BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843
www.boardofwatersupply.com

RICK BLANGIARDI, MAYOR

BRYAN P. ANDAYA, Chair
KAPUA SPROAT, Vice Chair
RAY C. SOON
MAX J. SWORD
NA`ALEHU ANTHONY

JADE T. BUTAY, Ex-Officio
ROGER BABCOCK, Jr., Ex-Officio

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

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

December 10, 2021

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

Dear Ms. Evans:

Subject: Final Environmental Assessment for Manoa Well II Exploratory Well
Manoa, Honolulu District, Oahu, Hawaii, Tax Map Key: [1] 2-9-054:033

The Honolulu Board of Water Supply has prepared the Final Environmental Assessment (FEA) for the subject project and determines a Finding of No Significant Impact. Please publish notice of availability of the FEA for this project in the next available Periodic Bulletin.

We have enclosed a searchable pdf file of the FEA.

If you have any questions, please contact our consultant, Howard Endo of Shimabukuro, Endo and Yoshizaki, Inc. (SEY) at 808-737-1875, or via e-mail: hendo@seyeng.com or Rian Adachi at 808-748-5943, or via e-mail: radachi@hbws.org.

Very truly yours,

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

Attachment

cc: Howard K. Endo, SEY Engineers

From: webmaster@hawaii.gov
To: DBEDT OPSD Environmental Review Program
Subject: New online submission for The Environmental Notice
Date: Monday, December 13, 2021 12:57:50 PM

Action Name

Manoa Well II Exploratory Well

Type of Document/Determination

Final environmental assessment and finding of no significant impact (FEA-FONSI)

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

Honolulu, Oʻahu

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

(1) 2-9-054:033

Action type

Agency

Other required permits and approvals

Numerous, identified in Final Environmental Assessment

Proposing/determining agency

Honolulu Board of Water Supply

Agency contact name

Rian Adachi

Agency contact email (for info about the action)

radachi@hbws.org

Agency contact phone

(808) 748-5943

Agency address

630 South Beretania Street
Honolulu, Hawaii 96843
United States
Map It

Was this submittal prepared by a consultant?

Yes

Consultant

Shimabukuro, Endo & Yoshizaki, Inc.

Consultant contact name

Howard Endo

Consultant contact email

hendo@seyeng.com

Consultant contact phone

(808) 737-1875

Consultant address

1126 12th Avenue #309
Honolulu, Hawaii 96816
United States
Map It

Action summary

The Honolulu Board of Water Supply (BWS) proposes to improve the performance and reliability of the Metro Water System serving Manoa and neighboring communities. A single well at the Manoa Well II Station supplies potable water for Manoa. Whenever this well needs service or maintenance, the region loses its water supply source and must rely on outside sources to supply Manoa with potable water. The Honolulu Board of Water Supply proposes to add a second well to the Manoa Well II Station to improve the overall reliability and performance of this urban water system. The production from the Station will remain the same even with the second well as only one well will be pumped at a time and no change in the Water Use Permit will be required. No adverse long-term impacts are anticipated from this project.

Reasons supporting determination

Please see Chapter 6, Section 2 of the Manoa Well II Exploratory Well Final Environmental Assessment for justification of the determination.

Attached documents (signed agency letter & EA/EIS)

- Manoa-Well-II-FEA-December-20211.pdf
- OEQC-Submittal-Letter1.pdf

Shapefile

- The location map for this Final EA is the same as the location map for the associated Draft EA.

Authorized individual

Howard Endo

Authorization

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

MANOA WELL II
EXPLORATORY WELL
FINAL ENVIRONMENTAL ASSESSMENT
HONOLULU, HAWAII

TAX MAP KEY: 2-9-054:033

This document is prepared pursuant to Chapter 343, HRS

Proposing Agency

City & County of Honolulu
Board of Water Supply
530 South Beretania Street
Honolulu, Hawaii 96843

Prepared By

Shimabukuro, Endo & Yoshizaki, Inc.
dba SEY Engineers
1126 12th Avenue, Room 309
Honolulu, Hawaii 96816

December 2021

TABLE OF CONTENTS

1. Summary ..... 1 - 1
1.1 General Information ..... 1 - 1
1.2 Environmental Assessment Information ..... 1 - 2
1.3 Parties Consulted ..... 1 - 3
1.3.1 Pre-Assessment Consultation ..... 1 - 3
1.3.2 Draft EA Review ..... 1 - 4
1.4 Approvals, Permits, Etc. ..... 1 - 4

2. Description of Proposed Action ..... 2 - 1
2.1 Proposed Action/Technical Characteristics ..... 2 - 1
2.2 Purpose of and Need for Action ..... 2 - 5
2.3 Socio-Economic Characteristics ..... 2 - 5
2.4 Environmental Characteristics ..... 2 - 7
2.5 Project Schedule and Funding Source ..... 2 - 7

3. Description of the Affected Environment and Potential Impacts and Mitigation Measures ..... 3 - 1
3.1 Project Location ..... 3 - 1
3.2 Land Ownership ..... 3 - 1
3.3 State and County Land Use Designation/Development Plan ..... 3 - 1
3.4 Surrounding Land Use ..... 3 - 4
3.5 Topography and Geology ..... 3 - 4
3.6 Soils ..... 3 - 6
3.7 Water Resources and Hydrology ..... 3 - 9
3.8 Climate and Air Quality ..... 3 - 10
3.9 Surface Water, Flood Hazard and Drainage ..... 3 - 11
3.10 Flora, Fauna and Significant Habitats ..... 3 - 13
3.11 Archaeological, Historical and Cultural Sites ..... 3 - 13
3.12 Utilities ..... 3 - 14
3.13 Noise ..... 3 - 14
3.14 Traffic ..... 3 - 15
3.15 Visual Impacts ..... 3 - 15

4. Summary of Potential Impacts and Proposed Mitigation Measures ..... 4 - 1
4.1 Short Term Impacts ..... 4 - 1
4.1.1 Land Use ..... 4 - 1
4.1.2 Air and Water Pollution ..... 4 - 1
4.1.3 Flora, Fauna and Significant Habitats ..... 4 - 1
4.1.4 Archaeological, Historical or Cultural Sites ..... 4 - 2
4.1.5 Utilities ..... 4 - 2
4.1.6 Noise ..... 4 - 2
4.1.7 Traffic ..... 4 - 2

4.2 Long Term Impacts....4 - 3
4.2.1 Socio-Economic....4 - 3
4.2.2 Water Resources and Hydrology....4 - 3
4.2.3 Visual Impacts....4 - 3

5. Alternatives to Proposed Action....5 - 1
5.1 Proposed Action....5 - 1
5.2 Alternatives to Proposed Action....5 - 1
5.2.1 No Action....5 - 1
5.2.2 Delayed Action....5 - 1
5.2.3 Alternative Sites....5 - 2

6. Determination, Findings and Justification....6 - 1
6.1 Determination....6 - 1
6.2 Findings and Justification....6 - 1

7. Approvals, Permits, Etc....7 - 1
7.1 Federal Government....7 - 1
7.2 State of Hawaii....7 - 1
7.3 City and County of Honolulu....7 - 1

8. References....8 - 1

LIST OF FIGURES

Figure 2-1 Location & Vicinity Maps & Metropolitan 405 & 705 Systems .....2 - 2
Figure 2-2 Manoa Well II Station Site Plan .....2 - 3
Figure 2-3 Section of Proposed Exploratory Manoa Second Well .....2 - 4
Figure 2-4 Metropolitan Water Systems in Manoa.....2 - 6
Figure 3-1 State Land Use Map.....3 - 2
Figure 3-2 City Zoning Map .....3 - 3
Figure 3-3 USGS Honolulu Topographic Quadrangle Map.....3 - 5
Figure 3-4 Honolulu Aquifer with Partitioned Six Regions .....3 - 7
Figure 3-5 Soil Classification Map .....3 - 8
Figure 3-6 Flood Zones .....3 - 12

LIST OF TABLES

Table 3-1 Results of Water Quality Analysis for the Manoa Well #1.....3 - 10

APPENDICES

Appendix A Pre-Assessment Consultation

Appendix B Draft Environmental Assessment Consultation

Appendix C Biological Survey for BWS Manoa Well II on TMK: 2-9-054:033, Honolulu, Hawaii

Appendix D Archaeological Literature Review and Field Inspection and Cultural Assessment Report

CHAPTER I

SUMMARY

1.1 GENERAL INFORMATION

The Honolulu Board of Water Supply (BWS) proposes to improve the performance and reliability of the Metro Water System serving Manoa and neighboring communities. A single well at the Manoa Well II Station supplies potable water for Manoa. Whenever this well needs service or maintenance, the region loses its water supply source and must rely on outside sources to supply Manoa with potable water. The Honolulu Board of Water Supply proposes to add a second well to the Manoa Well II Station to improve the overall reliability and performance of this urban water system. The production from the Station will remain the same even with the second well as only one well will be pumped at a time and no change in the Water Use Permit will be required.

The project will add a second well to the Manoa Well II Station and connect it to the existing water supply system. The Manoa Well II Station was constructed in the back of the valley approximately 2,150 feet northeast of the intersection of Manoa Road and Oahu Avenue in 1987. The address of the well station is 3738 Manoa Road, even though its primary entrance is from Loulu Place. The existing well is located next to the Control Building on the south end of the 93,060 square-foot BWS property and the second well will be drilled approximately 100 to 150 feet to the north of the existing well.

The proposed well will consist of 14-inch solid casing from the ground surface (approximate elevation 375 to 385 feet above mean sea level [msl]) to a depth of approximately 600 feet (approximate elevation (-)225 feet msl) followed by an open bore hole for another 300 feet to its terminal depth of approximately 900 feet where dike free basalt rock is expected to be encountered. Modifications to water line connections at the well station will be required to connect the new well to the water supply system and a short driveway will be constructed to connect the new well to the existing station driveway.

The Final Environmental Assessment (EA) has been prepared pursuant to Chapter 343, HRS. It describes the project and the affected environment, discusses proposed actions and potential environmental impacts, and proposes mitigation measures. After review of the Draft EA by various governmental agencies, other interested organizations and individuals and following a formal 30-day comment period, the proposing and approving agency, the BWS has concluded that the project will have no significant impact on the environment and has determined a **Finding of No Significant Impact**.

1.2 ENVIRONMENTAL ASSESSMENT INFORMATION

Project Name:	Manoa Well II Environmental Assessment
Applicant:	Board of Water Supply City & County of Honolulu 630 South Beretania Street Honolulu, Hawaii 96843 Contact: Mr. Rian Adachi, Project Manager
Agency's Consultant:	Shimabukuro, Endo & Yoshizaki, Inc. 1126 12th Avenue, Room 309 Honolulu, Hawaii 96816 Contact: Howard K. Endo, Ph.D., P.E.
Approving Agency:	Board of Water Supply, City & County of Honolulu
Project Description:	Prepare an Environmental Assessment for a second well at the Manoa Well II Station
Project Location:	3738 Manoa Road, Honolulu, Oahu, Hawaii
Existing Use:	The BWS owns, operates, and maintains the existing Manoa Well (State Well No. 1948-01), which serves the Metro Water System.
Land Ownership:	City and County of Honolulu Board of Water Supply
Tax Map Keys:	Manoa Well II Station: 2-9-054:033 Adjacent Properties: 2-9-053:068-070, 72-73, 2-9-054:007 and 018
Land Area:	Manoa Well II Station parcel is 93,060 square feet
Flood Insurance Rate Map:	15003C0360G – Zone X, beyond 500 year flood plain
State Land Use:	Conservation
City Zoning District:	Preservation - 1
Special Designation Districts:	None
Special Management Area:	No
Anticipated Determination:	Finding of No Significant Impact (FONSI)
Parties Consulted:	See Appendix A for Agencies and Public Consultation

1.3 PARTIES CONSULTED

1.3.1 Pre-Assessment Consultation

Prior to preparing the Draft Environmental Assessment (EA), the agencies, and organizations listed below from the master list provided by OEQC were consulted by letter on April 17, 2018. Also, residents of parcels adjoining the Manoa Well II Station were consulted by letter at the same time. Substantive comments were received from parties marked below with an asterisk (*) and the comments were incorporated into the Draft EA as appropriate. Copies of substantive comments letters are included in Appendix A.

Federal Agencies

- U.S. Department of Army Corps of Engineers
- U.S. Department of the Interior Fish and Wildlife Service *****

State of Hawaii Agencies

- Department of Business, Economic Development and Tourism
- Department of Education
- Department of Health (DOH), Environmental Planning Office *****
- DOH, Office of Environmental Control
- Department of Land and Natural Resources (DLNR) *****
- DLNR, State Historic Preservation Division
- Department of Transportation *****
- Manoa Elementary School
- Office of Hawaii Affairs
- Office of Planning, Land Use Commission *****
- Representative Isaac W. Choy
- Senator Brian T. Taniguchi

City and County of Honolulu Agencies

- Board of Water Supply (BWS)
- Department of Design and Construction *****
- Department of Environmental Services
- Department of Facility Maintenance *****
- Department of Parks and Recreation *****
- Department of Transportation Services (DTS) *****
- Fire Department *****
- Police Department *****
- Councilwoman Ann Kobayashi

Community Groups/Businesses/Individuals/Etc.

- Manoa Neighborhood Board No. 7
- Residents of Parcels Adjoining Manoa Well Station (14)

1.3.2 Draft EA Review

Notifications of the Draft EA were mailed to agencies, organizations and individuals similar to the Pre-Assessment Consultation. Responses were received from the parties listed below with as asterisk (*) and their comments were incorporated into the Final EA as appropriate. Copies of comments letters to the Draft EA and responses to the letters are contained in Appendix B.

Federal Agencies

- U.S. Department of Army Corps of Engineers
- U.S. Department of the Interior Fish and Wildlife Service *****

State of Hawaii Agencies

- Department of Business, Economic Development and Tourism
- Department of Education *****
- Department of Health (DOH), Clean Air Branch *****
- DOH, Office of Environmental Control
- Department of Land and Natural Resources (DLNR)
- DLNR, State Historic Preservation Division
- Department of Transportation
- Manoa Elementary School
- Office of Hawaii Affairs
- Office of Planning, Land Use Commission
- Representative Isaac W. Choy
- Senator Brian T. Taniguchi

City and County of Honolulu Agencies

- Board of Water Supply (BWS)
- Department of Design and Construction *****
- Department of Environmental Services
- Department of Facility Maintenance *****
- Department of Parks and Recreation *****
- Department of Planning and Permitting *****
- Department of Transportation Services (DTS)
- Fire Department *****
- Police Department *****
- Councilwoman Ann Kobayashi

Community Groups/Businesses/Individuals/Etc.

- Manoa Neighborhood Board No. 7
- Residents of Parcels Adjoining Manoa Well Station (14)

1.4 APPROVALS, PERMITS, ETC.

The following permits/approvals will likely be required for implementing the various improvements:

Federal Permits/Approvals

None

State of Hawaii Permits/Approvals

Well Construction Permit and Pump Installation Permit	DLNR, Commission on Water Resources Management
National Pollutant Discharge Elimination System Permit, General Permits, Form F Discharges of Treated Hydrotesting Effluent and Form I Treated Process Wastewater Associated with Well Drilling Activities	DOH, Clean Water Branch
Community Noise Control Permit	DOH, Indoor and Radiological Health Branch
Potable Water Source Approval and Well Connection Authorization	DOH, Safe Drinking Water Branch
Conservation District Use Permit	DLNR, Office of Conservation and Coastal Lands

City & County of Honolulu Permits/Approvals

Construction Plan Approval	Dept. of Planning & Permitting
Street Usage Permit	DTS
Building and Grading Permits	Dept. of Planning & Permitting
Effluent Discharge Permit	Dept. of Environmental Services
Public Infrastructure Map Amendment	Dept. of Planning & Permitting

CHAPTER 2

DESCRIPTION OF PROPOSED ACTION

2.1 PROPOSED ACTION/TECHNICAL CHARACTERISTICS

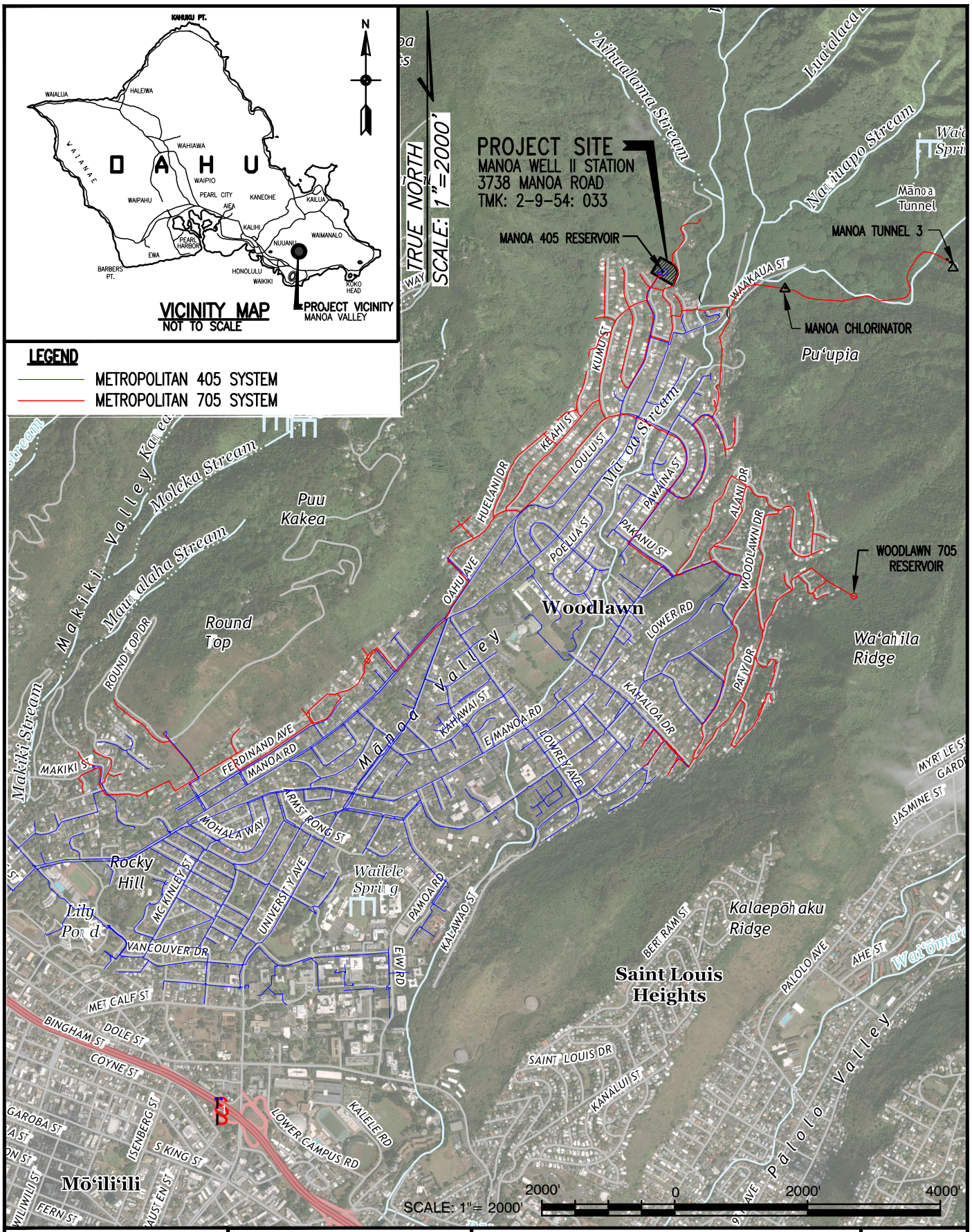
The Manoa Well II Station currently has one production well (Manoa Well #1) that supplies Manoa and the neighboring communities with potable water. Whenever this well needs service or maintenance, the region loses its single water supply source and must rely on outside sources to supply Manoa with potable water. The Honolulu Board of Water Supply proposes to add a second well to the Manoa Well II Station to improve the overall reliability and performance of its urban water system. The production from the Station will remain the same even with the second well as only one well will be pumped at a time so water use will remain unchanged. The objective of the second well is to provide a consistent and uninterrupted supply of potable water to Manoa and the surrounding communities.

The construction of the new Manoa well will proceed in two phases. Phase 1 will drill, case, and test an exploratory well at the Manoa Well II Station. The exploratory well will be drilled and tested for yield, water quality, and aquifer properties. If the results show that source development is feasible, Phase 2 will convert the exploratory well into a production well. In this phase, a submersible pump, motor and piping will be installed to connect the new well to the existing water supply system. A short-paved driveway will branch off of the existing Station driveway to provide access to the well from the Station.

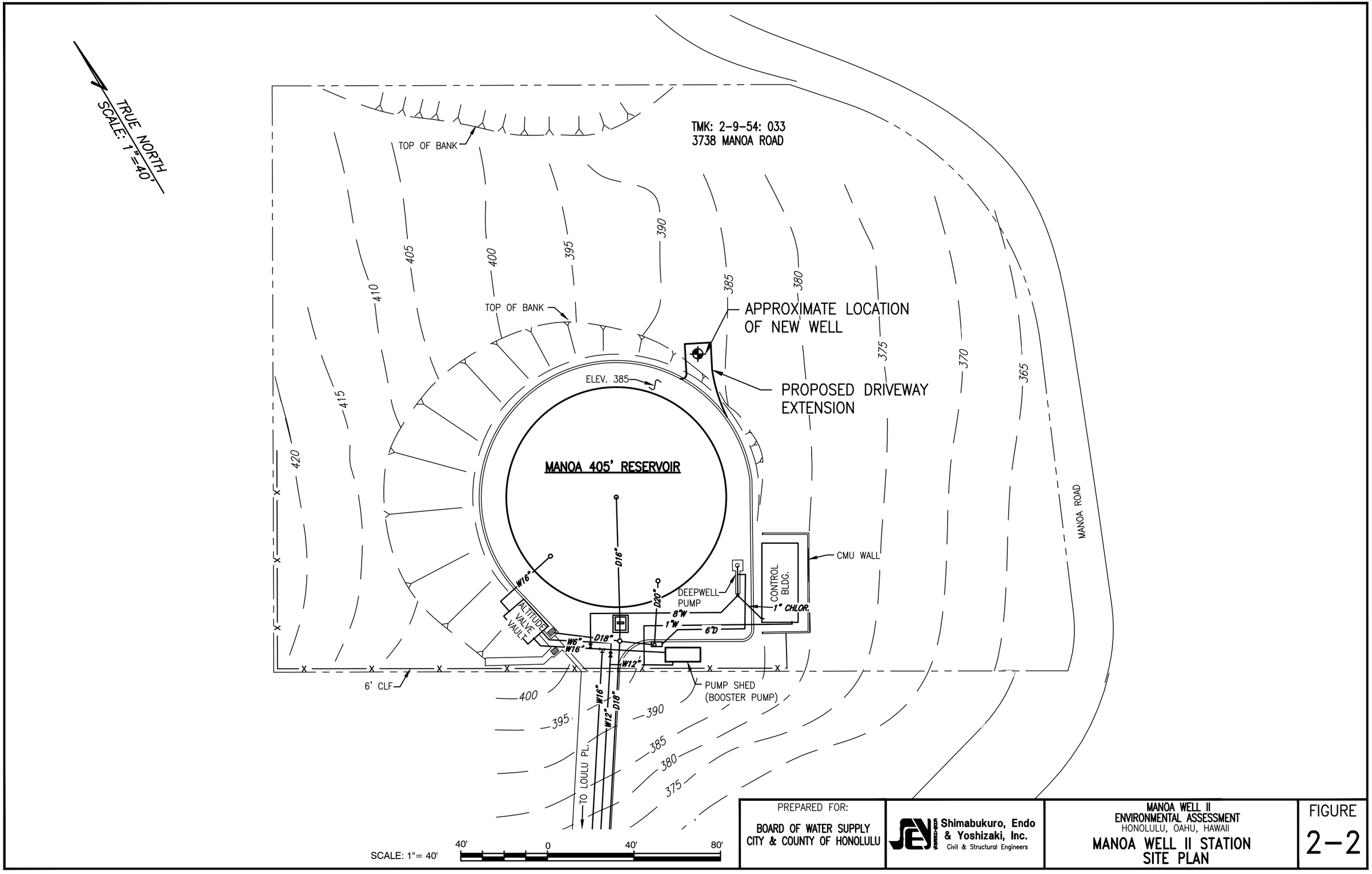
The Manoa Well II Station is located approximately 2,150 feet northeast of the intersection of Manoa Road and Oahu Avenue in the back northwest corner of the valley as shown on **Figure 2-1**. The address of the Station is 3738 Manoa Road and its TMK parcel number is 2-9-054:33. The entrance to the Well Station is on Loulu Place through a 20-foot wide by 150-foot long lot, TMK: 2-9-053:71. The site plan of the Well Station with proposed well location is shown on **Figure 2-2**.

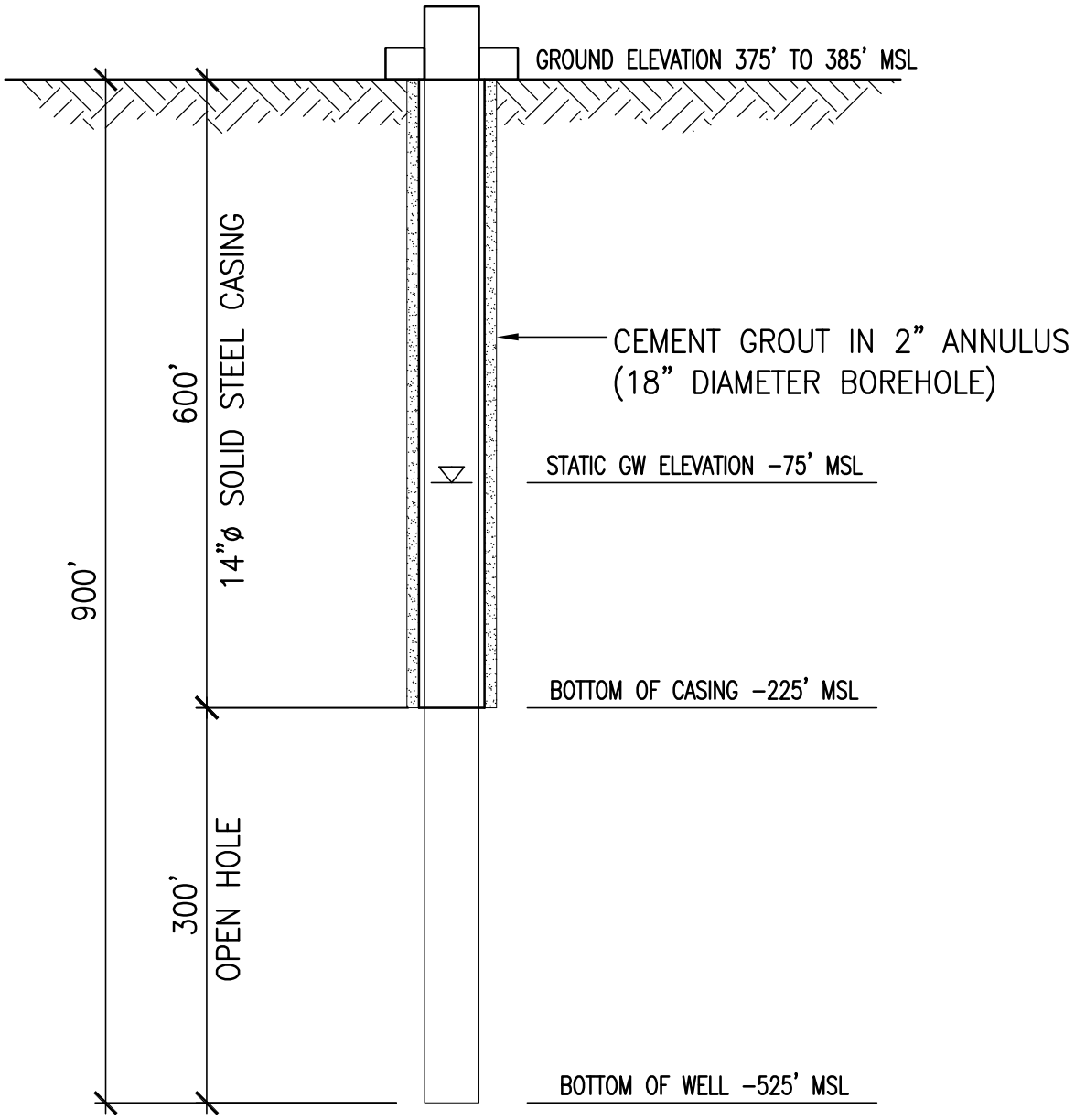
The project will add a second well to the Manoa Well II Station and connect it to the existing water supply system. The original well was drilled in 1983 and the Station was constructed in 1986. The existing well is located next to the Control Building on the south end of the 93,060 square-foot BWS property and the second well will be drilled approximately 100 to 150 feet to the north of the existing well.

The proposed well as shown in **Figure 2-3** will consist of 14-inch solid casing from the ground surface (approximate elevation 375 to 385 feet above mean sea level [msl]) for a depth of approximately 600 feet (approximate elevation (-)225 feet msl), followed by an open bore hole for another 300 feet to its terminal depth of approximately 900 feet below ground surface where dike free basalt rock is



PREPARED FOR:			
BOARD OF WATER SUPPLY CITY & COUNTY OF HONOLULU	Shimabukuro, Endo & Yoshizaki, Inc. Civil & Structural Engineers	MANOA WELL II ENVIRONMENTAL ASSESSMENT HONOLULU, OAHU, HAWAII LOCATION & VICINITY MAPS AND METROPOLITAN 405 & 705 SYSTEMS	FIGURE 2-1


TRUE NORTH
SCALE: 1"=40'
TMK: 2-9-54: 033
3738 MANOA ROAD
TOP OF BANK
TOP OF BANK
APPROXIMATE LOCATION OF NEW WELL
PROPOSED DRIVEWAY EXTENSION
ELEV. 385
MANOA 405' RESERVOIR
D16"
W16"
D20"
DEEPWELL PUMP
8"W
1"W
6"D
1" CHLOR.
CONTROL BLDG.
CMU WALL
MANOA ROAD
ALTITUDE VALVE VAULT
W6"
W16"
D18"
W12"
6' CLF
PUMP SHED (BOOSTER PUMP)
TO LOULU PL.
W16"
W12"
D18"
420
415
410
405
400
395
390
385
380
375
370
365
400
395
390
385
380
375
SCALE: 1"= 40'
40'
0
40'
80'
PREPARED FOR:
BOARD OF WATER SUPPLY
CITY & COUNTY OF HONOLULU
Shimabukuro, Endo & Yoshizaki, Inc.
Civil & Structural Engineers
MANOA WELL II
ENVIRONMENTAL ASSESSMENT
HONOLULU, OAHU, HAWAII
MANOA WELL II STATION
SITE PLAN
FIGURE
2-2



NOT TO SCALE

PREPARED FOR:			
BOARD OF WATER SUPPLY CITY & COUNTY OF HONOLULU	Shimabukuro, Endo & Yoshizaki, Inc. Civil & Structural Engineers	MANOA WELL II ENVIRONMENTAL ASSESSMENT HONOLULU, OAHU, HAWAII SECTION OF PROPOSED EXPLORATORY MANOA SECOND WELL	FIGURE 2-3

expected to be encountered. A new 8-inch water line will connect the new well to the existing water supply system.

The existing Manoa Well #1 is part of the BWS Metro 405 System serving Manoa and surrounding communities. The regional map of the Metro 405 Water System and Metro 705 Water System in Manoa is shown in **Figure 2-1** and a schematic diagram of the two pressure systems is shown in **Figure 2-4**. Pumpage from the existing well fills a 1.0 million-gallon (MG) reservoir at the Station that services the Metro 405 Water System. The Manoa Booster Pump is also located at the Manoa Well II Station and pumps water from the 1.0 MG reservoir across the valley to the Woodlawn 705 Reservoir. The Manoa Tunnel III is part of the Metro 705 Water System and supplies the 0.2 MG Woodlawn 705 Reservoir and the neighboring 0.3 MG Makiki 705 Reservoir.

