the mountain N. 80 45' W. 7.84 ch. descending in the mountain along the road and Palalauhala'i to the middle of Paupaka, thence on the ridge to the middle of puu Kawaipi and puu Kapilikua to the top of Kualono ridge to its curve thence go up along the ridge of Kamae pali to the place called the West onionioo of the tow mass to the edge of the mountain ridge, the boundary between Koolau and Ewa to the place called Oumakua adjoining the Mookapu Waianae ridge and Kahona thence going down toward the sea on the Mookapu of Waianae and Kahona to the middle of Puchulehule, thence go down on the narrow ridge between this and Hakipuu to the middle Pueo thence N. 70 E. 40 ch. going down to Hakipuu to the high-water mark at seashore thence run along high water mark to the place of beginning.

There is excepted from the foregoing, the kuleana mentioned below as follows:
The church lot is also reserved. Total area: 1,698 48/100 acres, more or less.
Made October.3, A.D. 1850

(Signed) Kamehameha III

No entry on pages 9 and 10.

A.2 Deed between Hall & Diamond to Elani & others 1862

(3)

<u>HALL & DIMOND</u> TO <u>ELANI & OTHERS</u>	} } } }	D E E D <u>DATED: APRIL 30th 1862</u> <u>CONSIDERATION: \$ 1.800</u> <u>LIBER 17 - PAGE 162</u>
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(TRANSLATION)

Know all men by these presents, That we, Edwin O. Hall and Henry Dimond of Honolulu, Island of Oahu, for and in consideration of One Thousand Eight Hundred Dollars, to us in hand paid by those parties which are herewith described below, we do hereby give, grant, bargain, sell, transfer and quit-claim all of our right, title and interest in the Ahupuaa of Waikane, Koolaupoko, Oahu, which is more particularly described in Grant No. 464 issued in our name, and containing an area of (1698) Acres more or less.

1. Elani	13. Kalaeloa	25. Puka
2. Hao	14. Keoloewa	26. Polani
3. Kapua	15. Makala	27. Waikiki
4. Kuiki	16. Moku	28. Kalili
5. Kalawaiapaa	17. Manoanoa	29. Kaiwi K.
6. Kamaua	18. Mahoe	30. Pine
7. S. Kailaa	19. Makaanui	31. Kinole
8. Kaikaina	20. Manono	32. Keliokalan
9. Kaiwi M.	21. R. S. Maka	33. Kaee
10. Kauoleloa	22. Naalelua	34. Hookoni
11. J. Kepau	23. Punikaau	35. L. Puweuweu
12. Kealoha	24. J. N. Nahili	

And to their heirs and assigns forever all those parcels of lands better known as the Ahupuaa of Waikane, Koolaupoko, Oahu aforesaid, together with the water and the fishing rights thereon and therein the Ahupuaa of Waikane.

(Sig) Edwin O. Hall
Henry Dimond

Acknowledged: August 19, 1863, before Thos. Brown, Registrar of Conveyances in Honolulu, Island of Oahu, Hawaiian Islands

Recorded & Compared: August 19, at 4:00 o'clock P. M.

A.3 Deed between Elizabeth Loy Marks and Windward Partners 1975

Recordation requested by: After recordation, return to: <i>Security Title</i> Return by Mail <input type="checkbox"/> Pickup <input checked="" type="checkbox"/>	<div style="font-size: 2em; font-weight: bold;">0</div> <div style="font-size: 1.5em; font-weight: bold;">75- 55044</div> <div style="text-align: right; font-size: 0.8em;"> LHM 10815 459 1975 JUL 30 PM 3:29 <i>CLERK</i> </div>
---	--

KNOW ALL MEN BY THESE PRESENTS:

That ELIZABETH LOY MARKS, widow of A. Lester Marks, whose residence and post office address is 3860 Old Pali Road, Honolulu, Hawaii, Grantor, in consideration of TEN DOLLARS (\$10.00) and other good and valuable consideration to her paid by WINDWARD PARTNERS, a general partnership registered with the State of Hawaii, whose principal place of business and post office address is 880 Wanaao Road, Kailua, Hawaii 96734 -----, Grantee, the receipt of which is hereby acknowledged, does hereby grant, remise, release and forever quitclaim unto the Grantee, its legal successors and assigns, the property more particularly described on Exhibit "A" attached hereto and made a part hereof.

AND the reversions, remainders, rents, issues and profits thereof, all the estate, right, title and interest of the Grantor therein and thereto, and all the improvements thereon, and the easements, privileges and appurtenances thereunto belonging or appertaining.

TO HAVE AND TO HOLD the same unto the Grantee, its legal successors and assigns, forever.

IN WITNESS WHEREOF, the Grantor has caused this

instrument to be duly executed this 18th day of July, 1975.

Elizabeth Loy Marks
ELIZABETH LOY MARKS

STATE OF HAWAII)
CITY AND COUNTY OF HONOLULU) SS.

On this 21 day of July, 1975,
before me personally appeared ELIZABETH LOY MARKS, to me
known to be the person described in and who executed the
foregoing instrument, and acknowledged that she executed the
same as her free act and deed.

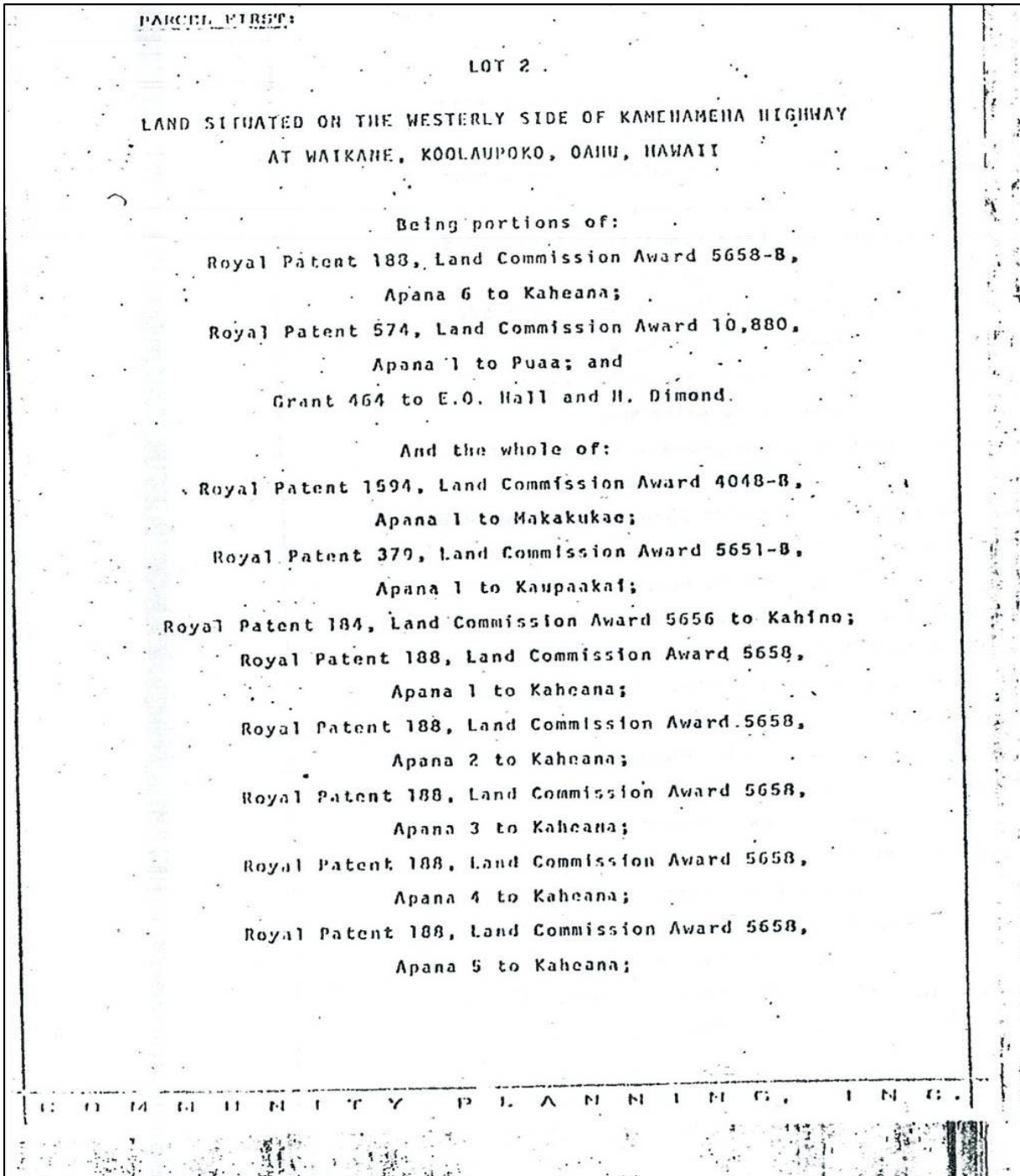
Margaret M. Soener
Notary Public, First Judicial
Circuit, State of Hawaii.
My commission expires 1/19/76

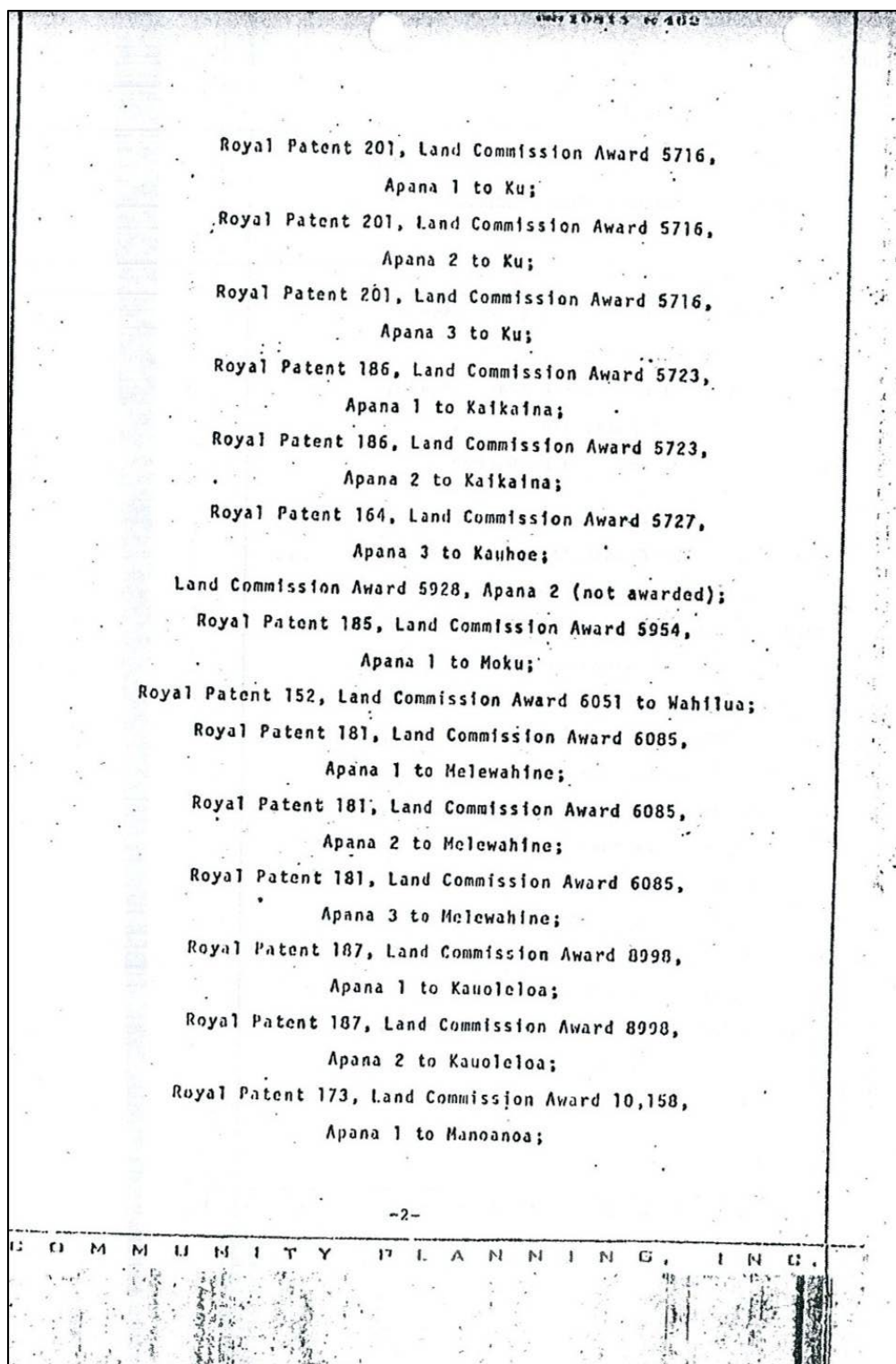
STATE OF HAWAII CONVEYANCE TAX...
P H JUL 30 75 10517 900.00

STATE OF HAWAII CONVEYANCE TAX...
P H JUL 30 75 10517 900.00

STATE OF HAWAII CONVEYANCE TAX...
P H JUL 30 75 10517 700.00

-2-





LINE 10815 PC 463

Royal Patent 574, Land Commission Award 10,880,

Apana 2 to Puua;

Royal Patent 183, Land Commission Award 10,880-B,

Apana 3 to Makahuli

Beginning at the Southwest corner of this parcel of land, the coordinates of which referred to Government Survey Triangulation Station "PUU KAUAI" being 3650.27 feet North and 5109.93 feet West and running by azimuths measured clockwise from true South:

1. 174° 56' 52" 4064.46 feet along remainder of Grant 464 to E.O. Hall and H. Dimond;

Thence up along the middle of ridge, along remainder of Grant 464 to E.O. Hall and H. Dimond for the next seven (7) courses, the direct azimuths and distances to points along said middle of ridge being:

2. 168° 00' 250.00 feet;
3. 158° 00' 630.00 feet;
4. 161° 00' 650.00 feet;
5. 150° 00' 210.00 feet;
6. 183° 00' 500.00 feet;
7. 186° 00' 450.00 feet;
8. 197° 19' 10" 527.74 feet;
9. 300° 30' 1254.00 feet along remainder of Grant 596, Apana 1 to A.S. Cooke;
10. 326° 00' 810.00 feet along remainder of R.P. 7482, L.C. Aw. 4452, Apana 14 to H. Kalama;
11. 312° 05' 375.00 feet along remainder of R.P. 7482, L.C. Aw. 4452, Apana 14 to H. Kalama;

-3-

C O M M U N I T Y P L A N N I N G , I N C .