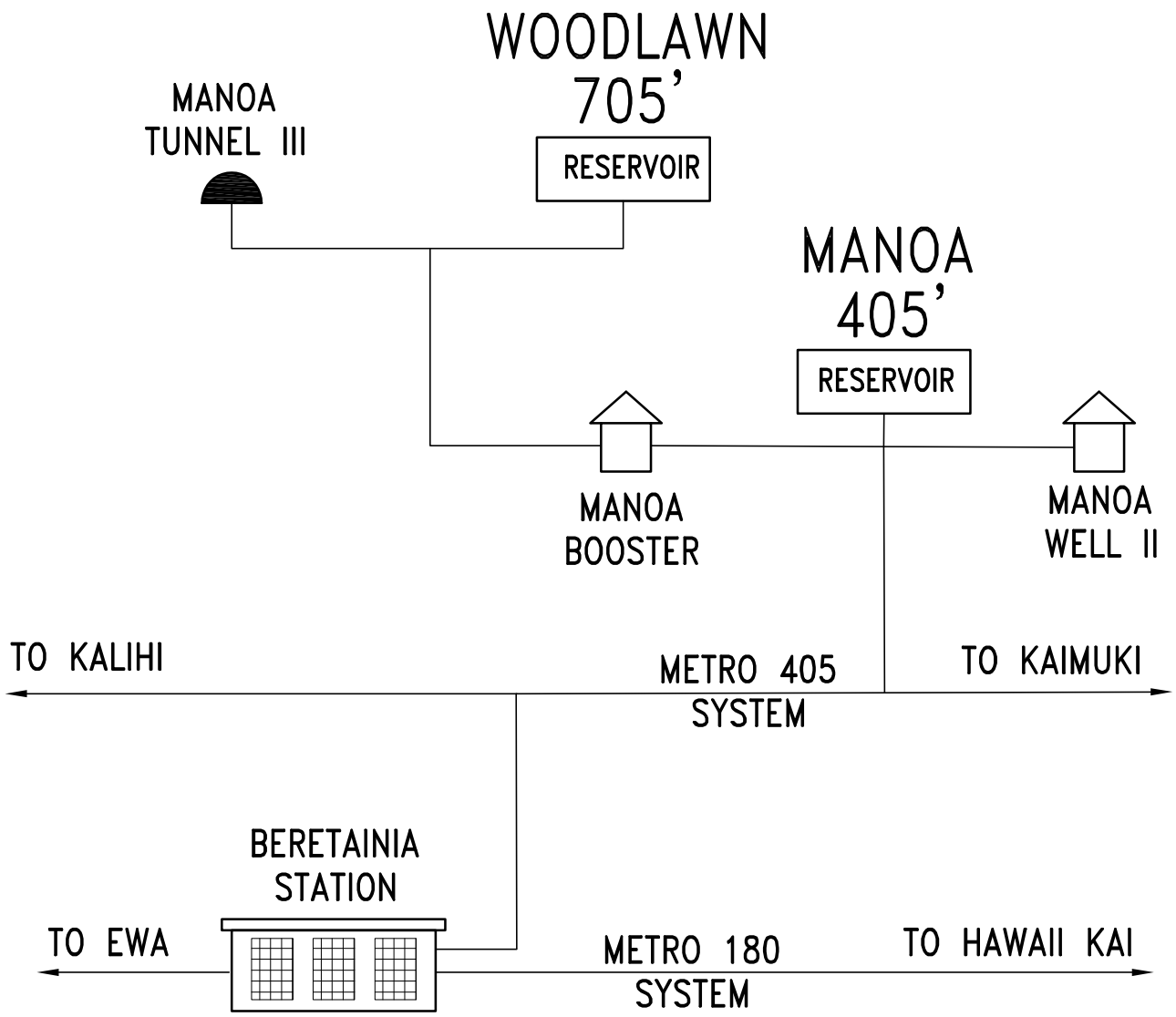
2.2 PURPOSE OF AND NEED FOR ACTION

The purpose of the proposed action is to improve the performance and sustain the reliability of the water supply system in Manoa. The existing Manoa Well #1 is the only source of potable groundwater in Manoa. By adding a second well, a consistent source of potable water will be present even if one of the wells is inoperable due to repairs or maintenance. The permitted water use of 0.7 mgd administered by the State Department of Land and Natural Resources, Commission on Water Resources Management (CWRM) will not change.

2.3 SOCIO-ECONOMIC CHARACTERISTICS

Manoa is an urban residential community located on the southern coast of Oahu between Makiki to its west and Kaimuki to its east. The residential community mainly consists of single-family homes concentrated along the base and lower slopes of a valley. Economic activities include small scale agriculture, retail shops, eateries and grocery stores serving both local residents and tourists. Manoa also has a fire station, two public elementary schools, two private K12 schools, a university, and a district park.

The new Manoa well is not anticipated to trigger a change to the existing resident population in Manoa. There are neither new residential units nor visitor housing units associated with this project. Therefore, the project should result in no in-migration of individuals to reside within Manoa and should have no impact on the existing resident population. The new Manoa well will neither change nor alter the character of the Manoa community or the character of this urban community. The existing project site already exists and has similar above- and below-ground structures that were already present. Therefore, this project will not change existing uses in the surrounding area or have a significant impact on surrounding urbanized land uses.



NOT TO SCALE

PREPARED FOR:			
BOARD OF WATER SUPPLY CITY & COUNTY OF HONOLULU	Shimabukuro, Endo & Yoshizaki, Inc. Civil & Structural Engineers	MANOA WELL II ENVIRONMENTAL ASSESSMENT HONOLULU, OAHU, HAWAII METROPOLITAN WATER SYSTEMS IN MANOA	FIGURE 2–4

The new Manoa well will create construction jobs over the construction period typically consisting of laborers, tradesmen, equipment operators, supervisors, etc. These jobs will generate personal income for workers through paid wages. Direct construction jobs created will also stimulate indirect and induce employment with other industries on Oahu. Fiscal impacts associated with this project would primarily involve slightly additional tax revenue generated to the State. Tax revenue sources for State government will be composed primarily of general excise taxes (GET) on development costs and construction materials, and corporate income tax. In addition, GET taxes on indirect and induced income spent stimulated by the spending of income will also contribute new revenues to the State.

Since City revenues are primarily limited to property tax revenues, there will be minimal changes to the City revenues. The new Manoa well will contribute to property value; however, this increase is expected to be minimal. No changes to the property values or existing surrounding residences are anticipated from the construction of the proposed additional well. The project will not generate any new in-migrant residents to Oahu. Thus, there will not be any effect on State and County operational expenditures for public services.

2.4 ENVIRONMENTAL CHARACTERISTICS

Temporary disruptions to the environment will occur due to the construction activities such as drilling of the proposed well. Traffic will be temporarily impacted during transportation of materials and equipment to the site. Operation of construction equipment will temporarily affect dust, noise and exhaust emission levels. Construction activities will be performed during normal working hours between 8:30 a.m. and 3:30 p.m., Monday through Friday, unless otherwise permitted by the City and County of Honolulu. Environmental impacts caused by the project will be mitigated by complying with applicable City, State and Federal standards, guidelines and permit requirements. In addition, the Contractor will be required to employ safety measures to protect the public, especially children, from the construction activity and to properly secure construction areas during non-working hours.

2.5 PROJECT SCHEDULE AND FUNDING SOURCE

Construction of the exploratory well for Phase 1 is expected to begin in 2022 and last approximately 6 months or longer. Pending acceptable yield and water quality results, Phase II of the project would convert the exploratory well into a production well and tie it into the existing water system. Phase II funds will be allocated if the exploratory well test results are positive.

CHAPTER 3

DESCRIPTION OF THE AFFECTED ENVIRONMENT AND POTENTIAL IMPACTS AND MITIGATION MEASURES

3.1 PROJECT LOCATION

The Manoa Well II Station is located at the back of Manoa Valley at 3738 Manoa Road in Honolulu, Hawaii. Access to the station is provided from Loulu Place. See Location Map **Figure 2-1**. The new well will be drilled within the existing well facility, approximately 100 to 150 linear feet from the existing well. The new well will be used as a back-up well to provide a consistent source of potable water for Manoa.

3.2 LAND OWNERSHIP

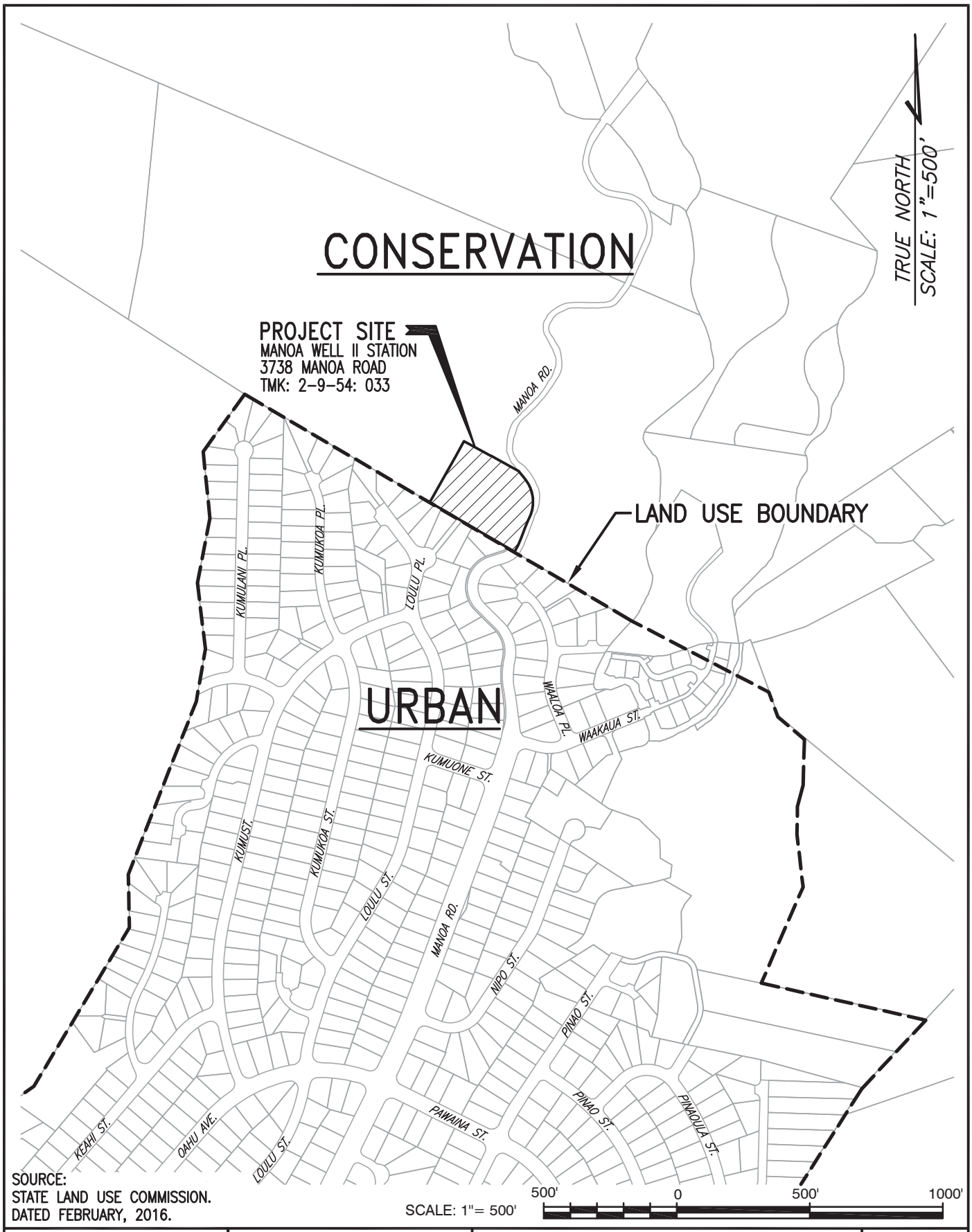
The Manoa Well II Station is located within lot Tax Map Key Number (TMK): 2-9-054:033, owned by the City and County of Honolulu Board of Water Supply. The lot is polygonal shaped with an area of 93,060 square feet. The longest side of the lot is 270 feet with its shortest side 206 feet. Land acquisition will not be required for construction of new well.

3.3 STATE AND COUNTY LAND USE DESIGNATION/DEVELOPMENT PLAN

The project site is zoned P-1 Restricted Preservation District by the City and County of Honolulu and Conservation - Resource by the State's Land Use District Boundary Map. See **Figures 3-1** and **3-2**. These designations are consistent with the intended use of Manoa Well II Station and the proposed improvements. Well construction and operation are classified as Type A utility installation which is a permitted use in P-1 Zones and is considered to have minor impact on adjacent land uses according to Article 10 of the Revised Ordinances of Hawaii, Chapter 21.

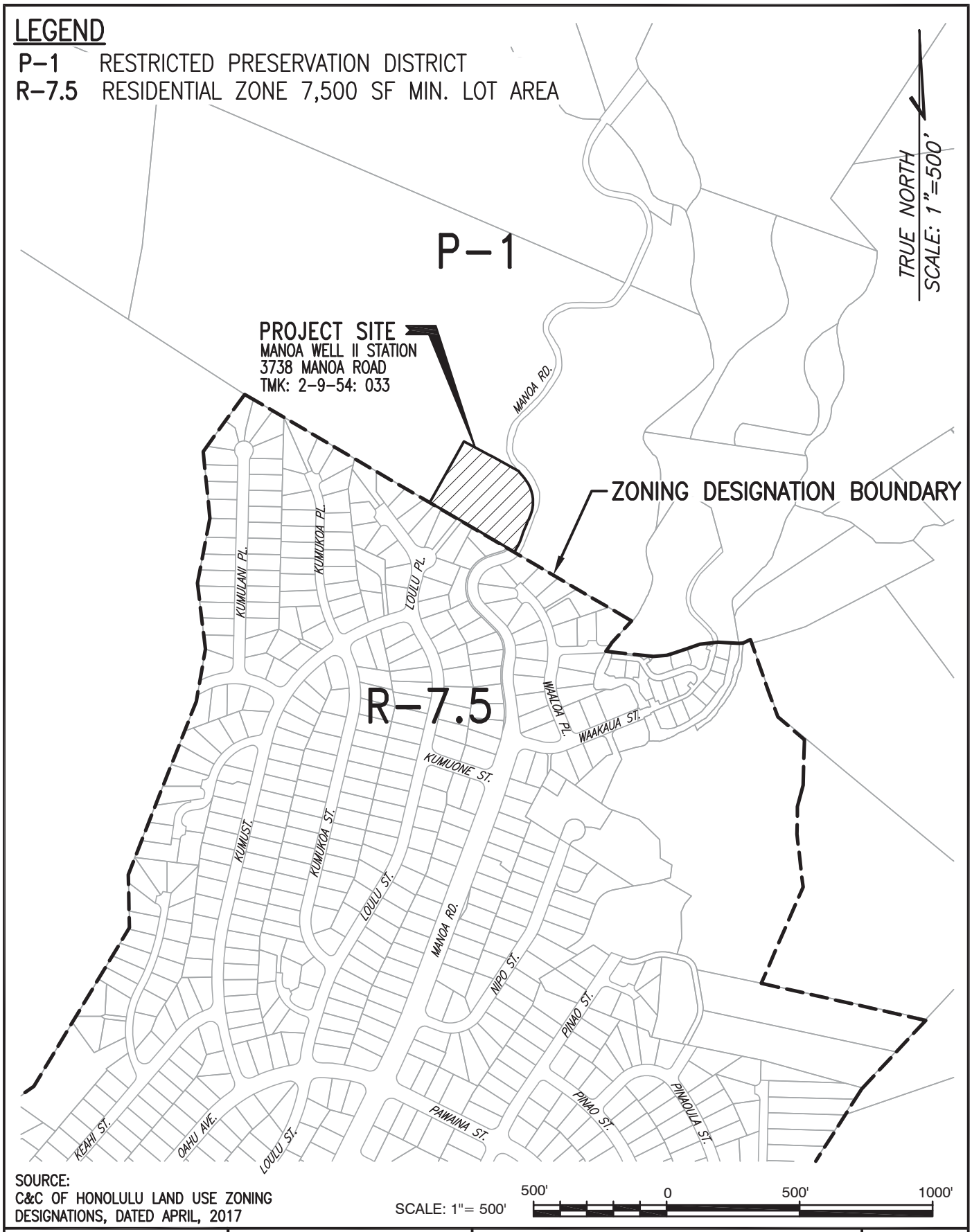
The Conservation district designation permits any and all activities as allowed by the ordinances or regulations of the Department of Land and Natural Resources. Conservation - Resource designated zones on the island of Oahu are regulated by the ordinances and regulations of the City and County of Honolulu per Hawaii Administrative Rules, Title 13 Chapter 5 13-5-24, 2011. Under these regulations, water systems are permitted land and resource management land uses. As a component of a water system, construction of a new well is a permitted use at the Manoa Well II Station based on State and County zoning.

The intended use of the Manoa Well II Station is consistent with the City's Primary Urban Center Development Plan that was adopted in June 2004. This development plan consists of policies, guidelines and conceptual schemes that provide a vision for future developments extending out to the year 2025. The Plan's jurisdiction extends horizontally from Waialae-Kahala to Pearl City, from the shoreline to the westerly slopes of the Koolau mountain range. The Plan states that the population



SOURCE:
STATE LAND USE COMMISSION.
DATED FEBRUARY, 2016.

PREPARED FOR:			
BOARD OF WATER SUPPLY CITY & COUNTY OF HONOLULU	Shimabukuro, Endo & Yoshizaki, Inc. Civil & Structural Engineers	MANOA WELL II ENVIRONMENTAL ASSESSMENT HONOLULU, OAHU, HAWAII STATE LAND USE MAP	FIGURE 3-1



PREPARED FOR:			
BOARD OF WATER SUPPLY CITY & COUNTY OF HONOLULU	Shimabukuro, Endo & Yoshizaki, Inc. Civil & Structural Engineers	MANOA WELL II ENVIRONMENTAL ASSESSMENT HONOLULU, OAHU, HAWAII CITY ZONING MAP	FIGURE 3-2

served by the BWS will continue to increase by seventeen percent through 2025. As population increases, the water demand is anticipated to increase. To meet the additional water demand, the Plan states that the BWS will focus on more efficient water system operations. Development of a second well for backup purposes will help to improve the reliability of the Manoa Well II Station and improve overall water system operations. The new well will help to manage the increased population growth and water demand by maintaining a reliable water source to serve the community.

3.4 SURROUNDING LAND USE

The Manoa Well II Station is located within a residential neighborhood near the back of Manoa Valley. Manoa Valley is bounded by Palolo Valley to the East, Koolau mountain range to the North, Makiki to the West and Moiliili to the South. Access to the project site is provided from Loulu Place. Properties to the south of the project site are zoned R-7.5, while properties to the north of the project site and surrounding Manoa Valley are zoned P-1 for Restricted Preservation. Lyon Arboretum and Manoa Falls Trail is approximately 3 miles north of the Manoa Well II Station.

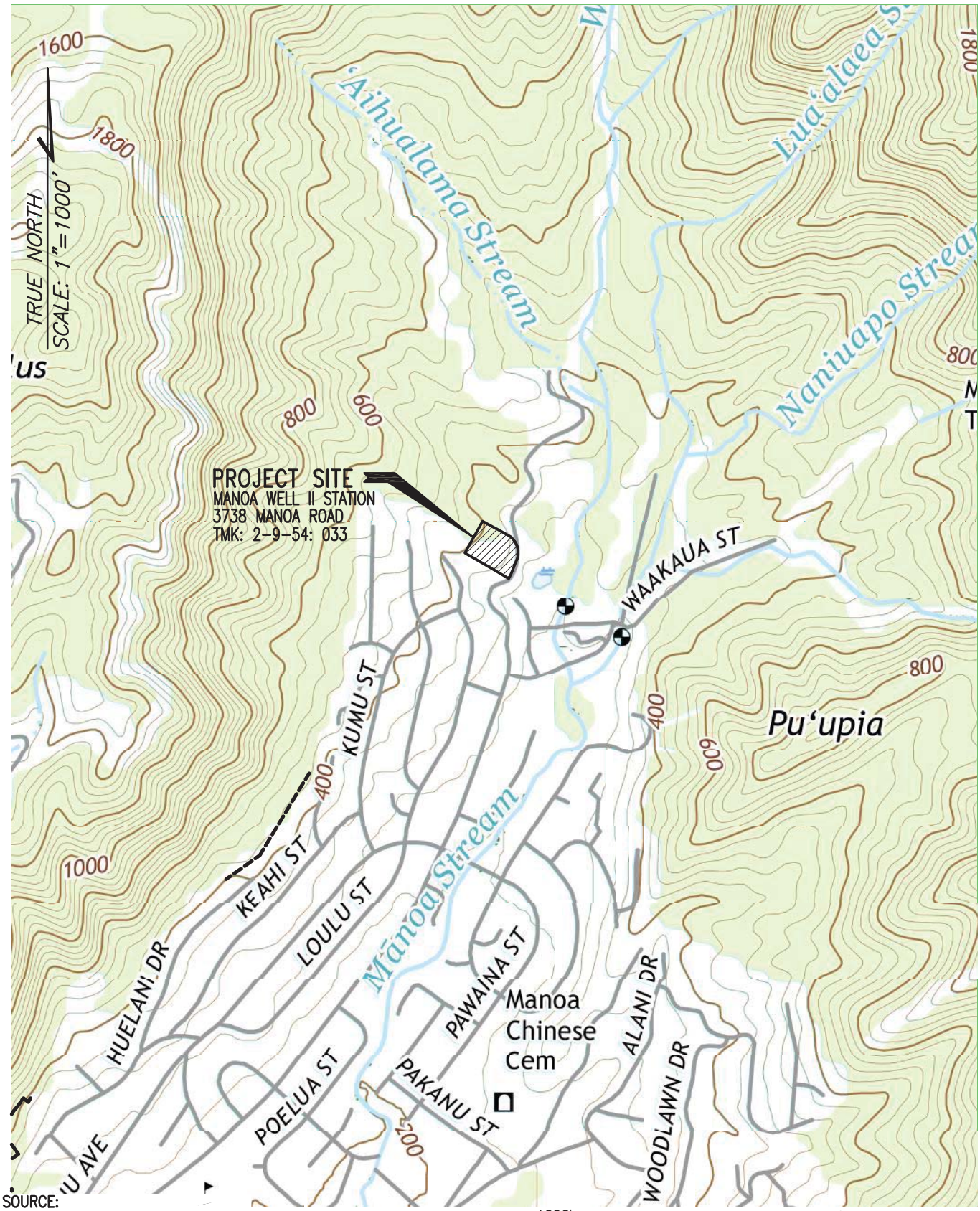
There will be no long-term interference with any of the existing land uses of the surrounding properties by constructing the new well. During construction of the well, vehicular access to adjoining roadways and driveways may be temporarily disrupted by transportation of construction equipment, machinery or materials to the site. However, construction will be confined to the project site. There will be no construction on adjacent properties or surrounding roadways.

3.5 TOPOGRAPHY AND GEOLOGY

The regional topography near the well station is shown in **Figure 3-3** (2017 USGS Honolulu Quadrangle Map). The well station is located at the inland end of a residential community in one of the widest amphitheater valleys in Honolulu.

Elevations within the project site ranges from 360 to 480 feet above mean sea level. In general, the site slopes in the southeast direction, with slopes ranging from 15 percent to 50 percent. There is a steep slope along the eastern boundary of the site that provides a transition from the surrounding embankment to a level surface for the control and booster pump buildings and access road around the tank. The proposed well site is located in the northeastern section of the Manoa Well II Station.

The Manoa Well II Well Station is located below the west flank of the Koolau Range. The basement geologic formation is the Koolau volcanic series, a typical primitive Hawaiian basalt composed of a’a and pahoehoe lavas. Thin overlapping layers of lava flows with dips between 5 to 10 degrees issuing from dikes along the Koolau rift zone formed the basement formation. The rift zone runs parallel the crest of the Koolau Range with the edge of the marginal dike zone more than a mile inland of the



PREPARED FOR:			
BOARD OF WATER SUPPLY CITY & COUNTY OF HONOLULU	Shimabukuro, Endo & Yoshizaki, Inc. Civil & Structural Engineers	MANOA WELL II ENVIRONMENTAL ASSESSMENT HONOLULU, OAHU, HAWAII USGS HONOLULU TOPOGRAPHIC QUADRANGLE MAP	FIGURE 3–3

Manoa Well as shown in **Figure 3-4**. The dike-free Koolau basalts beneath the Manoa Well are highly permeable and form the primary aquifers on Oahu.

Manoa valley was formed by extensive erosion following the primary eruptions of the Koolau Volcano and later Honolulu Volcanic Series. As the valley was incised by erosion, loose material from the valley walls filled the base of the valley. These terrestrial sediments are known as older alluvium and consist of consolidated and partly consolidated sediments of low permeability. Alluvium was encountered from ground surface to a depth of approximately 600 feet during the drilling at Manoa Well #1. The thickness of the alluvium is expected to increase towards the head of the valley.

The additional well is not expected to cause an adverse impact to the geology and topography. The borehole will be confined to an 18-inch diameter borehole drilled to a depth of approximately 900 feet below ground. The top six hundred feet of the well drilled through the older alluvium will consist of 14-inch solid casing and the lower two to three hundred feet drilled through the dike free Koolau basalts will consist of an open hole. The immediate area around the well site will be cleared and graded, but the extent of grading will no cause a major change to the topography at the well station.

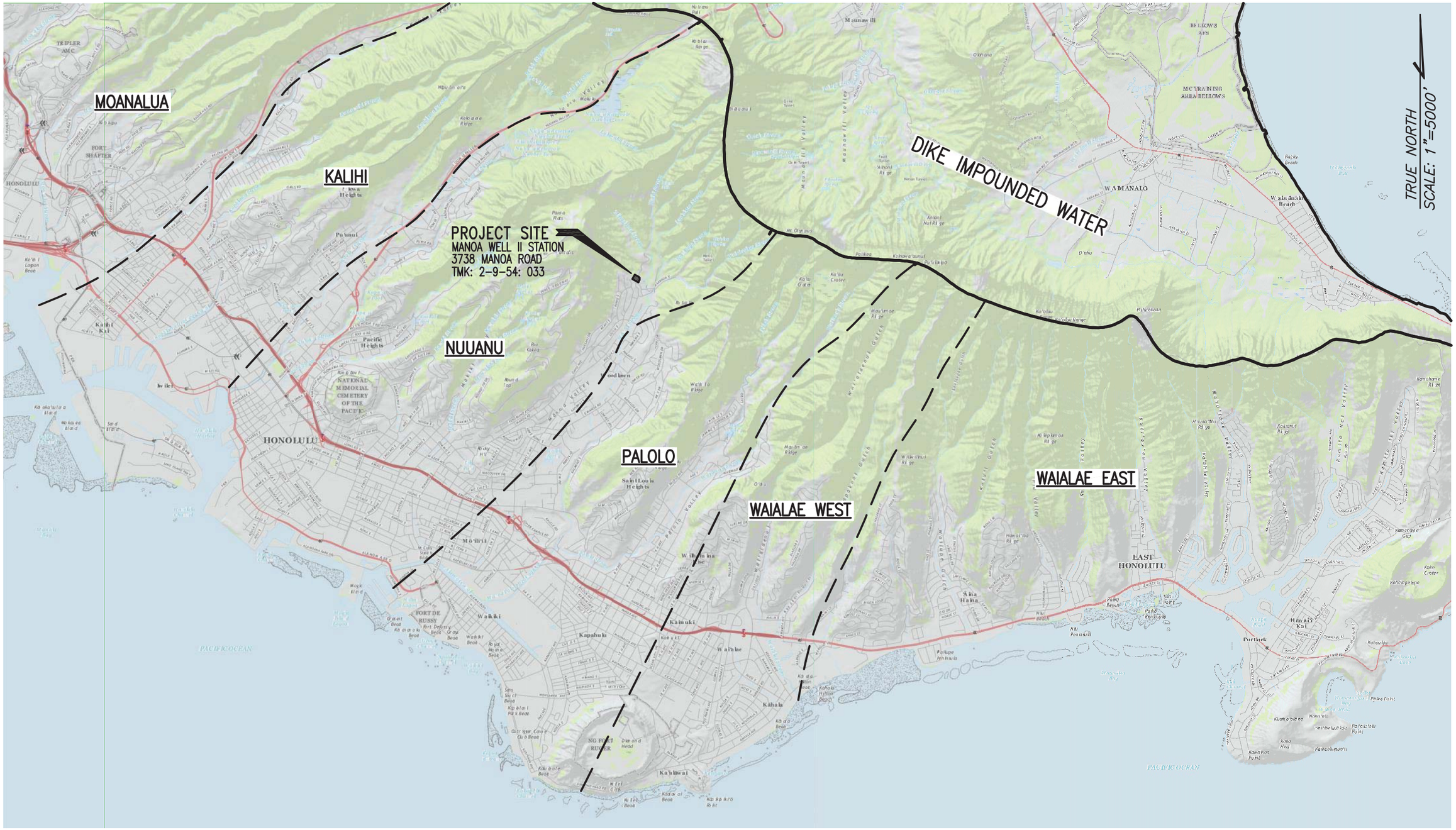
3.6 SOILS

There are three types of soils typical of alluvium and colluvium derived from basalt debris present within the project area: Hanalei Stony Silty Clay (HoB) covering the North Eastern corner, Lolekaa Silty Clay (LoC) covering the South East side and Tantalus Silt Loam (TAE) covering the West side. See **Figure 3-5**. According to the Soil Survey of Island of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii (U.S. Department of Agriculture Soil Conservation Services, 1972) HoB soils are found on slopes varying between 2 to 6 percent and are poorly drained. The HoB soil was derived from basic igneous rock. Storm water runoff on HoB soils is slow with slight erosion potential.

The LoC soils can be primarily found on fans and terraces on the windward side of Oahu on slopes varying between 8 to 15 percent. LoC soils are derived from old, gravelly colluvium and alluvium on gently to very steep slopes and are well-drained. Storm water runoff on LoC soils is slow to medium with slight to moderate erosion hazard. Workability is slightly difficult due to the steep slopes.

The TAE soils consist of well drained soils developed from volcanic ash and material weathered from cinders. TAE soils are found in high elevations with slopes varying between 15 to 40 percent. Runoff is medium with a moderate erosion hazard. TAE soils are commonly used for homesite, water supply and recreation.

Land disturbing activities associated with the proposed improvements will have minor impacts. Large excavation and grading are not anticipated for the project.



LEGEND

— — — — — APPROXIMATE AQUIFER REGION BOUNDARY

——————— APPROXIMATE DIKE ZONE BOUNDARY

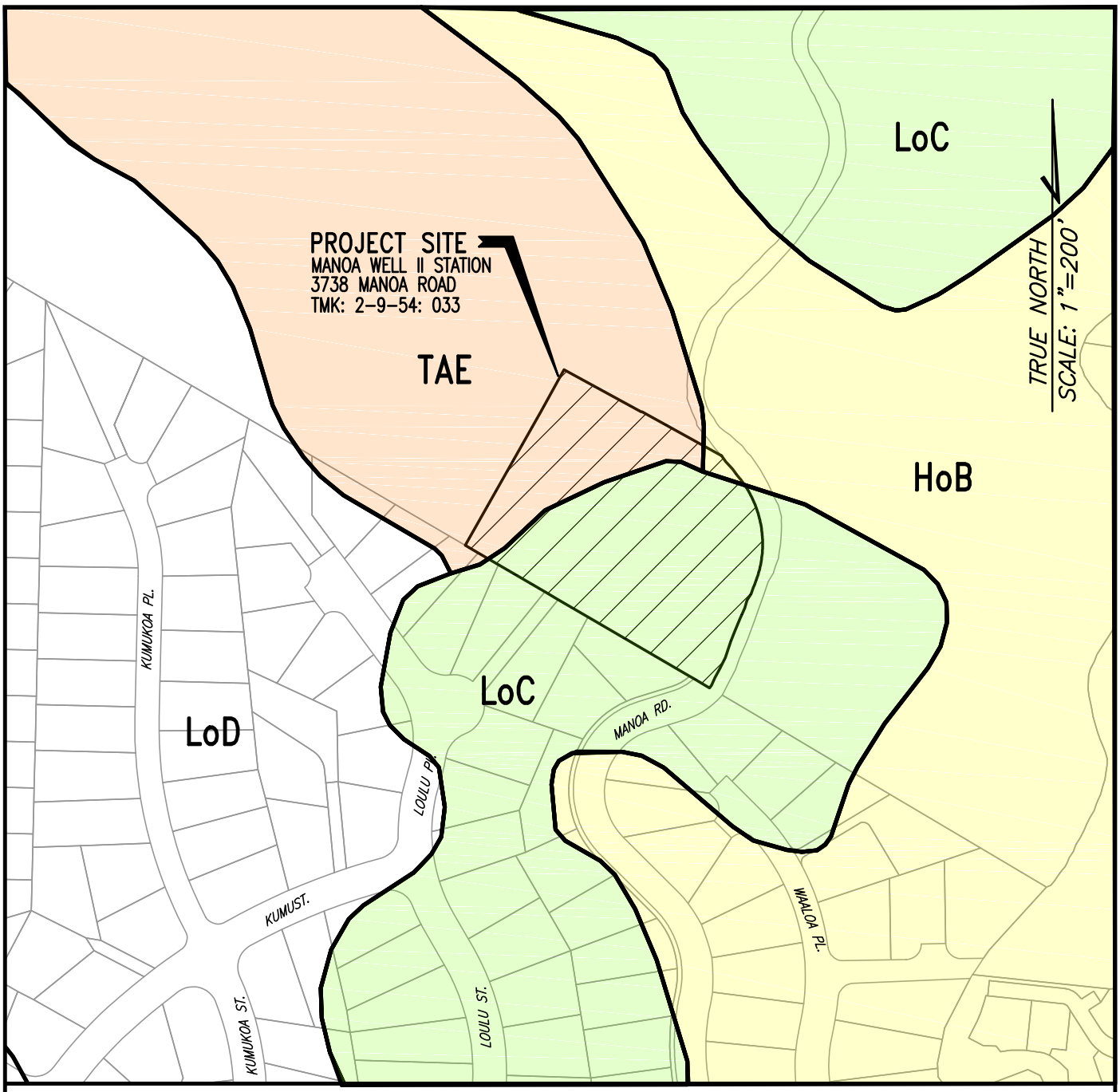
WAIALAE WEST AQUIFER NAME

SCALE: 1"= 5000'

5000' 0 5000' 10000'

SOURCE:
USGS U.S. TOPO 7.5 MINUTE MAP FOR
HONOLULU AND KOKOHEAD HI 2017

PREPARED FOR:			
BOARD OF WATER SUPPLY CITY & COUNTY OF HONOLULU	Shimabukuro, Endo & Yoshizaki, Inc. Civil & Structural Engineers	MANOA WELL II ENVIRONMENTAL ASSESSMENT HONOLULU, OAHU, HAWAII HONOLULU AQUIFER WITH PARTITIONED 6 REGIONS	FIGURE 3-4



LEGEND

HnB	Hanalei silty clay, 2 to 6 percent slopes
LoC	Lolekaa silty clay, 8 to 15 percent slopes
LoD	Lolekaa silty clay, 15 to 25 percent slopes
TAE	Tantalus silt loam, 15 to 40 percent slopes

SOURCE:
U.S. DEPT OF AGRICULTURE, NATURAL RESOURCE CONSERVATION SERVICE. SURVEY OCTOBER, 2017.