CONSULTING PLANNERS CITY ENGINEERS SURVEYORS

LIBER 10815 to 464

12.	317° 30'	595.00 feet	along remainders of R.P. 7482, L.C. Aw. 4452, Apana 14 to H. Kalama and Grant 379 to A.S. Cooke;
13.	270° 58' 53"	948.20 feet	along remainder of Grant 379 to A.S. Cooke;
14.	267° 34'	356.22 feet	along remainder of Grant 379 to A.S. Cooke;
15.	253° 58'	851.11 feet	along remainder of Grant 379 to A.S. Cooke;
16.	337° 56'	270.00 feet	along the Westerly side of Kamehameha Highway;
17.	67° 56'	315.00 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond;
18.	339° 08'	825.18 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond;
19.	247° 56'	332.28 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond;
20.	337° 56'	507.12 feet	along the Westerly side of Kamehameha Highway;
21.	69° 00'	379.50 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond (Roman Catholic Church);
22.	349° 55'	235.34 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond (Roman Catholic Church);
23.	80° 55'	91.74 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond (Roman Catholic Church);
24.	105° 30'	87.78 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond (Roman Catholic Church);
25.	3° 45'	210.68 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond (Roman Catholic Church);
26.	Thence following down along the centerline of a stream, along remainder of Grant 464 to E.O. Hall and H. Dimond (Roman Catholic Church), the direct azimuth and distance being 279° 05' 302.52 feet;		

-4-

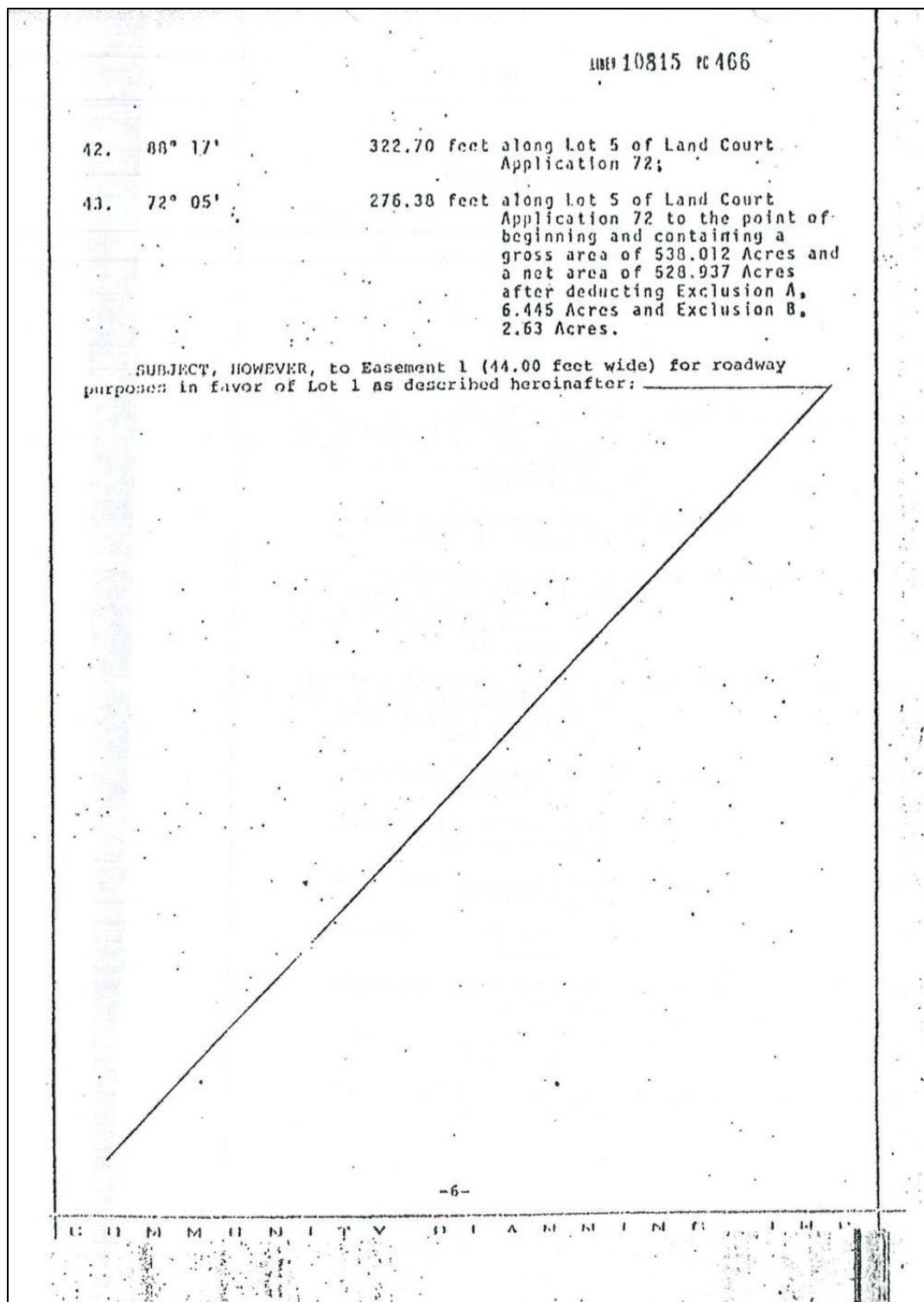
C O M M U N I T Y P L A N N I N G , I N C .

LOT 10815 AC 465

27.	181° 15'	105.60 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond (Roman Catholic Church);
28.	185° 00'	204.60 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond (Roman Catholic Church);
29.	200° 00'	336.60 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond (Roman Catholic Church);
30.	337° 54'	387.15 feet	along the Westerly side of Kamehameha Highway;
31.	Thence along the Westerly side of Kamehameha Highway on a curve to the right with a radius of 856.60 feet, the chord azimuth and distance being 349° 14' 336.67 feet;		
32.	0° 34'	391.80 feet	along the Westerly side of Kamehameha Highway;
33.	Thence along the Westerly side of Kamehameha Highway on a curve to the left with a radius of 3482.34 feet, the chord azimuth and distance being 351° 29' 16" 1098.99 feet;		
34.	Thence up along the centerline of a stream along Lot 5 of Land Court Application 72, the direct azimuth and distance being 73° 12' 1801.55 feet;		
35.	16° 30'	165.00 feet	along Lot 5 of Land Court Application 72;
36.	56° 12'	137.00 feet	along Lot 5 of Land Court Application 72;
37.	84° 15'	719.00 feet	along Lot 5 of Land Court Application 72;
38.	71° 04'	8.00 feet	along Lot 5 of Land Court Application 72;
39.	17° 48'	125.60 feet	along Lot 5 of Land Court Application 72;
40.	88° 10'	326.70 feet	along Lot 5 of Land Court Application 72;
41.	77° 16'	1158.00 feet	along Lot 5 of Land Court Application 72;

-5-

C O M M U N I T Y P L A N N I N G , I N C .
COMMUNITY PLANNERS, CIVIL ENGINEERS, SURVEYORS



LINE 10815 PC 467

EASEMENT 1

(44.00 FEET WIDE) FOR ROADWAY PURPOSES

LAND SITUATED AT WAIKANE, KOOLAUPOKO, OAHU, HAWAII

Being a portion of Grant 464 to E.O. Hall and H. Dimond

Beginning at the Northwest corner of this easement, being also the Northeast corner of Parcel 1, the coordinates of which referred to Government Survey Triangulation Station "PUU KAUAI" being 7698.94 feet North and 5467.86 feet West and running by azimuths measured clockwise from true South:

1.	240° 30'	170.40 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond;
2.	265° 30'	528.53 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond;
3.	325° 00'	317.93 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond;
4.	350° 00'	299.63 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond;
5.	321° 00'	192.96 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond;
6.	273° 00'	173.22 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond;
7.	343° 00'	201.90 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond;
8.	283° 00'	167.09 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond;
9.	320° 00'	150.00 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond;
10.	280° 00'	398.18 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond;

-7-

LIBER 10815 PC 468

11.	300° 00'	399.19 feet along remainder of Grant 464 to E.O. Hall and H. Dimond;
12.	279° 00'	245.18 feet along remainder of Grant 464 to E.O. Hall and H. Dimond;
13.	246° 00'	201.60 feet along remainder of Grant 464 to E.O. Hall and H. Dimond;
14.	295° 00'	206.59 feet along remainder of Grant 464 to E.O. Hall and H. Dimond;
15.	318° 00'	952.66 feet along remainder of Grant 464 to E.O. Hall and H. Dimond;
16.	287° 00'	218.75 feet along remainder of Grant 464 to E.O. Hall and H. Dimond;
17.	264° 28'	221.33 feet along remainder of Grant 464 to E.O. Hall and H. Dimond;
18.	269° 59'	475.18 feet along remainder of Grant 464 to E.O. Hall and H. Dimond;
19.	294° 00'	409.17 feet along remainder of Grant 464 to E.O. Hall and H. Dimond;
20.	273° 07' 30"	173.63 feet along remainder of Grant 464 to E.O. Hall and H. Dimond;
21.	Thence along the Westerly side of Kamehameha Highway on a curve to the left with a radius of 3482.34 feet, the chord azimuth and distance being 350° 23' 10" 45.11 feet;	
22.	93° 07' 30"	191.68 feet along R.P. 574, L.C. Av. 10,380, Apana 1 to Puua and along remainder of Grant 464 to E.O. Hall and H. Dimond;
23.	114° 00'	407.91 feet along remainder of Grant 464 to E.O. Hall and H. Dimond;
24.	89° 59'	463.70 feet along remainder of Grant 464 to E.O. Hall and H. Dimond;
25.	84° 28'	227.98 feet along remainder of Grant 464 to E.O. Hall and H. Dimond;
26.	107° 00'	239.72 feet along remainder of Grant 464 to E.O. Hall and H. Dimond;
27.	138° 00'	955.91 feet along remainder of Grant 464 to E.O. Hall and H. Dimond;

-B-

LIBER 10815 PC 469		
28. 115° 00'	177.59 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond;
29. 66° 00'	194.58 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond;
30. 99° 00'	266.37 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond;
31. 120° 00'	402.73 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond;
32. 108° 00'	406.17 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond;
33. 140° 00'	150.00 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond;
34. 108° 00'	179.88 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond;
35. 168° 00'	193.54 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond;
36. 93° 00'	159.05 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond;
37. 141° 00'	223.93 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond;
38. 170° 00'	301.26 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond;
39. 145° 00'	283.03 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond;
40. 85° 30'	493.63 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond;
41. 60° 30'	180.65 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond;
42. 174° 56' 52"	48.33 feet	along remainder of Grant 464 to E.O. Hall and H. Dimond to the point of beginning and containing an area of 268,440 square feet.
-9-		
C O M M U N I T Y P L A N N I N G , I N C . CONSULTANTS PLANNERS - CIVIL ENGINEERS - SURVEYORS		

m. 10918 p. 179

Easement 1 being a 44-foot wide roadway easement in favor of and appurtenant to Lot 1, with Lot 1 being described as follows:

LOT 1

LAND SITUATED AT WAIKANE, KOOLAUPŌKO, OAHU, HAWAII

Being portions of:

Grant 464 to E.O. Hall and H. Dimond and
Grant 2874 to Kaopulupulu

And the whole of:

Royal Patent 201, Land Commission Award 5716,
Apana 4 to Ku;
Royal Patent 574, Land Commission Award 10,880,
Apana 4 to Puua;
Royal Patent 3056, Land Commission Award 10,973,
Apana 2 to Wahahee
Royal Patent 574, Land Commission Award 10,880,
Apana 3 (unlocated) to Puua

Beginning at the Southeast corner of this parcel of land, on the boundary line between Waiahole and Waikane, approximately 4850 feet West of Kamehameha Highway, the coordinates of which referred to Government Survey Triangulation Station "PUU KAUA'I" being 3650.27 feet North and 5109.93 feet West and running by azimuths measured clockwise from True South:

1.	72° 05'	158.52 feet	along Lot 5 of Land Court Application 72 (Amd);
2.	117° 33'	594.00 feet	along remainder of Grant 2874 to Kaopulupulu;
3.	101° 32'	914.10 feet	along remainder of Grant 2874 to Kaopulupulu;
4.	80° 50'	338.60 feet	along remainder of Grant 2874 to Kaopulupulu;
5.	110° 43'	517.50 feet	along remainder of Grant 2874 to Kaopulupulu;

-10-

C O M M U N I T Y P L A N N I N G I N C .

LINE 10815 to 471

6. 136° 38' 389.43 feet along remainder of Grant 2874 to Kaopulupulu;
7. 4° 17' 779.26 feet along remainder of Grant 2874 to Kaopulupulu;
8. 123° 00' 480.95 feet along Grant 2702 to Kekakeiki;
9. 155° 59' 53" 1570.81 feet along Grant 2702 to Kekakeiki;

Thence following up along the middle of ridge along Grant 2702 to Kekakeiki for the next three (3) courses, the direct azimuths and distances to points along said middle of ridge being:

10. 143° 09' 10" 233.75 feet;
11. 113° 16' 55" 1765.50 feet;
12. 94° 00' 4510.00 feet;

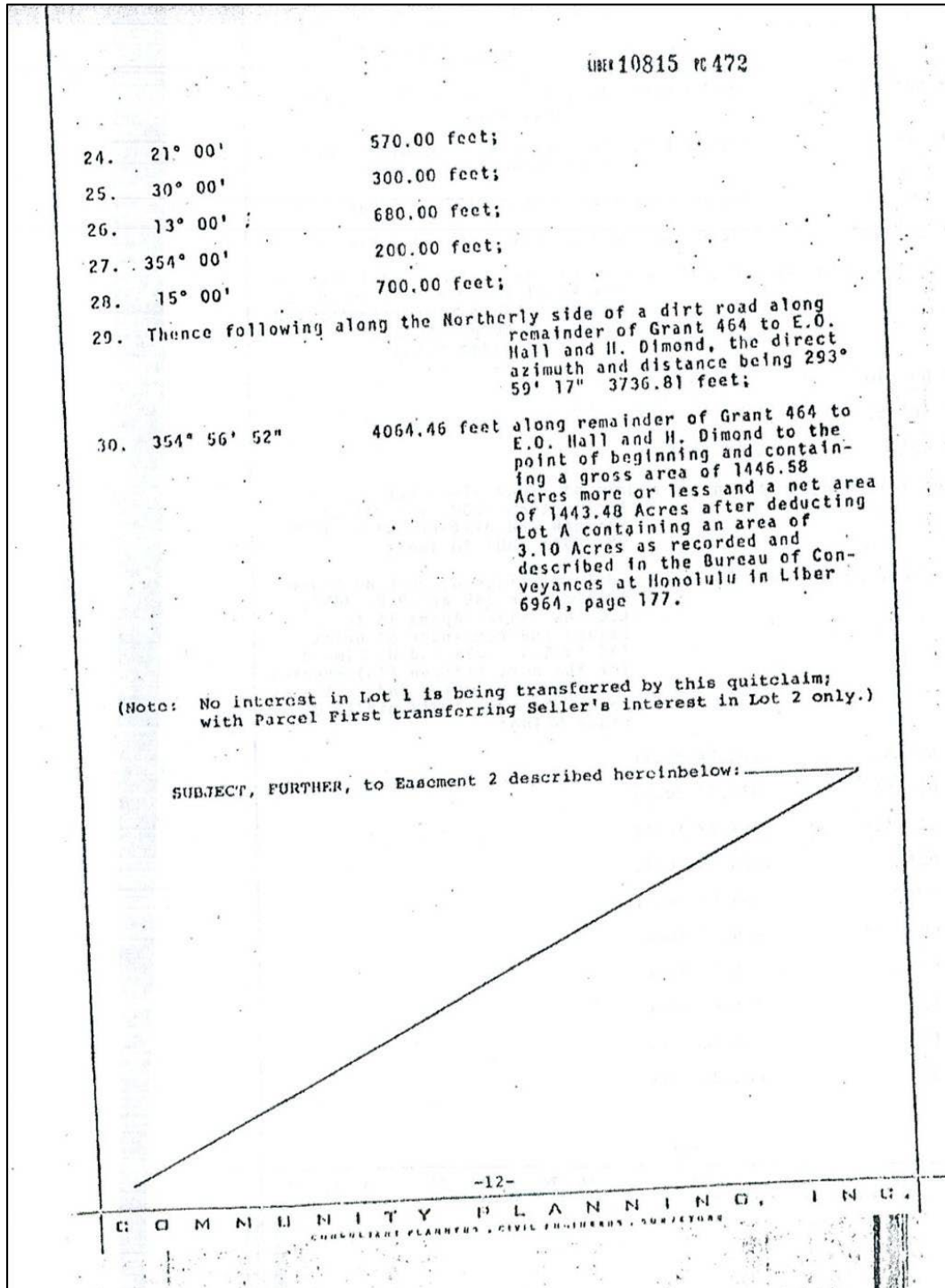
13. Thence following up along the middle of ridge along Land Court Application 1000, the direct azimuth and distance being 153° 30' 05" 3301.48 feet;

Thence following down along the middle of ridge along Land Court Application 285 and R.P. 7482, L.C. Aw. 4452, Apana 14 to H. Kalama and remainder of Grant 464 to E.O. Hall and H. Dimond for the next fifteen (15) courses, the direct azimuths and distances to points along said middle of ridge being:

14. 234° 05' 40" 4165.74 feet;
15. 190° 07' 25" 2036.03 feet;
16. 271° 53' 45" 917.72 feet;
17. 256° 00' 1700.00 feet;
18. 116° 00' 960.00 feet;
19. 278° 09' 26" 686.98 feet;
20. 333° 55' 635.00 feet;
21. 320° 15' 755.00 feet;
22. 335° 10' 230.23 feet;
23. 10° 00' 600.00 feet;