SCALE: 1"= 200'

200' 0 200' 400'

PREPARED FOR:			
BOARD OF WATER SUPPLY CITY & COUNTY OF HONOLULU	Shimabukuro, Endo & Yoshizaki, Inc. Civil & Structural Engineers	MANOA WELL II ENVIRONMENTAL ASSESSMENT HONOLULU, OAHU, HAWAII SOIL CLASSIFICATION MAP	FIGURE 3-5

Construction of the exploratory well will be limited to the project site and will consist of drilling an 18-inch diameter borehole to a depth of approximately 900 feet below existing ground. Grading will be confined to the immediate area surrounding the well. Best Management Practices to mitigate erosion and pollution generated by construction will be implemented.

3.7 WATER RESOURCES AND HYDROLOGY

Manoa Well #1 resides in the Nuuanu Aquifer of the Honolulu Hydrologic Unit as designated by the Commission on Water Resources Management (CWRM). See **Figure 3-4**. The Nuuanu Aquifer extends for approximately 2.5 miles from the middle of Manoa Valley in the southeast to Pali Highway in the northwest. The length of the aquifer is 6.5 miles from the shoreline to the crest of the Koolau Range. The aquifer is semi-compartmentalized as deep alluvium fills both Manoa and Nuuanu valleys and forms low permeability barriers between adjacent aquifers. Groundwater levels in neighboring aquifers can differ by several feet with the higher level in the aquifer receiving more rainfall.

Fresh groundwater in the Nuuanu Aquifer is impounded by dikes in the Koolau rift zone and floats on top of seawater between the Koolau rift zone and the coast. The edge of the Koolau marginal rift zone is shown in **Figure 3-4.** In the marginal dike zone, the density of dikes is less than 100 per mile. Isolated dikes have been observed in Manoa below the marginal rift zone, but their ability to impound water is remote. The Manoa Well resides in the portion of the fresh groundwater aquifer that floats on top of seawater, commonly referred to as basal water in Hawaii

Groundwater flow in the basal portion of the Nuuanu Aquifer is controlled by the caprock and is confined in near coastal areas and unconfined in inland areas such as Manoa. The static basal groundwater level at Manoa Well #1 measured in 1983 was 73.8 feet above MSL.

The sustainable yield of the Nuuanu Aquifer as established by CWRM is 14 million gallons per day (mgd). Manoa Well #1 has a permitted water use to withdraw 0.7 mgd from the Nuuanu Aquifer. Note that the allocation of water use will not be changed by the addition of the second well.

The water quality of the groundwater pumped from the new Manoa Well is expected to be good. **Table 3-1** presents the water quality data for Manoa Well #1 when it was placed into service by the BWS in the mid-1980s. Manoa Well #1 has been a reliable source of good quality water to the BWS for many years.

Table 3-1

Results of Water Quality Analysis for the Manoa Well #1

Parameter	Value
Regional head, feet	N.A.
Specific conductance, micromhos @ 25°C	131
pH value	7.95
Turbidity	0.6
Color	1.3
In Parts Per Million	
Silica	21
Calcium	6.9
Magnesium	5.7
Sodium	10
Potassium	0.6
Bicarbonate	49
Sulfate	2.3
Chloride	14
Fluoride	0.05
Nitrate	0.9
Phosphate	0.15
Iron	(Less than 0.02)
Manganese	(Less than 0.02)
Copper	(Less than 0.02)
Lead	(Less than 0.01)
Arsenic	(Less than 0.01)
Chromium	(Less than 0.01)
Total dissolved solids	111
Alkalinity	40
Total hardness	41

Groundwater conditions and water quality are expected to remain the same for the second well because of the proximity to the existing well. Only one well will be pumped at a time.

3.8 CLIMATE AND AIR QUALITY

The climate in Manoa can be characterized by persistent trade winds, frequent showers and sun with cloud cover near the Koolau Range. The trade winds prevail throughout the year with varying frequency. Periodically, Kona winds from the south will cast a haze of volcanic ash over the island. The haze is usually temporary and lasts until the trade winds return. Due to the trade winds, air quality is generally good and lacks stationary sources of pollutants. According to the Geography Department of the University of Hawaii, Climate of Hawaii, trade wind speeds generally range between 5 and 11 miles per hour. Temperatures in Manoa are

equable from day to day, ranging between 69°F and 74°F, with an annual average of 76°F. The hottest months of the year occur between August to October. The annual rainfall in Manoa is approximately 142 inches with a monthly average of 12 inches.

Air quality is generally good due to the effects of the trade winds and lack of stationary sources of pollutants. During periods of light winds, “hot spots” with air pollutants exceeding short-term standards could occur where traffic congestion occurs or near factory plants. Such locations do not exist near the project site.

Fugitive dust and exhaust from construction equipment and machinery will be generated during construction activities. Impacts due to exhaust emissions can be minimized by keeping all equipment properly tuned and maintained and minimizing unnecessary idle time. The contractor is required to comply with Hawaii Administrative Rules (HAR) Title 11, DOH Chapter 60.1 Air Pollution Control which regulates emissions from motor vehicles and fugitive dust generators. To reduce fugitive dust emissions, exposed surfaces should be kept watered whenever feasible.

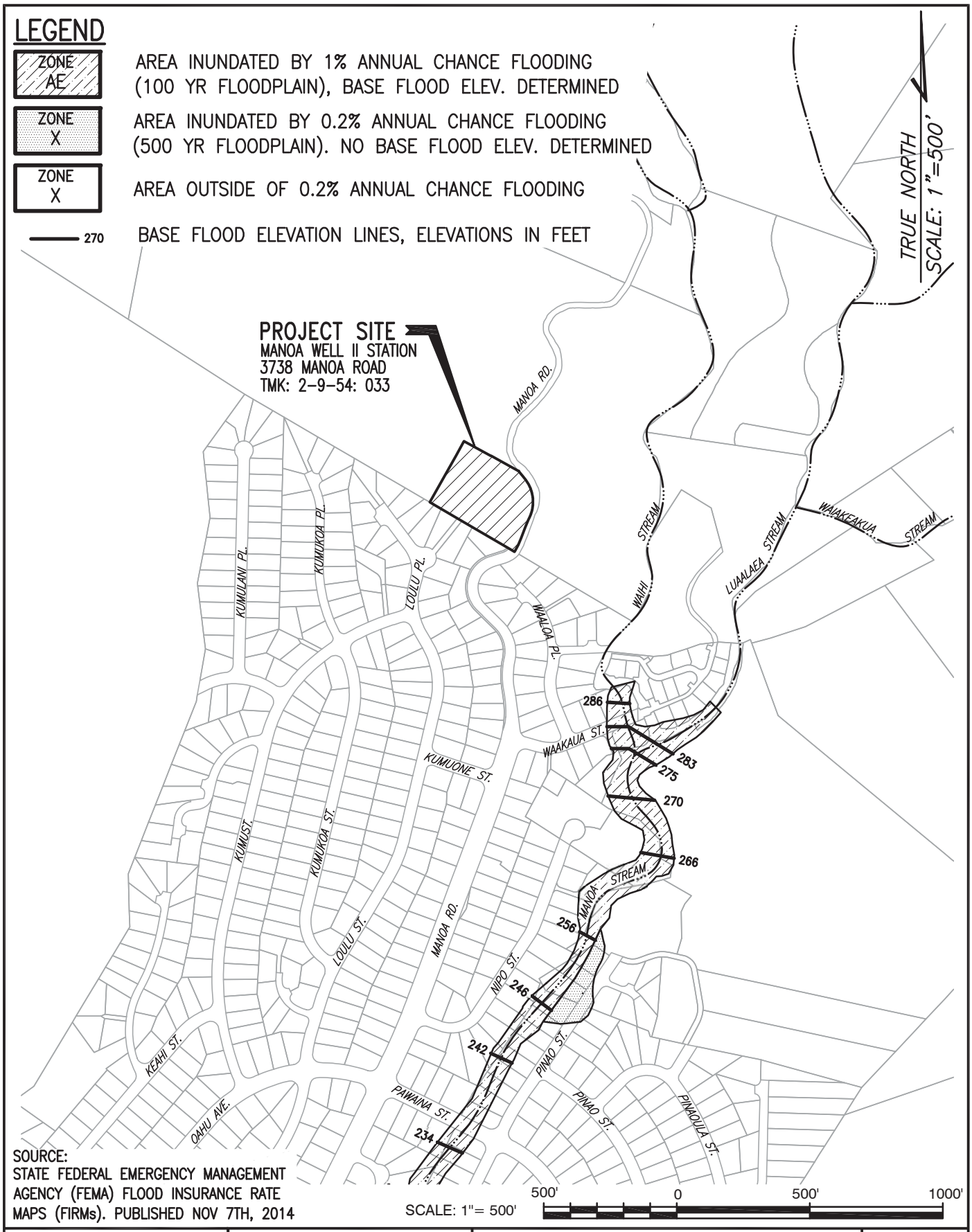
With the necessary measures put into place to address equipment and machinery exhaust, as well as dust control, the climate and air quality of Manoa will not be adversely impacted by this project.

3.9 SURFACE WATER, FLOOD HAZARD AND DRAINAGE

There are three streams located within a quarter of a mile of the Manoa Well II Station as shown in **Figure 2-1**: Waihi Stream located approximately 600 feet to the east, Aihualama Stream located approximately 1,400 feet to the north, and Luaalaea Stream located approximately 1,120 feet to the east. Near the Manoa Well II Station the streams are perennial. Aihualama Stream flows into Manoa Stream upstream of the Station and Luaalaea Stream flows into Manoa Stream downstream of the Station. The flow in the streams should not change with construction of the new well as the withdrawal from the aquifer will not change with the additional of the second well.

The project site is located in Zone X (areas determined to be outside the 0.2% annual chance floodplain) on the Flood Insurance Rate Map (FIRM) panel 360 dated January 19, 2011. See Flood Map **Figure 3-6**. The FIRM shows that flooding at the project site is expected to be rare due to its inland location.

The discharges of storm water into the City storm drainage system associated with hydrotesting effluent and treated process wastewater from well drilling activities will comply with the requirements of the National Pollutant Discharge Elimination System (NPDES) General Permits, as needed. Notices of Intent for NPDES permits will be



PREPARED FOR:			
BOARD OF WATER SUPPLY CITY & COUNTY OF HONOLULU	Shimabukuro, Endo & Yoshizaki, Inc. Civil & Structural Engineers	MANOA WELL II ENVIRONMENTAL ASSESSMENT HONOLULU, OAHU, HAWAII FLOOD ZONES	FIGURE 3-6

submitted to the State Department of Health Clean Water Branch at least 30 days prior to any discharge occurrence. During construction, the contractor will also adhere to requirements of the City's Grading, and Soil Erosion and Sediment Control Ordinance. Desilting fences and other erosion control measures shall be used by the contractor to contain sediment and prevent it from entering the City drainage system.

3.10 FLORA, FAUNA AND SIGNIFICANT HABITATS

A biological survey of the Manoa Well II Station was conducted by AECOS, Inc. in August 2018. The survey indicates that there are no valuable landscape trees, exceptional trees and/or rare native plants in the survey area. Clearing of the area for construction of a second well may even have a positive impact of eliminating a portion of the golden bamboo stand (*Pyllostachy aurea*) and problematic trees such as Moluccan albizia (*Falcataria moluccana*). No federally endangered or threatened avian and mammalian species were observed during the survey. The survey concluded that the project will not adversely impact avian resources extant in the project vicinity. While methods to detect the Hawaiian hoary bat *(Lasiurus cinereus semotus)* were not employed, impacts to the Hawaiian hoary bat can be minimized or avoided by not disturbing, removing or trimming woody vegetation greater than 15 feet tall during the bat birthing and pup rearing season between June 1 and September 15. Use of barbed wire on tops of fences should be avoided to prevent entanglement by bats. Based on the biological survey, Manoa Well II Station is not designated as a Critical Habitat for any species. Consequently, the construction of a new well is not expected to have an adverse impact on botanical resources or any native wildlife species or their habitat.

3.11 ARCHAEOLOGICAL, HISTORICAL AND CULTURAL SITES

An archaeological literature review, field inspection and cultural assessment for the Manoa Well II Station were performed by Cultural Surveys Hawaii, Inc. The report contained in **Appendix D** titled "Archaeological Literature Review and Field Inspection and Cultural Assessment Report for the Board of Water Supply, Manoa Wells II Exploratory Well Project, Manoa Ahupuaa, Honolulu, District, Oahu" indicates that there is no evidence of archaeological historic properties within the project area. The closest Land Commission Awards (LCS) to the project area is located around Waihi Stream, more than 600 feet to the east and southeast of the project site. The lack of LCAs in the project area and in the general upper Manoa Valley suggests that the project area was not a focus of traditional Hawaiian habitation or agriculture. The likelihood of encountering either burials or other historic properties within the project area during construction remains low. Consequently, the Manoa Well II Station project is not expected to have an adverse impact on cultural sites. In an unlikely event that subsurface historic resources should be encountered during construction, construction work will cease and the SHPD will be contacted.

3.12 UTILITIES

Both above ground and buried existing utilities installation should not be adversely affected by the proposed work. The only utility work to occur will be connecting the new well to the existing water supply system with new piping. The existing well will remain in place during the proposed project.

Coordination with all utilities (electrical, water, sewer, telephone, cable TV and gas) will be performed during the engineering design phase. Construction plans will be submitted to the City and utility companies for review.

During the construction phase, the Contractor will be required to verify utility locations, protect utilities during construction and coordinate any temporary displacement required for convenience during construction so as to ensure no interruption of utility services. In addition, fire apparatus access will be maintained throughout the construction site for the duration of the project. The Contractor will also be required to notify the Fire Communication Center (phone 523-4411) should there be any interruptions in the existing fire hydrant system during construction.

3.13 NOISE

Ambient noise levels during construction are regulated by the State Department of Health, HAR, Title 11, Chapter 46, Community Noise Control. The standards provide limits for the maximum allowable day and night noise levels in the preservation and residential zoning districts. In residential areas, the allowable noise level is 55 dBA at the property line during the day (7:00 a.m. to 10:00 p.m.) and 45 dBA at night (10:00 p.m. to 7:00 a.m.).

Additional noise will be created during construction and operation of the new well and pump. During construction the operation of construction equipment such as trucks and a drill rig will raise ambient noise levels in the vicinity of the project. Noise from the equipment has been measured at levels ranging from 70 to 90 dBA (at 50 feet). Noise impacts may have direct and indirect effects on the residential units adjacent to the Manoa Well II Station. Construction equipment and on-site vehicles or devices requiring exhaust of gas or air will be equipped with mufflers. Noise during operation of the new pump can be mitigated through use of a submersible pump or construction of a mute structure over an above-ground pump.

Since noise levels will exceed the allowable levels for more than 10 percent of the time within any twenty-minute period, a Community Noise Permit from DOH will be required for construction activities. Permit conditions which the Contractor must comply with include the following:

1. No permit shall allow any construction activities creating excessive noise when measured at or beyond the property line of the construction site for the hours before 7:00 a.m. and after 6:00 p.m. on weekdays.

2. No permit shall allow construction activities creating excessive noise when measures at or beyond the property line of the construction site for the hours before 9:00 a.m. and after 6:00 p.m. on Saturdays.

3. No permit shall allow construction activities which exceed the allowable noise levels on Sundays and holidays.

The above conditions shall be enforced and violators penalized by the Director of DOH. Nighttime construction work will not be permitted for the project.

3.14 TRAFFIC

Construction of the new well will take place entirely within the Well Station. The transportation of construction equipment and materials to the site may temporarily impact and create traffic adjacent to the project site on a short-term basis.

Should construction equipment park on streets adjacent to the project site, the contractor shall obtain a Street Usage Permit from the Department of Transportation Services (DTS). The Contractor shall implement traffic management practices during construction to minimize disruptions and inconveniences to the residents and the public as needed.

Continuous access to and from all driveways and public streets shall be maintained. All walkways and intersections shall be maintained in passable condition for pedestrian traffic. On-street parking of construction equipment will be limited on Loulu Place and Kumu Street. Appropriate signs and barriers will be required for parked vehicles, as needed. Night-time work will not be allowed.

The contractor will be required to coordinate work with the Manoa Neighborhood Board No. 7. At least two weeks prior to commencement of construction, the contractor will notify all affected residents adjacent to the project site, State Department of Transportation, Neighborhood Board No. 7, emergency services (fire, police, and ambulance), the general public, DPP, and DTS of the following: nature of the work, construction schedule, lane and street closures or detours, suggested alternate routes, the expected length of time of inconveniences, any restrictions which may be imposed to complete the work and the contractor's phone number to be called to report traffic concerns.

3.15 VISUAL IMPACTS

The new well will be constructed underground with piping exposed a few feet aboveground for approximately 20 feet. The new well will not be readily visible to nearby residents as the well will be constructed behind the existing water tank and in an area hidden from view by dense vegetation. There should be no adverse impacts to visual views caused by the new well.

CHAPTER 4

SUMMARY OF POTENTIAL IMPACTS AND PROPOSED MITIGATION MEASURES

4.1 SHORT TERM IMPACTS

The drilling and testing of the exploratory well in Phase 1 are scheduled to begin in 2021, take less than a year to complete, and should be finished in 2021. Phase 2 will commence should the testing in the exploratory phase show that the construction of a water supply well is feasible. As such, no schedule has been established for Phase 2. The following sections describe the short-term potential impacts anticipated during construction in Phases 1 and 2.

4.1.1 Land Use

The project will have minimal effect on existing and proposed land use since all construction will be confined within the BWS Manoa Well II Station property. There is no acquisition of land required to construct the new well and the project is consistent with State and County zoning for the property.

4.1.2 Air and Water Pollution

During construction, fugitive dust and exhaust emissions from construction equipment may degrade the air quality in the vicinity of the project. The contractor will be required to implement mitigative measures to limit the potential effects from dust generation within the project and surrounding areas. Construction shall be in conformance with HAR Title 11 DOH Chapter 60.1 Air Pollution Control. The contractor will also be required to maintain their construction equipment and vehicles in proper working condition to minimize pollutants from exhaust emissions.

Erosion control and best management practices will be implemented during construction to prevent soils, drilling muds and silts generated by construction activities from discharging beyond the project site into storm water runoff. These mitigative measures are intended to protect the water quality of nearby surface water and will be incorporated into the contract documents and environmental permits as required. All discharges related to project construction and operation activities shall comply with the State's Water Quality Standards as set forth in HAR Chapters 11-54. Implementation of these measures will mitigate the impact of the project on surface runoff.

4.1.3 Flora, Fauna and Significant Habitats

The new well at the Manoa Well II Station is located in a residential community and will have no effect on flora, fauna and significant habitats since no endangered or threatened plant or animal species are known to exist at the project site. Any

existing plants, grassed areas and surface improvements damaged by construction will be restored by the contractor to original or better condition.

4.1.4 Archaeological, Historical or Cultural Sites

Significant archaeological, historical or cultural sites including human burials are not known to exist at the project site. The likelihood of encountering either burials or other historic properties is low. The Manoa Well II Station project will have no adverse impact on significant archaeological, historical or cultural sites. However, should cultural remains be found, the construction work will cease and the SHPD will be contacted at 692-8015.

4.1.5 Utilities

Utility services for water, gas, sewer, electric, telephone, and cable TV should not be disrupted during construction activities. A short shutdown within the Manoa Well Station will occur during connection of the new well to the existing water supply system. However, water service to Manoa will not be interrupted during this period as water can also be supplied to the community from the existing well. The contractor will maintain the services of all existing utilities during construction.

4.1.6 Noise

Periodic noise from construction equipment such as the drill rig and trucks will impact residents near the project vicinity. Noise impacts will be mitigated during construction by requiring the contractor to consult with the Neighborhood Board No. 7 to develop a construction schedule that will minimize noise impacts. The Contractor shall use techniques and methods of sound attenuation and abatement such as noise reducing mufflers to reduce noise impacts. The contractor will obtain a Community Noise Control permit from the DOH and will observe and comply with HAR Title 11, DOH Chapter 46 regarding noise control to protect the public from the effects of noise from construction activities. Restrictions on noise levels and operational hours of the noisiest equipment will minimize the impacts to the adjacent neighborhood. Conditions of the Noise Permit shall be enforced by the DOH. Nighttime work is not anticipated for the project.

4.1.7 Traffic

There will be minimal, short term impacts to traffic during project mobilization/demobilization and transportation of materials to the site. All construction will be contained within BWS property. The project site is located at the inland end of the residential community and is not expected to adversely impact normal traffic enough to warrant mitigation.

4.2 LONG TERM IMPACTS

The long-term impacts of the project are positive. The following sections describe the long-term potential impacts anticipated from the construction of the new well at the Manoa Well II Station.

4.2.1 Socio-Economic

The construction costs associated with the new well will provide a positive economic impact on the construction industry. In addition, the hiring of additional full-time operators by the Honolulu Board of Water Supply for operation of new well will not be required. Maintenance and monitoring of the Manoa Well II Station is currently conducted on an as needed basis by BWS staff.

Construction of the new well is not anticipated to decrease or increase population. As a backup well, the project will not increase the total pumpage from the aquifer or the amount of water available in the water system. The project will, however, increase the reliability of this BWS Metro System by providing consistent water service when Manoa Well #1 is out of service. This will eliminate down times at the Manoa Well II Station and relieve the demand on other wells within the Metro System.

4.2.2 Water Resources and Hydrology Impacts

The groundwater conditions and water quality in the Nuuanu Aquifer are expected to remain the same with the new well. The new well will be constructed to tap the same basal aquifer as the existing well and will be located about 100 to 150 feet from the existing well. In addition, the yield of the well station well will remain the same as only one well will be pumped at a time so its overall influence on the aquifer should not change. Groundwater conditions and water quality in the aquifer should be maintained.

4.2.3 Visual Impacts

The drill rig, equipment and construction vehicles may be observed by residents passing the site during construction. However, this duration is expected to be limited to construction and the location should only affect the inland margin of the residential community. Once construction is complete a concrete pad on ground surface constructed to protect the well from surface contamination and less than 20 feet of aboveground piping will be the only visual evidence of the well.

CHAPTER 5
ALTERNATIVES TO PROPOSED ACTION

5.1 PROPOSED ACTION

The proposed action is to construct a new back up well at the BWS Manoa Well II Station. The existing well (State Well No. 3-1948-001) was constructed in 1983 and requires periodic maintenance. Production ceases for extended periods of time when the well needs to be taken out of service for repairs and maintenance and the single source of potable groundwater in Manoa is lost. Although the BWS has other water supply sources in Honolulu, during periods when the existing well is out of service, unnecessary stress to the aquifer at the other well locations can result. A back up well is needed to provide uninterrupted water service and increase reliability of the overall water system.

5.2 ALTERNATIVES TO THE PROPOSED ACTION

5.2.1 No Action

The “no action” alternative would result in no construction of a backup well at the Manoa Well II Station. If the existing well continues to require prolonged maintenance, Manoa Well II Station will be unable to supply potable water to Manoa. This BWS Metro System will be forced to rely on other sources within the system to supply the potable water to Manoa. Long term dependency on other sources to pump beyond their normal use may have adverse impacts on the aquifer and water quality.

The BWS is mandated by law under the Revised Ordinances of Honolulu (ROH), Chapter 30, Water Management, Article 2, Oahu Water Management Plan, 1990, amended 2010, to meet the public water needs for the City and County of Honolulu. The objective of the project is to sustain the performance and reliability of this Metro Water System serving Honolulu, which also satisfies ROH, Chapter 30, Article 2. The “no action” alternative would deter the BWS from fulfilling their commitment of providing a reliable water supply system in Honolulu.

5.2.2 Delayed Action

The “delayed action” would construct the backup well at a later date. The delay of the project would only postpone and not avoid the environmental impacts and the need for project expenditures. In the meantime, Manoa Well II Station will be without a source for potable water when the existing well requires maintenance or repair with the cost for well development escalating over time due to inflation. Considering the need for a consistent source of potable water for Manoa, the “delayed action” is not a viable option for the BWS in order to provide a reliable water supply system in Manoa.

5.2.3 Alternative Sites

The new well at Manoa Well II Station will be drilled approximately 100 to 150 feet from the existing well in the BWS property. No land acquisition, zoning permits, and additional hydrologic studies will be required to construct the new well. Constructing a new well elsewhere in Manoa may involve land purchases, zoning permits, environmental studies, site development, and uncertain groundwater/geologic conditions and water quality. The “alternative sites” option was rejected from further consideration because of the potential costs of land purchases, possibility of acquiring zoning permits, cost associated with developing a new site, testing of a new site with uncertain groundwater/geologic conditions and water quality, and the additional project time needed to perform environmental studies, acquire permits, test the well, and develop the site.

CHAPTER 6
DETERMINATION, FINDINGS AND JUSTIFICATION

6.1 DETERMINATION

This Final Environmental Assessment is part of the environmental review process to meet the requirements of Chapter 343, HRS. After completing an assessment of the potential environmental effects of the proposed project and consulting with governmental agencies and interested parties, the proposing agency does not anticipate any significant impacts on the environment. A **Finding of No Significant Impact** has been determined for the project with the reasons supporting this determination discussed below.

6.2 FINDINGS AND JUSTIFICATION

The following sections address the analysis of the proposed action on the significance criteria as required by State of Hawaii Office of Environmental Quality Control:

6.2.1 The proposed action will not involve an irrevocable commitment to loss or destruction of any natural or cultural resource including native Hawaiian cultural resources, beliefs or practices. The project site is located within the BWS Manoa Well II Station in the urban residential community of Manoa. The BWS property has been substantially altered from its natural condition throughout the years by improvements and renovations. According to the Archaeological Literature Review and Field Inspection and Cultural Assessment Report, no significant historic or cultural resources have been identified within the BWS well station lot. However, should archaeologically significant features be uncovered, construction will be halted and immediate archaeological consultation will be sought with SHPD in accordance with applicable regulations.

6.2.2 The proposed action does not curtail the range of beneficial uses of the environment. The proposed project is consistent with the City's General Plan, Development Plan, and Zoning Maps, and will follow the Board of Water Supply's design standards. The well project will not curtail beneficial uses of the environment in the area. The proposed well, piping and paved driveway will be compatible with the uses of the surrounding area.

6.2.3 The proposed action does not conflict with the State's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions or executive orders. The proposed project is consistent with the existing use of the property and all applicable State policies, goals, and guidelines. No long-term environmental conflicts are foreseen.

6.2.4 The proposed action will not substantially affect the economic or social welfare of the community or State. The economy will be affected by short-term construction related activities with the infusion of cash during construction. Upon completion of the project, the economic situation should return to the pre-existing condition.

6.2.5 The proposed action will not substantially affect public health. Construction of the additional well and connection to the existing water supply system will upgrade and provide a safe and reliable water source for the Metro Water System in Manoa that will balance the use of water resources and improve water quality in the Metro System. The proposed action will improve water system performance and reliability in meeting present and future domestic and fire protection needs of the community and will improve public health. The short-term negative impacts associated with construction activities such as noise, dust, and exhaust emissions will be mitigated by measures included in the project plans and specifications.

6.2.6 The proposed action complies with the objectives and policies of the Hawaii State Plan. The Hawaii State Plan serves as a guide for the long-term development of the State by providing goals, objectives, and priorities for growth, development and allocation of resources as promulgated by HRS Chapter 226. The State Plan is divided in three main parts: overall theme, goals, objectives, and policies, 2) planning coordination and implementation, and 3) priority guidelines. The sections of the State Plan relevant to this project include:

- Section 226-13 Objectives and policies for the physical environment, subpart (b)(2) – promoting the proper management of Hawaii land and water resources, and

- Section 226-16 – Objective and policies for facility systems – water, subparts (a), (b)(1), (b)(4), and (b)(6) dealing with provisions to accommodate and improve the long-term needs for adequate supply and quality of domestic and agricultural water.

The proposed action will allow the BWS to properly manage the groundwater resources in the Nuuanu Aquifer by providing a backup for the only potable groundwater supply source for the Metro 405 Water System in Manoa. The addition of the well is consistent with the State Plan's objectives and policies as it will provide the community with a dependable source of good quality potable water for many years and it will help to balance and preserve the use of groundwater resources in the Nuuanu Aquifer. The water quality of the aquifer at the well site will be tested during the exploratory phase of the project for compliance with the Safe Drinking Water Act.

The coastal zone management (CZM) area includes all lands extending seaward from the shoreline to the limit of the State's police power and management authority. All lands within the CZM area must comply with Hawaii Coastal Zone Law, HRS Chapter 205A. The objectives and policies of Chapter 205A apply to the following resources and activities: recreational resources, historic resources, scenic and open space resources, coastal ecosystems, economic uses, coastal hazards, managing development, public participation, beach protection and marine resources. The proposed well project is consistent with the Hawaii Coastal Zone Management Program objectives and policies as administered under Revised Ordinances of Honolulu, Chapter 25, Special Management Area and will not have any significant impacts or conflicts with the resources and activities associated with the CZM program.

6.2.7 The proposed action does not involve substantial secondary impacts such as population changes or effects on public facilities. The additional well will sustain the present population of the area in conformance with the existing development plans of the City and County of Honolulu. Population, traffic, and public facilities should remain stable with the replacement well.

6.2.8 The proposed action does not involve a substantial degradation of environmental quality. The topography in a small localized area at the well station will be negatively impacted on the short-term by drilling and plumbing activities. However, no construction will be performed outside of the BWS property. The drill rig, equipment and construction vehicles may be observed by residents passing the site during construction. However, this duration is expected to be less than a year for each of Phase 1 exploratory well and Phase 2 production well. In addition, the location should only affect the inland margin of the residential community. Once construction is complete a concrete pad on ground surface to protect the well from surface contamination, piping and an internal paved driveway will be the only visual evidence of the well. Temporary impacts will be mitigated by restoration measures included in the project plans and specifications.

6.2.9 The proposed action is individually limited and cumulatively does not have a considerable effect upon the environment or involve a commitment for larger actions. The proposed action, either individually or cumulatively, will have very little effect on the existing street and adjacent lots or will not involve any commitment for larger actions.

6.2.10 The proposed action does not substantially affect rare, threatened or endangered species, or its habitats. There are no known rare, threatened, or endangered species or habitat associated with the project site based on the biological surveys conducted at the project site. The Hawaiian hoary bat (Lasiurus cinereus semotus) may transit through the vicinity of the project area.

6.2.11 The proposed action does not detrimentally affect the air or water quality or ambient noise levels. Drilling of a well will be required for the project. It is anticipated that a drill rig and trucks will be used to drill the well and connect

the well to the existing water supply system. Emissions from the equipment will slightly degrade air quality for the short period of time they are in operation. However, all applicable emission and ambient air quality standards will continue to be met. Consequently, no adverse health effects from this source are anticipated. Depending upon meteorological conditions during the construction period, it is possible that odor from the exhaust may be noticeable in nearby homes.

Normal operation of the water supply well will not increase the production of air emissions from the project site, will not alter airflow in the vicinity, and will have no effect on the area's micro-climate. The electrical power consumed in the operation of the pump will remain the same (and therefore, fuel consumption and gaseous emissions) by the Hawaiian Electric Company. Thus, short term impacts on air and water quality, as well as noise may occur during the construction period, but will be mitigated by normal construction practices and will be regulated by City and State rules, regulations and permit requirements and by project plans, specifications and City inspectors.