-11-

C O M M U N I T Y P L A N N I N G , I N C .
CONSULTING PLANNERS, CIVIL ENGINEERS, SURVEYORS



LINE 10815 PC 473

EASEMENT 2

(44.00 FEET WIDE) FOR ROADWAY PURPOSES

LAND SITUATED AT WAIKANE, KOOLAUPOKO, OAHU, HAWAII

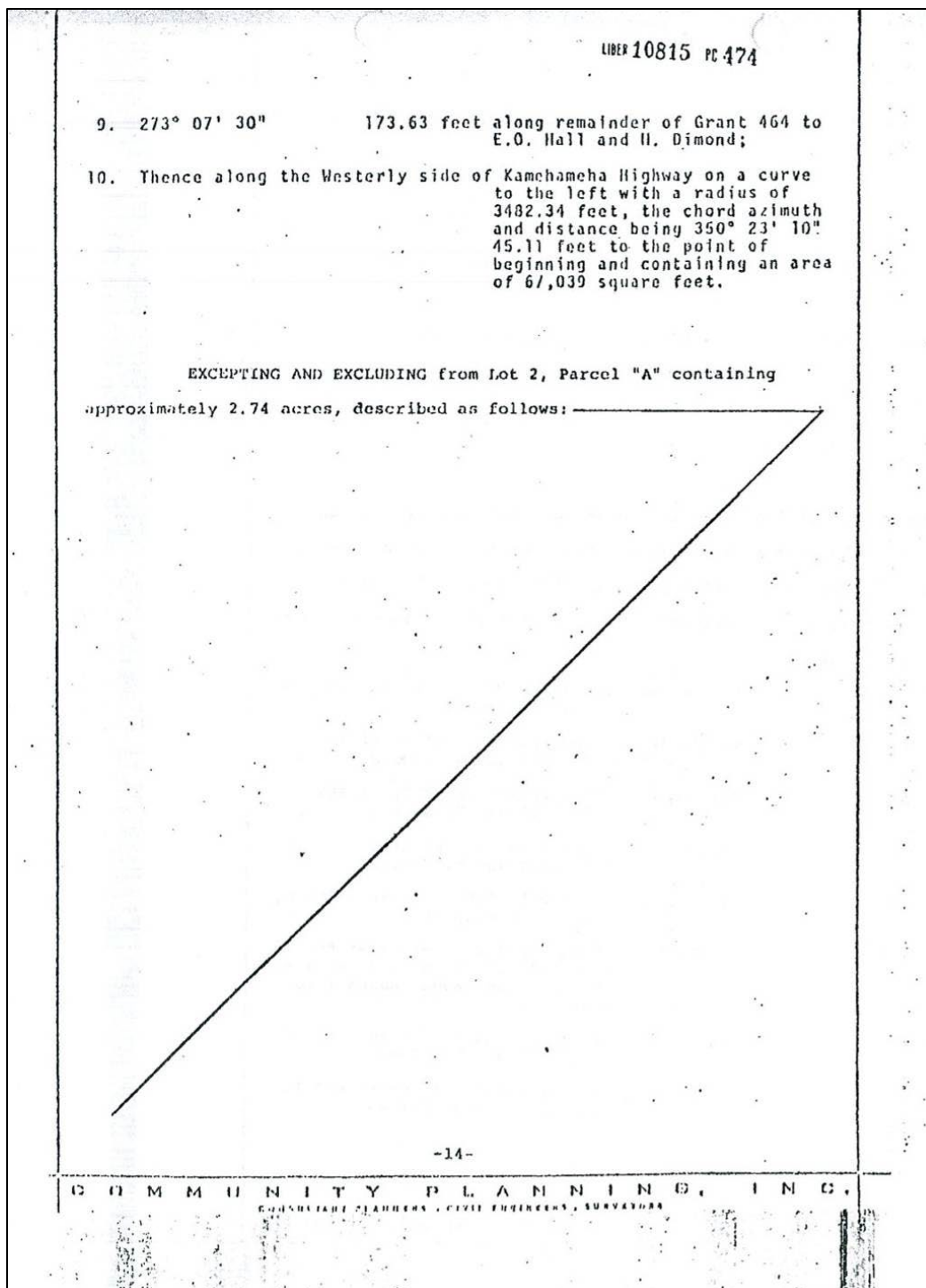
Being portions of Grant 464 to E.O. Hall and H. Dimond and
 Royal Patent 187, Land Commission Award 8998,
 Apana 1 to Kauoleloa

Beginning at the Southeast corner of this easement, on the
 Westerly side of Kamehameha Highway, the coordinates of which referred
 to Government Survey Triangulation Station "PUU KAUAI" being 5408.64
 feet North and 531.75 feet West and running by azimuths measured clock-
 wise from true South:

- | | | |
|----------------|-------------|--|
| 1. 93° 07' 30" | 191.68 feet | along R.P. 574, L.C. Aw. 10,880,
Apana 1 to Puaa; |
| 2. 114° 00' | 407.91 feet | along remainder of Grant 464 to
E.O. Hall and H. Dimond; |
| 3. 89° 59' | 363.25 feet | along remainder of Grant 464 to
E.O. Hall and H. Dimond; |
| 4. 164° 55' | 595.48 feet | along remainder of Grant 464 to
E.O. Hall and H. Dimond; |
| 5. 247° 25' | 44.38 feet | along R.P. 379, L.C. Aw. 5651-B,
Apana 1 to Kaupuka; |
| 6. 344° 55' | 567.55 feet | along remainders of Grant 464 to
E.O. Hall and H. Dimond and R.P.
187, L.C. Aw. 8998, Apana 1 to
Kauoleloa; |
| 7. 269° 59' | 338.89 feet | along remainder of Grant 464 to
E.O. Hall and H. Dimond; |
| 8. 294° 00' | 409.17 feet | along remainder of Grant 464 to
E.O. Hall and H. Dimond; |

-13-

C O M M U N I T Y P L A N N I N G , I N C .



LIDED 10815 PC 475

PARCEL "A"

LAND SITUATED ON THE WEST SIDE OF KAMEHAMEHA HIGHWAY
AT WAIKANE, KOOLAUPOKO, OAHU, HAWAII

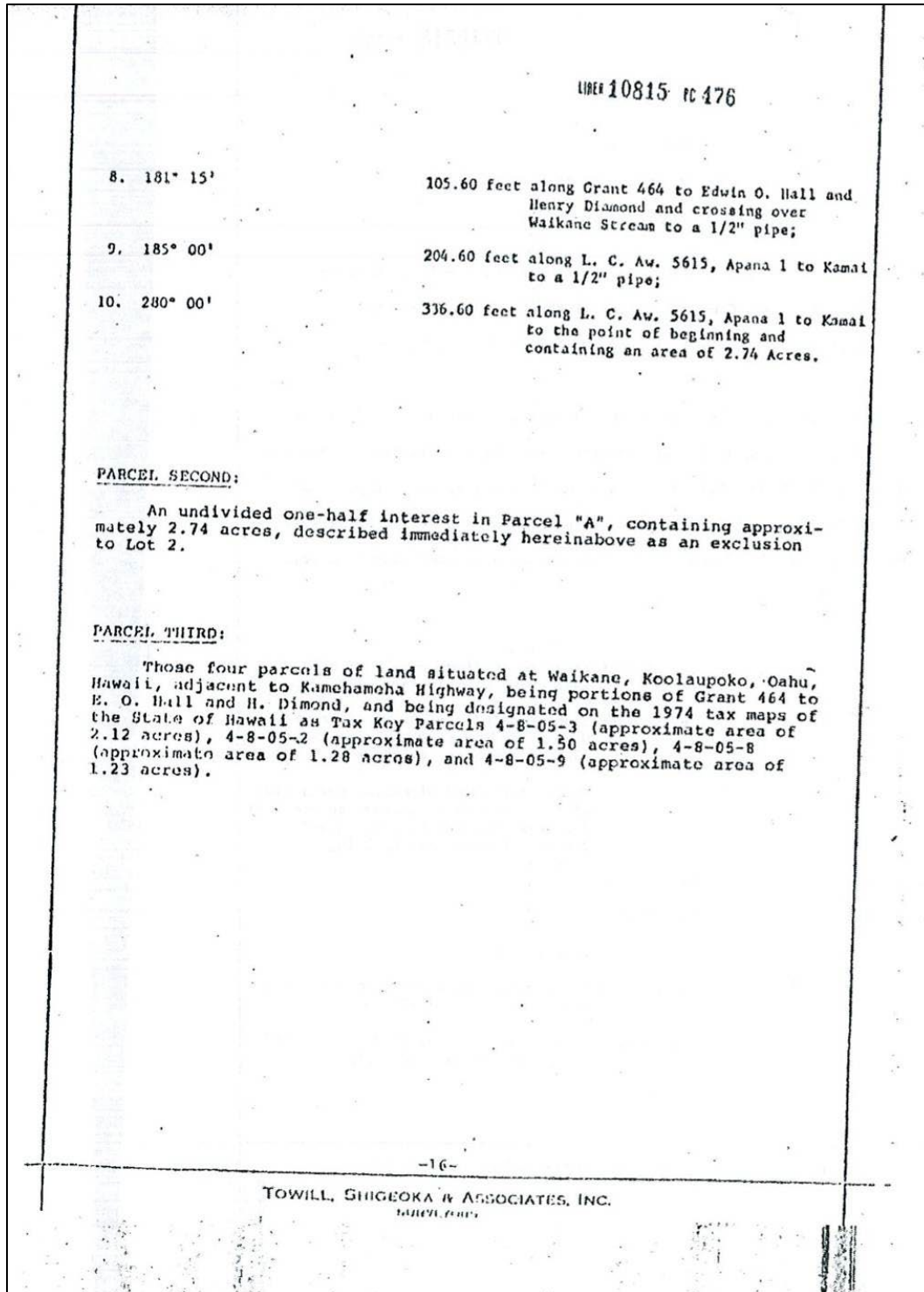
Being the whole of Royal Patent 152 Land Commission Award 6051 to Wahilua
Royal Patent 183 Land Commission Award 10880-B, Apana 3 to Makanui
and a Portion of Grant 464 to Edwin O. Hall and Henry Diamond

Beginning at a 3/4" pipe (found) at the Northeast corner of this parcel of
land on the West side of Kamehameha Highway the direct azimuth and distance to a State
Survey Monument being 159° 48' 40" 341.16 feet and the coordinates of said point of
beginning referred to Government Survey Triangulation Station "POU KAUAU" being 7,121.84
feet North and 787.31 feet West and running by azimuths measured clockwise from true
South:

1. 337° 54'	340.94 feet along fence along West side of Kamehameha Highway to a 1/2" pipe;
2. 67° 54'	61.18 feet along remainder of Grant 464 to Edwin O. Hall and Henry Diamond to the top bank of stream to a 1/2" pipe;
	Thence following along the North side of the top bank of stream for the next 3 courses the direct azimuth and distance between points being:
3. 132° 15'	125.00 feet;
4. 87° 30'	127.00 feet;
5. 97° 04'	20.69 feet to a 1/2" pipe;
6. 76° 15'	50.00 feet along Grant 464 to Edwin O. Hall and Henry Diamond to a 1/2" pipe;
7. 98° 00'	128.00 feet along Grant 464 to Edwin O. Hall and Henry Diamond to a 1/2" pipe;

-15-

TOWILL, SHIGEMURA & ASSOCIATES, INC.



PARCEL FOURTH: LIBER 10815 PC 477

LOT A

LAND SITUATED ON THE NORTHEASTERLY SIDE OF KAMEHAMEHA HIGHWAY
AT WAIKANE, KOOLAUPOKO, OAHU, HAWAII

Being portions of:
Grant 464 to E.O. Hall and H. Dimond and
Grant 6411 to M.K. Maka

And the whole of:
Royal Patent 576, Land Commission Award 5711, Apana 2 to Koma

Beginning at the Southwest corner of this parcel of land, on
the Northeasterly side of Kamehameha Highway, the coordinates of which
referred to Government Survey Triangulation Station "PUU KAUAI" being
8597.25 feet North and 1331.11 feet West and running by azimuths
measured clockwise from true South:

1. 157° 52'	429.87 feet along the Northeasterly side of Kamehameha Highway;
2. 253° 49'	517.96 feet along Grant 379 to A.S. Cooke, along Lot 1 of Hakipuu Lots Subdivision to the highwater mark (vegetation line located June 24, 1975);

Thence following along the highwater mark (vegetation line located
June 24, 1975) for the next
nineteen (19) courses, the direct
azimuths and distances between
points along said highwater mark
being:

3. 335° 01' 30"	10.57 feet;
4. 332° 18' 30"	33.51 feet;
5. 339° 17' 30"	28.66 feet;
6. 342° 49' 30"	57.35 feet;

-17-

C O M M U N I T Y P L A N N I N G, I N C.
CONSULTING PLANNERS - CIVIL ENGINEERS - SURVEYORS

LIBER 10815 PG 478

7.	346° 35' 30"	16.27 feet;
8.	340° 08'	29.33 feet;
9.	340° 04'	22.56 feet;
10.	334° 45' 30"	22.00 feet;
11.	337° 35'	21.54 feet;
12.	347° 29'	14.70 feet;
13.	350° 15'	14.41 feet;
14.	294° 03'	5.88 feet;
15.	358° 12'	17.83 feet;
16.	352° 49'	32.39 feet;
17.	329° 42' 30"	25.55 feet;
18.	329° 32'	19.41 feet;
19.	349° 33'	19.96 feet;
20.	357° 16' 30"	18.63 feet;
21.	339° 19' 30"	45.86 feet;
22.	76° 23'	494.54 feet along remainder of Grant 464 to E.O. Hall and H. Dimond (along Lots 6, 7, 8 and 11 of Kamaka Subdivision) to the point of beginning and containing an area of 5.130 Acres.

SUBJECT, HOWEVER, to a 40' building setback line running approximately parallel to the highwater mark line.

SUBJECT, FURTHER, as to Parcels First, Second, Third and Fourth, the encumbrances noted on ~~Schedule B~~ ^{EXHIBIT A} to the unrecorded Land Exchange and Purchase Agreement dated May 21, 1975, by the Grantor, as Seller, and Pao Investment Corporation, as Buyer, and now held by the Grantee, as Buyer.

-18-

C O M M U N I T Y P L A N N I N G

Certified to be a true and correct copy
of the original presented for record.

CHARLES F. NEUMAN III, Registrar

By: *E. Kuroda* Clerk

A.4 Deed Phoenix Limited Partnership and Pan-Pacific Development Inc 16 July 1987

STC 148463-A

RECORDATION REQUESTED BY:
SECURITY TITLE CORPORATION

AFTER RECORDATION, RETURN TO:
SECURITY TITLE CORPORATION

RETURN BY: MAIL () PICKUP ()

87-106201

37 JUL 16 P2:32
20907 544
C.F. BUREAU OF LANDS

SPACE ABOVE THIS LINE FOR REGISTRAR'S USE

WARRANTY DEED

KNOW ALL MEN BY THESE PRESENTS:

That PHOENIX LIMITED PARTNERSHIP, a Hawaii limited partnership, of Honolulu, Hawaii, hereinafter called "Grantor," for and in consideration of the sum of TEN AND NO/100 DOLLARS (\$10.00) and other good and valuable consideration to Grantor paid by PAN-PACIFIC DEVELOPMENT, INC., a Hawaii corporation, whose principal place of business and post office address is Suite 2710, Pacific Tower, 1001 Bishop Street, Honolulu, Hawaii 96813, hereinafter called the "Grantee," does hereby grant, bargain, sell and convey unto the Grantee, and its successors and assigns, all of the real property described in Exhibit "A" attached hereto and incorporated herein by reference.

TOGETHER WITH all and singular the buildings, improvements, tenements, hereditaments, rights, easements, privileges and appurtenances thereon as thereunto belonging or appertaining or held and enjoyed in connection therewith,

STATE OF HAWAII
CONVEYANCE TAX
\$00.00
P.S. JUL 16 1987

STATE OF HAWAII
RECORDATION
\$00.00
P.S. JUL 16 1987

2007 545

and all reversions, remainders, rents, issues and profits thereof, and all of the estate, right, title and interest of Grantor, both at law and in equity, therein and thereto.

TO HAVE AND TO HOLD the same unto Grantee, absolutely and in fee simple forever.

AND in consideration of the premises, Grantor does hereby covenant with Grantee that Grantor is lawfully seized in fee simple of said granted premises; that said premises are free and clear of and from all liens and encumbrances except as noted in Exhibit "A" and except for current real property taxes which shall be prorated between Grantor and Grantee as of the date of closing; that Grantor has good right to sell and convey the said premises as aforesaid, and that Grantor will WARRANT AND DEFEND the same unto Grantee against the lawful claims and demands of all persons, except as aforesaid.

The terms "Grantor" and "Grantee," or any pronoun used in place thereof, as and when used herein, shall mean and include the parties hereto and their respective successors and assigns.

IN WITNESS WHEREOF, the Grantor has executed these presents on this 17th day of June, 1987.