6.2.12 The proposed action does not affect nor is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters. The project site is in Zone X (areas determined to be outside the 0.2% annual chance floodplain) on the Flood Insurance Rate Map (FIRM) panel 360 dated April 2017 and is compliant with applicable regulations and guidance relating to flood plain management. Adverse flooding at the project site is not expected because of its flood hazard rating and its location at the upslope, back end of the residential subdivision. The project is not located in a tsunami zone, beach, erosion-prone area, geologically hazardous land or estuary. It is also not expected to have any significant adverse impacts on fresh or coastal waters.

6.2.13 The proposed action does not affect scenic vistas and viewplanes identified in City or State plans or studies. The additional well will be installed below the ground surface at the BWS Manoa Well II Station and will be hidden from public view. Piping connecting the new well to the existing water system will protrude a few feet above ground surface for approximately 20 feet.

6.12.14 The proposed action will not require substantial energy consumption. Energy will be consumed to construct the additional well since energy consuming construction equipment such as a drill rig and trucks, etc., will be used for the project. Substantial energy will not be consumed.

When the project is constructed, energy consumption will be the same as presently consumed.

CHAPTER 7
APPROVALS, PERMITS, ETC.

The following approvals, permits, and agreements will be required prior to the construction of the exploratory well in Phase 1 and the production well in Phase 2.

7.1 FEDERAL GOVERNMENT

The construction work will not involve discharge of dredged or fill material below the ordinary high-water mark of any stream. Thus, a Department of the Army (DA) Permit and authorization under the DA Corps of Engineers General or Nationwide Permit is not anticipated for the project.

7.2 STATE OF HAWAII

A Community Noise Control Permit will be required from the DOH Indoor and Radiological Health Branch for construction activities of the project. Other State permits required include:

National Pollutant Discharge Elimination System (NPDES) General Permit, Form I - Treated Process Wastewater Associated with Well Drilling Activities and General Permit Form F - Discharges of Treated Hydrotesting Effluent from the DOH Clean Water Branch,

Well Construction Permit and Pump Installation Permit from the Department of Land and Natural Resources, Commission on Water Resources Management,

Conservation District Use Permit based on the land use designation of the project site that will require action by the Board of Land and Natural Resources, and

Potable Water Source Approval and Well Connection Authorization from DOH Safe Drinking Water Branch.

7.3 CITY AND COUNTY OF HONOLULU

Construction Plans review and approval will be required from the BWS for the new well and well connection. The Public Infrastructure Map Amendment from DPP will also be needed to show the additional well on the Infrastructure Map. Construction plans for all work within or affecting City public streets shall be submitted to the Department of Planning and Permitting, Traffic Review Branch for review and approval. Traffic control plans during construction should also be submitted for review and approval, as required.

A Street Usage Permit will be required from DTS if temporary parking of construction vehicles in City streets is needed.

CHAPTER 8
REFERENCES

AECOS, Inc., Biological Survey for BWS Manoa Well II on TMK: 2-9-054:033, Honolulu, Hawaii, AECOS No. 1549, August 8, 2018.

City and County of Honolulu, General Plan, Honolulu, Hawaii.

City and County of Honolulu Board of Water Supply, Geographic Information System Maps, Honolulu, Hawaii, 2015.

City and County of Honolulu Board of Water Supply, Schematic Diagram of the Metro 405 Water Supply System in Manoa, Honolulu, Hawaii, 2018.

City and County of Honolulu Department of Planning and Permitting, Zoning Maps, Honolulu, Hawaii.

Cultural Surveys Hawaii, Inc., Draft Archaeological Literature Renew and Field Investigation and Cultural Assessment Report for the Board of Water Supply Manoa Wells II Exploratory Well Project, July 2021.

Federal Emergency Management Agency, Flood Insurance Rate Maps City and County of Honolulu, Hawaii; Washington, D.C., 2017.

Federal Emergency Management Agency, Flood Insurance Rate Maps City and County of Honolulu, Hawaii, as amended by Department of Planning and Permitting, Honolulu, Hawaii, 2017.

Giambelluca, T.W., Q. Chen, A.G. Fraizer, J.P. Price, Y.-L. Chen, P.-S. Chu, J.K. Eischeid, and D.M Delparte, 2013: Online Rainfall Atlas of Hawaii. Bull. Amer. Meteror. Soc, 94, 313-316, doi: 10.1175/BAMS-D-11-00228.1.

Giambelluca, T.W., X. Shuai, M.L. Barnes, R.J. Alliss, R.J. Longman, T. Miura, Q. Chen, A.G. Frazier, R.G. Mudd, L. Cuo, and A.D. Businger. 2014. Evapotranspiration of Hawai ‘i. Final report submitted to the U.S. Army Corps of Engineers—Honolulu District, and the Commission on Water Resource Management, State of Hawai ‘i.

State of Hawaii Land Use Commission, Land Use District Maps, Honolulu, Hawaii, 2005.

United States Department of Agriculture Soil Conservation Service, Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii; Washington, D.C., 1972.

APPENDIX A

PRE-ASSESSMENT CONSULTATION

SHIMABUKURO, ENDO & YOSHIZAKI, INC.
Civil, Environmental & Structural Engineers
1126 12th Avenue, Room 309
Honolulu, Hawaii 96816-3715
Ph.: (808) 737-1875 FAX: (808) 734-5516
E-mail: seyeng@seyeng.com

MEMORANDUM

Date: August 20, 2018

To: Project File

From: Howard K. Endo

Subject Manoa Well II EA

1. Pre-assessment letters were sent to agencies, organizations, utilities; and fourteen (14) neighboring or nearby property owners and recorded lessees were consulted notifying them of the proposed project and requesting pre-assessment comments regarding possible impacts due to the project. A list of parties consulted is included in Section 1.3 of the Draft EA.

2. Twenty-four (24) agencies, organizations, and utilities were consulted. Comments were received from eleven (11) parties and no resident comment was received.

3. Generally, the comments included impacts of noise, dust, street closures, traffic detours, parking, environmental permits, and request for prior public notification of construction and detour schedules.

4. All comments received to the pre-assessment letters have been reviewed, evaluated and incorporated into the Draft EA as appropriate.

5. Copies of comment letters and responses are included in Appendix A of the Draft EA.

SHIMABUKURO, ENDO & YOSHIZAKI, INC.
Civil, Environmental & Structural Engineers
1126 12th Avenue, Room 309
Honolulu, Hawaii 96816-3715
Ph.: (808) 737-1875 FAX: (808) 734-5516
E-mail: seyeng@seyeng.com

May 14, 2018

Mr. Ross S. Sasamura, P.E., Director
Department of Facility Maintenance
City & County of Honolulu
1000 Uluohia Street, Room 215
Kapolei, Hawaii 96707

Subject: Your Response of May 1, 2018 Regarding the Pre-Assessment Consultation Notice for the Proposed Honolulu Board of Water Supply Manoa Well II Exploratory Well Environmental Assessment Project

Dear Mr. Sasamura,

Thank you for your response regarding the Pre-Assessment Consultation Notice for the proposed Manoa Well II Exploratory Well Environmental Assessment project.

We acknowledge the Department of Facility Maintenance comments concerning the repair of any damage/deficiencies to Loulu Street right-of-way.

If you have any questions, please call me at 737-1875.

Very truly yours,

Howard K. Endo

Howard K. Endo, Ph.D., P.E.
President

cc: Michael Cubas, BWS

DEPARTMENT OF FACILITY MAINTENANCE

CITY AND COUNTY OF HONOLULU

1000 Ulu`ohia Street, Suite 215, Kapolei, Hawaii 96707
Phone: (808) 768-3343 • Fax: (808) 768-3381
Website: www.honolulu.gov

KIRK CALDWELL
MAYOR

ROSS S. SASAMURA, P.E.
DIRECTOR AND CHIEF ENGINEER

EDUARDO P. MANGLALLAN
DEPUTY DIRECTOR

IN REPLY REFER TO:
DRM 18-237

May 1, 2018

Mr. Howard K. Endo, Ph. D., P.E.
Shimabukuro, Endo & Yoshizaki, Inc.
1126 12th Avenue, Room 309
Honolulu, Hawaii 96816-3715

Dear Mr. Endo:

Subject: Pre-Assessment Environmental Assessment for the Proposed Manoa Well II Exploratory Well, Tax Map Key: 2-9-054:033

Thank you for the opportunity to review and comment on the subject project.

We have no objections at this time, as we do not have any facilities or easements on the subject property. However, during construction and upon completion of project; any damages/deficiencies to Loulu Street right-of-way shall be corrected to City Standards and accepted by the City at contractor's expense.

If you have any questions, please call Mr. Kyle Oyasato of the Division of Road Maintenance at 768-3697.

Sincerely,

for Ross S. Sasamura, P. E.
Director and Chief Engineer

SHIMABUKURO, ENDO & YOSHIZAKI, INC.
Civil, Environmental & Structural Engineers
1126 12th Avenue, Room 309
Honolulu, Hawaii 96816-3715
Ph.: (808) 737-1875 FAX: (808) 734-5516
E-mail: seyeng@seyeng.com

May 14, 2018

Ms. Suzanne D. Case, Chairperson
Department of Land and Natural Resources
1151 Punchbowl Street
Honolulu, Hawaii 96813

Attention: Lydia Morikawa

Subject: Your Response of May 8, 201 Regarding the Pre-Assessment Consultation Notice for the Proposed Honolulu Board of Water Supply Manoa Well II Exploratory Well Environmental Assessment Project

Dear Ms. Case,

Thank you for your response regarding the Pre-Assessment Consultation Notice for the proposed Manoa Well II Exploratory Well Environmental Assessment project.

We acknowledge that the Land Division - Oahu District does not have any comments at this time. The comments from the Engineering Division and the Commission on Resource Management regarding the rules and regulations of the National Flood Insurance Program and required permits will be addressed in the Environmental Assessment.

If you have any questions, please call me at 737-1875.

Very truly yours,

Howard K. Endo, Ph.D., P.E.
President

cc: Michael Cubas, BWS

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

May 8, 2018

Shimabukuro, Endo & Yoshizaki, Inc.
Attention: Mr. Howard Endo, President
1126 12th Avenue, Room 309
Honolulu, Hawaii 96816

via email: seyeng@seyeng.com

Dear Mr. Endo:

SUBJECT: Environmental Assessment (EA) for the **Manoa Well II Station Exploratory Well Project**

Thank you for the opportunity to review and comment on the subject matter. The Department of Land and Natural Resources' (DLNR) Land Division distributed or made available a copy of your report pertaining to the subject matter to DLNR Divisions for their review and comments.

At this time, enclosed are comments from the (a) Engineering Division, (b) Land Division – Oahu District and (c) Commission on Water Resource Management on the subject matter. Should you have any questions, please feel free to call Lydia Morikawa at 587-0410. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosure(s)
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

18 APR 24 AM 11:07 ENGINEERING

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

April 23, 2018

RECEIVED
LAND DIVISION
2018 MAY -3 AM 11:04
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

MEMORANDUM

TO: **DLNR Agencies:**
___Div. of Aquatic Resources
___Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
___Div. of State Parks
X Commission on Water Resource Management
___Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

FROM

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Environmental Assessment (EA) for the **Manoa Well II Station Exploratory Well Project**
LOCATION: Manoa, Island of Oahu; TMK: (1) 2-9-054-033
APPLICANT: City and County of Honolulu, Board of Water Supply

TO

Transmitted for your review and comment is information on the above-referenced project. We would appreciate your comments by **May 4, 2018**.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Lydia Morikawa at 587-0410. Thank you.

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed: _____

Print Name: ~~Carty S. Chang, Chief Engineer~~
Date: 5/2/18

Attachments
cc: Central Files

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/Russell Y. Tsuji
Ref: Environmental Assessment (EA) for the Manoa Well II Station Exploratory Well Project, Manoa, Island of Oahu; TMK: (1) 2-9-054-033

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 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), which can be viewed on our Flood Hazard Assessment Tool (FHAT) (http://gis.hawaiinfip.org/FHAT).

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) 270-7253.
- Kauai: County of Kauai, Department of Public Works (808) 241-4846.

Signed: _____
CARTY S. CHANG, CHIEF ENGINEER

Date: 5/2/10

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

RECEIVED
LAND DIVISION
2018 APR 25 AM 11:04
DEPT. OF LAND &
NATURAL RESOURCES
STATE OF HAWAII

April 23, 2018

MEMORANDUM

TO: **DLNR Agencies:**
___Div. of Aquatic Resources
___Div. of Boating & Ocean Recreation
_X_Engineering Division
_X_Div. of Forestry & Wildlife
___Div. of State Parks
_X_Commission on Water Resource Management
___Office of Conservation & Coastal Lands
_X_Land Division – Oahu District
_X_Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Environmental Assessment (EA) for the **Manoa Well II Station Exploratory Well Project**
LOCATION: Manoa, Island of Oahu; TMK: (1) 2-9-054-033
APPLICANT: City and County of Honolulu, Board of Water Supply

Transmitted for your review and comment is information on the above-referenced project. We would appreciate your comments by **May 4, 2018**.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Lydia Morikawa at 587-0410. Thank you.

( ) We have no objections.
(x) We have no comments.
( ) Comments are attached.

Signed: Darlene Bryant-Takamatsu

Print Name: Darlene Bryant-Takamatsu
Date: 4/25/18

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

RECEIVED
LAND DIVISION
2018 MAY -7 PM 4:10
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

April 23, 2018

RECEIVED
COMMISSION ON WATER RESOURCE MANAGEMENT
2018 APR 24 PM 2:53

MEMORANDUM

TO: **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
__Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

FR:

TO:

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Environmental Assessment (EA) for the **Manoa Well II Station Exploratory Well Project**
LOCATION: Manoa, Island of Oahu; TMK: (1) 2-9-054-033
APPLICANT: City and County of Honolulu, Board of Water Supply

Transmitted for your review and comment is information on the above-referenced project. We would appreciate your comments by **May 4, 2018**.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Lydia Morikawa at 587-0410. Thank you.

( ) We have no objections.
( ) We have no comments.
(x) Comments are attached.

Signed: /s/ Jeffrey T. Pearson, P.E.

Print Name: Deputy Director
Date: May 3, 2018

Attachments
cc: Central Files

FILE ID: RFD. 4838.3
DOC ID: 200411

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON

WILLIAM D. BALFOUR, JR.
KAMANA BEAMER, PH.D.
MICHAEL G. BUCK
NEIL J. HANNAHS
PAUL J. MEYER
VIRGINIA PRESSLER, M.D.

JEFFREY T. PEARSON, P.E.
DEPUTY DIRECTOR

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

May 3, 2018

REF: RFD.4838.3

TO: Mr. Russell Tsuji, Administrator
Land Division

FROM: Jeffrey T. Pearson, P.E., Deputy Director
Commission on Water Resource Management

SUBJECT: Environmental Assessment (EA) for the Manoa Well II Station Exploratory Well Project

FILE NO.: RFD.4838.3
TMK NO.: (1) 2-9-054:033

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/cwrm.

Our comments related to water resources are checked off below.

☐ 1. We recommend coordination with the county to incorporate this project into the county's Water Use and Development Plan. Please contact the respective Planning Department and/or Department of Water Supply for further information.

☐ 2. We recommend coordination with the Engineering Division of the State Department of Land and Natural Resources to incorporate this project into the State Water Projects Plan.

☐ 3. We recommend coordination with the Hawaii Department of Agriculture (HDOA) to incorporate the reclassification of agricultural zoned land and the redistribution of agricultural resources into the State's Agricultural Water Use and Development Plan (AWUDP). Please contact the HDOA for more information.

☐ 4. We recommend that water efficient fixtures be installed and water efficient practices implemented throughout the development to reduce the increased demand on the area's freshwater resources. Reducing the water usage of a home or building may earn credit towards Leadership in Energy and Environmental Design (LEED) certification. More information on LEED certification is available at http://www.usgbc.org/leed. A listing of fixtures certified by the EAP 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.

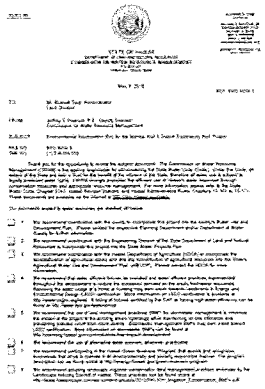
☐ 7. We recommend participating in the Hawaii Green Business Program, that assists and recognizes businesses that strive to operate in an environmentally and socially responsible manner. The program description can be found online at http://energy.hawaii.gov/green-business-program.

☐ 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.
- [X] 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.
- [X] 11. A Well Construction Permit(s) is (are) are required before the commencement of any well construction work.
- [X] 12. A Pump Installation Permit(s) is (are) required before ground water is developed as a source of supply for the project.
- [ ] 13. 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.
- [ ] 14. Ground-water withdrawals from this project may affect streamflows, which may require an instream flow standard amendment.
- [ ] 15. A Stream Channel Alteration Permit(s) is (are) required before any alteration can be made to the bed and/or banks of a steam channel.
- [ ] 16. A Stream Diversion Works Permit(s) is (are) required before any stream diversion works is constructed or altered.
- [ ] 17. A Petition to Amend the Interim Instream Flow Standard is required for any new or expanded diversion(s) of surface water.
- [ ] 18. 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:

If you have any questions, please contact W. Roy Hardy of the Commission staff at 587-0225.



Doc Review (2): RFD.4838.3 Manoa Well / RFD.4840.6 West Maui Wells

Adobe Sign Document History 05/03/2018

Created:	05/03/2018
By:	Kathy Yoda (kathy.s.yoda@hawaii.gov)
Status:	Signed
Transaction ID:	CBJCHBCAABAAyx2Cuot-HM3rJ6lKx3C-7pLwoSMcJsnn

"Doc Review (2): RFD.4838.3 Manoa Well / RFD.4840.6 West Maui Wells" History

Document created by Kathy Yoda (kathy.s.yoda@hawaii.gov)
05/03/2018 - 9:21:34 AM HST- IP address: 132.160.239.30

Document emailed to Jeffrey Pearson (jeff.pearson@hawaii.gov) for signature
05/03/2018 - 9:23:42 AM HST

Document viewed by Jeffrey Pearson (jeff.pearson@hawaii.gov)
05/03/2018 - 2:59:47 PM HST- IP address: 132.160.239.30

Document e-signed by Jeffrey Pearson (jeff.pearson@hawaii.gov)
Signature Date: 05/03/2018 - 3:00:13 PM HST - Time Source: server- IP address: 132.160.239.30

Signed document emailed to all eligible parties.
05/03/2018 - 3:00:13 PM HST

ETS
STATE OF HAWAI'I

SHIMABUKURO, ENDO & YOSHIZAKI, INC.
Civil, Environmental & Structural Engineers
1126 12th Avenue, Room 309
Honolulu, Hawaii 96816-3715
Ph.: (808) 737-1875 FAX: (808) 734-5516
E-mail: seyeng@seyeng.com

May 14, 2018

Ms. Virginia Pressler, M.D., Director
Department of Health
Environmental Planning Office
P.O. Box 3378
Honolulu, Hawaii 96801-3378

Subject: Your Response of April 24, 2018 Regarding the Pre-Assessment Consultation Notice for the Proposed Honolulu Board of Water Supply Manoa Well II Exploratory Well Environmental Assessment Project

Dear Dr. Pressler,

Thank you for your response regarding the Pre-Assessment Consultation Notice for the proposed Manoa Well II Exploratory Well Environmental Assessment project.

We acknowledge the comments of the Department of Health (DOH) and will review the referenced DOH websites for information and guidance.

If you have any questions, please call me at 737-1875.

Very truly yours,

Howard K Endo

Howard K. Endo, Ph.D., P.E.
President

cc: Michael Cubas, BWS

DAVID Y. IGE
GOVERNOR OF HAWAII

VIRGINIA PRESSLER, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
File:

EPO 18-117

April 24, 2018

Howard K. Endo, Ph.D., P.E.
President
Shimabukuro, Endo & Yoshizaki, Inc.
1126 12th Avenue, Room 309
Honolulu, Hawaii 96816-3715
Email: seyeng@seyeng.com

Dear Dr. Endo:

SUBJECT: Pre-Assessment Consultation (PAC) for Manoa Exploratory Well II Station, Oahu
TMK: 2-9-054:033

The Department of Health (DOH), Environmental Planning Office (EPO), acknowledges receipt of your PAC to our office on April 20, 2018.

We understand from the PAC that *"The Board of Water Supply proposes to add a second well to the Manoa Well II Station to improve the overall reliability and performance of its urban water system by providing a consistent source of water should a well need service or maintenance."*

Hawaii's environmental review laws require Environmental Assessments (EAs) and Environmental Impact Statements (EISs) to consider health in the discussion and the mitigation measures to reduce negative impacts. In its definition of 'impacts,' §11-200-2, Hawaii Administrative Rules (HAR) includes health effects, whether primary (direct), secondary (indirect), or cumulative. Further, §11-200-12(b)(5), HAR, lists public health as one of the criteria for determining whether an action may have a significant impact on the environment.

In the development and implementation of all projects, EPO strongly recommends regular review of State and Federal environmental health land use guidance. State standard comments to support sustainable healthy design are provided at: http://health.hawaii.gov/epo/landuse. Projects are required to adhere to all applicable standard comments.

EPO also encourages you to examine and utilize the Hawaii Environmental Health Portal at: https://eha-cloud.doh.hawaii.gov. This site provides links to our e-Permitting Portal, Environmental Health Warehouse, Groundwater Contamination Viewer, Hawaii Emergency Response Exchange, Hawaii State and Local Emission Inventory System, Water Pollution Control Viewer, Water Quality Data, Warnings, Advisories and Postings.

We suggest you review the requirements of the Clean Water Branch (Hawaii Administrative Rules {HAR}, Chapter 11-54-1.1, -3, 4-8) and/or the National Pollutant Discharge Elimination System (NPDES) permit (HAR, Chapter 11-55) at: http://health.hawaii.gov/cwb. If you have any questions, please contact the Clean Water Branch (CWB), Engineering Section at (808) 586-4309 or cleanwaterbranch@doh.hawaii.gov. If your project involves waters of the U.S., it is highly recommended that you contact the Army Corps of Engineers, Regulatory Branch at: (808) 835-4303.

Injection wells used for the subsurface disposal of wastewater, sewage effluent, or surface runoff are subject to environmental regulation and permitting (HAR, Chapter 11-23, "Underground Injection Control {UIC}"). DOH

approval must be obtained before any injection well construction commences. A UIC permit must be issued before any injection well operation occurs. For specific questions please email sdwb@doh.hawaii.gov or call (808) 586-4258.

Any waste generated by the project (that is not a hazardous waste as defined in state hazardous waste laws and regulations), needs to be disposed of at a solid waste management facility that complies with the applicable provisions (HAR, Chapter 11-58.1 "Solid Waste Management Control"). The open burning of any of these wastes, on or off site, is strictly prohibited. You may wish you review the Minimizing Construction & Demolition Waste Management Guide at: http://health.hawaii.gov/shwb/files/2016/05/constdem16.pdf Additional information is accessible at: http://health.hawaii.gov/shwb. For specific questions call (808) 586-4226.

If noise created during the construction phase of the project may exceed the maximum allowable levels (HAR, Chapter 11-46, "Community Noise Control") then a noise permit may be required and needs to be obtained before the commencement of work. Relevant information is online at: http://health.hawaii.gov/irhb/noise EPO recommends you contact the Indoor and Radiological Health Branch (IRHB) at (808) 586-4700 with any specific questions.

To better protect public health and the environment, the U.S. Environmental Protection Agency (EPA) has developed an environmental justice (EJ) mapping and screening tool called EJSCREEN. It is based on nationally consistent data and combines environmental and demographic indicators in maps and reports. EPO encourages you to explore, launch and utilize this powerful tool in planning your project. The EPA EJSCREEN tool is available at: http://www.epa.gov/ejscreen.

We hope this information is helpful. If you have any questions please contact us at DOH.epo@doh.hawaii.gov or call us at (808) 586-4337. Thank you for the opportunity to comment.

Mahalo nui loa,

Laura Leialoha Phillips McIntyre, AICP
Environmental Planning Office

LM:nn

c: SDWB {via email only}

Attachment: U.S. EPA EJSCREEN Report for Project Area

Attachment: U.S. EPA EJSCREEN Report for Project Area

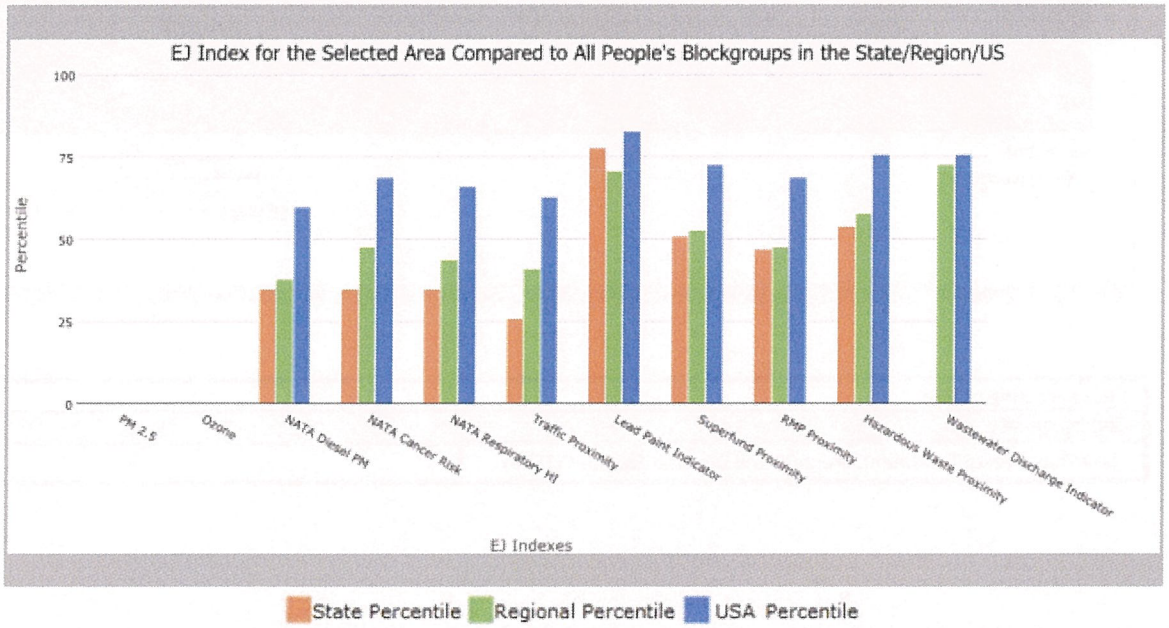
EJSCREEN Report (Version 2017)

1 mile Ring Centered at 21.329688,-157.802459, HAWAII, EPA Region 9

Approximate Population: 5,182

Input Area (sq. miles): 3.14

Selected Variables	State Percentile	EPA Region Percentile	USA Percentile
EJ Indexes			
EJ Index for PM2.5	N/A	N/A	N/A
EJ Index for Ozone	N/A	N/A	N/A
EJ Index for NATA* Diesel PM	35	38	60
EJ Index for NATA* Air Toxics Cancer Risk	35	48	69
EJ Index for NATA* Respiratory Hazard Index	35	44	66
EJ Index for Traffic Proximity and Volume	26	41	63
EJ Index for Lead Paint Indicator	78	71	83
EJ Index for Superfund Proximity	51	53	73
EJ Index for RMP Proximity	47	48	69
EJ Index for Hazardous Waste Proximity	54	58	76
EJ Index for Wastewater Discharge Indicator	N/A	73	76



This report shows the values for environmental and demographic indicators and EJSCREEN indexes. It shows environmental and demographic raw data (e.g., the estimated concentration of ozone in the air), and also shows what percentile each raw data value represents. These percentiles provide perspective on how the selected block group or buffer area compares to the entire state, EPA region, or nation. For example, if a given location is at the 95th percentile nationwide, this means that only 5 percent of the US population has a higher block group value than the average person in the location being analyzed. The years for which the data are available, and the methods used, vary across these indicators. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports.

EJSCREEN Report (Version 2017)

1 mile Ring Centered at 21.329688,-157.802459, HAWAII, EPA Region 9

Approximate Population: 5,182

Input Area (sq. miles): 3.14

April 24, 2018

Digitized Point

1:1,128

Sites reporting to EPA	
Superfund NPL	0
Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF)	0

EJSCREEN Report (Version 2017)

1 mile Ring Centered at 21.329688,-157.802459, HAWAII, EPA Region 9

Approximate Population: 5,182

Input Area (sq. miles): 3.14

Selected Variables	Value	State Avg.	%ile in State	EPA Region Avg.	%ile in EPA Region	USA Avg.	%ile in USA
Environmental Indicators							
Particulate Matter (PM 2.5 in µg/m³)	N/A	N/A	N/A	9.9	N/A	9.14	N/A
Ozone (ppb)	N/A	N/A	N/A	41.8	N/A	38.4	N/A
NATA* Diesel PM (µg/m³)	0.0484	0.149	29	0.978	<50th	0.938	<50th
NATA* Cancer Risk (lifetime risk per million)	29	34	35	43	<50th	40	<50th
NATA* Respiratory Hazard Index	0.76	1	37	2	<50th	1.8	<50th
Traffic Proximity and Volume (daily traffic count/distance to road)	9.2	1000	17	1100	11	590	16
Lead Paint Indicator (% Pre-1960 Housing)	0.4	0.16	85	0.24	71	0.29	69
Superfund Proximity (site count/km distance)	0.05	0.1	44	0.15	36	0.13	42
RMP Proximity (facility count/km distance)	0.22	0.39	53	0.98	32	0.73	42
Hazardous Waste Proximity (facility count/km distance)	0.067	0.1	56	0.12	52	0.093	60
Wastewater Discharge Indicator (toxicity-weighted concentration/m distance)	0	0.04	N/A	13	59	30	40
Demographic Indicators							
Demographic Index	46%	51%	32	47%	50	36%	70
Minority Population	79%	77%	43	59%	69	38%	84
Low Income Population	13%	26%	25	36%	17	34%	17
Linguistically Isolated Population	2%	6%	37	9%	27	5%	55
Population With Less Than High School Education	3%	9%	20	17%	14	13%	16
Population Under 5 years of age	3%	6%	17	7%	19	6%	20
Population over 64 years of age	25%	16%	88	13%	91	14%	91

* The National-Scale Air Toxics Assessment (NATA) is EPA's ongoing, comprehensive evaluation of air toxics in the United States. EPA developed the NATA to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that NATA provides broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. More information on the NATA analysis can be found at: https://www.epa.gov/national-air-toxics-assessment.

For additional information, see: www.epa.gov/environmentaljustice

EJSCREEN is a screening tool for pre-decisional use only. It can help identify areas that may warrant additional consideration, analysis, or outreach. It does not provide a basis for decision-making, but it may help identify potential areas of EJ concern. Users should keep in mind that screening tools are subject to substantial uncertainty in their demographic and environmental data, particularly when looking at small geographic areas. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports. This screening tool does not provide data on every environmental impact and demographic factor that may be relevant to a particular location. EJSCREEN outputs should be supplemented with additional information and local knowledge before taking any action to address potential EJ concerns.

SHIMABUKURO, ENDO & YOSHIZAKI, INC.
Civil, Environmental & Structural Engineers
1126 12th Avenue, Room 309
Honolulu, Hawaii 96816-3715
Ph.: (808) 737-1875 FAX: (808) 734-5516
E-mail: seyeng@seyeng.com

June 15, 2018

Mr. Wes Frysztacki, Director
Department of Transportation Services
City & County of Honolulu
650 S. King Street
Honolulu, Hawaii 96813

Subject: Your Response of May 4, 2018 Regarding the Pre-Assessment Consultation Notice for the Proposed Honolulu Board of Water Supply Manoa Well II Exploratory Well Environmental Assessment Project

Dear Mr. Frysztacki,

Thank you for your response regarding the Pre-Assessment Consultation Notice for the proposed Manoa Well II Exploratory Well Environmental Assessment project.

We will incorporate your comments into the Environmental Assessment and Contract Documents.

If you have any questions, please call me at 737-1875.

Very truly yours,

Howard K. Endo, Ph.D., P.E.
President

cc: Michael Cubas, BWS

DEPARTMENT OF TRANSPORTATION SERVICES
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 3RD FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8305 • Fax: (808) 768-4730 • Internet: www.honolulu.gov

KIRK CALDWELL
MAYOR

WES FRYSZTACKI
DIRECTOR

JON Y. NOUCHI
DEPUTY DIRECTOR

TP4/18-726770R

May 4, 2018

Mr. Howard K. Endo, Ph.D., P.E.
President
Shimabukuro, Endo & Yoshizaki, Inc.
1126 12th Avenue, Room 309
Honolulu, Hawaii 96816-3715

Dear Mr. Endo:

SUBJECT: Pre-Consultation Draft Environmental Assessment for Manoa Well II Exploratory Well, Manoa, Oahu, Hawaii

In response to your letter dated April 18, 2018, we have the following comments:

1. This project is in an existing public transit service area. To ensure that the project development does not affect public transit services (bus operations, bus routes, bus stops and para-transit operations) submit project plans to the Department of Transportation Services (DTS) – Public Transit Division (PTD) for review and approval. Contact DTS-PTD at 768-8396, 768-8370, 768-8374 or TheBusStop@honolulu.gov.

2. Construction materials and equipment should be transferred to and from the project site during off-peak traffic hours (8:30 a.m. to 3:30 p.m.) to minimize any possible disruption to traffic on the local streets.

3. Residents should have access to their property at all times during the project. Any existing pedestrian, bicycle, and vehicle access/crossing shall be maintained with the highest safety measures during construction.

4. Best Management Practice controls should be included at the construction site to prevent trailing of dirt and debris on City roadways.

5. Any damage to the existing roadway and sidewalk area caused by the project should be repaired to current City standards as well as meet Americans with Disabilities Act requirements.

6. The area representatives, neighborhood board, as well as the area residents, businesses, emergency personnel (fire, ambulance, and police), Oahu Transit Services, Inc. (TheBus and TheHandi-Van), etc., should be kept apprised of the details and status throughout the project and the impacts that the project may have on the adjoining local street area network.

7. A street usage permit should be obtained from the DTS for any construction-related work that may require the temporary closure of any traffic lane on a City street.

Thank you for the opportunity to review this matter. Should you have any questions, please contact Renee Yamasaki of my staff at 768-8383.

Very truly yours,

Wes Frysztacki
Director

SHIMABUKURO, ENDO & YOSHIZAKI, INC.
Civil, Environmental & Structural Engineers
1126 12th Avenue, Room 309
Honolulu, Hawaii 96816-3715
Ph.: (808) 737-1875. FAX: (808) 734-5516
E-mail: seyeng@seyeng.com

May 14, 2018

Mr. Aaron Nadig
Island Team Manager
U.S. Fish and Wildlife Service
Pacific Island Fish and Wildlife Office
300 Ala Moana Blvd., Room 3-122
Honolulu, HI 96850

Subject: Species List for the Manoa Well II Exploratory Well Environmental Assessment Project

Dear Mr. Nadig

Thank you for your letter of April 30, 2018 in response to our inquiry regarding the presence of federally listed and proposed endangered or threatened species and critical habitat in the vicinity of the subject project. We acknowledge that the federally endangered Hawaiian hoary bat (Lasiurus cinereus semotus) may transit through the vicinity of the project area and we will incorporate that information into the Environmental Assessment.

Please do not hesitate to contact me should you have any questions.

Very truly yours,

Howard K. Endo, Ph.D., P.E.
President

cc: Michael Cubas, BWS

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:
01EPIF00-2018-TA-0287

April 30, 2018

Mr. Howard K. Endo, Ph.D., P.E.
SEY Engineers, INC.
1126 12th Avenue, Room 309
Honolulu, Hawaii 96816-3715

Subject: Preparation Notice Environmental Assessment Manoa Well II Oahu

Dear Mr. Endo.

Thank you for your recent correspondence requesting technical assistance on species biology, habitat, or life requisite requirements. The Pacific Islands Fish and Wildlife Office (PIFWO) of the U.S. Fish and Wildlife Service (Service) appreciates your efforts to avoid or minimize effects to protected species associated with your proposed actions. We provide the following information for your consideration under the authorities of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 *et seq.*), as amended and Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-712).

Due to significant workload constraints, PIFWO is currently unable to specifically address your information request. The table below lists the protected species most likely to be encountered by projects implemented within the Hawaiian Islands. Based on your project location and description, we have noted the species most likely to occur within the vicinity of the project area, in the '**Occurs In or Near Project Area'** column. Please note, this list is not comprehensive and should only be used for general guidance.

If you are representing a federal action agency, please use the official species list on our web-site for your section 7 consultation. You can find out if your project occurs in or near designated critical habitat here: https://ecos.fws.gov/ipac/.

Under section 7 of the ESA, it is the Federal agency's (or their non-Federal designee) responsibility to make the determination of whether or not the proposed project "may affect" federally listed species or designated critical habitat. A "may affect, not likely to adversely affect" determination is appropriate when effects to federally listed species are expected to be discountable (*i.e.*, unlikely to occur), insignificant (minimal in size), or completely beneficial. This conclusion requires written concurrence from the Service. If a "may affect, likely to adversely affect" determination is made, then the Federal agency must initiate formal consultation with the Service. Projects that are determined to have "no effect" on federally listed species and/or critical habitat do not require additional coordination or consultation.

Implementing the avoidance, minimization, or conservation measures for the species that may occur in your project area will normally enable you to make a "may affect, not likely to adversely affect" determination for your project. If it is determined that the proposed project may affect federally listed species, we recommend you contact our office early in the planning process so that we may assist you with the ESA compliance. If the proposed project is funded, authorized, or permitted by a Federal agency, then that agency should consult with us pursuant to section 7(a)(2) of the ESA. If no Federal agency is involved with the proposed project, the applicant should apply for an incidental take permit under section 10(a)(1)(B) of the ESA. A section 10 permit application must include a habitat conservation plan that identifies the effects of the action on listed species and their habitats, and defines measures to minimize and mitigate those adverse effects.

We appreciate your efforts to conserve endangered species. We regret that we cannot provide you with more specific protected species information for your project site. If you have questions that are not answered by the information on our website, you can contact PIFWO at (808) 792-9400 and ask to speak to the lead biologist for the island where your project is located.

Sincerely,

AARON NADIG

Digitally signed by AARON NADIG
Date: 2018.04.30 14:54:45 -10'00'

Island Team Manager
Pacific islands Fish and Wildlife Office

The table below lists the protected species most likely to be encountered by projects implemented within the Hawaiian Islands. For your guidance, we've marked species that may occur in the vicinity of your project

Scientific Name	**Common Name / Hawaiian Name**	**Federal Status**	**Occurs In or Near Project Area**
Mammals			
Lasiurus cinereus semotus	Hawaiian hoary bat/ `ōpe`ape`a	E	☒
Reptiles			
Chelonia mydas	Green sea turtle/honu - Central North Pacific DPS	T	☐
Erectmochelys imbricate	Hawksbill sea turtle/ honu`ea	E	☐
Birds			
Anas wyvilliana	Hawaiian duck/ koloa	E	☐
Branta sandvicensis	Hawaiian goose/ nēnē	E	☐
Fulica alai	Hawaiian coot/ `alae kea	E	☐
Gallinula galeata sandvicensis	Hawaiian gallinule/ `alae `ula	E	☐
Himantopus mexicanus knudseni	Hawaiian stilt/ ae`o	E	☐
Oceanodroma castro	Band-rumped storm-petrel/ `akē`akē	E	☐
Pterodroma sandwichensis	Hawaiian petrel/ `ua`u	E	☐
Puffinus auricularis newelli	Newell's shearwater/ `a`o	T	☐
Ardenna pacificus	Wedge-tailed Shearwater/ `ua`u kani	MBTA	☐
Gygis alba	White Tern/ manu-o-kū	MBTA	☐
Buteo solitarius	Hawaiian hawk/ 'io	E	☐
Insects			
Manduca blackburni	Blackburn's sphinx moth	E	☐
Megalagrion pacificum	Damselfly, Pacific Hawaiian	E	☐
M. xanthomelas	Damselfly, Orangeblack	E	☐

Below are our general conservation measures to avoid and minimize potential impacts to federally listed species that may occur in your project area:

Endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*): 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. Additionally, 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.

SHIMABUKURO, ENDO & YOSHIZAKI, INC.
Civil, Environmental & Structural Engineers
1126 12th Avenue, Room 309
Honolulu, Hawaii 96816-3715
Ph.: (808) 737-1875 FAX: (808) 734-5516
E-mail: seyeng@seyeng.com

May 14, 2018

Manuel P. Neves, Chief
Honolulu Fire Department
636 South Street
Honolulu, Hawaii 96813

Attention: Wayne Masuda, Battalion Chief

Subject: Your Response of April 27, 2018 Regarding the Pre-Assessment Consultation Notice for the Proposed Honolulu Board of Water Supply Manoa Well II Exploratory Well Environmental Assessment Project

Dear Chief Neves,

Thank you for your response regarding the Pre-Assessment Consultation Notice for the proposed Manoa Well II Exploratory Well Environmental Assessment project.

We acknowledge that the Honolulu Fire Department does not have any comments at this time.

If you have any questions, please call me at 737-1875.

Very truly yours,

Howard K. Endo, Ph.D., P.E.
President

cc: Michael Cubas, BWS

HONOLULU FIRE DEPARTMENT

CITY AND COUNTY OF HONOLULU

636 South Street
Honolulu, Hawaii 96813-5007
Phone: 808-723-7139 Fax: 808-723-7111 Internet: www.honolulu.gov/hfd

KIRK CALDWELL
MAYOR

MANUEL P. NEVES
FIRE CHIEF

LIONEL CAMARA JR.
DEPUTY FIRE CHIEF

April 27, 2018

Mr. Howard Endo, Ph.D., P.E.
President
Shimabukuro, Endo & Yoshizaki, Inc.
1126 12th Avenue, Room 309
Honolulu, Hawaii 96816-3715

Dear Mr. Endo:

Subject: Environmental Assessment
Manoa Well II Exploratory Well Project
3738 Manoa Road
Honolulu, Hawaii 96822
Tax Map Key: 2-9-054: 033

In response to your letter dated April 18, 2018, regarding the abovementioned subject, the Honolulu Fire Department determined that there will be no significant impact to fire department services.

Should you have questions, please contact Battalion Chief Wayne Masuda of our Fire Prevention Bureau at 723-7151 or wmasuda@honolulu.gov.

Sincerely,

SOCRATES D. BRATAKOS
Assistant Chief

SDB/TC:bh

SHIMABUKURO, ENDO & YOSHIZAKI, INC.
Civil, Environmental & Structural Engineers
1126 12th Avenue, Room 309
Honolulu, Hawaii 96816-3715
Ph.: (808) 737-1875 FAX: (808) 734-5516
E-mail: seyeng@seyeng.com

May 14, 2018

Susan Ballard, Chief of Police
City & County of Honolulu
Police Department
801 South Beretania Street
Honolulu, Hawaii 96813

Attention: Major William Baldwin (District 7)

Subject: Your Response of April 27, 2018 Regarding the Pre-Assessment Consultation Notice for the Proposed Honolulu Board of Water Supply Manoa Well II Exploratory Well Environmental Assessment Project

Dear Chief Ballard,

Thank you for your response regarding the Pre-Assessment Notice for the proposed Manoa Well II Exploratory Well Environmental Assessment project.

We acknowledge that the Honolulu Police Department has concerns regarding the safe flow of vehicular traffic in the residential area. Those concerns will be addressed in the Environmental Assessment.

If you have any questions, please call me at 737-1875.

Very truly yours,

Howard K Endo

Howard K. Endo, Ph.D., P.E.
President

cc: Michael Cubas, BWS

POLICE DEPARTMENT
CITY AND COUNTY OF HONOLULU
801 SOUTH BERETANIA STREET · HONOLULU, HAWAII 96813
TELEPHONE: (808) 529-3111 · INTERNET: www.honolulupd.org

KIRK CALDWELL
MAYOR

SUSAN BALLARD
CHIEF

JOHN D. McCARTHY
JONATHON GREMS
DEPUTY CHIEFS

OUR REFERENCE MT-AL

April 27, 2018

Mr. Howard K. Endo, Ph.D., P.E.
Shimabukuro, Endo & Yoshizaki, Inc.
1126 12th Avenue, Room 309
Honolulu, Hawaii 96816-3715

Dear Mr. Endo:

This is in response to your letter of April 18, 2018, requesting comments on an Environmental Assessment for the Manoa Well II Exploratory Well project.

The Honolulu Police Department has reviewed this project and has concerns regarding the safe flow of vehicular traffic in the project area.

Due to the narrow width of Manoa Road, any parked vehicles along the project site may cause an obstruction to the flow of traffic. Special duty police officers should be utilized to provide traffic safety controls to ensure a safe means of ingress/egress for construction vehicles, motorists, and pedestrians in the vicinity.

If there are any questions, please call Major William Baldwin of District 7 (East Honolulu) at 723-3369.

Thank you for the opportunity to review this project.

Sincerely,

MARK TSUYEMURA
Management Analyst VI
Office of the Chief

SHIMABUKURO, ENDO & YOSHIZAKI, INC.
Civil, Environmental & Structural Engineers
1126 12th Avenue, Room 309
Honolulu, Hawaii 96816-3715
Ph.: (808) 737-1875 FAX: (808) 734-5516
E-mail: seyeng@seyeng.com

May 14, 2018

Mr. Leo R. Asuncion, Jr., AICP, Acting Director
State of Hawaii
Office of Planning
235 S. Beretania Street, 6th Floor
Honolulu, Hawaii 96813

Attention: Joshua Hekekia

Subject: Your Response of May 2, 2018 Regarding the Pre-Assessment Consultation Notice for the Proposed Honolulu Board of Water Supply Manoa Well II Exploratory Well Environmental Assessment Project

Dear Mr. Asuncion,

Thank you for your response regarding the Pre-Assessment Consultation Notice for the proposed Manoa Well II Exploratory Well Environmental Assessment project.

We appreciate the Office of Planning comments regarding conformance to the objectives and policies of the Hawaii State Planning Act, and Hawaii Coastal Zone Management Act. In addition, the EA will address any issues regarding stormwater runoff, erosion control and flooding.

Your office will be kept abreast during the Environmental Assessment process for the subject project.

If you have any questions, please call me at 737-1875.

Very truly yours,

Howard K. Endo, Ph.D., P.E.
President

cc: Michael Cubas, BWS

OFFICE OF PLANNING
STATE OF HAWAII

DAVID Y. IGE
GOVERNOR

LEO R. ASUNCION
DIRECTOR
OFFICE OF PLANNING

235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

Telephone: (808) 587-2846
Fax: (808) 587-2824
Web: http://planning.hawaii.gov/

DTS201805021238RI

May 2, 2018

Mr. Howard Endo, Ph.D., P.E.
President
Shimabukuro, Endo & Yoshizaki, Inc.
1126 12th Avenue, Room 309
Honolulu, Hawaii 96816-3715

Dear Mr. Endo:

Subject: Pre-Assessment Consultation, Draft Environmental Assessment for the Manoa Well II Exploratory Well, Honolulu, Oahu; TMK: (1) 2-9-054: 033

Thank you for the opportunity to provide comments on the pre-consultation request for the preparation of a Draft Environmental Assessment (Draft EA) for the Manoa Well II Exploratory Well project. The pre-consultation review material was transmitted to our office via letter dated April 18, 2018.

It is our understanding the City and County of Honolulu, Honolulu Board of Water Supply (BWS) proposes to add a second well to the Manoa Well II Station to improve the overall reliability and performance of its urban water system serving the Manoa Valley area of Honolulu. The improvements are expected to provide a consistent source of potable water for residential and commercial BWS customers should an existing well need to be shut down for service or emergency maintenance.

The Office of Planning (OP) has reviewed the transmitted material and has the following comments to offer:

1. The Hawaii State Planning Act. Pursuant to Hawaii Administrative Rules (HAR) § 11-200-10(4) – general description of the action's technical, economic, social, and environmental characteristics; this project must demonstrate that it is consistent with State environmental, social, economic goals, and policies. Hawaii Revised Statutes (HRS) Chapter 226, the Hawaii State Planning Act, provides goals, objectives, policies, planning coordination and implementation, and priority guidelines for growth, development, and the allocation of resources throughout the State.

   The Draft EA should include a discussion on the project's ability to meet all parts of HRS Chapter 226. The analysis should examine consistency with these statutes, clarify where it is in conflict with them, and what steps will be taken for it be in compliance with HRS Chapter 226. If any of these statutes are not applicable to the project, the analysis should affirmatively state such determination, followed by discussion paragraphs.

2. The Hawaii Coastal Zone Management Program. The Coastal Zone Management (CZM) area is defined as "all lands of the State and the area extending seaward from the shoreline to the limit of

the State's police power and management authority, including the U.S. territorial sea" (HRS § 205A-1).

The Draft EA should include an assessment as to how the proposed action conforms to each of the goals and objectives as listed in HRS § 205A-2. Compliance with HRS § 205A-2 is an important component for satisfying the requirements of HRS Chapter 343.

3. Stormwater Runoff, Erosion Controls, and Flooding. Pursuant to HAR § 11-200-10(6) – identification and summary of impacts and alternatives considered; to ensure that the surface water and nearshore marine resources of Oahu remain protected, the negative effects of stormwater inundation from this project should be evaluated in the Draft EA.

   Issues that may be examined include, but are not limited to, project site characteristics in relation to flood and erosion prone areas, the potential vulnerability of surface water resources, the soil absorption characteristics of the project area, and the amount of permeable versus impervious surfaces. Assessing the need for mitigation measures in the protection for surface water resources and the coastal ecosystem should take this into account, pursuant to HAR § 11-200-10(7).

   To assist in the development of additional stormwater runoff strategies, OP has developed the Stormwater Impact Assessment. This guidance can be used in your stormwater impact evaluation. This document can be used to identify and evaluate information on hydrology, stressors, sensitivity of aquatic and riparian resources, and management measures to control runoff occurrences. Mitigation measures and best management practices listed in this document can be applied to water runoff strategies to prevent damage to coastal ecosystems. This document will assist in integrating stormwater impact assessment within the planning and environmental review process of a project.

   The document can be viewed or downloaded via our website at: http://files.hawaii.gov/dbedt/op/czm/initiative/stomwater_imapct/final_stormwater_impact_assessments_guidance.pdf.

If you have any questions regarding this comment letter, please contact Joshua Hekekia of our office at (808) 587-2845.

Sincerely,

Leo R. Asuncion
Director

SHIMABUKURO, ENDO & YOSHIZAKI, INC.
Civil, Environmental & Structural Engineers
1126 12th Avenue, Room 309
Honolulu, Hawaii 96816-3715
Ph.: (808) 737-1875 FAX: (808) 734-5516
E-mail: seyeng@seyeng.com

May 14, 2018

Ms. Michele K. Nekota, Director
Department of Parks & Recreation
City & County of Honolulu
1000 Uluohia Street, Room 309
Kapolei, Hawaii 96707

Subject: Your Response of April 26, 2018 Regarding the Pre-Assessment Consultation Notice for the Proposed Honolulu Board of Water Supply Manoa Well II Exploratory Well Environmental Assessment Project

Dear Ms. Nekota,

Thank you for your response regarding the Pre-Assessment Notice for the proposed Manoa Well II Exploratory Well Environmental Assessment project.

We acknowledge that the City & County of Honolulu, Department of Parks & Recreation do not have any comments at this time. Per your request, you will be removed as a consulting party for the balance of this EA process.

If you have any questions, please call me at 737-1875.

Very truly yours,

Howard K Endo

Howard K. Endo, Ph.D., P.E.
President

cc: Michael Cubas, BWS

DEPARTMENT OF PARKS & RECREATION

CITY AND COUNTY OF HONOLULU

1000 Uluohia Street, Suite 309, Kapolei, Hawaii 96707
Phone: (808) 768-3003 • Fax: (808) 768-3053
Website: www.honolulu.gov

KIRK CALDWELL
MAYOR

MICHELE K. NEKOTA
DIRECTOR

JEANNE C. ISHIKAWA
DEPUTY DIRECTOR

April 26, 2018

Mr. Howard Kendo Ph.D., P.E., President
Shimabukuro, Endo & Yoshizaki, Inc.
1126 12th Avenue, Room 309
Honolulu, Hawaii 96816-3715

Dear Mr. Kendo:

SUBJECT: Pre-Assessment Consultation Manoa Well II, Draft Environmental Assessment TMK: 2-9-054:033

Thank you for the opportunity to review and comment on the pre-assessment consultation stage of the Draft Environmental Assessment for the proposed second well at the Manoa Well II Station.

The Department of Parks and Recreation has no comment. As the proposed project will have no impact on any program or facility of the Department, you may remove us as a consulted party to the balance of the EIS process.

Should you have any questions, please contact John Reid, Planner at 768-3017.

Sincerely,

Michele K. Nekota
Director

MKN:jr
(726639)

SHIMABUKURO, ENDO & YOSHIZAKI, INC.
Civil, Environmental & Structural Engineers
1126 12th Avenue, Room 309
Honolulu, Hawaii 96816-3715
Ph.: (808) 737-1875 FAX: (808) 734-5516
E-mail: seyeng@seyeng.com

May 15, 2018

Mr. Jade Butay, Director
Department of Transportation
869 Punchbowl Street, Room 513
Honolulu, Hawaii 96813

Attention: Mr. Robert Shin

Subject: Your Response of May 10, 2018 Regarding the Pre-Assessment Consultation Notice for the Proposed Honolulu Board of Water Supply Manoa Well II Exploratory Well Environmental Assessment Project

Dear Mr. Butay,

Thank you for your response regarding the Pre-Assessment Notice for the proposed Manoa Well II Exploratory Well Environmental Assessment project.

We acknowledge that the State of Hawaii, Department of Transportation does not have any comments at this time.

If you have any questions, please call me at 737-1875.

Very truly yours,

Howard K. Endo, Ph.D., P.E.
President

cc: Michael Cubas, BWS

DAVID Y. IGE
GOVERNOR

JADE T. BUTAY
DIRECTOR

Deputy Directors
ROY CATALANI
ROSS M. HIGASHI
EDWIN H. SNIFFEN
DARRELL T. YOUNG

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:
DIR 0443
HWY-CM 2.7508

May 10, 2018

Mr. Howard Endo, Ph.D., P.E.
Shimabukuro, Endo & Yoshizaki, Inc.
1126 12th Avenue, Room 309
Honolulu, Hawaii 96816

Dear Mr. Endo:

Subject: Manoa Well II Exploratory Well
3738 Manoa Road, Honolulu, Oahu, Hawaii
TMK: 2-9-054:033
Pre-Consultation for Environmental Assessment

Thank you for the opportunity to comment on the proposal for the drilling, casing, testing and production of a second well at the Manoa Well II Station.

Based on the information provided, the State Department of Transportation (DOT) has no comment as the proposed project does not appear to impact DOT facilities at this time.

Should you have any questions, please call Mr. Robert Shin, Engineering Program Manager, Construction and Maintenance Branch, Highways Division, at (808) 587-2185 or email at Robert.Shin@hawaii.gov.

Sincerely,

JADE T. BUTAY
Director of Transportation

APPENDIX B

DRAFT ENVIRONMENTAL ASSESSMENT CONSULTATION

SHIMABUKURO, ENDO & YOSHIZAKI, INC.
Civil, Environmental & Structural Engineers
1126 12th Avenue, Room 309
Honolulu, Hawaii 96816-3715
Ph.: (808) 737-1875 FAX: (808) 734-5516
E-mail: seyeng@seyeng.com

MEMORANDUM

Date: December 13, 2021

To: Project File

From: Howard K. Endo

Subject Manoa Well II EA

1. Consultation letters were sent to agencies, organizations, utilities; and fourteen (14) neighboring or nearby property owners and recorded lessees were consulted notifying them of the proposed project and requesting comments regarding possible impacts due to the project. A list of parties consulted is included in Section 1.3 of the Final EA.

2. Twenty-four (24) agencies, organizations, and utilities were consulted. Comments were received from nine (9) parties and no resident comment was received.

3. Generally, the comments included impacts of noise, dust, street closures, traffic detours, parking, environmental permits, and request for prior public notification of construction and detour schedules.

4. All comments received to the Draft EA letters have been reviewed, evaluated and incorporated into the Final EA as appropriate.

5. Copies of comment letters and responses are included in Appendix B of the Final EA.

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843
www.boardofwatersupply.com

RICK BLANGIARDI, MAYOR

BRYAN P. ANDAYA, Chair
KAPUA SPROAT, Vice Chair
RAY C. SOON
MAX J. SWORD
NA'ALEHU ANTHONY

JADE T. BUTAY, Ex-Officio
ROGER BABCOCK, Jr., Ex-Officio

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

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

December 3, 2021

TO: LIONEL CAMARA JR., ACTING FIRE CHIEF
HONOLULU FIRE DEPARTMENT

ATTN: BATTALION CHIEF REID YOSHIDA

FROM: ERNEST Y. W. LAU, P.E., MANAGER AND CHIEF ENGINEER

SUBJECT: YOUR LETTER DATED NOVEMBER 16, 2021 REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT FOR THE MANOA WELL II EXPLORATORY WELL, TAX MAP KEY: 2-9-054-033, HONOLULU, HAWAII

Thank you for your comments of November 16, 2021 regarding the Draft Environmental Assessment for the Manoa Well II Exploratory Well Project.

We acknowledge that the Honolulu Fire Department has no comments or concerns regarding the project at this time.

If you have any questions, please contact Rian Adachi, Long-Range Planning Branch of our Water Resources Division at (808) 748-5943 or email at radachi@hbws.org.

cc: Howard K. Endo, Ph.D., SEY Engineers

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

LIONEL CAMARA JR.
ACTING FIRE CHIEF

SHELDON K. HAO
ACTING DEPUTY FIRE CHIEF

November 16, 2021

Mr. Howard Endo, President
Shimabukuro, Endo & Yoshizaki, Inc.
1126 12th Avenue, Room 309
Honolulu, Hawaii 96816-3715

Dear Mr. Endo:

Subject: Environmental Assessment for Manoa Well II Exploratory Well Project
3738 Manoa Road
Honolulu, Hawaii 96822
Tax Map Key: 2-9-054: 033

In response to your letter dated November 8, 2021, regarding the abovementioned subject, the Honolulu Fire Department reviewed the submitted information and determined there will be no significant impact to fire department services.

Should you have questions, please contact Battalion Chief Reid Yoshida of our Fire Prevention Bureau at 808-723-7151 or ryoshida@honolulu.gov.

Sincerely,

Jason Samala
Assistant Chief

JS/RZ:gl

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843
www.boardofwatersupply.com

RICK BLANGIARDI, MAYOR

BRYAN P. ANDAYA, Chair
KAPUA SPROAT, Vice Chair
RAY C. SOON
MAX J. SWORD
NA`ALEHU ANTHONY

JADE T. BUTAY, Ex-Officio
ROGER BABCOCK, Jr., Ex-Officio

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

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

December 3, 2021

TO: RADE K. VANIC, INTERIM CHIEF
HONOLULU POLICE DEPARTMENT

ATTN: ACTING MAJOR BRIAN LYNCH

FROM: ERNEST Y. W. LAU, P.E., MANAGER AND CHIEF ENGINEER

SUBJECT: YOUR LETTER DATED NOVEMBER 16, 2021 REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT FOR THE MANOA WELL II EXPLORATORY WELL, TAX MAP KEY: 2-9-054-033, HONOLULU, HAWAII

Thank you for your comments of November 16, 2021 regarding the Draft Environmental Assessment for the Manoa Well II Exploratory Well project.

We acknowledge the Honolulu Police Department concerns regarding the anticipated short-term impacts of pedestrian and vehicular traffic in the residential areas near the project site. Adequate notification will be made to area residents due to the ingress and egress of construction vehicles, equipment, and deliveries during the construction phase of the project.

If you have any questions, please contact Rian Adachi, Long-Range Planning Branch of our Water Resources Division at (808) 748-5943 or email at radachi@hbws.org.

cc: Howard K. Endo, Ph.D., SEY Engineers

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

RADE K. VANIC
INTERIM CHIEF

OUR REFERENCE EO-DK

November 16, 2021

Howard K. Endo, Ph.D., P.E.
President
Shimabukuro, Endo & Yoshizaki, Inc.
1126 12th Avenue, Room 309
Honolulu, Hawaii 96816-3715

Dear Dr. Endo:

This is in response to your letter of November 8, 2021, requesting input on the Draft Environmental Assessment for the construction of the Manoa Well II Exploratory Well in Honolulu.

The Honolulu Police Department (HPD) has reviewed the project plans and anticipates short-term impacts to pedestrian and vehicular traffic in the area near the well located by Loulu Place and also Manoa Road, as the project is situated in a residential area. The HPD recommends that adequate notification be made to area residents due to the ingress and egress of construction vehicles, equipment, and deliveries during the construction phase of the project.

If there are any questions, please call Acting Major Brian Lynch of District 7 (East Honolulu) at (808) 723-3369.

Thank you for the opportunity to review this project.

Sincerely,

DARREN CHUN
Assistant Chief of Police
Support Services Bureau

cc: Office of Planning and Sustainable Development
Mr. Rian Adachi, Board of Water Supply

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843
www.boardofwatersupply.com

RICK BLANGIARDI, MAYOR

BRYAN P. ANDAYA, Chair
KAPUA SPROAT, Vice Chair
RAY C. SOON
MAX J. SWORD
NA`ALEHU ANTHONY

JADE T. BUTAY, Ex-Officio
ROGER BABCOCK, Jr., Ex-Officio

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

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

December 7, 2021

TO: LAURA H. THIELEN, DIRECTOR
DEPARTMENT OF PARKS AND RECREATION

ATTN: JOHN REID

FROM: ERNEST Y. W. LAU, P.E., MANAGER AND CHIEF ENGINEER

SUBJECT: YOUR LETTER DATED NOVEMBER 18, 2021 REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT FOR THE MANOA WELL II EXPLORATORY WELL, TAX MAP KEY: 2-9-054-033, HONOLULU, HAWAII

Thank you for your comments of November 18, 2021 regarding the Draft Environmental Assessment for the Manoa Well II Exploratory Well Project.

We acknowledge that the Department of Parks and Recreation has no comments or concerns regarding the project at this time.

If you have any questions, please contact Rian Adachi, Long-Range Planning Branch of our Water Resources Division at (808) 748-5948 or email at radachi@hbws.org.

cc: Howard K. Endo, Ph.D., SEY Engineers

DEPARTMENT OF PARKS & RECREATION

CITY AND COUNTY OF HONOLULU

1000 Uluohia Street, Suite 309, Kapolei, Hawaii 96707
Phone: (808) 768-3003 • Fax: (808) 768-3053
Website: www.honolulu.gov

RICK BLANGIARDI
MAYOR

LAURA H. THIELEN
DIRECTOR

KEHAULANI PU'U
DEPUTY DIRECTOR

November 18, 2021

Mr. Howard Endo, Ph.D., P.E., President
Shimabukuro, Endo & Yoshizaki, Inc.
1126 12th Avenue, Room 309
Honolulu, Hawaii 96816-3715

Dear Mr. Endo:

SUBJECT: Draft Environmental Assessment
Manoa Well II Exploratory Well
Tax Map Key No. 2-9-054:033

Thank you for the opportunity to review and comment on the subject Draft Environmental Assessment for the proposed Manoa Well II Exploratory Well.

The Department of Parks and Recreation has no comment.

As the project is not in close proximity to any park and will not impact any facility and or program of the department you are invited to remove us from the balance of the Environmental Assessment process.

Should you have any questions, please contact Mr. John Reid, Planner at 808-768-3017.

Sincerely,

Laura H. Thielen
Director

LHT:jr
(867445)

cc: Office of Planning and Sustainable Development
235 South King Street, State Office Tower, Suite 702, Honolulu, Hawaii 96813
Board of Water Supply, Attention Rian Adachi
630 South Beretania Street, Honolulu, Hawaii 96843

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843
www.boardofwatersupply.com

RICK BLANGIARDI, MAYOR

BRYAN P. ANDAYA, Chair
KAPUA SPROAT, Vice Chair
RAY C. SOON
MAX J. SWORD
NA`ALEHU ANTHONY

JADE T. BUTAY, Ex-Officio
ROGER BABCOCK, Jr., Ex-Officio

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

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

December 3, 2021

TO: ROGER BABCOCK, JR., PH.D., P.E.
DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF FACILITY MAINTENANCE

ATTN: KYLE OYASATO

FROM: ERNEST Y. W. LAU, P.E., MANAGER AND CHIEF ENGINEER

SUBJECT: YOUR LETTER DATED NOVEMBER 19, 2021 REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT FOR THE MANOA WELL II EXPLORATORY WELL, TAX MAP KEY: 2-9-054-033, HONOLULU, HAWAII

Thank you for your comments of November 19, 2021 regarding the Draft Environmental Assessment for the Manoa Well II Exploratory Well project.

We acknowledge that the Department of Facility Maintenance has no comments or concerns regarding the project at this time.

If you have any questions, please contact Rian Adachi, Long-Range Planning Branch of our Water Resources Division at (808) 748-5943 or email at radachi@hbws.org.

cc: Howard K. Endo, Ph.D., SEY Engineers

DEPARTMENT OF FACILITY MAINTENANCE

CITY AND COUNTY OF HONOLULU

1000 Ulu`ohia Street, Suite 215, Kapolei, Hawaii 96707
Phone: (808) 768-3343 • Fax: (808) 768-3381
Website: www.honolulu.gov

RICK BLANGIARDI
MAYOR

ROGER BABCOCK, JR., Ph.D., P.E.
DIRECTOR AND CHIEF ENGINEER

DAWN B. SZEWCZYK, P.E.
DEPUTY DIRECTOR

IN REPLY REFER TO:
21-673

November 19, 2021

Shimabukuro, Endo & Yoshizaki, Inc.
1126 12th Avenue, Room 309
Honolulu, Hawaii 96186-3715
Attention: Mr. Howard Endo

Dear Mr. Howard Endo:

Subject: Draft Environmental Assessment for Manoa Well II Exploratory Well
Tax Map Key: 2-9-054:033
Honolulu, Island of Oahu, Hawaii

Thank you for the opportunity to review and to give our input regarding the subject "Draft Environmental Assessment for Manoa Well II Exploratory Well."