PHOENIX LIMITED PARTNERSHIP,
a Hawaii Limited Partnership

By [Signature]
Its Managing General Partner

2

20907 547

EXHIBIT "A"

All of that certain parcel of land situated in the State of Hawaii, at Waikane, Koolaupoko, City and County of Honolulu, and more particularly described as follows:

PARCEL FIRST:

All of that certain parcel of land (being portions of: Royal Patent 188, Land Commission Award 5658-B, Apana 6 to Kaheana; Royal Patent 574, Land Commission Award 10,880, Apana 1 to Puua; and Grant 464 to E. O. Hall and H. Dimond; and the whole of: Royal Patent 1594, Land Commission Award 4048-B, Apana 1 to Makakukae; Royal Patent 379, Land Commission Award 5651-B, Apana 1 to Kaupaakai; Royal Patent 184, Land Commission Award 5656 to Kahino; Royal Patent 188, Land Commission Award 5658, Apana 1 to Kaheana; Royal Patent 188, Land Commission Award 5658, Apana 2 to Kaheana; Royal Patent 188, Land Commission Award 5658, Apana 3 to Kaheana; Royal Patent 188, Land Commission Award 5658, Apana 4 to Kaheana; Royal Patent 188, Land Commission Award 5658, Apana 5 to Kaheana; Royal Patent 201, Land Commission Award 5716, Apana 1 to Ku; Royal Patent 201, Land Commission Award 5716, Apana 2 to Ku; Royal Patent 201, Land Commission Award 5716, Apana 3 to Ku; Royal Patent 186, Land Commission Award 5723, Apana 1 to Kaikaina; Royal Patent 186, Land Commission Award 5723, Apana 2 to Kaikaina; Royal Patent 164, Land Commission Award 5727, Apana 3 to Kauhoe; Land Commission Award 5928, Apana 2 (not awarded); Royal Patent 185, Land Commission Award 5954, Apana 1 to Moku; Royal Patent 152, Land Commission Award 6051 to Waihilua; Royal Patent 181, Land Commission Award 6085, Apana 1 to Melewahine; Royal Patent 181, Land Commission Award 6085, Apana 2 to Melewahine; Royal Patent 181, Land Commission Award 6085, Apana 3 to Melewahine; Royal Patent 187, Land Commission Award 8998, Apana 1 to Kauoleloa; Royal Patent 187, Land Commission Award 8998, Apana 2 to Kauoleloa; Royal Patent 173, Land Commission Award 10,158, Apana 1 to Manoana; Royal Patent 574, Land Commission Award 10,880, Apana 2 to Puua; and Royal Patent 183, Land Commission Award 10,880-B, Apana 3 to Makahui) situated on the Westerly side of Kamehameha Highway, at Waikane, Koolaupoko, City and County of Honolulu, State of Hawaii, being LOT 2, and thus bounded and described:

Beginning at the Southwest corner of this parcel of land, the coordinates of which referred to Government Survey Triangulation Station "PUU KAUAI" being 3650.27 feet North and 5109.93 feet West and running by azimuths measured clockwise from true South:

20907 548

1. 174° 56' 52" 4064.46 feet along remainder of Grant
464 to E. O. Hall and H. Dimond;

Thence up along the middle of ridge along remainder of Grant
464 to E. O. Hall and H. Dimond for the next seven (7)
courses, the direct azimuths and distances to points along
said middle of ridge being:

- | | | |
|-----|--------------|--|
| 2. | 168° 00' | 250.00 feet; |
| 3. | 158° 00' | 630.00 feet; |
| 4. | 161° 00' | 650.00 feet; |
| | 150° 00' | 210.00 feet; |
| 6. | 193° 00' | 500.00 feet; |
| 7. | 186° 00' | 450.00 feet; |
| 8. | 197° 19' 10" | 527.74 feet; |
| 9. | 300° 30' | 1254.00 feet along remainder of Grant
596, Apana 1 to A. S. Cooke; |
| 10. | 326° 00' | 810.00 feet along remainder of R. P.
7482, L. C. Aw. 4452, Apana 14
to H. Kalama; |
| 11. | 319° 05' | 375.00 feet along remainder of R. P.
7482, L. C. Aw. 4452, Apana 14
to H. Kalama; |
| 12. | 317° 30' | 595.00 feet along remainders of R. P.
7482, L. C. Aw. 4452, Apana 14
to H. Kalama and Grant 379 to
A. S. Cooke; |
| 13. | 270° 58' 53" | 948.20 feet along remainder of Grant
379 to A. S. Cooke; |
| 14. | 267° 34' | 356.22 feet along remainder of Grant
379 to A. S. Cooke; |
| 15. | 253° 58' | 851.11 feet along remainder of Grant
379 to A. S. Cooke; |

-2-

20907 549

- | | |
|---|---|
| 16. 337° 56' | 270.00 feet along the Westerly side of Kamehameha Highway; |
| 17. 67° 56' | 315.00 feet along remainder of Grant 464 to E. O. Hall and H. Dimond; |
| 18. 339° 08' | 825.18 feet along remainder of Grant 464 to E. O. Hall and H. Dimond; |
| 19. 247° 56' | 332.28 feet along remainder of Grant 464 to E. O. Hall and H. Dimond; |
| 20. 337° 56' | 507.12 feet along the Westerly side of Kamehameha Highway; |
| 21. 69° 00' | 379.50 feet along remainder of Grant 464 to E. O. Hall and H. Dimond (Roman Catholic Church); |
| 22. 349° 55' | 235.34 feet along remainder of Grant 464 to E. O. Hall and H. Dimond (Roman Catholic Church); |
| 23. 80° 55' | 91.74 feet along remainder of Grant 464 to E. O. Hall and H. Dimond (Roman Catholic Church); |
| 24. 105° 30' | 87.78 feet along remainder of Grant 464 to E. O. Hall and H. Dimond (Roman Catholic Church); |
| 25. 3° 45' | 210.68 feet along remainder of Grant 464 to E. O. Hall and H. Dimond (Roman Catholic Church); |
| 26. Thence following down along the centerline of a stream, | along remainder of Grant 464 to E. O. Hall and H. Dimond (Roman Catholic Church), the direct azimuth and distance being 279° 05' 302.52 feet; |
| 27. 181° 15' | 105.60 feet along remainder of Grant 464 to E. O. Hall and H. Dimond (Roman Catholic Church); |

-3-

20907 550

28. 185° 00' 204.60 feet along remainder of Grant
464 to E. O. Hall and H. Dimond
(Roman Catholic Church);
29. 280° 00' 336.60 feet along remainder of Grant
464 to E. O. Hall and H. Dimond
(Roman Catholic Church);
30. 337° 54' 387.15 feet along the Westerly side of
Kamehameha Highway;
31. Thence along the Westerly side of Kamehameha Highway on a
curve to the right with a radius
of 856.60 feet, the chord
azimuth and distance being 349°
14' 336.67 feet;
32. 0° 34' 391.80 feet along the Westerly side of
Kamehameha Highway;
33. Thence along the Westerly side of Kamehameha Highway on a
curve to the left with a radius
of 3482.34 feet, the chord
azimuth and distance being 351°
29' 16" 1098.99 feet;
34. Thence up along the centerline of a stream along Lot 5 of
Land Court Application 72, the
direct azimuth and distance
being 73° 12' 1801.55 feet;
35. 16° 30' 165.00 feet along Lot 5 of Land Court
Application 72;
36. 56° 12' 137.00 feet along Lot 5 of Land Court
Application 72;
37. 84° 15' 719.00 feet along Lot 5 of Land Court
Application 72;
38. 71° 04' 8.00 feet along Lot 5 of Land Court
Application 72;
39. 17° 48' 125.60 feet along Lot 5 of Land Court
Application 72;
40. 88° 10' 326.70 feet along Lot 5 of Land Court
Application 72;

- 4 -

20907 551

- 41. 77° 16' 1158.00 feet along Lot 5 of Land Court Application 72;
- 42. 88° 17' 322.70 feet along Lot 5 of Land Court Application 72;
- 43. 72° 05' 275.38 feet along Lot 5 of Land Court Application 72 to the point of beginning and containing a gross area of 538.012 acres and a net area of 528.937 acres after deducting Exclusion A, 6.445 acres, and Exclusion B, 2.63 acres.

Being a portion of the land conveyed to PHOENIX LIMITED PARTNERSHIP, a Hawaii Limited Partnership, by Warranty Deed dated November 14, 1985, recorded on November 15, 1985 in the Bureau of Conveyances of the State of Hawaii in Book 19081, Page 49.

SUBJECT, HOWEVER, to the following:

1. Reservation in favor of the State of Hawaii of all mineral and metallic mines as reserved in Royal Patents Numbered 164, 173, 181, 185, 186, 187, 188, 189, 201 and 379, and Royal Patent Grant No. 464.

2. Rights of Native Tenants as reserved in Royal Patent Grant No. 464.

3. The terms and provisions of that certain Lease of Easement dated December 31, 1954, recorded April 19, 1955 in the Bureau of Conveyances of the State of Hawaii in Book 2951, Page 25, made by and between the TRUSTEES UNDER THE WILL AND OF THE ESTATE OF LINCOLN L. McCANDLESS, DECEASED, ET AL., as Lessors, and THE HAWAIIAN ELECTRIC COMPANY, LIMITED, a Hawaii corporation, and HAWAIIAN TELEPHONE COMPANY, also a Hawaii corporation, as Lessees.

4. A perpetual nonexclusive access easement for ingress, egress and utility purposes in favor of Exclusion "A", as described and set forth in Judgment under Civil No. 8966, First Circuit Court, recorded in said Bureau of Conveyances in Book 6964, Page 155.

-5-

20907 552

5. Easement for auwai rights appurtenant to Land Commission Award 5657 (5651-B) Apana 1 to Kaupaakai (Tax Key Parcel 4-8-04-3) as set forth in said Judgment of the First Circuit Court recorded in said Bureau of Conveyances in Book 6954, Page 155.

6. The exception and reservation in favor of Waiahole Irrigation Company, Limited, of all rights and water rights under Agreement dated December 30, 1912, together with nonexclusive perpetual easements for access roads, etc., as described in that certain Deed dated December 15, 1971, recorded in said Bureau of Conveyances in Book 8038, Page 421.

7. A 20-foot wide roadway easement in favor of ABRAHAM K. KAMAKA, et al. "for ingress and egress to and from the Grantees' land situate in Waikane, Koolaupoko, Hawaii", as described in Grant of Easement dated July 17, 1974, recorded in said Bureau of Conveyances in Book 10055, Page 71.

8. Grant of Easement 25 feet wide for construction, operation and maintenance of pole and wire lines in favor of the HAWAIIAN ELECTRIC COMPANY, INC., and HAWAIIAN TELEPHONE COMPANY, dated June 13, 1974, recorded in said Bureau of Conveyances in Book 10086, Page 67; Additional Security Mortgage and Financing Statement of HAWAIIAN ELECTRIC COMPANY, INC. recorded in Book 10086, Page 373, and Additional Security Mortgage and Financing Statement of HAWAIIAN TELEPHONE COMPANY recorded in Book 10086, Page 374.

9. Easement 1, 44 feet wide, for roadway purposes in favor of Lot 1.

10. Easement 2, 44 feet wide, for roadway purposes in favor of Exclusions "A" and "B".

11. The right, title and interest if any of Phoenix Limited Partnership in and to all of the following, to-wit:

a) Portion of Apana 1 of Land Commission Award 10880, Royal Patent 574 to Puua, area 0.73 acre, more or less, being Tax Parcel 8 (Tax Key: 4-8-04).

b) Portion of said Apana 1 of Land Commission Award 10880, Royal Patent 574 to Puua, area 0.09 acre, more or less, being Tax Parcel 9 (Tax Key: 4-8-04).

-6-

2007 553

c) Portion of said Apana 1 of Land Commission Award 10880, Royal Patent 574 to Puaa, area 0.85 acre, more or less, being Tax Parcel 15 (Tax Key: 4-8-04).

d) All of Apana 2 of Land Commission Award 10880, Royal Patent 574 to Puaa, area 0.53 acre, more or less, being Tax Parcel 10 (Tax Key: 4-8-04).

e) All of Land Commission Award 5656, Royal Patent 184 to Kahinu, area 2.508 acres, more or less, being Tax Parcel 7 (Tax Key: 4-8-04).

12. The effect of the water rights and other interests of WAIHOLE WATER COMPANY, LIMITED, under that certain indenture dated December 30, 1912, recorded on August 7, 1913 in said Bureau of Conveyances in Book 386, Page 355, made by and between L. L. McCANDLESS, the WAIKANE WATER COMPANY, LIMITED, and the WAIHOLE WATER COMPANY, LIMITED.

a) By unrecorded instrument dated May 22, 1969, the foregoing indenture was amended, as disclosed by the instrument next hereinafter described.

b) By instrument dated September 18, 1970, recorded on September 29, 1970 in said Bureau of Conveyances in Book 7213, Page 338, WAIHOLE WATER COMPANY, LIMITED, a Hawaii corporation, assigned all of its rights under the foregoing indenture to WAIHOLE IRRIGATION COMPANY, LIMITED, a Hawaii corporation.

c) By instrument dated December 15, 1971, recorded on January 3, 1972 in said Bureau of Conveyances in Book 8038, Page 421, the foregoing indenture was further amended.

WAIK
EX A

-7-

A.5 Deed Between Azabu USA Corp and City and County of Honolulu 15 May 1998

<p style="text-align: center;">LAND COURT SYSTEM</p>	<p style="text-align: center;">REGULAR SYSTEM</p>
<p>RETURN BY PICKUP (X) TO: City and County of Honolulu Division of Land Survey & Acquisition Phone No. 527-5086</p>	
<p>DEED</p>	
<p>GRANTOR: AZABU U.S.A. CORPORATION</p>	
<p>GRANTEE: CITY AND COUNTY OF HONOLULU Honolulu Hale City and County of Honolulu Honolulu, Hawaii 96813</p>	
<p>TMK: (1) 4-8-4-4; 4-8-6-8 & 10; 4-8-14-4 (RS)</p>	
<p><small>WAIKANE NATURE PRESERVE DOCID: H:\LAND\GENERAL\ACQ\98-024.DOC</small></p>	

EXHIBIT "A"

WAIKANE NATURE PRESERVE - Being all of those certain parcels of land, being identified on the tax map of the island of Oahu as the following:

Description Compared
and Checked
Division of Land Survey
and Acquisition
mw

<u>TAX MAP KEY</u>	<u>AREA</u>
4-8-04:04	45.600 acres
4-8-06:08	375.965 acres
4-8-06:10	10.284 acres
4-8-14:04	72± acres

and containing an area of 503.849 acres, more or less.

Situate at Waikane, Koolaupoko, Oahu, Hawaii.

KNOW ALL MEN BY THESE PRESENTS:

THIS INDENTURE, made this 15th day of May,
19 48, by and between AZABU U.S.A. CORPORATION, a Hawaii
corporation, of Honolulu, City and County of Honolulu, State of
Hawaii, hereinafter called the "Grantor", and the CITY AND COUNTY
OF HONOLULU, a municipal corporation of the State of Hawaii, whose
business and post office address is Honolulu Hale, Honolulu, City
and County of Honolulu, State of Hawaii, hereinafter called the
"Grantee",

W I T N E S S E T H :

That the Grantor, in consideration of the sum of THREE
MILLION FIVE HUNDRED THOUSAND AND NO/100 DOLLARS (\$3,500,000.00),
to it paid by the Grantee, the receipt whereof is hereby
acknowledged, does hereby grant, bargain, sell and convey unto the
Grantee, its successors and assigns, the property described in
Exhibit "A" attached hereto and made a part hereof.

And the reversions, remainders, rents, issues and profits
thereof, and all of the estate, right, title and interest of the
Grantor both at law and in equity therein and thereto.

TO HAVE AND TO HOLD the same, together with all
improvements, rights, easements, privileges and appurtenances
thereon and thereunto belonging or appertaining or held and enjoyed
therewith, unto the said Grantee, its successors and assigns,
forever.

-2-

And for the consideration aforesaid, the Grantor does hereby for itself, its successors and assigns, covenant and agree with the Grantee, its successors and assigns, that the Grantor is seised in fee simple of the subject premises; that same are free and clear of and from all encumbrances, except as set forth in said Exhibit "A"; that the Grantor has good right to sell and convey the same unto the Grantee, and that the Grantor will and its successors and assigns shall WARRANT AND DEFEND the same unto the Grantee, its successors and assigns, forever, against the lawful claims and demands of all persons.

That when more than one person is involved in this Indenture, the terms "Grantor" and "Grantee" and related verbs and pronouns in the singular shall include the plural. Where and as appropriate, the masculine gender shall be deemed to include the feminine or neuter genders.

IN WITNESS WHEREOF, the party hereto has caused this instrument to be executed on the day and year first above written.

APPROVED AS TO CONTENTS

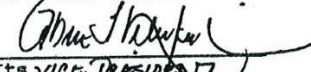

Department of Parks and Recreation

APPROVED AS TO FORM AND
LEGALITY


Deputy Corporation Counsel

FUNDS APPROPRIATED IN CAPITAL
BUDGET ORDINANCE NO. 97-38.

AZABU U.S.A. CORPORATION

By 
Its VICE PRESIDENT
ALBERT T. KELIIKULA

By _____
Its _____

STATE OF HAWAII)
CITY AND COUNTY OF HONOLULU) ss.

On this 15TH day of MAY, 19 98,
before me personally appeared ALBERT T. KELIIKULOA
and _____, to me personally known,
who, being by me duly sworn or affirmed, did say that such persons
executed the foregoing instrument as the free act and deed of such
persons, and if applicable in the capacity shown, having been duly
authorized to execute such instrument in such capacity.



[Signature]
Notary Public, State of Hawaii
My commission expires: 6/22/99

-4-

A.6 Lease Between John M. Kamaka and Waiahole Water Company 1922 & 1934

<p style="text-align: right;">Bk 630 Pg. 257</p> <p>This Indenture made this 3rd day of May, 1922, by and between John M. Kamaka, of Waikane, City and County of Honolulu, Territory of Hawaii, hereinafter called the "Lessor", of the first part, and Waiahole Water Company, Limited, an Hawaiian corporation, hereinafter called the "Lessee", of the second part.</p> <p>Whereas the said Lessor is the owner of one share of the Hui Aina of Waikane, and of the Ahupuaa of Waikane, District of Koolau-kopo, City and County of Honolulu;</p> <p>And Whereas the Lessor has agreed to lease to the Lessee, all of his share of and interest in the water appurtenant to the said Ahupuaa of Waikane above the elevation of 450 feet above sea level, to which he is entitled as the owner of the said share, and the rights hereinafter mentioned, at the rent hereinafter reserved;</p> <p>Now this Indenture Witnesseth: That the Lessor in consideration of the rent hereinafter reserved and of the covenant herein contained and on the part of the Lessee to be observed and performed, doth hereby demise and lease unto the Lessee:</p> <p>All water appurtenant to the Ahupuaa of Waikane aforesaid to which the Lessor as an owner of one share of the Hui Aina of Waikane is entitled and which may be found on the said Ahupuaa at or above the elevation of 450 feet above sea level;</p> <p>Together with (1) the right to enter the said Ahupuaa for the purpose of developing and conveying water, (2) rights of way for roads, ditches, tunnels and flumes; and (3) sites for storage reservoirs, dams, weirs, spillways, power and pumping plants, but only above an elevation of 450 feet above sea level; and the right to use and exercise the same and all things necessary for their use and enjoyment.</p> <p>To have and to hold the premises expressed to be hereby demised, together with the appurtenances, unto the Lessee from the 27th day of April, 1922, for the term of twenty (20) years thence next ensuing, the Lessee Yielding and paying therefor unto the Lessor as rent, the sum of Three Thousand Four Hundred Dollars (\$3400.00) for the whole of the said term of twenty years, which shall be paid, however, in two instalments of \$2550.00 and \$850.00 respectively, the first instalment of Two Thousand Five Hundred and Fifty Dollars (\$2550.00) to be made on the execution hereof (the receipt of which the Lessor hereby acknowledges), and the second instalment of Eight Hundred and Fifty Dollars (\$850.00) to be made on the 27th day of April, 1937;</p>	<p style="text-align: right;">25</p> <p>John M. Kamaka by Atty.</p> <p>To</p> <p>Waiahole Water Co Ltd.</p> <p>Lease</p>
---	--

BK 654
PL 258

200

And the Lessee hereby covenants with the Lessor that it (the Lessee) will pay the second instalment of rent, to wit \$850.00 in gold coin on the 27th day of April, 1937.

In Witness Whereof the Lessor has set his hand and seal and the Lessee has caused its name and corporate seal to be set by its proper officers hereunto and to another instrument of the same date and tenor the day and year first before written.

John M. Kamaka
By Archie E. Kahele His Attorney in Fact.
(Corporate Seal) Waiahole Water Company, Limited,
By Wm. Searby Its Second Vice-President
and S. M. Lowrey Its Treasurer.

Territory of Hawaii,)
: ss.
City and County of Honolulu.) On this 3rd day of May, 1922,
before me personally appeared Archie E. Kahele, to me known to be the person who executed the foregoing instrument in behalf of John M. Kamaka, and acknowledged that he executed the same as the free act and deed of said John M. Kamaka.

(Notarial Seal) Jas. F. Yeaman, Notary Public,
First Judicial Circuit, Territory of Hawaii.

Territory of Hawaii,)
: ss.
City and County of Honolulu.)

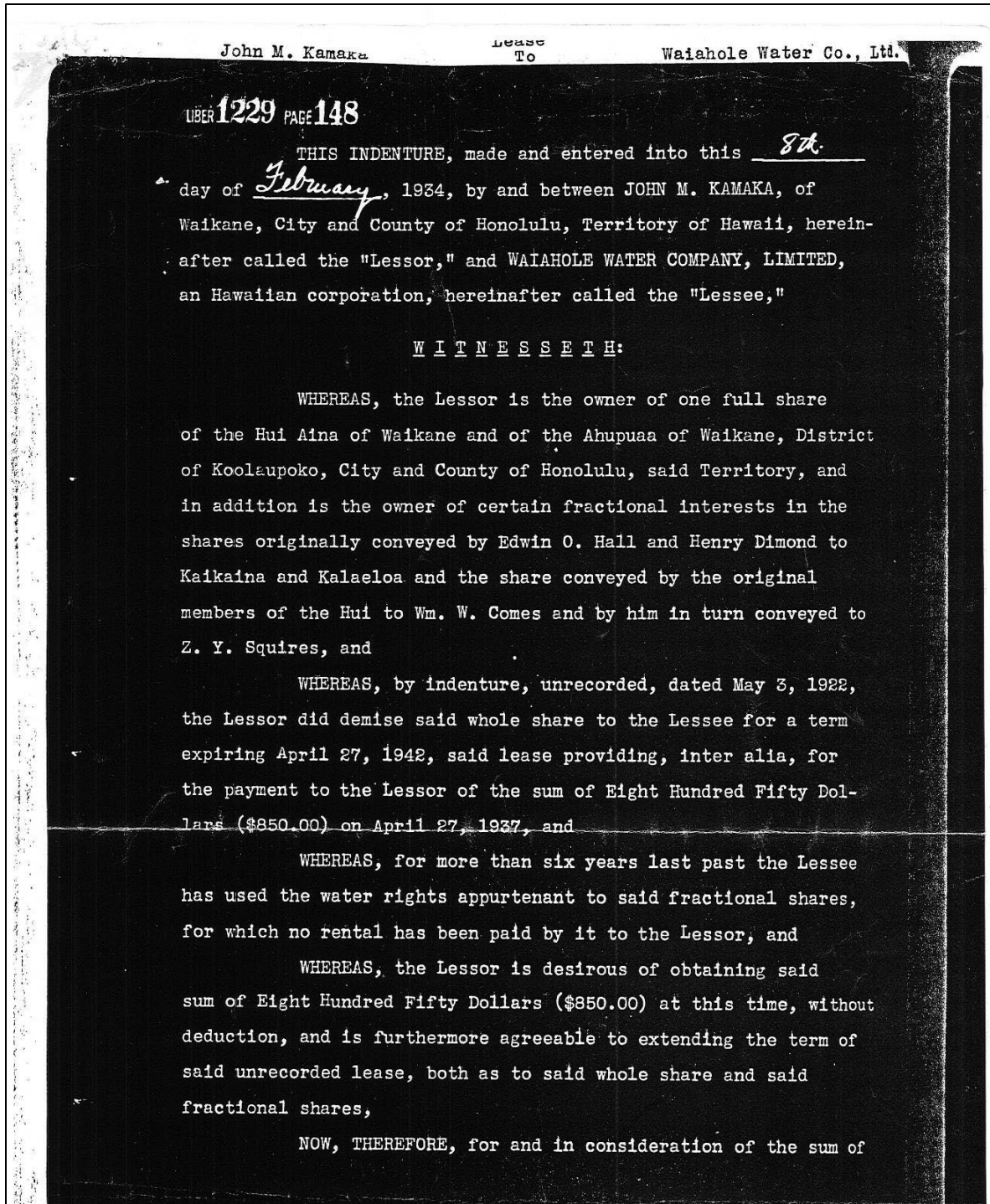
On this 3rd day of May, 1922, before me appeared Wm. Searby and S. M. Lowrey to me personally known, who being by me duly sworn did say that ~~he~~ they are the Second Vice President and Treasurer respectively of Waiahole Water Company, Limited, an Hawaiian Corporation, and that the seal affixed to the foregoing instrument is the corporate seal of said Corporation and that said instrument was signed and sealed in behalf of said Corporation by authority of its Board of Directors, and the said Wm. Searby and S. M. Lowrey acknowledged said instrument to be the free act and deed of said Corporation.

(Notarial Seal) Jas. F. Yeaman,
Notary Public, First Judicial
Circuit, Territory of Hawaii.

Entered of record this 4th day of May A.D. 1922 at 1:50 o'clock P. M.
and compared.

Carl F. Wislander
Registrar of Conveyances.

Fee \$4.00 THW.



LIBER 1229 PAGE 149

Eight Hundred Fifty Dollars (\$850.00) to him paid by the Lessee, and being and representing the whole of the Eight Hundred Fifty Dollars (\$850.00) described and referred to in said lease, the receipt whereof is hereby acknowledged, the Lessor does hereby confirm and ratify in all respects the occupancy and use by said Lessee of said fractional shares, and does demise and lease, in further consideration of said payment, the water appurtenant to said fractional shares to the Lessee for the balance of the term in said lease expressed.

AND THIS INDENTURE FURTHER WITNESSETH that the Lessor, in consideration of the rent hereinafter reserved and of the covenants herein contained and on the part of the Lessee to be observed and performed, doth hereby demise and lease unto the Lessee, its successors and assigns:

ALL water appurtenant to the Ahupuaa of Waikane aforesaid to which the Lessor as an owner of one full share and said fractional interests in three shares aforesaid in and to the Hui of Waikane is entitled and which may be found on the said Ahupuaa at or above the elevation of 450 feet above sea level;

TOGETHER with (1) the right to enter the said Ahupuaa for the purpose of developing and conveying water, (2) rights of way for roads, ditches, tunnels and flumes, and (3) sites for storage reservoirs, dams, weirs, spillways, power and pumping plants, but only above an elevation of 450 feet above sea level; and the right to use and exercise the same and all things necessary for their use and enjoyment.

TO HAVE AND TO HOLD the premises and rights expressed to be hereby demised, together with the appurtenances, unto the Lessee from the 27th day of April 1942, for the term of Seventeen (17) years thence next ensuing, the Lessee yielding and paying

-2-

UBER 1229 PAGE 150

therefor unto the Lessor as rent the sum of Three Thousand One Hundred Seventy-nine Dollars (\$3,179.00) for the whole of said term of Seventeen (17) years, which shall be paid in two installments of Two Thousand Dollars (\$2,000.00) and One Thousand One Hundred Seventy-nine Dollars (\$1,179.00) respectively, the first installment of Two Thousand Dollars (\$2,000.00) to be made on the execution hereof, the receipt of which the Lessor hereby acknowledges, and the second installment of One Thousand One Hundred Seventy-nine Dollars (\$1,179.00) to be made on the 27th day of April, 1954.

AND THE LESSEE HEREBY COVENANTS with the Lessor that it will pay the second installment of rent, to-wit, One Thousand One Hundred Seventy-nine Dollars (\$1,179.00) on the 27th day of April, 1954.

AND THE LESSOR HEREBY COVENANTS with the Lessee that:

(1) The Lessee, paying the rent hereby reserved, shall peaceably and quietly have, hold and enjoy the demised property and rights during the said term from the date hereof until the expiration of this lease;

(2) In case, prior to the expiration of this lease, it shall appear that the Lessor is or shall be or become the owner of any whole or fractional shares of said Hui, he will, upon written request of the Lessee, lease the same to the Lessee for the then remainder of the term of this lease at a prorated rental at the rate of One Hundred Seventy Dollars (\$170.00) per full share per annum.

IN WITNESS WHEREOF the parties hereto have executed this instrument in duplicate the day and year first above written.

John M. Yamada

WAIHAOLE WATER COMPANY, LIMITED,

By *W. H. Hui*
Its End Vice-President

By *M. H. Hui*
Its Treasurer

LIBER 1229 PAGE 151

TERRITORY OF HAWAII }
CITY AND COUNTY OF HONOLULU } SS:

On this 8th day of February, 1934, before me personally appeared JOHN M. KAMAKA, to me known to be the person described in and who executed the foregoing instrument and acknowledged that he executed the same as his free act and deed.

[Signature]
Notary Public, First Judicial
Circuit, Territory of Hawaii.

TERRITORY OF HAWAII }
CITY AND COUNTY OF HONOLULU } SS:

On this 8th day of February, 1934, before me personally appeared H. A. Walker and S. M. Rowley, to me personally known, who being by me duly sworn did say that they are the 2nd Vice President and Treasurer of WAIHOLE WATER COMPANY, LIMITED, a Hawaiian corporation; that the seal affixed to the foregoing instrument is the corporate seal of said corporation, and that the instrument was signed and sealed in behalf of said corporation by authority of its Board of Directors, and the said H. A. Walker and S. M. Rowley acknowledged said instrument to be the free act and deed of said corporation.

[Signature]
Notary Public, First Judicial
Circuit, Territory of Hawaii.

Entered of Record this 8th day of February A. D. 1934 at 1:41 o'clock P.M. and compared, Carl F. Wikander, Registrar of Conveyances.
By [Signature] S. C. Clerk.

-4-

Appendix B Community Outreach Letters

B.1 Community Outreach Letter

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



P.O. Box 1114

Kailua, Hawai'i 96734

Ph: (808) 262-9972-

Fax: (808) 262-4950

Job code: WAIKANE 7 bbeauchan@culturalsurveys.com enielsen@culturalsurveys.com www.culturalsurveys.com

May 2018

Aloha,

Cultural Surveys Hawai'i (CSH) at the request of Bills Engineering, Inc., has reached out to you on 15 May 2018 regarding a cultural impact assessment (CIA) for the Waiāhole Valley Water System (WVWS) Improvements and Reservoir Project, Waikāne and Waiāhole Ahupua'a, Ko'olaupoko District, O'ahu Island, TMK: [1] 4-8-007 to 012. The total project area is approximately 2.4 acres (0.97 hectares).

Recently, CSH has been notified regarding an addition to the project area. This addition to the project area is now depicted on the project figures and labeled as "Temporary Access Rd.". The temporary access road will span two additional lots just *makai* (towards the ocean) of the reservoir lot. These two lots are currently occupied by single family homes and, in the future, may be used for a possible temporary gravel access road to the reservoir site. This temporary road will provide ease of access to transport the well driller to the well site. Construction of this roadway would consist of grading and placement of gravel along existing unpaved driveways/paths. Disturbance will be minimal through these two lots. We would like to inform you of these changes, and kindly ask for your *kōkua* (assistance) in this matter. Please do not hesitate to contact us if you have any questions regarding this project or the additions. All other aspects of the project remain the same.

The proposed project involves the repair/modification of the Waiāhole Valley Water System in two phases. The proposed actions include the following:

1. Construction of a new domestic water reservoir and two new wells for potable domestic water within TMK: 4-8-12: 31, at the end of Waiāhole Valley Road North Branch. The reservoir and wells will replace 2 existing wells and a 1.0 MG reservoir. A drain line connection for the reservoir will be made within TMK: 4-8-12: 5.
2. A separate fire flow line connecting to the Board of Water Supply (BWS) system in Kamehameha Highway will provide the Waiāhole Elementary School with fire flow in accordance with BWS standards. The line will extend past the school and up towards the North-South fork to provide for an emergency connections to the BWS system. Work will be confined to paved areas within Kamehameha Highway and Waiāhole Valley Road.
3. The project will include provisions for possible future connection of the lots along Kamehameha Highway and Waiāhole Homestead Road by constructing two water line stubs on the BWS water main. Work will be confined to paved areas within Kamehameha Highway and Waiāhole Homestead Road.
4. The existing 1.0 MG reservoir along Waiāhole Valley Road South Branch and the booster pump station along Waiāhole Valley Road North Branch may be abandoned after the reservoir and well are constructed. Bypass water lines may be installed within the paved roads to disconnect service to the facilities.
5. The Water Use Permit for the two existing wells will need to be transferred to the two new wells.

WAIKANE 7 – CIA for the Waiāhole Valley Water System Improvements

Page 2

The original 1985 Environmental Impact Statement (EIS) for the Waiāhole Valley Agricultural Park and Residential Lots Subdivision proposed the construction of a 0.2 MG reservoir, however, the reservoir was never constructed.

The purpose of the CIA is to gather information about the project area and its surroundings through research and interviews with individuals that are knowledgeable about this area. The research and interviews assists us when assessing potential impacts to the cultural resources, cultural practices, and beliefs identified as a result of the planned project. We are seeking your *kōkua* and guidance regarding the following aspects of our study:

- General history and present and past land use of the project area.
- Knowledge of cultural sites- for example, historic sites, archaeological sites, and burials.
- Knowledge of traditional gathering practices in the project area, both past and ongoing.
- Cultural associations of the project area, such as legends and traditional uses.
- Referrals of *kūpuna* or elders and *kama'āina* [native born] who might be willing to share their cultural knowledge of the project area and the surrounding *ahupua'a* [land division extending from the mountains to the sea] lands.
- Any other cultural concerns the community might have related to Hawaiian cultural practices within or in the vicinity of the project area.