We have no comments at this time, as we do not have any facilities or easements on the subject property.

Should you have any questions, please contact Kyle Oyasato of the Division of Road Maintenance, at 768-3697.

Sincerely,

Roger Babcock, Jr., Ph.D., P.E.
Director and Chief Engineer

cc: (1) Office of Planning and Sustainable Development,
235 South King St, State Office Tower, Suite 702, Honolulu, HI 96813
(2) Board of Water Supply,
630 South Beretania Street, Honolulu, HI 96843
Attn: Rian Adachi

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843
www.boardofwatersupply.com

RICK BLANGIARDI, MAYOR

BRYAN P. ANDAYA, Chair
KAPUA SPROAT, Vice Chair
RAY C. SOON
MAX J. SWORD
NA'ALEHU ANTHONY

JADE T. BUTAY, Ex-Officio
ROGER BABCOCK, Jr., Ex-Officio

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

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

December 3, 2021

Mr. Roy Ikeda, Interim Public Works Manager
Planning Section
Department of Education
State of Hawaii
P. O. Box 2360
Honolulu, Hawaii 96804

Attention: Robyn Loudermilk

Dear Mr. Ikeda:

Subject: Your Letter Dated November 16, 2021 Regarding the Draft Environmental Assessment for the Manoa Well II Exploratory Well Project, Tax Map Key: 2-9-054-033, Honolulu, Hawaii

Thank you for your comments of November 19, 2021 regarding the Draft Environmental Assessment for the Manoa Well II Exploratory Well project.

We acknowledge that the Hawaii State Department of Education has no comments or concerns regarding the project at this time.

If you have any questions, please contact Rian Adachi, Long-Range Planning Branch of our Water Resources Division at (808) 748-5943 or email at radachi@hbws.org.

Very Truly Yours,

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

cc: Howard K. Endo, Ph.D., SEY Engineers

DAVID Y. IGE
GOVERNOR

KEITH T. HAYASHI
INTERIM SUPERINTENDENT

STATE OF HAWAI'I
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAI'I 96804

OFFICE OF FACILITIES AND OPERATIONS

November 19, 2021

Shimabukuro, Endo & Yoshizaki, Inc.
Attention: Howard K. Endo, President
1126 12th Avenue, Room 309
Honolulu, Hawaii 96816

Re: Draft Environmental Assessment for Manoa Well II Exploratory Well
Tax Map Key No. (1)2-9-054:033
Honolulu, Island of Oahu, Hawaii

Dear Mr. Endo:

Thank you for your letter dated November 8, 2021. The Hawaii State Department of Education (Department) has the following comment for the Draft Environmental Assessment for the proposed Manoa Well II Exploratory Well (Project).

Based on the information provided, the proposed Project will not impact Department facilities.

Thank you for the opportunity to comment. Should you have questions, please contact Robyn Loudermilk, School Lands and Facilities Specialist with the Facilities Development Branch, Planning Section, at (808) 784-5093 or via email at robyn.loudermilk@k12.hi.us.

Sincerely,

Roy Ikeda
Interim Public Works Manager
Planning Section

RI:ctc

c: Office of Planning and Sustainable Development
Rian Adachi, Board of Water Supply
Facilities Development Branch

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843
www.boardofwatersupply.com

RICK BLANGIARDI, MAYOR

BRYAN P. ANDAYA, Chair
KAPUA SPROAT, Vice Chair
RAY C. SOON
MAX J. SWORD
NA'ALEHU ANTHONY

JADE T. BUTAY, Ex-Officio
ROGER BABCOCK, Jr., Ex-Officio

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

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

December 3, 2021

TO: DEAN UCHIDA, DIRECTOR
DEPARTMENT OF PLANNING AND PERMITTING

ATTN: DINA L.T. WONG, CHIEF
PLANNING DIVISION

FROM: ERNEST Y. W. LAU, P.E., MANAGER AND CHIEF ENGINEER

SUBJECT: YOUR LETTER DATED NOVEMBER 19, 2021 REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT FOR THE MANOA WELL II EXPLORATORY WELL, TAX MAP KEY: 2-9-054-033, HONOLULU, HAWAII

Thank you for your comments of November 19, 2021 regarding the Draft Environmental Assessment for the Manoa Well II Exploratory Well project. We have the following responses to your comments:

1. Discussion of the project's consistency with the General Plan and the Primary Urban Center Development Plan is provided in Section 3.3 State and County Land Use Designation/Development Plan.

2. Public Infrastructure Map Amendment is presented as one of the approvals to be sought in Sections 1.4 Approvals, Permits, Etc. and 7.3 City and County of Honolulu (Approval, Permits, Etc.).

If you have any questions, please contact Rian Adachi, Long-Range Planning Branch of our Water Resources Division at (808) 748-5943 or email at radachi@hbws.org.

cc: Howard K. Endo, Ph.D., SEY Engineers

DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 7TH FLOOR • HONOLULU, HAWAII 96813
PHONE: (808) 768-8000 • FAX: (808) 768-6041
DEPT. WEB SITE: www.honoluludpp.org • CITY WEB SITE: www.honolulu.gov

RICK BLANGIARDI
MAYOR

DEAN UCHIDA
DIRECTOR

DAWN TAKEUCHI APUNA
DEPUTY DIRECTOR

EUGENE H. TAKAHASHI
DEPUTY DIRECTOR

November 19, 2021

2021/ELOG-2418(jl)
2112529

Mr. Howard K. Endo, President
Shimabukuro, Endo & Yoshizaki, Inc.
1126 12th Avenue, Room 309
Honolulu, Hawaii 96816-3715

Dear Mr. Endo:

SUBJECT: Draft Environmental Assessment (DEA) for Manoa Well II Exploratory Well

This is in response to your letter dated, November 8, 2021, regarding the request for comments on the DEA for the second well at the Manoa Well II Station (Project).

Based on the information provided in the DEA, the Department of Planning and Permitting provides the following comments:

1. The Final Environmental Assessment should include a discussion on the Project's consistency with the General Plan and the Primary Urban Center Development Plan.

2. The Project should submit a formal request for determination on whether a Public Infrastructure Map Amendment will be required for the project.

Should you have any questions, please contact Jeffrey Lee, of our staff, at (808) 768-8202.

Very truly yours,

Dina L.T. Wong
Chief
Planning Division

DLTW:tc

cc: Office of Planning and Sustainable Development
Rian Adachi
Board of Water Supply

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843
www.boardofwatersupply.com

RICK BLANGIARDI, MAYOR

BRYAN P. ANDAYA, Chair
KAPUA SPROAT, Vice Chair
RAY C. SOON
MAX J. SWORD
NA`ALEHU ANTHONY

JADE T. BUTAY, Ex-Officio
ROGER BABCOCK, Jr., Ex-Officio

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

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

December 3, 2021

Ms. Marianne Rossio, P.E., Chief
Clean Air Branch
Environmental Health Administration
Department of Health
2827 Waimano Home Road, Room 130
Pearl City, Hawaii 96782

Attention: Lisa M.M. Wallace, EHS QA Officer

Subject: Your Email Dated November 24, 2021 Regarding the Draft Environmental Assessment for the Manoa Well II Exploratory Well, Tax Map Key: 2-9-054-033, Honolulu, Hawaii

Dear Ms. Rossio:

Thank you for your comments of November 24, 2021 regarding the Draft Environmental Assessment for the Manoa Well II Exploratory Well project.

We appreciate the references to the Department of Health (DOH), Clean Air Branch Standard Comments for Land Use Reviews in regard to potential air polluting activities and their required permits. The DOH website will be reviewed for proper permit coverages and measures to consider in order to reduce the project's impact on air quality in the surrounding area.

If you have any questions, please contact Rian Adachi, Long-Range Planning Branch of our Water Resources Division at (808) 748-5943 or email at radachi@hbws.org.

Very Truly Yours,

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

cc: Howard K. Endo, Ph.D., SEY Engineers

From: Cab General <Cab.General@doh.hawaii.gov>
Sent: Wednesday, November 24, 2021 10:44 AM
To: radachi@hbws.org; hendo@seyeng.com
Subject: Manoa Well II Exploratory Well--Draft EA (AFNSI)

Aloha

Thank you for the opportunity to provide comments on the subject project. I apologize for sending this past the deadline.
Please see our standard comments at:

https://health.hawaii.gov/cab/files/2019/08/Standard-Comments-Clean-Air-Branch-2019.pdf

Lisa M.M. Wallace
EHS QA Officer
Clean Air Branch
Environmental Health Office
Hilo, Hawaii 96720

Standard Comments for Land Use Reviews
Clean Air Branch
Hawaii State Department of Health

If your proposed project:

Requires an Air Pollution Control Permit

You must obtain an air pollution control permit from the Clean Air Branch and comply with all applicable conditions and requirements. If you do not know if you need an air pollution control permit, please contact the Permitting Section of the Clean Air Branch.

Includes construction or demolition activities that involve asbestos

You must contact the Asbestos Abatement Office in the Indoor and Radiological Health Branch.

Has the potential to generate fugitive dust

You must control the generation of all airborne, visible fugitive dust. Note that construction activities that occur near to existing residences, business, public areas and major thoroughfares exacerbate potential dust concerns. It is recommended that a dust control management plan be developed which identifies and mitigates all activities that may generate airborne, visible fugitive dust. The plan, which does *not* require Department of Health approval, should help you recognize and minimize potential airborne, visible fugitive dust problems.

Construction activities must comply with the provisions of Hawaii Administrative Rules, §11-60.1-33 on Fugitive Dust. In addition, for cases involving mixed land use, we strongly recommend that buffer zones be established, wherever possible, in order to alleviate potential nuisance complaints.

You should provide reasonable measures to control airborne, visible fugitive dust from the road areas and during the various phases of construction. These measures include, but are not limited to, the following:

a) Planning the different phases of construction, focusing on minimizing the amount of airborne, visible fugitive dust-generating materials and activities, centralizing on-site vehicular traffic routes, and locating potential dust-generating equipment in areas of the least impact;
b) Providing an adequate water source at the site prior to start-up of construction activities;
c) Landscaping and providing rapid covering of bare areas, including slopes, starting from the initial grading phase;
d) Minimizing airborne, visible fugitive dust from shoulders and access roads;
e) Providing reasonable dust control measures during weekends, after hours, and prior to daily start-up of construction activities; and
f) Controlling airborne, visible fugitive dust from debris being hauled away from the project site.

If you have questions about fugitive dust, please contact the Enforcement Section of the Clean Air Branch

Clean Air Branch (808) 586-4200 cab@doh.hawaii.gov	Indoor Radiological Health Branch (808) 586-4700

April 1, 2019

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843
www.boardofwatersupply.com

RICK BLANGIARDI, MAYOR

BRYAN P. ANDAYA, Chair
KAPUA SPROAT, Vice Chair
RAY C. SOON
MAX J. SWORD
NA'ALEHU ANTHONY

JADE T. BUTAY, Ex-Officio
ROGER BABCOCK, Jr., Ex-Officio

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

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

December 7, 2021

Mr. Aaron Nadig
Island Team Manager
Pacific Island Fish and Wildlife Office
U.S. Fish and Wildlife Service
300 Ala Moana Boulevard., Room 3-122
Honolulu, Hawaii 96850

Dear Mr. Nadig:

Subject: Your letter of December 1, 2021 on the Species List for the Draft Environmental Assessment for the Manoa Well II Exploratory Well, Tax Map Key: 2-9-054: 033, Honolulu, Hawaii, Reference: 01EPIF00-2022-TA-0083

Thank you for your letter of December 1, 2021 in response to our inquiry regarding the presence of federally listed and proposed endangered or threatened species and critical habitat in the vicinity of the subject project. We acknowledge that the following federally endangered/threatened animals may transit through the vicinity of the project area:

1. Hawaiian hoary bat (Lasiurus cinereus semotus)
2. Band-rumped storm-petrel Hawai'i (Oceanodroma castro)
3. Hawaiian petrel (Pterodroma sandwichensis)
4. Newell's shearwater (Puffinus auricularis newelli)
5. Wedge-tailed shearwater (Ardenna pacificus)

No federally endangered or threatened avian and mammalian resources were observed during the biological survey for this project. However, methods to detect the Hawaiian hoary bat were not employed, so measures to avoid and minimize the impact to the Hawaiian hoary bat will be discussed in the Environmental Assessment.

If you have any questions, please contact Rian Adachi, Long-Range Planning Branch of our Water Resources Division at (808) 748-5943 or email at radachi@hbws.org.

Very Truly Yours,

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

cc: Howard K. Endo, Ph.D., SEY Engineers

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:
01EPIF00-2022-TA-0083

December 1, 2021

Mr. Howard Endo
Shimabukuro, Endo & Yoshizaki, Inc
1126 12th Avenue, Room 309
Honolulu, Hawai‘i 96816

Subject: Technical Assistance Regarding the Draft Environmental Assessment for the Mānoa II Exploratory Well Project, TMK [1] 2-9-054: 033, O‘ahu

Dear Mr. Endo:

Thank you for your recent correspondence requesting technical assistance on species biology, habitat, or life requisite requirements. The Pacific Islands Fish and Wildlife Office (PIFWO) of the U.S. Fish and Wildlife Service (Service) appreciates your efforts to avoid or minimize effects to protected species associated with your proposed actions. We provide the following information for your consideration under the authorities of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 *et seq.*), as amended.

Due to significant workload constraints, PIFWO is currently unable to specifically address your information request. The table below lists the protected species most likely to be encountered by projects implemented within the Hawaiian Islands. Based on your project location and description, we have noted the species most likely to occur within the vicinity of the project area, in the ‘**Occurs In or Near Project Area’** column. Please note this list is not comprehensive and should only be used for general guidance. We have added to the PIFWO website, located at https://www.fws.gov/pacificislands/promo.cfm?id=177175840 recommended conservation measures intended to avoid or minimize adverse effects to these federally protected species and best management practices to minimize and avoid sedimentation and erosion impacts to water quality. If your project occurs on the island of Hawai‘i, we have also enclosed our biosecurity protocol for activities in or near natural areas.

If you are representing a federal action agency, please request an official species list following the instructions at our PIFWO website https://www.fws.gov/pacificislands/articles.cfm?id=149489558. You can find out if your project occurs in or near designated critical habitat here: https://ecos.fws.gov/ipac/.

Under section 7 of the ESA, it is the Federal agency's (or their non-Federal designee) responsibility to make the determination of whether or not the proposed project "may affect" federally listed species or designated critical habitat. A "may affect, not likely to adversely affect" determination is appropriate when effects to federally listed species are expected to be discountable (i.e., unlikely to occur), insignificant (minimal in size), or completely beneficial. This conclusion requires written concurrence from the Service. If a "may affect, likely to adversely affect" determination is made, then the Federal agency must initiate formal consultation with the Service. Projects that are determined to have "no effect" on federally listed species and/or critical habitat do not require additional coordination or consultation.

Implementing the avoidance, minimization, or conservation measures for the species that may occur in your project area will normally enable you to make a "may affect, not likely to adversely affect" determination for your project. If it is determined that the proposed project may affect federally listed species, we recommend you contact our office early in the planning process so that we may assist you with the ESA compliance. If the proposed project is funded, authorized, or permitted by a Federal agency, then that agency should consult with us pursuant to section 7(a)(2) of the ESA. If no Federal agency is involved with the proposed project, the applicant should apply for an incidental take permit under section 10(a)(1)(B) of the ESA. A section 10 permit application must include a habitat conservation plan that identifies the effects of the action on listed species and their habitats and defines measures to minimize and mitigate those adverse effects.

We appreciate your efforts to conserve endangered species. We regret that we cannot provide you with more specific protected species information for your project site. If you have questions that are not answered by the information on our website, you can contact PIFWO at (808) 792-9400 and ask to speak to the lead biologist for the island where your project is located.

Sincerely,

AARON NADIG

Digitally signed by AARON NADIG
Date: 2021.12.01 14:31:16 -10'00'

Island Team Manager
Pacific Islands Fish and Wildlife Office

Enclosures (2)

The table below lists the protected species most likely to be encountered by projects implemented within the Hawaiian Islands. For your guidance, we have marked species that may occur in the vicinity of your project, this list is not comprehensive and should only be used for general guidance.

Enclosure 1. Federal Status of Animal Species

Scientific Name	**Common Name / Hawaiian Name**	**Federal Status**	**May Occur In Project Area**
Mammals			
Lasiurus cinereus semotus	Hawaiian hoary bat/‘ōpe‘ape‘a	E	☒
Reptiles			
Chelonia mydas	green sea turtle/honu - Central North Pacific distinct population segment (DPS)	T	☐
Eretmochelys imbricata	hawksbill sea turtle/ honu ‘ea or ‘ea	E	☐
Birds			
Anas wyvilliana	Hawaiian duck/koloa	E	☐
Branta sandvicensis	Hawaiian goose/nēnē	T	☐
Fulica alai	Hawaiian coot/‘alae ke‘oke‘o	E	☐
Gallinula galeata sandvicensis	Hawaiian gallinule/‘alae ‘ula	E	☐
Himantopus mexicanus knudseni	Hawaiian stilt/ae‘o	E	☐
Oceanodroma castro	band-rumped storm-petrel Hawai‘i DPS/‘akē‘akē	E	☒
Pterodroma sandwichensis	Hawaiian petrel/‘ua‘u	E	☒
Puffinus auricularis newelli	Newell’s shearwater/‘a‘o	T	☒
Ardenna pacificus	wedge-tailed shearwater/‘ua‘u kani	MBTA	☒
Buteo solitarius	Hawaiian hawk/‘io	MBTA	☐
Gygis alba	white tern/manu-o-kū	MBTA	☐
Insects			
Manduca blackburni	Blackburn’s sphinx moth	E	☐
Megalagrion pacificum	Pacific Hawaiian damselfly	E	☐
Megalagrion xanthomelas	orangeblack Hawaiian damselfly	E	☐
Megalagrion nigrohamatum nigrolineatum	blackline Hawaiian damselfly	E	☐

Enclosure 2. Federal Status of Plant Species

Plants				
Scientific Name	**Common Name or Hawaiian Name**	**Federal Status**	**Locations**	**May Occur In Project Area**
Abutilon menziesii	koʻoloaʻula	E	O, L, M, H	☐
Achyranthes splendens var. *rotundata*	ʻewa hinahina	E	O	☐
Bonamia menziesii	no common name	E	K, O, L, M, H	☐
Canavalia pubescens	ʻāwikiwiki	E	Ni, K, L, M	☐
Colubrina oppositifolia	kauila	E	O, M, H	☐
Cyperus trachysanthos	puʻukaʻa	E	K, O	☐
Gouania hillebrandii	no common name	E	Mo, M	☐
Hibiscus brackenridgei	maʻo hau hele	E	O, Mo, L, M, H	☐
Ischaemum byrone	Hilo ischaemum	E	K, O, Mo, M, H	☐
Isodendrion pyrifolium	wahine noho kula	E	O, H	☐
Marsilea villosa	ʻihiʻihi	E	Ni, O, Mo	☐
Mezoneuron kavaiense	uhiuhi	E	O, H	☐
Nothocestrum breviflorum	ʻaiea	E	H	☐
Panicum fauriei var. *carteri*	Carter's panicgrass	E	Molokini Islet (O), Mo	☐
Panicum niihauense	lauʻehu	E	K	☐
Peucedanum sandwicense	makou	E	K, O, Mo, M	☐
Pleomele (Chrysodracon) hawaiiensis	halapepe	E	H	☐
Portulaca sclerocarpa	ʻihi	E	L, H	☐
Portulaca villosa	ʻihi	E	Le, Ka, Ni, O, Mo, M, L, H, Nihoa	☐
Pritchardia affinis (maideniana)	loulu	E	H	☐
Pseudognaphalium sandwicensium var. *molokaiense*	ʻenaʻena	E	Mo, M	☐
Scaevola coriacea	dwarf naupaka	E	Mo, M	☐
Schenkia (*Centaurium*) *sebaeoides*	ʻāwiwi	E	K, O, Mo, L, M	☐
Sesbania tomentosa	ʻōhai	E	Ni, Ka, K, O, Mo, M, L, H, Necker, Nihoa	☐
Tetramolopium rockii	no common name	T	Mo	☐
Vigna o-wahuensis	no common name	E	Mo, M, L, H, Ka	☐

Location key: O=Oʻahu, K=Kauaʻi, M=Maui, H=island of Hawaiʻi, L=Lānaʻi, Mo=Molokaʻi, Ka=Kahoʻolawe, Ni=Niʻihau, Le=Lehua

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843
www.boardofwatersupply.com

RICK BLANGIARDI, MAYOR

BRYAN P. ANDAYA, Chair
KAPUA SPROAT, Vice Chair
RAY C. SOON
MAX J. SWORD
NA'ALEHU ANTHONY

JADE T. BUTAY, Ex-Officio
ROGER BABCOCK, Jr., Ex-Officio

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

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

December 10, 2021

TO: ALEX KOZLOV, P.E., DIRECTOR
DEPARTMENT OF DESIGN AND CONSTRUCTION

FROM: ERNEST Y. W. LAU, P.E., MANAGER AND CHIEF ENGINEER

SUBJECT: YOUR LETTER DATED DECEMBER 2, 2021 REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT FOR THE MANOA WELL II EXPLORATORY WELL, TAX MAP KEY: 2-9-054-033, HONOLULU, HAWAII

Thank you for your comments of December 2, 2021 regarding the Draft Environmental Assessment for the Manoa Well II Exploratory Well Project.

We acknowledge that the Department of Design and Construction has no comments or concerns regarding the project at this time.

If you have any questions, please contact Rian Adachi, Long-Range Planning of our Water Resources Division at (808) 748-5943 or email at radachi@hbws.org.

cc: Howard K. Endo, Ph.D., SEY Engineers

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 11TH FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8480 • Fax: (808) 768-4567
Web site: www.honolulu.gov

RICK BLANGIARDI
MAYOR

ALEX KOZLOV, P.E.
DIRECTOR

HAKU MILLES, P.E.
DEPUTY DIRECTOR

December 2, 2021

Shimabukuro, Endo & Yoshizaki, Inc.
1126 12th Avenue, Room 309
Honolulu, Hawaii 96816-3715

Attn: Howard K. Endo

Subject: Draft Environmental Assessment for Manoa Well II Exploratory Well
TMK: 2-9-054:033
Honolulu, Island of Oahu, Hawaii

Dear Mr. Endo:

Thank you for the opportunity to review and comment. The Department of Design and Construction has no comments to offer at this time.

Should you have any further questions, please contact me at (808) 768-8480.

Sincerely,

for Alex Kozlov, P.E.
Director

AK:krn (867346)

cc: Office of Planning and Sustainable Development
Rian Adachi, Board of Water Supply

APPENDIX C

BIOLOGICAL SURVEY FOR BWS MANOA WELL II ON TMK: 2-9-0554:033, HONOLULU, HAWAII

AECOS No. 1549

Biological survey for BWS Mānoa Well II on TMK: 2-9-054:033, Honolulu, Hawaiʻi

Prepared by:

AECOS, Inc.
45-939 Kamehameha Hwy, Suite 104
Kāneʻohe, Hawaiʻi 96744-3221

August 8, 2018

Biological survey for BWS Mānoa Well II on TMK: 2-9-054:033, Honolulu, Hawaiʻi

August 8, 2018 | ***Draft*** | *AECOS* No. 1549

Susan Burr and Bryson Luke
AECOS, Inc.
45-939 Kamehameha Hwy, Suite 104
Kāneʼohe , Hawaiʼi 96744
Phone: (808) 234-7770 Fax: (808) 234-7775 Email: sburr@aecos.com

Introduction

The Mānoa Well II Exploratory Well project (herein the "Project") proposed by the City and County of Honolulu, Board of Water Supply (BWS) includes drilling, casing, and testing of a second well at the existing Mānoa Well II site in upper Mānoa Valley (Figure 1). *AECOS*, Inc. was contracted by SEY Engineers[1] to conduct a flora and fauna survey to document existing site conditions and evaluate potential impacts on the natural environment of the Project in support of an Environmental Assessment (EA).

Mānoa Valley is a large fluvial feature cut by Mānoa Stream and its tributaries on the south slope of the Koʻolau mountain range. Annual rainfall in this upper part of Mānoa Valley is around 3900 mm (154 in; Giambelluca et al., 2013), being one of the wettest places on Oʻahu. Mānoa Well II is located within the Honolulu Watershed Forest Reserve, an area regarded as important for rain catchment and, therefore, future development is restricted.

Survey Methods

Flora Survey

The botanical survey was conducted on July 19, 2018. Our survey methodology entailed walking multiple "transects" across parcel TMK: 2-9-054:033 (the survey area) to achieve coverage sufficient to discover the presence of any

[1] Report prepared for SEY Engineers for environmental entitlements and will become part of the public record for the Project.

biological resources of interest or concern. The biologists noted names and relative abundances of ferns, fern allies, gymnosperms, and flowering plants encountered on the parcel. Field notes were translated into a flora listing. Plant names 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 crop and ornamental plants. Some names have been updated to reflect recent taxonomic or nomenclatural changes as presented in Imada (2012).

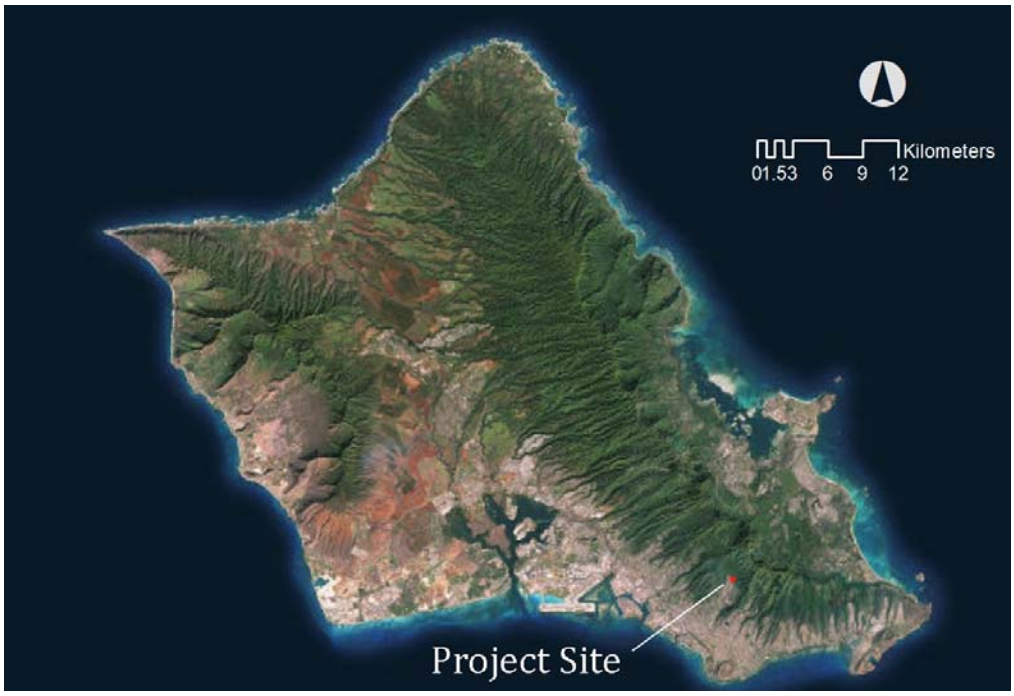


Figure 1. Project location (in red) in Mānoa Valley on Island of O'ahu.

Avifauna Survey

An avian survey was conducted during the morning (when birds are most active) of July 19 and consisted of two point-count stations. Station locations (shown in Figure 2) were selected in representative environments within the survey area in order to maximize the likelihood of observing a full range of bird species utilizing the area. Weather conditions during the survey were ideal, with no rain, unlimited visibility, and light winds from the northeast. At each point-count station, all birds observed and/or heard during a 6-minute period

were identified to species and counted. Bird species not observed during stationary point-counts but observed at other times of the survey were noted as incidental observations. Avian phylogenetic order and nomenclature follows the Checklist of North and Middle American Birds by American Ornithological Society (AOS, 2018).

Figure 2. Survey area (outlined in red)
showing avian point-count station locations in light blue.

Mammal Survey

AECOS biologists compiled a list of terrestrial mammal species observed in the survey area as they conducted botanical and avian surveys. Visual observations of tracks, scat, and other sign indicating mammals using the survey area were noted.

Survey Results

Vegetation

The fenced portion of the parcel surrounding the existing well site and a reservoir is maintained largely free of plants (see cover photo). A wet mesic forest, consisting of introduced species, occupies most of the remaining parcel (Figure 3). The southeastern corner of the parcel is currently under cultivation, and an abandoned house surrounded by persisting ornamentals is located just northeast of the existing reservoir.

Figure 3. Typical wet mesic forest that surrounds the reservoir.

The northern portion of the parcel is occupied by a monotypic stand of golden bamboo (*Phyllostachys aurea*) and other forested portions of the parcel are dominated by *Macaranga tanarius* with an understory of *Heliconia bihai*. Various heliconias, gardenias, and edible food crops are being cultivated to the southeast of the reservoir. An abandoned house (Figure 4) and farm plot are largely overgrown with various gingers, typical ornamental houseplants, and Australian tree fern (*Sphaeropteris cooperi*), Here, the overstory is also *Macaranga tanarius*.

Flora

A listing of all vascular plants observed in the survey area is presented as Table 1. A total of one conifer, three ferns, and 68 flowering plants were recorded in the survey area. Of these 72 species, only one (1%)—*Cyperus polystachyos*—is native to the Hawaiian Islands and three (4%) are regarded as early Polynesian introductions (so-called "canoe plants"): breadfruit or *ʻulu* (*Artocarpius atlis*), banana (*Musa* x*paradisiaca*) and *ki* or ti plant (*Cordyline fruticosa*). The remaining species (94%) are naturalized species (introduced species growing and spreading on their own) or are persisting or escaped ornamentals.

Table 1. List of plants found in the Mānoa Wells II Station survey area.

FAMILY SPECIES	Common Name	Status	Abund.	Notes
	PINOPSIDA ~ CONIFERS			
CUPRESSACEAE				
Thuja sp.	cedar	Orn	R	<4>
	PTERIDOPHYTES ~ FERNS			
CYATHEACEAE				
Sphaeropteris cooperi (Hook. Ex F. Muell.) R. M. Tryon	Australian tree fern	Nat	U	<3>
POLYPODIACEAE				
Phymatosorus grossus (Langsd. & Fisch.) Brownlie	*lauaʻe*	Nat	R	
THELYPTERIDACEAE				
Christella dentata (Forssk.) Brownsey & Jermy	*paiʻiʻihā*	Nat	U	

Table 1 (continued).

FAMILY SPECIES	Common Name	Status	Abund.	Notes
	FLOWERING PLANTS DICOTYLEDONE			
APOCYNACEAE				
Plumeria rubra L.	plumeria	Orn	R	<1>
ARALIACEAE				
Schefflera actinophylla (Endl.) Harms.	octopus tree	Nat	O	
ASTERACEAE				
Ageratum conyzoides L.	*maile hohono*	Nat	C	
Bidens alba (L.) DC.	--	Nat	R	<1>
Bidens pilosa (L.)	*kī*	Nat	O	<1>
Sphagneticola trilobata (L.) Pruski	wedelia	Nat	O	<1>
BEGONIACEAE				
Begonia hirtella Link	--	Nat	O	
BIGNONIACEAE				
Spathodea campanulata P. Beauv.	African tulip	Nat	U	
BRASSICACEAE				
Cardamine flexuosa With.	---	Nat	R	<1>
CECROPIACEAE				
Cecropia obtusifolia Bertol.	guarumo	Nat	O	
CONVOLVULACEAE				
Ipomoea obscura (L.) Sweet	---	Nat	C	
Ipomoea triloba L.	little bell	Nat	U	<2>
CUCURBITACEAE				
Cucurbita maxima Duchesne	squash	Orn	--	<3>
Momordica charantia L.	balsam pear	Nat	O	
Coccinia grandis (L.) Voigt	scarlet-fruited gourd	Nat	U	
EUPHORBIACEAE				
Codiaeum variegatum (L.) Bl.	croton	Orn	R	<1>
Euphorbia heterophylla L.	*kaliko*	Nat	U	<1>
Euphorbia hirta L.	garden spurge	Nat	U	<2>
Euphorbia prostrata Aiton	prostrate spurge	Nat	U	<1>
Macaranga tanarius (L.) Müll. Arg.	---	Nat	AA	
Phyllanthus debilis Klein ex Willd.	niuri	Nat	O	<1>
FABACEAE				
Chamaecrista nictitans (L.) Moench	partridge pea	Nat	U	<1>
Falcataria moluccana (Miq.) Barneby & J.W. Grimes	Moluccan albizia	Nat	O	
MELASTOMATACEAE				
Clidemia hirta (L.) D. Don	Koster's curse	Nat	U	
MORACEAE				
Artocarpus altilis (Parkinson) Fosberg	*'ulu*, breadfruit	**Pol**	R	<3>
Ficus microcarpa L. fil.	Chinese banyan	Nat	U	

Table 1 (continued).

FAMILY SPECIES	Common Name	Status	Abund.	Notes
MYRSINACEAE				
Ardisia elliptica Thunb.	shoebutton ardesia	Nat	O	
RUBIACEAE				
Gardenia sp.	gardenia	Orn	--	<2>
Paederia foetida L.	*maile pilau*	Nat	O	
RUTACEAE				
Citrus maxima (J. Burm.) Merr.	pummelo	Orn	R	<3>
SAPINDACEAE				
Litchi chinensis Sonn.	lychee	Orn	R	<3>
SOLANACEAE				
Capsicum annuum L.	chili pepper	Orn	--	<2>
URTICACEAE				
Pilea microphylla (L.) Liebm.	artillery plant	Nat	U	
VERBENACEAE				
Citharexylum caudatum L.	fiddlewood	Nat	R	
Clerodendrum macrostegium Schauer	velvetleaf glorybower	Nat	R	<3>
	FLOWERING PLANTS			
	MONOCOTYLEDONE			
AGAVACEAE				
Cordyline fruticosa (L.) A. Chev.	*ki*, ti	**Pol**	U	
Dracaena fragrans (L.) Ker Gawl.	"corn" plant	Orn	R	<1>
ARACEAE				
Alocasia cucullata (Lour.) G. Don	Chinese taro	Orn	R	<1>
Dieffenbachia maculata (N. Jacq.) Schott	dumb cane	Orn	O	<3>
Philodendron bipinnatifidum Schott ex Endl.	selloum	Orn	R	<1>
Philodendron cordatum (Vellozo) Kunth.	heart leaf philodendron	Nat	R	<3>
Syngonium sp.	nephthys	Nat	O	
Xanthosoma robustum Schott	*'ape*	Nat	R	<1>
ARECACEAE				
Dypsis lutescens (H. Wendl.) Beentje & J. Drans.	golden-fruited palm	Orn	O	<3>
Roystonea regia (Kunth) O.F. Cook	royal palm	Orn	R	<3>
CARYOPHYLLACEAE				
Drymaria cordata (L.) Willd. Ex Schult. var. *pacifica* Mizush	*pilipili*	Nat	R	<1>
COSTACEAE				
Costus speciosus (J. König) J. E. Smith	crepe ginger	Nat	C	

Table 1 (continued).

FAMILY SPECIES	Common Name	Status	Abund.	Notes
CYPERACEAE				
Cyperus involucratus Rottb.	umbrella sedge	Nat	R	<1>
Cyperus polystachyos Rottb.	---	**Ind**	O	
Kyllinga brevifolia Rottb.	*kiliʻoʻopu*	Nat	R	<1>
Kyllinga nemoralis (Forst.) Dandy ex Hutch. & Dalz.	*kiliʻoʻopu*	Nat	O	
HELICONIACEAE				
Heliconia psittacorum L. f.	rhizomatosa heliconia	Orn	U	
Heliconia bihai (L.) L.	lobster claw	Nat	A	
MUSACEAE				
Musa x*paradisiaca* L.	banana	**Pol**	--	<2>
ORCHIDACEAE				
Spathoglottis plicata Blume	Philippine ground orchid	Nat	R	
POACEAE (GRAMINEAE)				
Axonopus compressa (Swartz) P. Beauv.	brd-lvd carpet grass	Nat	O	<1>
Cynodon dactylon (L.) Pers	Bermuda grass	Nat	O	<1>
Eleusine indica (L.) Gartn.	wiregrass	Nat	R	<1>
Eragrostis pectinacea (Michx.) Nees	Carolina lovegrass	Nat	R	
Paspalum conjugatum Bergius	Hilo grass	Nat	O	
Paspalum urvillei Steud.	Vasey grass	Nat	O	
Phyllostachys aurea A. & C. Rivière	golden bamboo	Nat	AA	
ZINGIBERACEAE				
unid. Zingiberaceae	ginger	Orn	U	<3>
Alpinia purpurata (Vieill.) K. Schum.	red ginger	Nat	O	
Etlingera elatior (Jack) R.M. Smith	torch ginger	Orn	O	<3>
Etlingera hemisphaerica (Blume) R.M. Smith	tulip torch ginger	Orn	O	<3>
Hedychium flavescens Roscoe	yellow ginger	Nat	O	<3>
Zingiber spectabile Griffith	golden beehive ginger	Orn	O	<3>

Legend to Table 1

Status categories:

Ind – Indigenous; native to the Hawaiian Islands and elsewhere.

Nat – Naturalized; exotic, plant introduced to the Hawaiian Islands since the arrival of the Cook Expedition in 1778, and well-established outside of cultivation.

Orn – Ornamental; a cultivated plant; a species not thought to be naturalized (spreading on its own) in Hawaiʻi.

Pol – Early Polynesian introduction; canoe plant.

Abundance categories:

R – Rare – seen in only one or perhaps two locations.

U - Uncommon – seen at most in several locations.

O - Occasional – seen with some regularity.

C - Common – observed numerous times during the survey.

A - Abundant – found in large numbers; may be locally dominant (AA).

Table 1 (continued).

Notes:

<1> - Species recorded only inside fence around reservoir/well site.
<2> - Species recorded only in area under cultivation. Relative abundance not recorded.
<3> - Species recorded only in abandoned house area.
<4> - Species lacking flowers or fruit and therefore identification uncertain.

Figure 4. Abandoned house overgrown mostly with persisting ornamentals.

Avian point count

During the two 6-minute avian point-count surveys, 127 individual birds of 15 species representing 12 families were identified (Table 2). No additional bird species were encountered outside of the point-count surveys, so no "incidental sightings" are listed. No native bird species were detected.

The species recorded during the survey are representative of those encountered

in forested lowland valleys of the southern Koʻoalu Mountains, although the density of birds is relatively high for the region. All bird species recorded are non-native introductions to Hawaiʻi. The three most common species observed were Rose-ringed Parakeet (*Psittacula krameria*), Japanese White-eye (*Zosterops japonicus*), and Red-vented Bulbul (*Pycnonotus cafer*), accounting for nearly one third (34%) of all the birds counted during the survey. Rose-ringed Parakeet was locally abundant because a resident flock roosts in an albizia (*Falcataria moluccana*) tree in the Project vicinity. The population of Rose-ringed Parakeet are on the rise on Oʻahu and Kauaʻi (Pyle and Pyle, 2017), and are now listed as Hawaiian Injurious Wildlife under Hawaiʻi Administrative Rule (HAR) 13-124 Exhibit 5 due to their capacity for causing agricultural harm.

Table 2. Avian species detected in the survey area on July 19, 2018.

ORDER FAMILY *Species*	Common name	Status	Station 1	Station 2	***RA*†**
GALLIFORMES					
PHASIANIDAE – Pheasants & Partridges					
Gallus gallus Linnaeus	domestic chicken	NN	3	6	7.1
COLUMBIDAE – Pigeons & Doves					
Geopelia striata Linnaeus	Zebra Dove	NN	8	1	7.1
Streptopelia chinensis Scopoli	Spotted Dove	NN	5	4	7.1
PSITTACIFORMES					
PSITTACIDAE - Parrots					
Psittacula krameri Scopoli	Rose-ringed Parakeet	NN	12	4	12.6
PASSERIFORMES					
ESTRILDIDAE – Estrildid Finches					
Lonchura atricapilla Vieillot	Chestnut Munia	NN	8	-	6.3
FRINGILLIDAE - Finches					
Haemorhous mexicanus Muller*	House Finch	NN	1	-	0.8
LEIOTRICHIDAE - Laughingthrushes					
Garrulax canorus Linnaeus	Chinese Hwamei	NN	-	1	0.8
Leiothrix lutea Scopoli	Red-billed Leiothrix	NN	5	3	6.3
MUSCICAPIDAE – Old World Flycatchers					
Copsychus malabaricus Scopoli	White-rumped Shama Thrush	NN	3	8	8.7

Table 2 (continued).

ORDER FAMILY *Species*	Common name	Status	Station 1	Station 2	***RA*†**
PASSERIDAE - Sparrows					
Passer domesticus Linnaeus	House Sparrow	NN	2	-	1.6
PYCNONOTIDAE - Bulbuls					
Pycnonotus cafer Linnaeus	Red-vented Bulbul	NN	11	2	10.2
Pycnonotus jocosus Linnaeus	Red-whiskered Bulbul	NN	4	4	6.3
STURNIDAE - Starlings					
Acridotheres tristis Linnaeus	Common Myna	NN	8	3	8.7
THRAUPIDAE - Tanagers					
Paroaria coronata Miller	Red-crested Cardinal	NN	6	-	4.7
ZOSTEROPIDAE - White-eyes					
Zosterops japonicus Temminck	Japanese White-eye	NN	9	6	11.8

Legend to Table 2

† Relative Abundance (**RA**) – Number of birds detected divided by the number of count stations (2).

* Species protected by Migratory Bird Treaty Act (MBTA).

Status categories:

Non-native (NN) species introduced to Hawaiʻi by humans intentionally or accidentally.

Mammalian survey

Domesticated animals are common in the Project vicinity, which is adjacent to residences. During our survey, the biologists observed a cat (*Felis catus*) in the survey area and heard a domestic dog (*Canis lupus familiaris*) barking. Feral pigs are in the area and it is certainly possible that one or all of the four naturalized rodents (Family Muridae) in the Hawaiian Islands utilize the survey area.

Assessment

Botanical Resources

Botanical resources of interest or potential concern from a conservation perspective are valuable landscape trees, exceptional trees, and rare native species. None of these occurs in the survey area. No plants proposed or listed as endangered or threatened under the federal Endangered Species Act of 1973

(ESA) as amended, or the State of Hawaiʻi endangered species statute, Hawaiʻi Revised Statutes (HRS) 195D (USFWS, nd; HDLNR, 1998) were observed. For plants, state listing follows the federal listing. The trees in the area do not have landscape value and no trees listed by the City and County of Honolulu, Exceptional Trees program (CCH, 2016) occur here.

Clearing of the area to facilitate drilling, casing, and testing of a second well will not have a negative impact on botanical resource of the area and can even have the positive impact of eliminating a portion of the golden bamboo stand and problematic trees such as Moluccan albizia. Once cleared, if it does not need to remain unvegetated, the area could be replanted with native, mesic forest species such as *hapuʻu* (*Cibotium* spp.), *ʻōhiʻa* (*Metrosideros polymorpha*), *lama* (*Diospyros sandwicensis*), *hala* (*Pandanus tectorius*), and *koa* (*Acacia koa*). A rapid growing alternative would be native *kou* (*Cordia subcordata*).

Avian Resources

All the species encountered in the Survey area are naturalized, urban dwelling birds. The Spotted Dove, Red-vented Bulbul, Japanese White-eye, Common Myna, and Rose-ringed Parakeet are all listed as injurious species—animals known to be harmful to agriculture, aquaculture, indigenous wildlife or plants, or constitute a nuisance or health hazard (HDLNR, 2015). No species listed as federally endangered or threatened species (USFWS, n.d.) are present. House Finch is the only species observed in the Project area protected under the Migratory Bird Treaty Act, but it is a naturalized, non-native introduced species in Hawaiʻi. The Project will not adversely impact avian resources extant in the Project vicinity.

Mammalian Resources

No mammalian species currently protected or proposed for protection under either the federal or State of Hawaiʻi endangered species programs were observed during the course of this survey (USFWS; n.d.; HDLNR, 2015); however, methods to detect Hawaiian hoary bat or *ʻōpeʻapeʻa* (*Lasiurus cinereus semotus*) were not employed, requiring special equipment deployed at night. Even if this species is present in the Project area, adverse impacts to Hawaiian hoary bat can be minimized or avoided by not clearing woody vegetation taller than 5 m (15 ft) during the pupping season (USFWS, 1998).

Hawaiian hoary bat roosts in both native and introduced trees (USFWS, 1998). Individual bats can rapidly vacate trees that are being trimmed or felled, but females carrying flightless pups are less able to vacate a roost tree. Trimming and felling trees taller than 5 m (15 ft) should not occur during the pupping

season (June 1 to September 15) to avoid incidental take of this species. Use of barbed wire on tops of fences should be avoided to prevent entanglement by bats.

Critical Habitat

Manoa Well II is not designated as Critical Habitat for any species (USFWS, 2018b). Thus the modification of the habitat on all or any part of the site will not result in impacts to federally designated Critical Habitat. No equivalent statute exists under state law. Critical habitat for the State- and Federal-listed (65 FR 20769; 66 FR 63752-63782) endangered Oʻahu *ʻElepaio* (*Chasiempis ibidis*) occurs approximately 0.4 km (0.25 mi) *mauka* of the Project site, but no *ʻElepaio* were observed during the survey.

References

American Ornithological Society (AOS). 2018. American Ornithological Society. Updated Check-list of Birds of North and Middle America. Available online at URL: http://checklist.aou.org/; last accessed on July 23, 2018.

City and County of Honolulu (CCH). 2017. A bill for an ordinance relating to exceptional trees. Bill 84 (2104), CD1: 25 pp.

Giambelluca, T. W., Q. Chen, A.G. Frazier, J.P. Price, Y.-L. Chen, P.-S. Chu, J.K. Eischeid, and D.M. Delparte. 2013: Online Rainfall Atlas of Hawaiʻi. *Bull. Amer. Meteor. Soc.* 94: 313-316, doi: 10.1175/BAMS-D-11-00228.1. Online at URL: http://rainfall.geography.hawaii.edu/; last accessed on July 23, 2018.

Hawaiʻi Department of Land and Natural Resources (HDLNR). 1998. Indigenous wildlife, endangered and threatened wildlife and plants, and introduced wild birds. Department of Land and Natural Resources. State of Hawaii. Administrative Rule §13-124-1 through §13-124-10, with exhibits, dated March 02, 1998.

_____. 2015. Hawaiʻi Administrative Rules, Title 13, Department of Land and Natural Resources, Subtitle 5 Forestry and Wildlife, Part 2 Wildlife, Chapter 124, Indigenous Wildlife, Endangered and Threatened Wildlife, Injurious Wildlife, Introduced Wild Birds, and Introduced Wildlife. February 17, 2015. 16 pp

Imada, C. 2012. Hawaiian Native and Naturalized Vascular Plants Checklist: December 2012 update. *Bishop Museum Technical Report* 60. Hawaiʻi Biological Survey No. 2012-021. 343 pp.

Palmer, D. D. 2003. *Hawai`i's ferns and fern allies*. University of Hawaii Press, Honolulu. 324 pp.

Staples, G. W. and D. R. Herbst. 2005. *A Tropical Garden Flora. Plants Cultivated in the Hawaiian Islands and other Tropical Places*. Bishop Museum, Honolulu. 908 pp.

U.S. Fish and Wildlife Service (USFWS). nd. Endangered and Threatened Wildlife and Plants. 50 CFR 17:11 and 17:12. Available online at URL: http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=HI&s8fid=112761032792&s8fid=112762573902; last accessed on July 30, 2018.

_____. 1998. Recovery Plan for the Hawaiian Hoary Bat (Lasiurus cinereus semotus). U.S. Fish and Wildlife Service, Region 1, Portland, OR. Available online at: https://ecos.fws.gov/docs/recovery_plans/1998/980511b.pdf; last accessed August 2, 2018.

_____. 2001. Endangered and Threatened Wildlife and Plants; Determination of Critical Habitat for the Oahu *Elepaio* (*Chasiempis sandwichensis ibidis*). 66 FR 63752 and 63782. Available online at URL: https://www.gpo.gov/fdsys/pkg/FR-2001-12-10/pdf/01-29475.pdf#page=2; last accessed August 2, 2018.

_____. 2018. Critical habitat for threatened and endangered species [USFWS]. Available online at URL: https://fws.maps.arcgis.com/home/webmap/viewer.html?useExisting=1; last accessed July 19, 2018.

Wagner, W. L., D. R. Herbst and S. H. Sohmer. 1990. *Manual of the Flowering Plants of Hawaiʻi: Volumes I and II*. Bishop Museum Special Publication 83. University of Hawaiʻi Press. 1853 pp.

_____ and _____. 1999. *Supplement to the Manual of the flowering plants of Hawaiʻi*, pp. 1855-1918. *In:* Wagner, W.L., D.R. Herbst, and S.H. Sohmer, Manual of the flowering plants of Hawaiʻi. Revised edition. 2 vols. University of Hawaii Press and B. P. Bishop Museum.

APPENDIX D

ARCHAEOLOGICAL LITERATURE REVIEW AND FIELD INSPECTION AND CULTURAL ASSESSMENT REPORT

Draft
Archaeological Literature Review and Field Inspection and Cultural Assessment Report for the Board of Water Supply Mānoa Wells II Exploratory Well Project, Mānoa Ahupuaʻa, Honolulu District, Oʻahu TMK: [1] 2-9-054:033

Prepared for
Shimabukuro, Endo & Yoshizaki, Inc. dba SEY Engineers
on behalf of the
City and County of Honolulu Board of Water Supply

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

Cultural Surveys Hawaiʻi, Inc.
Kailua, Hawaiʻi
(Job Code: MANOA 63)

July 2021

Oʻahu Office
P.O. Box 1114
Kailua, Hawaiʻi 96734
Ph.: (808) 262-9972
Fax: (808) 262-4950

www.culturalsurveys.com

Maui Office
1860 Main St.
Wailuku, Hawaiʻi 96793
Ph.: (808) 242-9882
Fax: (808) 244-1994

Management Summary

Reference	Archaeological Literature Review and Field Inspection and Cultural Assessment Report for the Board of Water Supply Mānoa Wells II Exploratory Well Project, Mānoa Ahupua‘a, Honolulu District, O‘ahu, TMK: [1] 2-9-054:033 (Shideler and Hammatt 2021)
Date	July 2021
Project Number(s)	Cultural Surveys Hawai‘i, Inc. (CSH) Job Code: MANOA 63
Investigation Permit Number	CSH completed the fieldwork component of this study under archaeological fieldwork permit number 18-15, issued by the Hawai‘i State Historic Preservation Division (SHPD) per Hawai‘i Administrative Rules (HAR) §13-282.
Agencies	SHPD; City and County of Honolulu Board of Water Supply (BWS)
Land Jurisdiction	BWS
Project Proponent	BWS
Project Funding	BWS
Project Location	The BWS Mānoa Wells II Exploratory Well project area is in the back of suburban Mānoa Valley in east central Honolulu and is accessed from a driveway off Loulu Street (TMK: [1] 2-9-054:033). The project area is depicted on a portion of the 1998 Honolulu U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle.
Project Description	The proposed project includes the drilling, casing, testing, and production of a second well at the BWS Mānoa Wells II Station.
Project Acreage	Approximately 2.1 acres (0.85 hectares)
Document Purpose	This investigation was designed—through detailed historical, cultural, and archaeological background research and a field inspection of the project area—to determine the likelihood that historic properties may be affected by the project and, based on findings, consider cultural resource management recommendations. This document is intended to facilitate the project’s planning and support the project’s historic preservation and environmental review compliance. This investigation does not fulfill the requirements of an archaeological inventory survey investigation, per HAR §13-276.
Fieldwork Effort	CSH archaeologists Scott Belluomini, B.A. and David Shideler, M.A., conducted fieldwork on 24 July 2018 under the general supervision of Principal Investigator Hallett H. Hammatt, Ph.D. This work required approximately 0.5 person-days to complete.
Results Summary	In general, ground visibility was good with denser ground cover in the east portion of the project area. The project area consists of the current Manoa Wells II site and an above ground water tank in the south portion of the project. The water tank likely dates to the construction of

	the neighborhood to the south and the Manoa Wells II structure has a plaque with the date “1987”. Surrounding the water tank is an asphalt paved roadway and fence that secures the current BWS structures. The cut slope on the northwest side of the structure is steep and appears to have been heavily modified. Vegetation in the upslope area consists of grasses and bamboo with some large albiza trees. There is no evidence of prior use on the surface in this area. In the north corner of the project area, the topography turns from gently sloping to steep near the project area’s northeast boundary. This appears to be the southwest slope of a drainage swale or natural gully. To the south of the gully is an earthen ditch that extends southwest-northeast and meets a drainage culvert crudely constructed of mortared basalt headwall and wingwalls and a corrugated metal pipe. The pipe appears to extend toward the northeast, however, the end of the pipe was not observed in the project area and the pipe may extend under Mānoa Road. The culvert’s headwall is approximately 1.5 m in length and the wingwalls slope upward and away from the headwall approximately 2.0 m northwest. This is likely for water control and drainage as opposed to agricultural purposes. No inscriptions were observed and the age of the culvert is unknown. To the south of the culvert is an abandoned house and associated infrastructure and trash. The one-story wooden structure with corrugated metal roof is partially collapsed. In the southwest corner of the project area, a garden is present. It is not clear who maintains the garden. The garden contains various plants such as varieties of heliconia (*Heliconiaceae*), Latundan banana (apple banana, *Musa sapientum*), gardenia (*Gardenia jasminoides*), papaya (*Carica papaya*), and *kabocha* (Japanese pumpkin; *Cucurbita maxima*). No evidence of pre-Contact and early post-Contact use of the project area was observed. Structures in the east corner of the project area first appear in the 1930s; however, there was no evidence of historic use observed in the north and northwest portions of the project area.
Cultural Assessment Summary	The closest Land Commission Awards (LCA) to the current project area remain clustered around Waihī Stream (see Figure 12), the closest being approximately 200 m (656 feet [ft]) to the east and southeast. This small cluster of LCA parcels is also separate from the densely inhabited portions of Mānoa Valley, where parcels are generally clustered further down valley around streams. The lack of LCAs in the project area and the upper Mānoa Valley, in general, suggests the project area was not a foci of traditional Hawaiian habitation or agriculture. The general absence of previously identified historic properties in the vicinity of the

	project area may also suggest this region was not commonly availed for resource extraction. While the upper Mānoa Valley, in general, holds a high degree of cultural significance, the proposed project should not have any impacts to significant *wahi pana* or cultural resources known to exist within the project area. Additionally, due to the absence of LCAs, sensitive soils, or previous finds within the project area, the likelihood of encountering either burials or other historic properties remains low.
Recommendations	Based on the archaeological background research and the field inspection, it is likely that the culvert and the collapsed house are not significant historic properties. There was no evidence of pre-Contact or early post-Contact agricultural use or habitation. It is likely that there is a low potential for subsurface historic properties in the project area. No further archaeological work is recommended. Through documentary research only, the cultural assessment found that there are no cultural or historical resources within the project area. This cultural assessment is intended to facilitate the project’s planning and support the project’s historic preservation and environmental review compliance.

Table of Contents

Management Summary ..... **i**

Section 1 Introduction **1**

1.1 Project Background 1
1.2 Document Purpose 1
1.3 Environmental Setting 1
1.3.1 Natural Environment 1
1.3.2 Built Environment 7

Section 2 Methods **8**

2.1 Field Methods 8
2.2 Research Methods 8

Section 3 Background Research **9**

3.1 Mānoa Place Names and *Wahi Pana* (Legendary Sites) 9
3.1.1 *Mo‘olelo* Associated with Rivers and Springs in Upper Mānoa Valley 11
3.1.2 Kāne and the Fish of Mānoa 18
3.1.3 *Mo‘olelo* Associated with Hills and Peaks in Upper Mānoa 18
3.1.4 Akāka and Kūmauna Peaks and the Princess of Mānoa, Kahalaopuna 20
3.1.5 Puka‘ōma‘o, or Puka‘ōma‘oma‘o and Ka‘ahumanu’s House 22
3.1.6 Interview with Maka Woolsey, Storied Places in West Mānoa Valley 27
3.2 Mānoa Historical Background 28
3.2.1 Mānoa Valley Description 28
3.2.2 Agriculture in Mānoa Valley 29
3.2.3 Early Ownership and Use of Mānoa Valley 31
3.2.4 Mid-Eighteenth Century and the Māhele 32
3.2.5 1900 to Present 32
3.2.6 Prominent Structures and Areas in Upper Mānoa 35
3.3 Previous Archaeological Research 48
3.3.1 McAllister 1933 48
3.3.2 Soehren 1963 48
3.3.3 Sterling and Summers 1978 55
3.3.4 Smith 1988 55
3.3.5 Fager and Graves 1992 55
3.3.6 Dixon 1993 55
3.3.7 O’Hare et al. 2010 55
3.3.8 Lee and Spear 2015 56
3.3.9 Hammatt and Shideler 2017 56
3.3.10 Groza and Hammatt 2018 56
3.4 Background Summary and Predictive Model 56

Section 4 Results of Fieldwork **58**

Section 5 Cultural Assessment **60**

5.1 Results of Background Research 60
5.2 Cultural Resources in the Vicinity of the Project Area 61
5.2.1 Archaeological Resources 61

5.2.2 Burials 61
5.2.3 Faunal Resources 61
5.2.4 Plant Resources 61
5.2.5 Trails 62
5.2.6 Wahi Pana 62
5.3 Conclusion 62

Section 6 Recommendations 63

Section 7 References Cited 64

List of Figures

Figure 1. Portion of the 1998 Honolulu USGS 7.5-minute topographic quadrangle showing the location of the project area 2
Figure 2. TMK [1] 2-9-054 showing the project area (Hawai‘i TMK Service 2014) 3
Figure 3. Aerial photograph showing the location of the project area (Google Earth 2013) 4
Figure 4. Overlay of *Soil Survey of the State of Hawaii* (Foote et al. 1972; USDA SSURGO 2001) on a 2013 Google Earth aerial photograph, indicating soil types within and surrounding the project area 6
Figure 5. 1929 photograph by Ray Jerome Baker on the Inter-Island Airway's amphibian plane, *Hawaii*, passing over Mānoa Valley (Original photograph at Hawai‘i State Archives; Baker 1929; reprinted in Van Dyke and Ronck 1982:214) 10
Figure 6. Trails leading up to the project area ca. 1810 (map by Gerald Ober; reprinted in ‘Ī‘ī 1959:93; not to scale), showing locations of some place names in Mānoa 12
Figure 7. Traced outline of 1882 Hawaiian Government Survey map by E.D. Baldwin, showing topographic points and traditional land units in Mānoa Valley 13
Figure 8. Early twentieth century photograph of waterfalls in the back of Mānoa Valley as seen from Kanānā (Original at Bernice Pauahi Bishop Museum n.d.; reprinted in Bouslog et al. 1994:4) 15
Figure 9. 1882 Baldwin map of Mānoa Valley showing the project area 24
Figure 10. 1855 LaPasse map of the South Coast of O‘ahu (portion), showing relationships of taro fields (rectangles) to the project area 30
Figure 11. 1847 Hawaiian Government Survey Metcalf map of Mānoa, surveyed by Theophilus Metcalf showing project area 33
Figure 12. Land Commission Awards near the project area shown on a 2011 USGS orthoimagery aerial photograph with hillshade 34
Figure 13. Early twentieth century photograph of checkerboard taro fields on the floor of Mānoa Valley just *makai* of the project area (Original photograph from Hawai‘i State Archives; reprinted in Bouslog et al. 1994:9) 36
Figure 14. 1919 U.S Army War Department fire control map (Honolulu quadrangle), showing unpaved roads (double dotted lines), cattle paddocks (dot and dashed lines), and scattered residences (black boxes) in upper Mānoa Valley (note several houses near the cross-country 12-inch water main portion of the project area) 37
Figure 15. 1933 U.S. Army War Department fire control map (Honolulu quadrangle); Mānoa Road has now been paved (double solid lines) up to the project area and the upper valley 38
Figure 16. 1943 U.S. Army War Department terrain map (Honolulu quadrangle), showing the still undeveloped nature of project area 39
Figure 17. Portion of 1959 Honolulu USGS topographic quadrangle; paved roads now extend into the west portion of the project area 40
Figure 18. Portion of 1969 Honolulu USGS topographic quadrangle, showing the final development of the paved roads (Pāwaina Street) of the project area 41
Figure 19. 1978 aerial photograph of upper Mānoa Valley (USGS Orthophoto), showing project area in undeveloped uplands above main residential area 42
Figure 20. Waioli Tea Room 1920s (Bouslog et al. 1994:101) 43

Figure 21. Robert Louis Stevenson Memorial Grass Shack (Wikipedia 2017).....43
Figure 22. Chinese Cemetery, section on east side of East Mānoa Road, view to the west (CSH photograph from O'Hare et al. 2010) 44
Figure 23. Lyon Arboretum 1920s (photograph from Wikimedia Commons; public domain).....44
Figure 24. Map showing locations mentioned in the battle at "The Pen" at the head of Mānoa Valley; this map is not to scale, so the location of the project area in relation to the Republican and rebel forces is approximate (map from Loomis 1976:165) 47
Figure 25. 1895 Rebellion line of march of Republican forces with cannon (Hawai‘i State Archives 1895).....49
Figure 26. Search for rebels at the head of Mānoa Valley (Grant 2000:168–169).....49
Figure 27. Portion of the 1998 Honolulu USGS 7.5-minute topographic quadrangle showing the project area and previous archaeological projects in Upper Mānoa 50
Figure 28. Location of previously identified historic properties (archaeological and historic sites) in the vicinity of the project area (base map: 1998 Honolulu USGS topographic quadrangle) 52
Figure 29. GPS track log showing coverage of one of two archaeologists during the field inspection (Base Map: Google Earth 2013).....59

List of Tables

Table 1. Previous archaeological studies in upper Mānoa Valley 51
Table 2. Previously identified archaeological historic properties near the project area 53
Table 3. Historic properties in Upper Mānoa listed on the HRHP and NRHP (see Figure 28 for locations).....54

Section 1 Introduction

1.1 Project Background

At the request of Shimabukuro, Endo & Yoshizaki, Inc. dba SEY Engineers and on behalf of the City and County of Honolulu Board of Water (BWS), Cultural Surveys Hawai‘i, Inc. (CSH) has prepared this literature review and field inspection (LRFI) and cultural assessment report for the Board of Water Supply Mānoa Wells II Exploratory Well project, Mānoa Ahupua‘a, Honolulu District, O‘ahu, TMK: [1] 2-9-054:033. The project area is in the back of suburban Mānoa Valley in east central Honolulu and is accessed from a driveway off Loulu Street. The project area is depicted on a portion of the 1998 U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle (Figure 1), a Tax Map Key (TMK) plat map [1] 2-9-054 (Figure 2), and a 2013 aerial photograph (Figure 3).

The proposed project includes the drilling, casing, testing, and production of a second well at the BWS Mānoa Wells II Station.

1.2 Document Purpose

This investigation was designed—through detailed historical, cultural, and archaeological background research and a field inspection of the project area—to determine the likelihood that historic properties may be affected by the project and, based on findings, consider cultural resource management recommendations. This document is intended to facilitate the project’s planning and support the project’s historic preservation and environmental review compliance. This investigation does not fulfill the requirements of an archaeological inventory survey investigation, per Hawai‘i Administrative Rules (HAR) §13-276.

1.3 Environmental Setting

1.3.1 Natural Environment

Mānoa Valley formed during the volcanic eruptions that formed the Ko‘olau Mountains starting about 10 million years ago. This volcanic activity and the following erosion caused amphitheater-headed, deep V-shaped valleys on the southeast coast of O‘ahu, which are separated by sharp, high ridges. The Ko‘olau volcano reactivated approximately 250,000 years ago, pouring lava into the valley. This eruption built up new cones, including Pu‘u ‘Ōhi‘a (Tantalus) in the upper valley and lower down, the smaller cones of Pu‘u Kākea (Sugar Loaf), Pu‘u ‘Ualaka‘a (Round Top), and Pu‘u o Mānoa (Rocky Hill). The erupted lava cascaded down the western ridge of Mānoa Valley. This shifted Mānoa Stream to the east side and partially filled in the V-shaped valley, giving it a more rounded U-shaped appearance (Bouslog et al. 1994:4–5).

The Mānoa sub-basin watershed covers 6,150 acres and includes 12 miles of streams. There are six named tributary streams in the upper valley that merge at an elevation of 400 feet into the main Mānoa Stream: ‘Aihualama, Waihī, Lua‘alaea, Nāniu‘apo, Wa‘aloa, and Waiakeakua. On some maps, portions of these streams have additional names.