Once again, if you have any questions or concerns regarding the project or its additions, please do not hesitate to contact Beauchan at bbeauchan@culturalsurveys.com or Erika Nielsen at enielsen@culturalsurveys.com. We are also available by phone at (808) 262-9972. We kindly ask for your response by July 31, 2018.

Me ka ha'aha'a,

Brittany Beauchan
Cultural Researcher

And

Erika Nielsen
Cultural Researcher

B.2 Revised Community Outreach Letter

CULTURAL SURVEYS HAWAII

ARCHAEOLOGICAL, CULTURAL, AND HISTORICAL DOCUMENTATION SERVICES - SINCE 1982



P.O. Box 1114

Kailua, Hawai'i 96734

Ph: (808) 262-9972

Fax: (808) 262-4950

Aloha mai kāua,

With this letter, Cultural Surveys Hawai'i (CSH) humbly requests your *mana'o* and *'ike* (experience, insights, and perspectives) regarding past and ongoing cultural practices, beliefs, and resources within Waikāne and Waiāhole Ahupua'a.

Consultation with traditional cultural practitioners, *kūpuna*, *kama'āina*, and Hawai'i's diverse ethnic communities is an important and deeply valued part of our work and the environmental review process for proposed projects in Hawai'i. Your contributions will revitalize and keep alive knowledge of cultural practices, storied places, and life experiences that will remind Hawai'i's children of their history for generations to come.

Project Description

At the request of Bills Engineering, Inc., on behalf of Hawaii Housing Finance and Development Corporation (HHFDC), CSH is updating a previous Cultural Impact Assessment (CIA) for the Waiāhole Valley Water System Improvements and Reservoir Project, Waikāne and Waiāhole Ahupua'a, Ko'olaupoko District, O'ahu, TMKs: [1] 4-8-007 through 4-8-012 due to recent changes to the potential project. The project area includes the length of Waiāhole Valley Road from its intersection with Kamehameha Highway to its division into the North and South Branch roads; Waiāhole Valley Road North Branch and a portion of Waiāhole Valley Road South Branch; an HHFDC-owned land parcel at the *mauka* (inland) terminus of Waiāhole Valley Road North Branch; a portion of Waiāhole Homestead Road; and portions of Kamehameha Highway north of Waiāhole Valley Road and north and south of Waiāhole Homestead Road. The project area is shown on a portion of the 1998 Kaneohe U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle (Figure 1) and a 2020 aerial photograph (Figure 2) attached to this invitation.

The purpose of this project is to confirm that a new well site could provide adequate water supply and improve water resource reliability to the Waiāhole Valley. This CIA supports the Environmental Assessment that is required for the well site work.

Should the new well site be determined to be adequate as a water supply source, one of two options will be pursued. Option 1 (Board of Water Supply [BWS] Compliant System) involves the installation of a new water system that meets BWS standards. Option 2 (Private System) involves modification of the existing water system that could be managed by a company specializing in water system operation and management. This option would improve the water system and turn it over to a private water system management company to operate and maintain; the ownership would continue to be HHFDC. If Option 1 is not feasible, Option 2 would be pursued. However, for either Option 1 or Option 2 to be feasible, a suitable well site at the 365-foot (ft) elevation reservoir site must be developed. The well site would be located on Lot 50 at the end of Waiāhole Valley Road North Branch. Development of the wells would include drilling, testing, and allocation of water allotments.

CIA for the Waiāhole Valley Water System (WVWS) Improvements and Reservoir**Page 2**

Option 1 (BWS Compliant System) would require the following project elements:

1. Install two new wells and 0.5 MG reservoir at the end of the Waiāhole Valley Road North Branch.
2. Install an access road to the new 0.5 MG reservoir and well site.
3. Provide reliable 3-phase power in Waiāhole Valley Road North Branch to the 0.5 MG reservoir and well site.
4. Outfit the two new wells and pump station at the 365-ft elevation site.
5. Replace all potable water system piping in both north and south branches of Waiāhole Valley Road, the water line below the fork and water line in Waiāhole Valley Road with ductile iron pipe class 53 to BWS standards, as well as potable water meters with backflow preventors. The new potable water system on Waiāhole Valley North and South forks and the section of Waiāhole Valley Road below the fork would be fed by the new 0.5 MG reservoir.
6. Provide emergency feed connection to the new 365-ft elevation reservoir by installing dual fire hydrants on the north branch of Waiāhole Valley Road and the main Waiāhole Valley Road. This is only used should an emergency arise and the new wells cannot feed the 0.5 MG reservoir. Use is expected to occur very rarely or not at all.
7. Provide a connection to the BWS 265 water system on Kamehameha Highway to serve all lots below the fork in Waiāhole Valley Road should flow from the 0.5 MG reservoir through the pressure reducing valve not be able to keep up with flow required below the Fork. The waterline connection on Kamehameha Highway will also upgrade fire flow to Waiāhole Valley Elementary School to the required 2,000 gallons per minute (gpm).
8. Connect all valley lots fronting Kamehameha Highway to the existing BWS 265 water system in the highway.
9. Provide a connection to the BWS 265 water system in Kamehameha Highway to serve all lots on Waiāhole Homestead Road.
10. Abandon the existing water system on Waiāhole Valley Road South Branch above the State Conservation/Urban Land Use boundary and decommission the existing two 1.0 MG wells, 1.0 MG reservoir, and 2,100 G overflow tank in accordance with the Commission on Resource Water Management (CWRM) rules. In addition, the existing booster pump station on Waiāhole Valley Road North Branch would no longer be required, and the station would be decommissioned. Abandonment of the booster pump station does not require CWRM approval.

As a general statement regarding a BWS Compliant system, the new Valley wells will be serving most of the Valley for a great majority of the time. Even though there is a connection to the BWS system at Kamehameha Highway, the BWS Compliant system will serve all of the Waiāhole Valley road system including both the North and South Forks unless the BWS system has a severe loss of pressure in its 265 system. That would be considered an abnormal operating

CIA for the Waiāhole Valley Water System (WVWS) Improvements and Reservoir**Page 3**

condition. The Kamehameha Highway connection is necessary since BWS will not operate and maintain a totally stand-a-lone water system.

Option 2 (Private System) would require the following project elements:

1. Install two new wells and 0.5 MG potable water reservoir at the end of the Waiāhole Valley Road North Branch.
2. Install an access road to the new 0.5 MG reservoir and well site.
3. Provide reliable 3-phase power in Waiāhole Valley Road North Branch to the 0.5 MG reservoir and well site.
4. Outfit the two new wells and pump station at the 365-ft elevation site.

(Note: Items 1 through 4 are essentially identical to Option 1).

5. The existing potable water main lines and laterals would remain as potable and irrigation water service lines, and all applicable lots in existing service area would be provided with a water meter and backflow preventor. The primary change, from how the existing water systems currently operates, is that the potable water system would be fed by the new well and 0.5 MG reservoir at the end of Waiāhole Valley Road North Branch instead of the existing wells. The existing water system on Waiāhole Valley Road South Branch would be abandoned above the State Conservation/Urban Land Use boundary, and the existing two 1.0 MG wells, 1.0 MG reservoir, and 2,100 G overflow tank would be decommissioned in accordance with the CWRM rules. In addition, the existing booster pump station on Waiāhole Valley Road North Branch would no longer be required, and the station would be decommissioned.

The existing potable water pipe would be connected to the BWS water system in Kamehameha Highway. The connection would be equipped with a BWS Detector Check Meter (DC Meter) and 12-inch water line to the Waiāhole Elementary School to provide adequate fire protection. Associated work with all construction will be traffic control, erosion and sediment control, staging area management, material delivery management, possible temporary water delivery during water system change-over, construction equipment management, and inspection services.

Ground Disturbance

Assuming successful well verification, the proposed project calls for the installation of a permanent access road, 0.5 MG reservoir, and well outfitting at the 365 reservoir site. This will include clearing and grubbing for the access road, 0.5 MG reservoir, and well sites. Grading will then follow clearing and grubbing for the roadway construction, 0.5 MG reservoir installation, and well outfitting. The permanent access road will be 12 ft wide with a maximum cut of 6 ft and fill of 2 ft. Grading for the 0.5 MG reservoir (74-ft diameter with surrounding temporary 10-ft wide access road) will encompass 3 acres, with the cut ranging from 2-6 ft, and fill ranging from 2.5 ft (for the temporary access road) up to 6 ft (for a 13,600-sq-ft temporary earth pad). No additional grading will be necessary for the Reservoir Control Building and well outfitting.

CIA for the Waiāhole Valley Water System (WVWS) Improvements and Reservoir**Page 4**

The permanent access road will include paving, water distribution line installation, reservoir drain line installation, and overhead electric and telecommunications installation. Adequate electrical services is not available at the new well site; new overhead electric and telecommunications will be brought to the site via Waiāhole Valley Road North Fork and the permanent access road. The 12-inch diameter drain line will be installed within the access road, with depth ranging from 3-4.5 ft. The 12-inch diameter water line will be installed within the reservoir access road, with depth ranging from 3-5 ft. Overhead electric and telecommunications will be installed from the intersection of Waiāhole Valley Road North and South Branches to the Reservoir Control Building. Overhead pole spacing will be 100 ft along the shoulder of the access road and Waiāhole Valley Road North Branch, with typical pole depth of 10 ft.

Water line installation will include trenching, water line installation, and backfilling of the water line trench, with the final surface being asphaltic concrete paving. Lateral installation to individual lots will include service connections to the new water mains, terminating with a meter installation and shut-off valve just inside each lot property line. 8- and 12-inch water line installation in existing roadways will involve a 4-ft-wide trench approximately 3-6 ft deep. The 1-2-inch water laterals to lot street frontages will have an average length of 20 ft, depth of 2 ft, and width of 2 ft.

Note: Option 1 (BWS Compliant Option) would involve substantially more ground disturbance than Option 2 (Private Option).

Purpose of this Study

The purpose of a CIA is to gather information on Hawai'i's cultural resources, practices, or beliefs that have occurred or still occur within the proposed project area and Waikāne and Waiāhole Ahupua'a. This is accomplished through consultation and background research using previously written documents, studies, and interviews. This information is used to assess potential impacts by the proposed project to the specific identified resources, practices, and beliefs in the project area and throughout Waikāne and Waiāhole Ahupua'a. As a traditional cultural practitioner and holder of long-term knowledge, your insight, input, and perspective provide a valuable contribution to the assessment of potential effects of this project and an understanding of how to protect these resources and practices.

Insights focused on the following topics in the project area (shown on the attached Figure 1 and Figure 2) are especially helpful and appreciated:

- Your knowledge of traditional cultural practices of the past within the proposed project area and Waikāne and Waiāhole Ahupua'a
- Your specific traditional cultural practice and its connection to the proposed project area and Waikāne and Waiāhole Ahupua'a
- The different natural resources associated with your specific traditional cultural practice

CIA for the Waiāhole Valley Water System (WVWS) Improvements and Reservoir

Page 5

- Legends, stories, or chants associated with your specific traditional cultural practices and their relationships to the proposed project area and Waikāne and Waiāhole Ahupua'a
- Referrals to other *kūpuna*, *kama'āina*, and traditional cultural practitioners knowledgeable about the proposed project area and Waikāne and Waiāhole Ahupua'a
- Your comments or thoughts on the potential impacts the proposed project may have on your ongoing traditional cultural practices and natural resources within the proposed project area and Waikāne and Waiāhole Ahupua'a
- Your knowledge of cultural sites and *wahi pana* (storied places) within the proposed project area and Waikāne and Waiāhole Ahupua'a
- Your comments or thoughts on the potential impacts the proposed project may have on cultural sites and *wahi pana* within the proposed project area and Waikāne and Waiāhole Ahupua'a

Consultation Information

Consultation is an important and deeply valued part of the CIA and environmental review process. Your contributions will revitalize and keep alive our combined knowledge of past and ongoing cultural practices, historic places, and experiences, reminding our children of their history generation after generation.

With your agreement to participate in this study, your contributions will become part of the comprehensive understanding of traditions of the area, and will be part of the public record. The study will be included as an appendix of the Environmental Assessment (EA), which is being prepared for the proposed project; the EA and CIA will be available for future access through the State Office of Planning and Sustainable Development (OPSD) Environmental Review Program (ERP) (<https://planning.hawaii.gov/erp>) and at the State Historic Preservation Division Library (<https://dlnr.hawaii.gov/shpd/about/research-resources-library>).

As a part of this process, your knowledge may be used to inform future CIAs and other heritage studies of cultural practices and resources that need protection from impacts of proposed future projects. If you engage in consultation, and the *mana'o* and *'ike* you provide appears in the study, we would like to recognize your contribution by including your name. If you prefer not to allow your name to be included, your information can be attributed to an anonymous source.

The consultation interview structure and format are flexible. We will accommodate your preference on how to get together: talk story, over the phone, by email correspondence, remotely via Zoom, MS Teams, Google Chat, or other remote meeting platform.

Your knowledge of the resources and potential effect of the project on traditional practices in the project area and Waikāne and Waiāhole Ahupua'a focusing on the topics in the bullet points above can also be submitted in a written statement. CSH will provide return postage for your written statement on request.

CIA for the Waiāhole Valley Water System (WVWS) Improvements and Reservoir

Page 6

CSH is happy to provide a list of topics for discussion, a more structured questionnaire of interview questions, or any other assistance that might be helpful.

If you have questions regarding consultation, or are interested in participating in this study, please contact Kellen Tanaka by email at ktanaka@culturalsurveys.com or phone at (808) 262-9972 or Chantellee Spencer at cspencer@culturalsurveys.com.

Mahalo nui loa for your time and attention to this request for consultation.

Yours with much aloha and appreciation,

Kellen Tanaka
CSH Cultural Researcher

Appendix F. Biological Survey

Biological surveys for improvements to the Waiāhole Valley Water System on windward O‘ahu¹

October 4, 2018

AECOS No. 1532

Chad Linebaugh and Bryson Luke
AECOS, Inc.

45-939 Kamehameha Hwy, Suite 104
Kāne‘ohe, Hawai‘i 96744

Phone: (808) 234-7770 Fax: (808) 234-7775 Email aecos@aecos.com

Introduction

The Hawaii Housing Finance and Development Corporation is proposing various improvements to the existing Waiāhole Valley Water System. The subject project, a part of those improvements, includes construction of a new 0.2 million gallon reservoir, two new wells, associated buildings, drain line and access road (“Project”) in Waiāhole Valley on windward O‘ahu (Figure 1). The reservoir, wells and associated buildings will be located on TMK: (1) 4-8-012: 031, a 5.5-ac parcel. The trail providing access to the site, through TMKs: (1) 4-8-012: 020 & 030, is to be improved from its existing condition to allow construction of the proposed facility. A drain line is to be constructed along the western margin of TMK: (1) 4-8-012: 005, linking the facility to Uwao Stream, a tributary to Waiāhole Stream, via an existing drain outlet and headwall. AECOS, Inc. was contracted to conduct a survey of the site flora and fauna, in the proposed Project area. This report details the finding of that field effort.

Site Description

The Project site in Waiāhole Valley is located on the windward side of the Ko‘olau Mountain, between Waikāne and Ka‘alaia valleys, at an elevation ranging from around 300 to 350 ft above sea level (ASL). This area, located near the *mauka* terminus of Waiāhole Valley Rd. (north fork), receives 260 cm (102 in) of rainfall per year (Figure 2).

¹ Report prepared for Bills Engineering

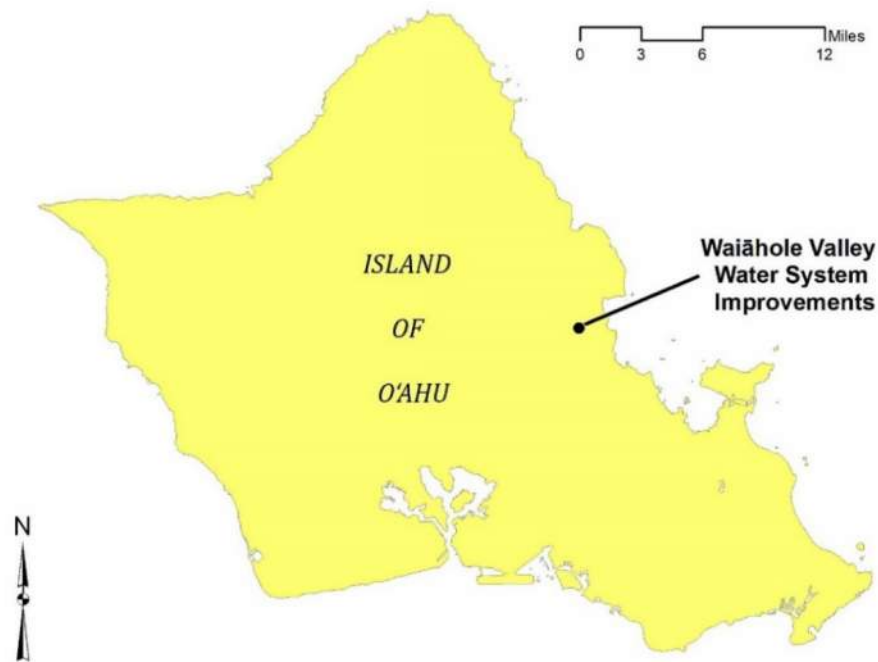


Figure 1. Project location on O’ahu.

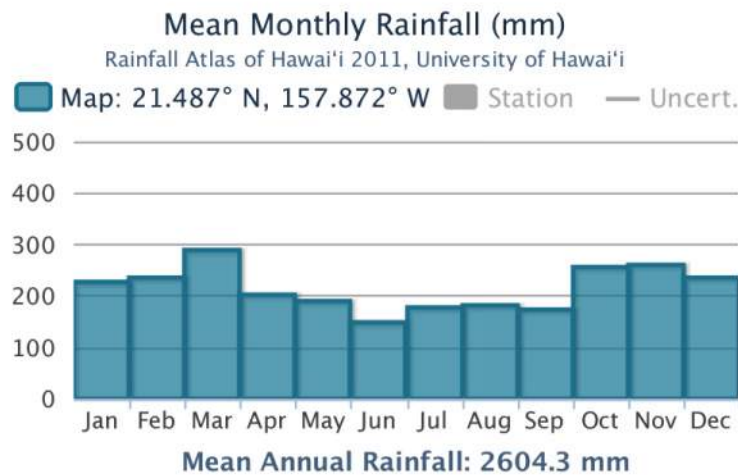


Figure 2. Rainfall data at the proposed Project site (Giambelluca et al, 2011).

Rather than survey the entirety of the parcels, our survey focused on the specific areas where the reservoir, wells, building, access road, and drain line would be located (Figure 3). The weather at the time was overcast with slowly increasing rainfall occurring.



AECOS biologists, Chad Linebaugh and Bryson Luke, conducted a plant survey for the Project on July 3, 2018 using a pedestrian or wandering transect method that

entailed covering the Project site on foot and noting each plant species as it was encountered. A handheld GNSS unit was utilized to navigate to specific Project locations and through the forested areas of the subject parcels. Any plant not immediately recognized during the survey was photographed and/or a representative feature (e.g., a flower, fruit, or leaf) collected for later identification at the laboratory.

Plant names used herein follow *Manual of the Flowering Plants of Hawai'i* (Wagner, Herbst, & Sohmer, 1990; Wagner & Herbst, 1999) for native and naturalized flowering plants, *Hawai'i's Ferns and Fern Allies* (Palmer, 2003) for ferns, and *A Tropical Garden Flora* (Staples & Herbst, 2005) for ornamental plants. More recent name changes for plant species follow Imada (2012).

Avian Resources

Three stationary avian count stations were established in the areas proposed for Project work: Sta. 1 along the access road, Sta. 2 at the reservoir and well site, and Sta. 3 near the headwall along Uwao Stream (see Fig. 3, above). A single eight-minute avian point count was made at each station. Field observations were made with the aid of Zeiss 8 X 32 binoculars and by listening for vocalizations. The point counts were conducted between 8:00 am and 10:00 am, within the peak of daily bird activity. Biologists also noted any bird species encountered during the botanical survey that were not encountered during the stationary-counts. An AECOS biologist also performed a 30-minute time-dependent waterbird count on Uwao Stream at the proposed drainage entry point.

The avian phylogenetic order and nomenclature used in this report follow the AOS Check-List of North and Middle American Birds (Chesser et al., 2018)

Mammalian Resources

The survey of mammals was limited to visual and auditory detection, coupled with observation of scat, tracks, and other animal sign. A running tally was kept of all terrestrial vertebrate mammalian species detected within the survey area. Mammal scientific names follow *Mammal Species of the World: a Taxonomic and Geographic Reference* (Wilson and Reeder, 2005).

Native Damselflies

Two native damselflies are known to have populations in the nearby Waihe'e and Kahalu'u watersheds (Polhemus, 2007), south of Waiāhole. Historically, these species were also present in the Waiāhole watershed (Parham et al, 2008). Any

damselflies observed during the course of the botanical and avian surveys were identified. Additionally, a stationary five minute flying insect survey was conducted to search for damselflies present at a small water feature near the proposed drainline corridor. Damselflies were also noted if observed along Uwao Stream during the 30-minute time-dependent waterbird count.

Results

Vegetation

Access Road - The beginning of the access road location is an existing paved driveway that transitions to an unimproved track. The area near Waiāhole Valley Road is planted in ornamentals and food crop plants along both sides of the driveway. Further upslope, a house site exists and several additional areas are planted in ornamentals. Upslope from the house site, the trail narrows as the terrain steepens and becomes more rugged (Figure 4). Both sides of the trail are forested in a canopy of albizia (*Falcataria moluccano*) with a shoebutton ardisia (*Ardisia elliptica*) shrub layer.

Reservoir and Well Site - The reservoir and well sites are located below the ridge that extends northwest separating Waiāhole and Waikāne Valleys. The area is generally forested or a dense shrubland with a few open trails extending in several directions. Trails and their margins are generally covered with grasses and shrubs. The ridge face upslope is covered in fern, grasses and shrubs, and with trees lining the top of the ridge.

Drainline - The location of the proposed drainline is dense shrubland near the reservoir site but transitions to forest in the southern half of its course. A small water feature present near the 100-m (328-ft) elevation, is overgrown by shrubs. The drainline enters the stream adjacent to a gravel road that continues from Waiahole Valley Rd, and hence some ruderal species are also present.

Flora

A total of 110 species of plants were recorded from the survey (Table 1). Six of the species (5%) listed in Table 1 are native species (all indigenous) and 11 more (10%) are early Polynesian introductions. These percentages are above what is typically encountered across lowland O'ahu (10 to 12% native and Polynesian introduced species), owing to cultivation of numerous native and Polynesian introduced species along the access road. None of the native or



Figure 4 (upper). The access road is lined with ornamental plantings near Waiāhole Valley Road. Figure 5 (lower). The area is covered with grasses and shrubs near the reservoir and well site.

Table 1. Flora recorded at the Project site in Waiāhole Valley, O'ahu.

FAMILY	Species Authority	Common name	Status	Abundance
PTERIDOPHYTES - FERNS & FERN ALLIES				
ATHYRIACEAE				
	<i>Diplazium esculentum</i> (Retz.) Sw.	<i>paca</i> ; vegetable fern	Ind	O
GLEICHENEACEAE				
	<i>Dicranopteris linearis</i> f. <i>linearis</i> (Burm. f.) Underw.	<i>uluhe</i>	Ind	O
NEPHROLEDIACEAE				
	<i>Nephrolepis multiflora</i> (Roxb.) F.M. Jarrett ex C.V. Morton	sword fern	Nat	O
POLYPODIACEAE				
	<i>Phymatosorus grossus</i> (Langsd. & Fisch.) Brownlie	<i>laua'e</i> ; <i>maile</i> -scented fern	Nat	R
PTERIDACEAE				
	<i>Adiantum raddianum</i> C.Presl	---	Nat	O
	<i>Pteris cretica</i> L.	<i>'ōali</i>	Ind	O
CONIFERS AND CYCADS				
CYCADACEAE				
	<i>Cycas revoluta</i> Thunb.	Japanese or king sago palm	Orn	R
FLOWERING PLANTS - DICOTYLEDONS				
ACANTHACEAE				
	<i>Asystasia gangetica</i> (L.) T.Anderson	Chinese violet	Nat	R
	<i>Thunbergia fragrans</i> Roxb.	sweet clock-vine	Nat	R
ANACARDACEAE				
	<i>Mangifera indica</i> L.	mango	Nat	O
ARALIACEAE				
	<i>Schefflera actinophylla</i> (Endl.) Harms	octopus tree	Nat	O
ASCLEPIADACEAE				
	<i>Asclepias physocarpa</i> (E.Mey.) Schltr	balloon plant	Nat	R
ASTERACEAE				
	<i>Ageratum houstonianum</i> Mill.	<i>maile honohono</i>	Nat	U
	<i>Bidens alba</i> (L.) DC. var. <i>radiata</i> (Sch.Bip.)Ballard ex Melchert	---	Nat	C
	<i>Crassocephalum crepidioides</i> (Benth.) S.Moore	---	Nat	R
	<i>Eclipta prostrata</i> (L.) L	false daisy	Nat	O
	<i>Emilia fosbergii</i> Nicolson	Flora's paintbrush	Nat	O
	<i>Pluchea carolinensis</i> (Jacq.) G. Don	sourbush	Nat	R
	<i>Spagneticola trilobata</i> (L.) Pruski	wedelia	Nat	C
BEGONIACEAE				
	<i>Begonia hirtella</i> Link	---	Nat	U

Table 1 (continued).

FAMILY	<i>Species</i> Authority	Common name	Status	Abundance
BIGNONIACEAE				
	<i>Spathodea campanulata</i> P. Beauv.	African tulip tree	Nat	R
BRASSICACEAE				
	<i>Lepidium virginicum</i> L.	peppergrass	Nat	R
CANNABACEAE				
	<i>Cannabis sativa</i> L. ssp. <i>indica</i> (Lam.) E. Small & Cronq.	<i>pakālōlō</i> ;	Orn	R
CARICACEAE				
	<i>Carica papaya</i> L.	papaya	Nat	U
CLUSIACEAE				
	<i>Calophyllum inophyllum</i> L.	<i>kamani</i>	Pol	R
	<i>Clusia rosea</i> Jacq.	autograph tree	Nat	R
CONVOLVULACEAE				
	<i>Ipomoea obscura</i> (L.) Ker Gawl.	---	Nat	C
	<i>Ipomoea cairica</i> (L.) Sweet	<i>koali 'ai</i> ; ivy-leaved morning glory	Nat	U
	<i>Merremia tuberosa</i> (L.) Rendle	woodrose	Nat	R
CUCURBITACEAE				
	<i>Coccinia grandis</i> (L.) Voigt	ivy gourd	Nat	R
	<i>Momordica charantia</i> L.	bitter melon	Nat	R
EUPHORBIACEAE				
	<i>Euphorbia hirta</i> L.	hairy or garden spurge	Nat	R
	<i>Euphorbia hypericifolia</i> L.	graceful spurge	Nat	R
	<i>Manihot esculenta</i> Crantz	cassava; tapioca	Nat	R
	<i>Ricinus communis</i> L.	castor bean	Nat	R
FABACEAE				
	<i>Chamaecrista nictitans</i> (L.) Moench ssp. <i>patellaria</i> (DC. ex Collad.) H.S.Irwin & Barneby var. <i>glabrata</i> (Vogel)H.S.Irwin & Barneby	partridge pea	Nat	U
	<i>Desmodium incanum</i> DC.	Spanish clover	Nat	O
	<i>Desmanthus pernambucanus</i> (L.) Thell.	upright mimosa	Nat	O
	<i>Falcataria moluccana</i> (Miq.) Barneby & J. W.Grimes	albizia	Nat	C
	<i>Indigofera spicata</i> Forssk.	creeping indigo	Nat	O
	<i>Indigofera suffruticosa</i> Mill.	upright indigo	Nat	R
	<i>Leucaena leucocephala</i> (Lam.) deWit	<i>koa haole</i>	Nat	R
	<i>Mimosa pudica</i> var. <i>unijuga</i> (Duchass. & Walp.) Griseb.	sensitive plant	Nat	C
	<i>Vigna unguiculata</i> (L.) Walp. ssp. <i>sesquipedalis</i> (L.) Verd.	longbean	Orn	R
LAMIACEAE				
	<i>Ocimum gratissimum</i> L.	wild basil	Nat	R
	<i>Plectranthus</i> cf. <i>fruticosus</i> L' Hér	spur flower	Orn	R

Table 1 (continued).

FAMILY	<i>Species</i> Authority	Common name	Status	Abundance
LAURACEAE				
	<i>Persea americana</i> Mill.	avocado	Nat	O
MALVACEAE				
	<i>Hibiscus tiliaceus</i> L.	<i>hau</i>	Ind	O
	<i>Theobroma cacao</i> L.	cacao	Orn	R
MELASTOMATACEAE				
	<i>Clidemia hirta</i> (L.) D. Don	Koster's curse	Nat	U
	<i>Dissotis rotundifolia</i> (Sm.) Triana	dissotis	Nat	R
MORACEAE				
	<i>Artocarpus altilis</i> (Parkinson ex Z) Fosberg	'ulu; breadfruit	Pol	R
	<i>Broussonetia papyrifera</i> (L.) Vent.	<i>wauke</i>	Pol	R
MUSACEAE				
	<i>Musa X paradisiaca</i> L.	<i>mai'a</i> ; banana	Pol	R
MYRSINACEAE				
	<i>Ardisia crenata</i> Sims	Hilo holly	Nat	O
	<i>Ardisia elliptica</i> Thunb.	shoebutton ardisia	Nat	A
MYRTACEAE				
	<i>Melaleuca quinquenervia</i> (Cav.) S.T. Blake	paperbark	Nat	U
	<i>Psidium guajava</i> L.	common guava	Nat	R
	<i>Psidium cattleianum</i> Sabine	strawberry guava	Nat	A
	<i>Syzygium cumini</i> (L.) Skeels	Java plum	Nat	C
PASSIFLORACEAE				
	<i>Passiflora quadrangularis</i> L.	sweet granadilla	Nat	R
PIPERACEAE				
	<i>Piper auritum</i> Kunth	false 'awa	Nat	R
RUBIACEAE				
	<i>Paederia scandens</i> L.	<i>maile pilau</i>	Nat	O
	<i>Spermacoce assurgens</i> Ruiz & Pav.	buttonweed	Nat	U
SOLANACEAE				
	<i>Capsicum annuum</i> L.	chili pepper	Nat	R
	<i>Solanum lycopersicum</i> L. var. <i>cerasiforme</i> (Dunal) D.M.Spooner, G.J.Anderson & R.K.Jansen	cherry tomato	Nat	U
STERCULIACEAE				
	<i>Waltheria indica</i> L.	<i>'uhaloa</i>	Ind	O
TILIACEAE				
	<i>Heliocarpus popayanensis</i> Kunth	<i>moho</i>	Nat	R
ULMACEAE				
	<i>Trema orientalis</i> (L.) Blume	gunpowder tree	Nat	O
URTICACEAE				
	<i>Pilea microphylla</i> (L.) Liebm.	artillery plant	Nat	O
	<i>Stachytarpheta jamaicensis</i> (L.) Vahl	Jamaican vervain	Nat	R

Table 1 (continued).

FAMILY	Species Authority	Common name	Status	Abundance
VERBENACEAE				
	<i>Citharexylum caudatum</i> L.	fiddlewood	Nat	A
	<i>Verbena litoralis</i> Kunth	<i>o'iwi</i>	Nat	R
FLOWERING PLANTS – MONOCOTYLEDONS				
AGAVACEAE				
	<i>Cordyline fruticosa</i> (L.) A.Chev.	<i>ti</i>	Pol	O
	<i>Dracaena marginata</i> Lam.	moneytree	Orn	R
	<i>Dracaena reflexa</i> L.	dracaena	Orn	R
ARACACEAE				
	<i>Alocasia macrorrhizos</i> (L.) G.Don	'ape; elephant ear	Pol	R
	<i>Epipremnum pinnatum</i> (L.) Engl	golden pothos	Nat	R
ARECACEAE				
	<i>Archontophoenix alexandrae</i> (F.Muell.) H. Wendl. & Drude	Alexander palm	Nat	R
	<i>Cocos nucifera</i> L.	<i>niu</i> ; coconut	Pol	R
BIGNONACEAE				
	<i>Spathodea campanulata</i> P .Beauv.	African tulip	Nat	R
BROMELIACEAE				
	<i>Neoregelia compacta</i> (Mez) L. B. Smith	bromeliad	Orn	R
COMMELINACEAE				
	<i>Commelina diffusa</i> N. L. Burm.	day flower	Pol	C
CYPERACEAE				
	<i>Cyperus gracilis</i> R. Br.	McCoy grass	Nat	R
	<i>Cyperus involucratus</i> Rottb.	umbrella sedge	Nat	O
	<i>Cyperus polystachyos</i> Rottb.	---	Ind	U
	<i>Cyperus rotundus</i> L.	nutgrass	Nat	U
	<i>Kyllinga nemoralis</i> (J. R. Forster & G. Forster) Dandy ex Hutchinson & Dalziel	<i>kili'o'opu</i>	Nat	R
DISCOREACEA				
	<i>Dioscorea bulbifera</i> L.	<i>hoi</i> ; biter yam	Pol	R
HELICONACEAE				
	<i>Heliconia bihai</i> (L.) L.	lobster claw	Orn	O
ORCHIDACEAE				
	<i>Arundina graminifolia</i> (D. Don) Hochr.	bamboo orchid	Nat	U
POACEAE (GRAMINEAE)				
	<i>Andropogon virginicus</i> L.	broomsedge	Nat	C
	<i>Axonopus compressus</i> (Swartz) P. Beauv.	brd-lvd carpetgrass	Nat	O
	<i>Axonopus fissifolius</i> (Raddi) Kuhlm.	nrv-lvd carpetgrass	Nat	R
	<i>Coix lachryma-jobi</i> L.	Job's tears	Nat	R
	<i>Chloris barbata</i> Sw.	swollen finger grass	Nat	O
	<i>Eleusine indica</i> (L.) Gaertn.	wiregrass	Nat	C
	<i>Megathyrsus maximus</i> (Jacq.) B. K. Simon & W. L. Jacobs	Guinea grass	Nat	U

Table 1 (continued).

FAMILY		Common name	Status	Abundance
<i>Species</i>	Authority			
POACEAE (cont.)				
<i>Oplismenus hirtellus hirtellus</i> (L.) P. Beauv.		basketgrass	Nat	U
<i>Paspalum conjugatum</i> P.J. Bergius		Hilo grass	Nat	C
<i>Paspalum dilatatum</i> Poir.		Dallis grass	Nat	U
<i>Saccharum spontaneum</i> L.		sugar cane	Nat	R
<i>Sacciolepis indica</i> (L.) Chase		Glenwood grass	Nat	C
<i>Setaria parviflora</i> (Poir.) Kerguélen		yellow foxtail	Nat	O
<i>Setaria verticillata</i> (L.) P. Beauv.		bristly foxtail	Nat	R
<i>Sorghum halepense</i> (L.) Pers.		Johnson grass	Nat	O
STRETLITZIACEAE				
<i>Strelitzia reginae</i> Aiton		bird-of-paradise	Orn	O
ZINGIBERACEAE				
<i>Alpinia purpurata</i> (Vieill.) K.Schum.		‘awapuhi ‘ula‘ula red ginger	Nat	O
<i>Hedychium coronarium</i> J.König		‘awapuhi ke‘oke‘o white ginger	Nat	O
<i>Hedychium flavescens</i> Carey ex Roscoe		‘awapuhi melemele yellow ginger	Nat	O
<i>Zingiber zerumbet</i> (L.) Sm.		‘awapuhi kuahiwi shampoo ginger	Pol	U

Key to Table 1.

Status = distributional status

End = endemic; native to Hawaii and found naturally nowhere else.**Ind** = indigenous; native to Hawaii, but not unique to the Hawaiian Islands.**Nat** = naturalized, exotic, plant introduced to the Hawaiian Islands since 1778 and well-established.**Orn** = exotic, ornamental or cultivated; plant not naturalized (not well-established outside of cultivation).**Pol** = Polynesian introduction before 1778.R

Abundance = occurrence ratings for plants in survey area.

R - Rare - only one, two, or three plants seen.**U** - Uncommon - several to a dozen plants observed.**O** - Occasional - found regularly around the site.**C** - Common - considered an important part of the vegetation and observed numerous times.**A** - Abundant - found in large numbers; may be locally dominant.

Polynesian introduced plant species are present in abundance in the Project area.

The lower portion of the access road is cultivated in food plants on both sides. 'ulu (*Artocarpus altilis*), mai'a (*Musa x paradisiaca*), niu (*Cocos nucifera*), cassava (*Manihot esculenta*), cacao (*Theobroma cacao*), and papaya (*Carica papaya*) are present growing close to the asphalt and gravel road. Hilo grass (*Paspalum*

conjugatum), wedelia (*Spagneticola trilobata*), *Bidens alba* and sleeping “grass” (*Mimosa pudica*) grow along the margins of the road. Further upslope, a natural landscape is present, and the access road is covered by small grasses, mostly Glenwood (*Sacciolepis indica*) and foxtail (*Setaria parviflora*); broomsedge (*Andropogon virginicus*) and honohono (*Commelina diffusa*) occur in lesser abundance. The upper segment of the access road runs through a forest of albizia, Java plum (*Syzygium cumini*), and fiddlewood (*Citharexylum caudatum*; Figure 6).



Figure 6. View toward Pu'ukiolea from the ridge upslope from the Project site showing a canopy dominated by albizia, fiddlewood; umbrella plant and shoebutton ardisia are also visible.

The reservoir/well site is home to a similar forest with shoebutton ardisia (*Ardisia elliptica*) and fiddlewood comprising the bulk of the dense growth. Strawberry guava (*Psidium cattleianum*) is also present, forming thickets, and umbrella tree (*Schefflera actinophylla*) is conspicuous in some places. Upslope from the well site, outside of the Project area, uluhe fern (*Dicranopteris linearis*) and hala (*Pandanus tectorius*) are visible growing along the ridge, vestiges of the native plant communities that likely once dominated the area.

The proposed drainline location is partially forested with the remainder being dense shrubland. Albizia and shoebutton ardisia dominate the landscape while fiddlewood, strawberry guava, and Hilo holly (*Ardisia crenata*) are encountered

occasionally. The drainline is proposed to enter Uwao Stream through an existing headwall. Shoebutt ardisia, Koster's curse (*Clidemia hirta*), swordfern (*Nephrolepis multiflora*), moho (*Heliocarpus popayanensis*), and yellow ginger (*Hedychium flavescens*) grow at the headwall. The flora near the stream includes albizia, Java plum, hō'i'o or paca fern (*Diplazium esculentum*), bitter yam (*Dioscorea bulbifera*), golden pothos (*Epipremnum pinnatum*), and wauke (*Broussonetia papyrifera*).

Avian Survey

A total of 97 individual birds of 15 species, representing eleven separate families, was recorded during station counts (Table 2). Nearly all avian species recorded during the course of this survey are alien to the Hawaiian Islands. The lone exception was a singular O'ahu 'Amakihi (*Chlorodrepanis flava*) heard near the location of the proposed well site. Three species: Japanese White-eye (*Zosterops japonicus*), Red-vented Bulbul (*Pycnonotus cafer*), and Common Waxbill (*Estrilda astrild*) accounted for 47% of the total birds recorded.

Table 2. Avian species detected during point-counts for at the Project area.

ORDER, FAMILY			Station			Relative Abundance
Species Authority	Common name	Status	1	2	3	
COLOMBIFORMES						
COLUMBIDAE						
<i>Geopelia striata</i> Linnaeus	Zebra Dove	NN	3	-	1	1.33
<i>Streptopelia chinensis</i> Scopoli	Spotted Dove	NN	4	2	4	3.33
GALLIFORMES						
PHASIANIDAE						
<i>Gallus gallus</i> Linnaeus	Domestic Chicken	NN	4	3	-	2.33
PASSERIFORMES						
ESTRILDIDAE						
<i>Estrilda astrild</i> Linnaeus	Common Waxbill	NN	9	3	-	4.00
<i>Lonchura atricapilla</i> Vieillot	Chestnut Munia	NN	4	-	-	1.33
FRINGILLIDAE						
<i>Chlorodrepanis flava</i> Bloxham	O'ahu 'Amakihi	E	-	1	-	0.33
<i>Haemorhous mexicanus</i> Muller	House Finch	NN	1	-	-	0.33

Table 2 (continued).

ORDER, FAMILY		Station			Relative		
<i>Species</i>	Authority	Common name	Status	1	2	3	Abundance
LEIOTRICHIDAE							
<i>Garrulax canorus</i>	Linnaeus	Chinese Hwamei	NN	-	1	-	0.33
<i>Leiothrix lutea</i>	Scopoli	Red-billed Leiothrix	NN	-	3	-	1.00
MUSCICAPIDAE							
<i>Copsychus malabaricus</i>	Scopoli	White-rumped Shama Thrush	NN	1	4	3	2.67
PASSERIDAE							
<i>Passer domesticus</i>	Linnaeus	House Sparrow	NN	2	-	-	0.66
PYCNONOTIDAE							
<i>Pycnonotus cafer</i>	Linnaeus	Red-vented Bulbul	NN	3	7	1	3.67
<i>Pycnonotus jocosus</i>	Linnaeus	Red-whiskered Bulbul	NN	2	-	-	0.66
STURNIDAE							
<i>Acridotheres tristis</i>	Linnaeus	Common Myna	NN	4	3	-	2.33
THRAUPIDAE							
<i>Paroaria coronata</i>	Miller	Red-crested Cardinal	NN	1	2	-	1.00
ZOSTEROPIDAE							
<i>Zosterops japonicus</i>	Temminck	Japanese White- eye	NN	5	11	6	7.33

Legend – Table 2

Status – E = Endemic Resident

NN = Naturalized, non-native species (introduced).

Relative Abundance = station count / number of stations (3).

The waterbird survey at Uwao Stream did not reveal any waterbirds to be present at the location where the drainline would enter the stream or in nearby areas.

Mammalian Survey

Two terrestrial mammalian species were detected during the course of this survey. Dog (*Canis familiaris*) were heard barking from residences downslope

from the Project site. Pig (*Sus scrofa*) tracks, trails, and signs of rooting were encountered occasionally along the drainline route.

Native Damselflies

No damselflies, native or otherwise, were observed at or near the Project site during any of the surveys conducted on July 3, 2018.

Discussion

Botanical Resources

The property along the access road is interesting from a botanical perspective owing to the diversity of cultivated food and ornamental species. Many of these plants are Polynesian introductions, resulting in a higher than typical percentage of native species in the survey flora.

No plant species proposed for listing or listed under the federal endangered species act of 1973 (USFWS, nd(b)) as amended or the identical State of Hawai'i listing (H.R.S. 195D; HDLNR, 1998) were recorded during the course of this survey.

Avian Resources

The findings of the avian survey are consistent with the location of the property, and varied flora on the site. As previously mentioned, we recorded 15 avian species, only one of which is native, 'Oahu 'Amakihi. This endemic species appears to have a stable population (estimated at 20,000 to 60,000; Lindsey et al., 1998) and may have developed resistance to avian malaria. As such, the species is able to survive at low elevations where mosquito borne diseases have decimated populations of most other native birds.

No migratory shorebirds were recorded, nor were any expected as no suitable habitat exists on the parcels for use by these migratory indigenous species. Although no seabirds were detected, it is possible that the endemic sub-species of Newell's Shearwater (*Puffinus newelli*) and the indigenous Wedge-tailed Shearwater (*Ardenna pacifica*) over-fly the Project area between April and the middle of December each year. Newell's Shearwater (listed as a threatened species) is not known to breed on the Island of O'ahu, though birds likely to be this species have been recorded by ornithological radar and from vocalizations flying over the Island in low numbers (R. E. David, personal communication).

The primary cause of mortality in seabirds is thought to be predation by alien mammalian species at the nesting colonies (USFWS, 1983; Simons and Hodges, 1998; Ainley et al., 2001). Collision with man-made structures is considered the second most significant cause of mortality of seabird species in Hawai'i. Nocturnally flying seabirds, especially fledglings on their way to sea in the summer and fall, can become disoriented by exterior lighting. When disoriented, these birds may collide with man-made structures and, if not killed outright, the dazed or injured birds become easy targets of opportunity for feral mammals (Hue et al., 2001; Day et al., 2003).

No avian species proposed for listing or listed under the federal endangered species act of 1973 (USFWS, nd(b)), as amended or the State of Hawai'i's (H.R.S. 195D; HDLNR, 1998, 2015) were recorded during the course of this survey.

The potential impact that the Project poses to protected seabirds is the threat that birds will be downed after becoming disoriented by lights associated with Project construction, if coincident with the seabird fledging season which runs from September 15 through December 15. The two main areas that outdoor lighting could pose a threat to these nocturnally flying seabirds are: a) during construction, if it is deemed expedient or necessary to conduct nighttime construction activities; and b) operational use by the facility of streetlights or exterior lighting.

If streetlights or exterior facility lighting is installed in conjunction with the Project, it is recommended that the lights be shielded to reduce the potential for interactions of nocturnally flying seabirds with external lights and manmade structures (Reed et al., 1985; Telfer et al., 1987). Guidelines for responsible exterior lighting options that limit the attraction of wildlife are available from DLNR-DOFAW (2016).

Mammalian Resources

With the exception of the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus* or 'ōpe'ape'a), all terrestrial mammals currently found on the Island of O'ahu are alien species, and most are ubiquitous. Although no rodents were recorded it is likely that one or more of the four established alien Muridae found on O'ahu—roof rat (*Rattus rattus*), brown rat (*Rattus norvegicus*), Polynesian rat (*Rattus exulans hawaiiensis*), and European house mouse (*Mus musculus domesticus*)—use various resources found within the general Project area. It is also to be expected that small Indian mongoose (*Herpestes auropunctatus*) and domestic cat (*Felis catus*) use resources within the general Project area. All of these introduced mammalian species are deleterious to native ecosystems and the native fauna associated with them.

No Hawaiian hoary bats were detected during the course of this survey. The potential impact that the Project poses to the Hawaiian hoary bat would be from trimming or removal of trees at the Project site. Such action may temporarily displace individual bats roosting in trees. As bats use multiple roosts within their home territories, the disturbance resulting from the removal of vegetation would be minimal. However, during the pupping season, females carrying pups may be less able to rapidly vacate a roost site if the tree is trimmed or felled. Adverse impacts from such disturbance can be avoided or minimized by not clearing woody vegetation taller than 4.6 m (15 ft) during the pupping season between June 1 and September 15.

Native Damselflies

Two endemic damselflies are reported from Waiāhole watershed: oceanic Hawaiian damselfly (*Megalagrion oceanicum*) and Hawaiian upland damselfly (*Megalagrion hawaiiense*). The oceanic Hawaiian damselfly was listed as endangered under the Endangered Species Act (USFWS, 2012). The species currently occupies 12 known locations above 100 m (328 ft) in elevation on the windward side of the Koʻolau Mountains at Kahawainui, Wailele, Koloa, Kaipapaʻu, Maʻakua, upper Kaluanui, Kawai iki, ʻŌpaeʻula, upper Helemano, Makaua, Waiheʻe, and Kahaluʻu in lowland mesic, lowland wet, and wet cliff ecosystems (USFWS, 2012). The oceanic Hawaiian damselfly is constrained to portions of streams not occupied by non-native predatory fish. Critical habitat for the oceanic Hawaiian damselfly has been designated covering portions of the upper leeward and windward slopes of Koʻolau mountain from Hauʻula to Waimānalo.

The Hawaiian Upland damselfly is found on all of the major Hawaiian islands except Kauaʻi, with a wide variation in color across its range. This species breeds in the upper reaches of small, spring-fed streams (HDLNR-DOFAW, 2018). None of the habitats preferred by these native damselflies is present in the Project area, hence no impact to these species is anticipated.

Critical Habitat

Oʻahu ʻElepaio (*Chasiempis sandwichensis ibidis*) and oceanic Hawaiian damselfly have federally delineated Critical Habitat present approximately 60 m (200 ft) upslope from the reservoir site (USFWS, 2012). However neither species was found in the survey and neither are anticipated to be present in the Project area. The Project will not impinge on federally designated Critical Habitat, as none is present in the Project site. No equivalent habitat designation exists under state law.

Jurisdictional Waters

Given the relatively steep slopes and absence of flowing or ponded water, no wetlands are likely present on most of the survey area. The National Wetlands Inventory (NWI) Wetlands Mapper (USFWS, nd(a)) shows no aquatic features other than Uwao Stream occurring in the Project area. A small water feature is located near the proposed drainline route at about 100-m (328-ft) elevation (Figure 7). This feature is not directly adjacent to a traditionally navigable water, but could be jurisdictional if found to be a wetland under the U.S. Army definition (USACE, 1987). A formal wetland investigation and delineation is recommended to determine the nature and jurisdictional status of the water feature.



Figure 7. Unknown water feature present near the corridor proposed for construction of the drain line.

The drainline will enter Uwao Stream, a tributary to Waiāhole Stream through an existing drain outlet and headwall. The stream is jurisdictional and any construction work to be conducted within the OHWM of the stream will require a Department of the Army permit under Section 404 of the Clean Water Act. Such work would likely require an Applicable Monitoring and Assessment Plan

(AMAP) to be approved, implemented and reported to the Department of Health, Clean Water Branch.

A Best Management Practices (BMP) plan should be designed and implemented to minimize and localize adverse environmental impacts to water quality and aquatic biota near the Project work sites and downstream of the Project.

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