Halfway down the center of the valley, the Sugar Loaf eruption has pushed the streambed to the extreme east of the valley. Before the construction of the Ala Wai Canal, the lower portion of the stream, called Kālia Stream, flowed in a westerly direction, then made a wide bend to the east

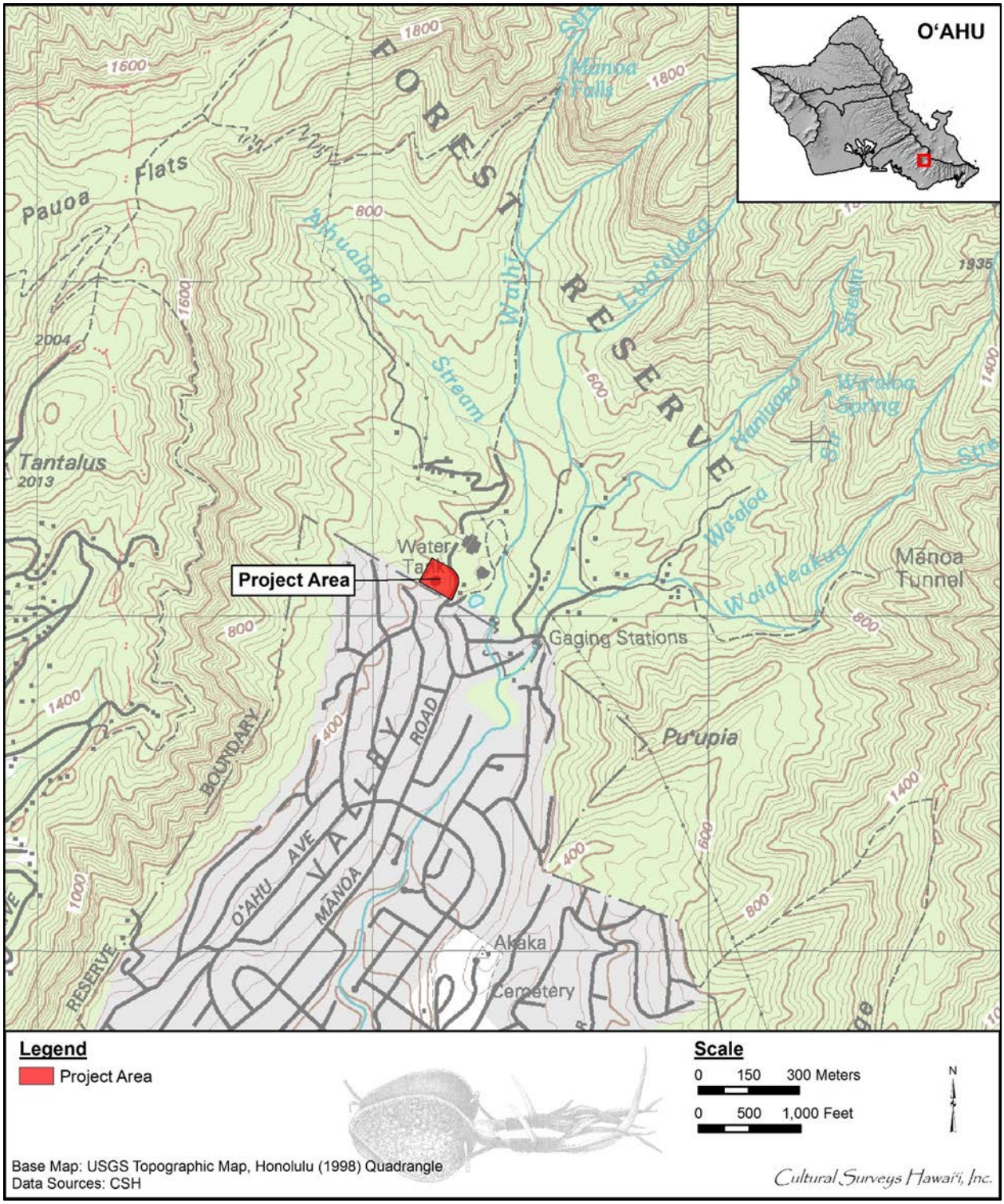


Figure 1. Portion of the 1998 Honolulu USGS 7.5-minute topographic quadrangle showing the location of the project area

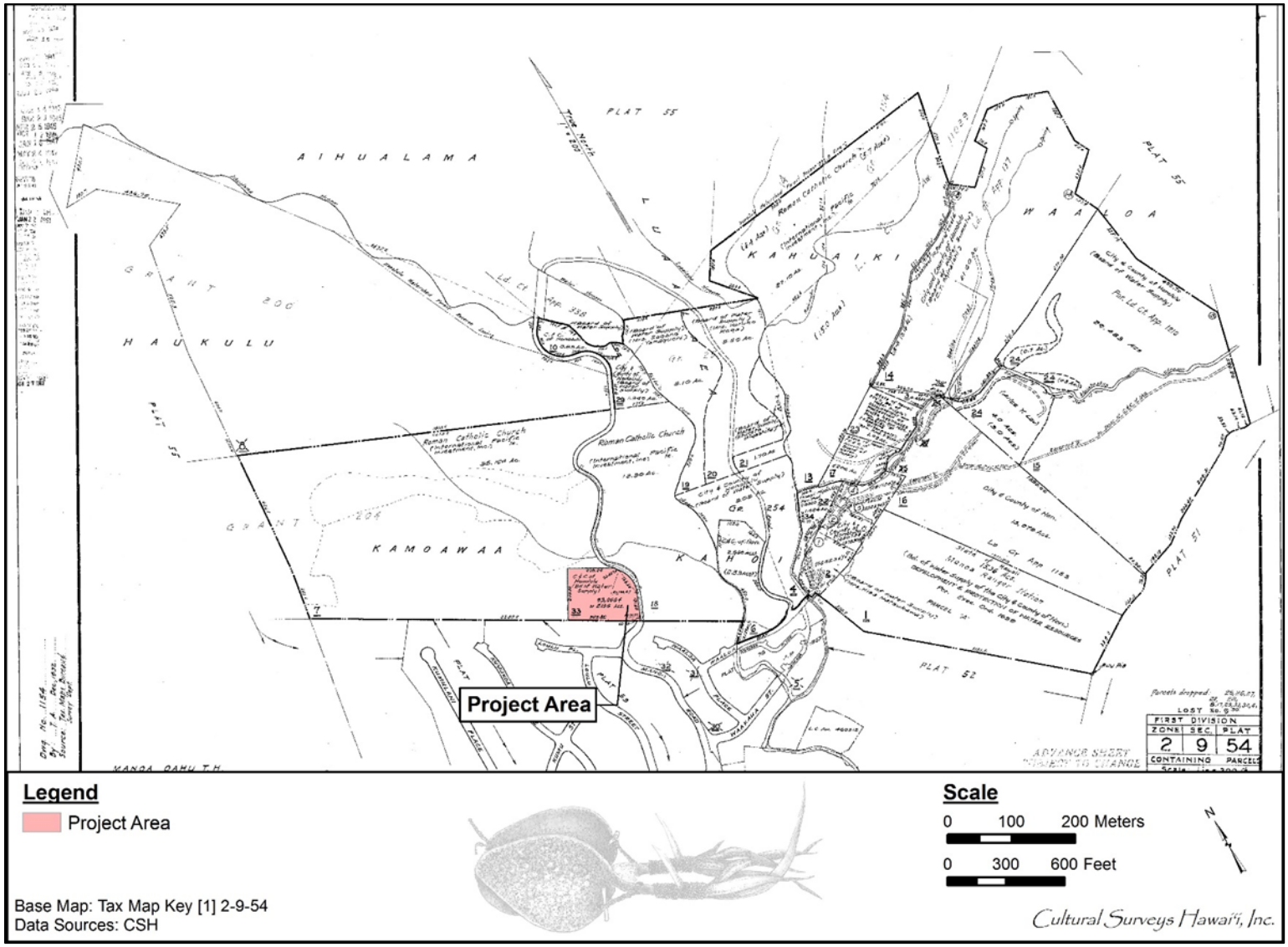


Figure 2. TMK [1] 2-9-054 showing the project area (Hawai‘i TMK Service 2014)

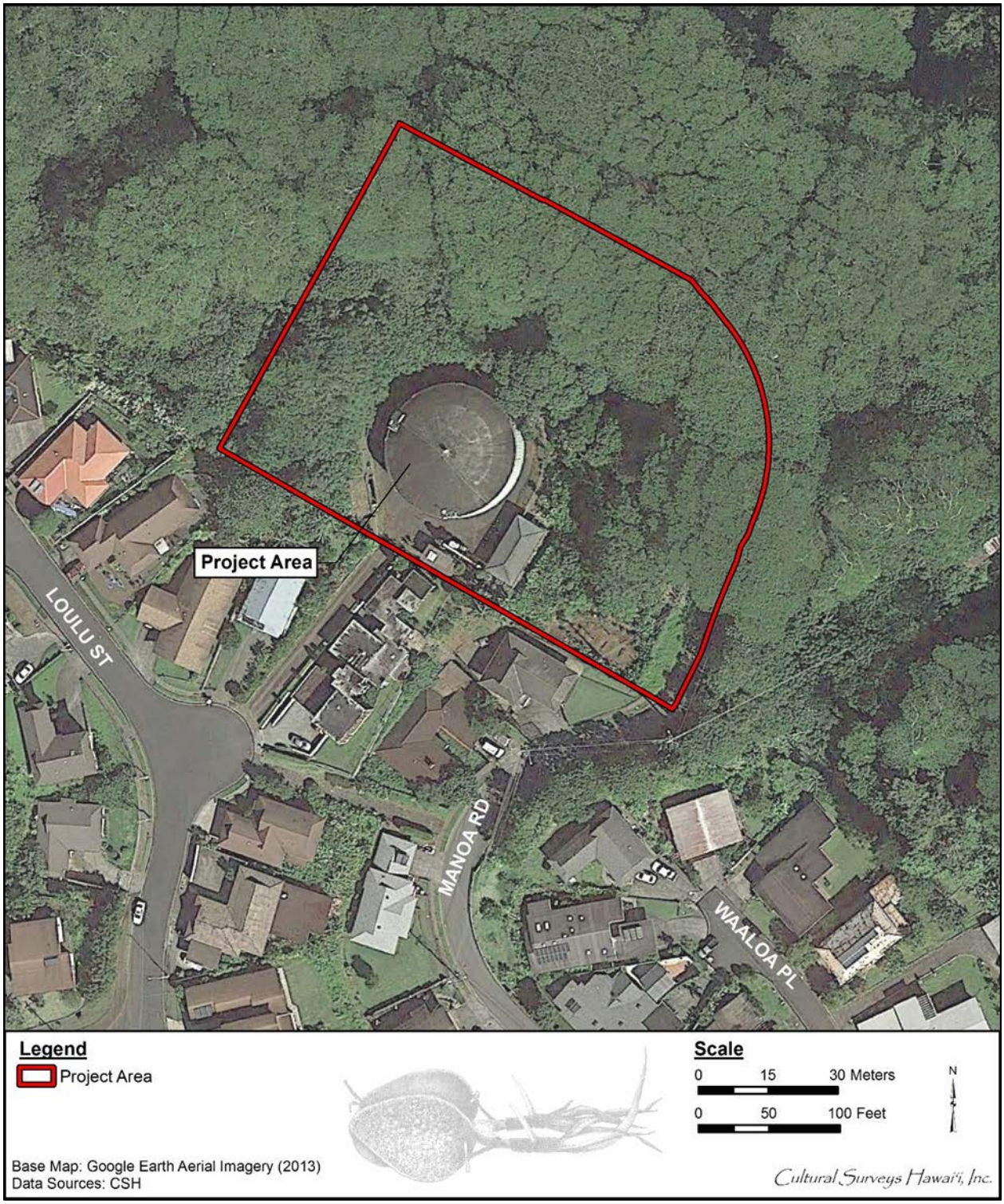


Figure 3. Aerial photograph showing the location of the project area (Google Earth 2013)

where it joined the Pālolo Channel in the general vicinity of the present-day Date Street near the *mauka* (inland) side of the Ala Wai Golf Course. *‘Auwai* (irrigation ditches) once extended from this wide bend to water the *lo‘i* (irrigated fields) of taro and rice. In the 1930s, after the completion of the Ala Wai Canal, the course of the lower stream was pushed to the east (the course of the Pālolo Stream was also pushed to the west) to form an artificial Mānoa/Pālolo Channel that now empties into the Ala Wai Canal (Oceanit 2004:7).

Annual rainfall at the head of Mānoa Valley can reach up to 160 inches per year (Giambelluca et al. 2013). At the lower boundary, rainfall is only 35 inches per year. The valley is often swept with strong winds that bring rain, including *ala‘eli*, the “cool wind of the land,” and *kākea*, a “stormy wind” (Bouslog et al. 1994:6). Before Hawaiian settlement, the slopes of Mānoa’s ridges were probably covered with a dense forest dominated by *‘ōhi‘a-lehua*, *koa*, and the native fan palm, *loulu*. The undergrowth would have included shrubs such as *naupaka kuahiwi*, ferns such as *hāpu‘u*, *‘ama‘u*, *pala‘ā*, and *palapalai*, and vines such as *‘ie‘ie* (Bouslog et al. 1994:8). Due to its broad, well-watered valley, people probably settled in Mānoa soon after the arrival of the first Polynesians, who probably cleared much of the lower areas near streams for wetland taro cultivation.

According to the U.S. Department of Agriculture (USDA) Soil Survey Geographic (SSURGO) database (2001) and soil survey data gathered by Foote et al. (1972), the project area’s soils consist of three soil types (Figure 4), the north half is dominated by Tantalus silt loam, 15 to 40% slopes (TAE), the south half is dominated by Lolekaa silty clay, 8 to 15% slopes (LoC), and there is a small area of Hanalei stony silty clay, 2 to 6% slopes (HoB) soil in the northeast corner.

The Lolekaa series soils are described as follows:

> . . . consist of well-drained soils on fans and terraces on the windward side of the island of Oahu. These soils developed in old, gravelly colluvium and alluvium. They are gently sloping to very steep. Elevations range from nearly sea level to 500 feet. The annual rainfall amounts to 70 to 90 inches and is well distributed throughout the year. The mean annual soil temperature is 71° F. Lolekaa soils are geographically associated with Alaeloa and Waikane soils.
>
> These soils are used for pasture, homesites, orchards, and truck crops. The natural vegetation consists of guava, Christmas berry, californiagrass, hilograss, and ricegrass. [Foote et al. 1972:83]

Lolekaa silty clay, 8 to 15% slopes (LoC), are described that “on this soil, runoff is slow to medium and the erosion hazard is slight to moderate. Workability is slightly difficult because of the slope. Included in mapping were small, eroded spots and small, gravelly areas. This soil is used for pasture, homesites, papaya, and bananas” (Foote et al. 1972:84).

The Tantalus series soils are described as follows:

> . . . consists of well-drained soils on uplands on the island of Oahu. These soils developed in volcanic ash and material weathered from cinders. They are moderately sloping to very steep. Elevations range from 100 to 2,200 feet. The annual rainfall amounts to 50 to 150 inches. It is well distributed throughout the year. The mean annual soil temperature is 70° F. Tantalus soils are geographically associated with Makiki soils.

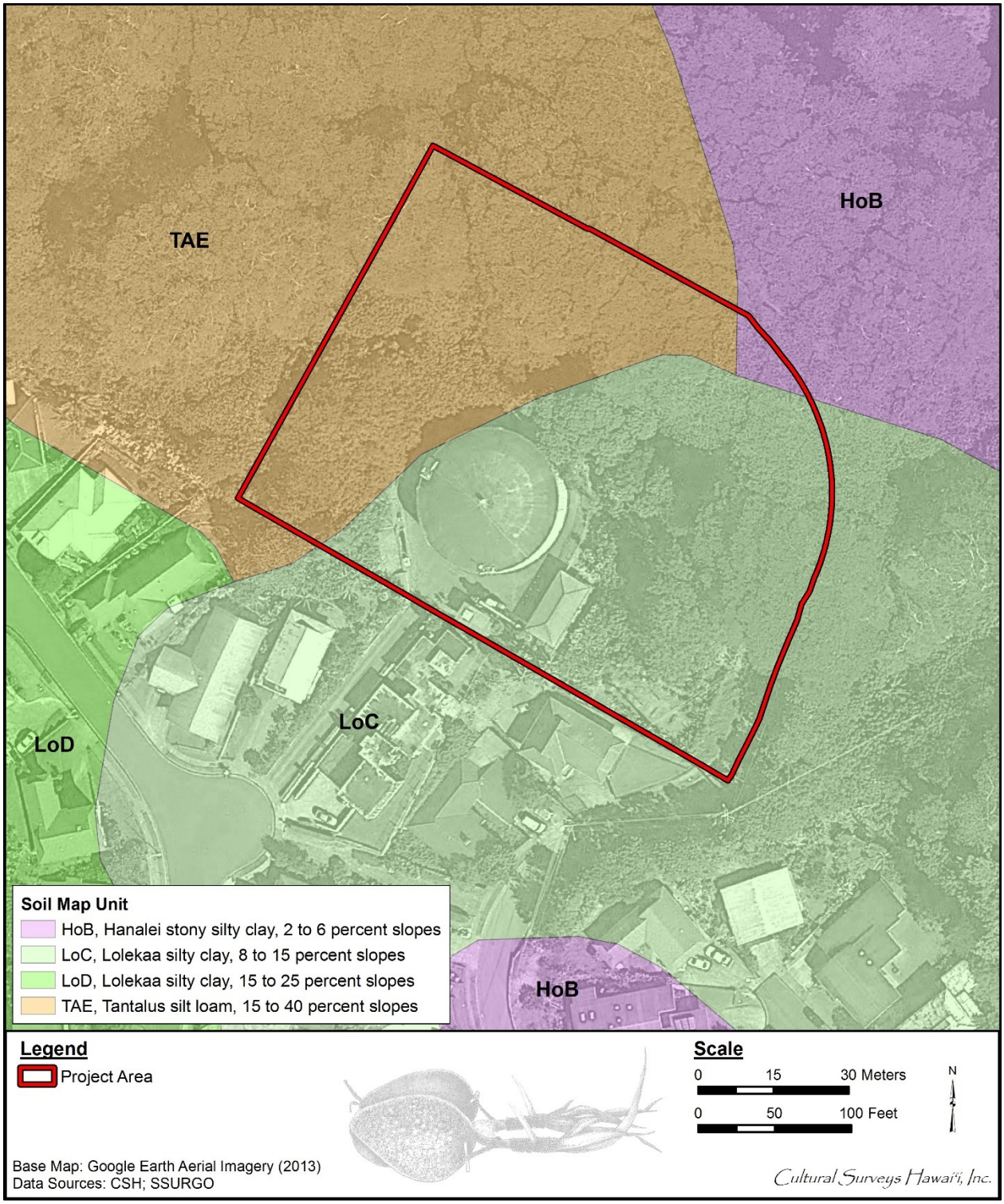


Figure 4. Overlay of *Soil Survey of the State of Hawaii* (Foote et al. 1972; USDA SSURGO 2001) on a 2013 Google Earth aerial photograph, indicating soil types within and surrounding the project area

> These soils are used for homesites, water supply, and recreation. The natural vegetation consists of ferns, Formosa koa, koa haole, kukui, and eucalyptus. [Foote et al. 1972:121]

Tantalus silt loam, 15 to 40% slopes (TAE) soils are further described as “On this soil, runoff is medium and the erosion hazard is moderate. This soil is used for water supply and recreation” (Foote et al. 1972:121).

The Hanalei Series Soils are described as follows:

> . . . somewhat poorly drained to poorly drained soils on bottom lands on the islands of Kauai and Oahu. These soils developed in alluvium derived 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]

Hanalei stony silty clay, 2 to 6% slopes (HoB), are described as similar to Hanalei silty clay (HnB), found on “stream bottoms and flood plains,” and ranging from very strongly acid to neutral. “Runoff is slow, and the erosion hazard is slight. Stones hinder machine cultivation. This soil is used for sugarcane and pasture” (Foote et al. 1972:38).

1.3.2 Built Environment

The project area is in a wooded, tropical section on the northern edge of the Mānoa Road residential area, which consists of single-story and multi-story homes in the back of Mānoa Valley. Single-family homes are located to the south of the project area. The present Mānoa Wells II site and a water tank is present in the southwest portion of the project area.

Section 2 Methods

2.1 Field Methods

CSH completed the fieldwork component of this study under archaeological fieldwork permit 18-15, issued by the State Historic Preservation Division (SHPD) pursuant to HAR §13-282. CSH archaeologists Scott Belluomini, B.A., and David Shideler, M.A., conducted fieldwork on 24 July 2018 under the general supervision of Principal Investigator Hallett H. Hammatt, Ph.D. This work required approximately 0.5 person-days to complete.

A 100%-coverage pedestrian inspection of the project area was undertaken for the purpose of historic property identification and documentation. The pedestrian survey was accomplished through systematic sweeps spaced 16.4 to 33.8 feet (5 to 10 m) apart. Any potential archaeological historic properties encountered were recorded and GPS points were collected for each site.

2.2 Research Methods

Background research included a review of previous archaeological studies on file at the SHPD; review of documents at Hamilton Library of the University of Hawai‘i, the Hawai‘i State Archives, the Mission Houses Museum Library, the Hawai‘i Public Library, and the Bishop Museum Archives; study of historic photographs at the Hawai‘i State Archives and the Bishop Museum Archives; and study of historic maps at the Survey Office of the Department of Land and Natural Resources. Historic maps and photographs from the CSH library were also consulted. In addition, Māhele records were examined from the Waihona ‘Aina database (Waihona ‘Aina 2000).

This research provided the environmental, cultural, historic, and archaeological background for the project area. The sources studied were used to formulate a predictive model regarding the expected types and locations of historic properties in the project area.

Section 3 Background Research

3.1 Mānoa Place Names and *Wahi Pana* (Legendary Sites)

Wahi pana are legendary or storied places of an area. These legendary or storied places may include a variety of natural or human-made structures. Oftentimes dating to the pre-Contact period, most *wahi pana* are in some way connected to a particular *mo‘olelo* (story or myth), however, a *wahi pana* may exist without a connection to any particular story. Davianna McGregor outlines the types of natural and human-made structures that may constitute *wahi pana*:

> Natural places have mana, and are sacred because of the presence of the gods, the akua, and the ancestral guardian spirits, the ‘aumakua. Human-made structures for the Hawaiian religion and family religious practices are also sacred. These structures and places include temples, and shrines, or heiau, for war, peace, agriculture, fishing, healing, and the like; pu‘uhonua, places of refuge and sanctuaries for healing and rebirth; agricultural sites and sites of food production such as the lo‘i pond fields and terraces slopes, ‘auwai irrigation ditches, and the fishponds; and special function sites such as trails, salt pans, holua slides, quarries, petroglyphs, gaming sites, and canoe landings. [McGregor 1996:22]

As McGregor makes clear, *wahi pana* can refer to natural geographic locations such as streams, peaks, rock formations, ridges, offshore islands, and reefs, or they can refer to Hawaiian land divisions such as *ahupua‘a* (traditional land division) or *‘ili* (land division smaller than an *ahupua‘a*), and man-made structures such as fishponds. In this way, the *wahi pana* of Mānoa tangibly link the *kama‘āina* (native born) of Mānoa to their past. It is common for places and landscape features to have multiple names, some of which may only be known to certain *‘ohana* (family) or even certain individuals within an *‘ohana*, and many have been lost, forgotten or kept secret through time. Place names also convey *kaona* and *huna* (secret) information that may even have political or subversive undertones. Before the introduction of writing to the Hawaiian Islands, cultural information was exclusively preserved and perpetuated orally. Hawaiians gave names to literally everything in their environment, including individual garden plots and *‘auwai* (water courses), house sites, intangible phenomena such as meteorological and atmospheric effects, *pōhaku*, *pūnāwai* (freshwater springs), and many others. According to Landgraf (1994), Hawaiian *wahi pana* “physically and poetically describes an area while revealing its historical or legendary significance” (Landgraf 1994:v).

The project area is within the traditional Hawaiian land division (*‘ili)* of Puka‘ōma‘oma‘o. The *‘ili* of Puka‘ōma‘oma‘o may have been formerly part of Pū‘ahu‘ula (*lit.* feather-cloak spring; Pukui et al. 1974:190–191) and may have been renamed Puka‘ōma‘oma‘o (*lit.* green opening) after Ka‘ahumanu’s home located there (the queen’s house had green shutters) (Pukui et al. 1974:193). The project area is northwest of the point where tributary streams (Waihī and Lua‘alaea streams) of Mānoa Stream meet.

Mānoa, along with Nu‘uanu, Pauoa, and Pālolo (Figure 5), is one of the famous “valleys of the rainbow,” as described in the legend of “The Lady of the Moon”:

> Almost all day long the valley is open to the sun, which, looking on the luxuriant verdure and clinging mist, sends its abundant blessing of penetrating light.

Figure 5. 1929 photograph by Ray Jerome Baker on the Inter-Island Airway’s amphibian plane, *Hawaii*, passing over Mānoa Valley (Original photograph at Hawai‘i State Archives; Baker 1929; reprinted in Van Dyke and Ronck 1982:214)

> Rainbows upon rainbows are painted on the steep precipices at the head of the valley. There are arches of exquisite beauty, smashed fragments of scattered color, broad pillars of glorious fire blazing around green branches of ghost-like trees, great bands of opal hues lying in magnificent masses on the hillside, and lunar rainbows almost circular outlined in soft prismatic shades in the time of a full moon. [Irwin 1936:18]

> When showers creep down the valley one by one, rainbows also chase each other in matchless symmetry of quiet, graceful motion. Sometimes the mist in the doorway of the valley has become so ethereal that splendid arches hang in the apparently clear sky without cloud support. [Westervelt 1963a:128]

The literal meaning of Mānoa is “wide or vast.” It is a contraction of the word *mānoanoa*, which means “thick or solid—deep as a substance having breadth and depth” (Mānoa School PTA 1952:6). Another possible meaning of the name relates to the central *mo‘olelo* of Mānoa, that of Kahalaopuna, a chiefess who is betrothed to a Ko‘olau chief, Kauhi, who slays her upon hearing accounts of her infidelity. Important aspects of the *mo‘olelo* are that Kahalaopuna is indeed still a virgin and that characters in the various legendary accounts are names of landforms in Mānoa. The Hawaiian word for hymen is “*‘ili mānoa*” (Pukui et al. 1974:79). The entrance to Mānoa Valley is notably blocked by a variety of geological landforms. There were two places near the head of the valley, one on each side, called Alamihi, meaning “path of regret.” When a Mānoa native died, a “rainbow would span the two points across the valley” (Pukui et al. 1974:9).

There were several ancient trails in Mānoa, one cross-*ahupua‘a* trail, now covered by the present alignment of King Street/Wai‘alae Avenue, and two *mauka-makai* (mountain/sea) trails on each side of the valley, now East Mānoa and Mānoa Road. Several place names within Mānoa are located on a map of early nineteenth century trails as described by John Papa ‘Ī‘ī (Figure 6):

> Our description of the trails of the royal town is finished, but we have not yet told of the trails going to lower Waikiki, Kamoiliili, and Manoa . . . At Kawaiahao a trail passed in front of the stone house of Kaina, late father of Kikaha. The trail went above Kalanipuu’s place, along the stream running down from Poopoo to the sea, close by Kaaihee in Makiki, to Puu o Manoa, then below Puupueo, where a trail branched off to upper Kaaipu and Kahoiwai, and another to go below Kaahulue, to Kapulena [Pu‘ulena] and Kolowalu. [‘Ī‘ī 1959:92]

Mānoa Road approximates a traditional Hawaiian trail into the back of Mānoa Valley. An outline of an 1882 map of Mānoa Valley (Figure 7) shows many of the place names discussed.

3.1.1 *Mo‘olelo* Associated with Rivers and Springs in Upper Mānoa Valley

Six tributary streams merge to form the lower Mānoa Stream and water Mānoa Valley. The five tributary streams are ‘Aihualama (“eating *lama* fruit”; Thrum 1923:626), Waihī (*lit*. trickling water), Nāniu‘apo (*lit*. the grasped coconuts), Lua‘alaea (*lit*. pit [of] red earth), Wa‘aloa (*lit.* long canoe), and Waiakeakua (*lit*. water [used] by the god). Soehren (2017) mentions a stream called Keawa‘ahua, which was probably in the *‘ili* of Keawa‘ahua (“the young fish harbor,” Pukui and Elbert 1986) on the upper east valley. According to Pukui et al. (1974:96), there was also a gulch called Kauwahipouli at the head of Mānoa Valley. Kauwahipouli means“dark place,” in reference

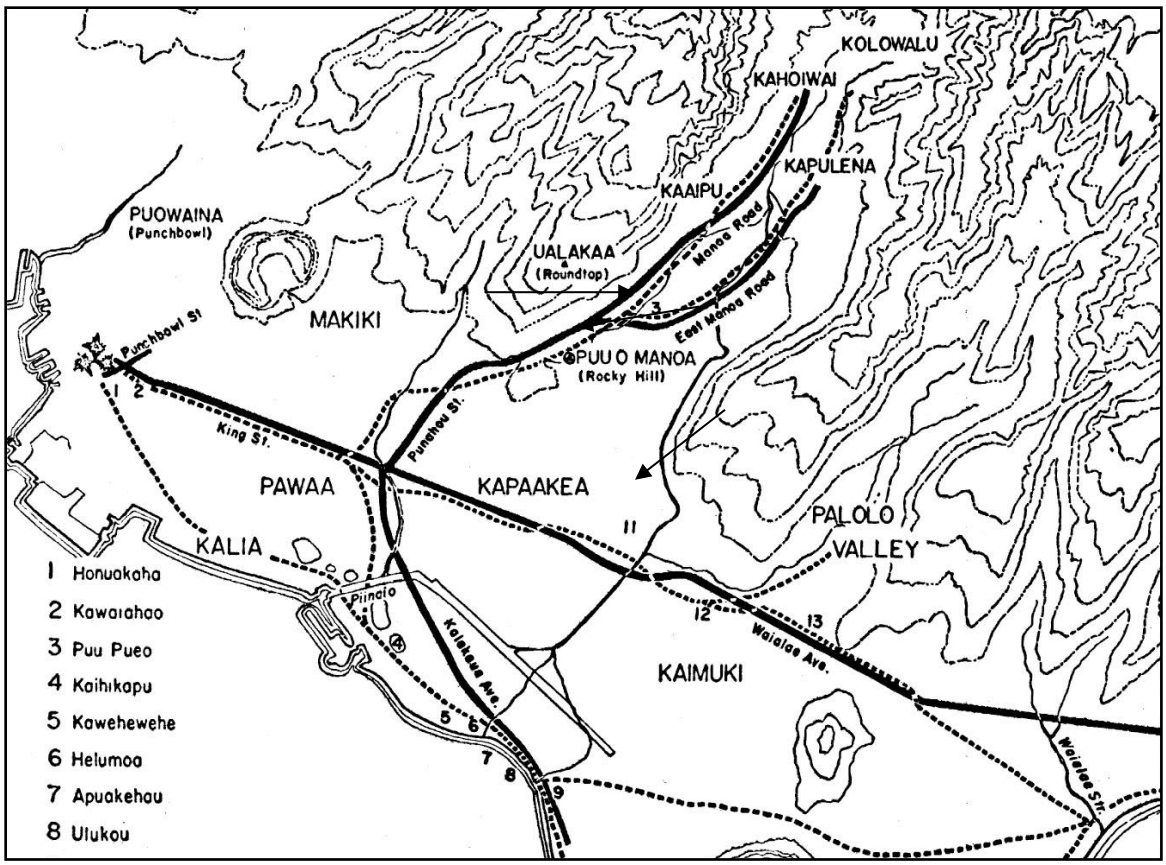


Figure 6. Trails leading up to the project area ca. 1810 (map by Gerald Ober; reprinted in ‘Ī‘ī 1959:93; not to scale), showing locations of some place names in Mānoa

Figure 7. Traced outline of 1882 Hawaiian Government Survey map by E.D. Baldwin, showing topographic points and traditional land units in Mānoa Valley

to the first area darkened by the setting sun and the last area lightened by the rising sun. Neither of these last two streams/gulches are shown on the 1882 Baldwin map (see Figure 7). There are seven prominent waterfalls in the back of Mānoa Valley, named Waihī‘iki (“small trickling water”), Waihī‘nui (“big trickling water”), Lua‘aulaia, Nāniu‘apo, Wa‘aloa, Kahuwai‘iki (“little water tender”), and Waiakeakua (Figure 8).

3.1.1.1 Lower Valley Springs

Kōnāhuanui is the highest peak in the Ko‘olau Mountains and is the northwest corner of Mānoa Ahupua‘a. In Hawaiian oral tradition, it is the home of the gods Kāne and Kanaloa. It was where their parents came on their way to and from the east from above and from the right (*mai kahiki a mai ka hiwamai*), meaning it was the starting and resting point of the gods since the first formation of the islands (Bouslog et al. 1994:133). In several *mo‘olelo,* two gods travel through Mānoa Valley, from the valley end and into the uplands. Kāne and Kanaloa fished in the ocean off Kāhala (east of Mānoa Ahupua‘a). One day the two gods traveled inland, looking for fresh water to wash off the saltwater on their bodies. They came to Kamō‘ili‘ili, and Kanaloa said,

> Where are the springs and streams of living waters? Our people are always singing the chants of your life-giving springs and stream. They tell me that they are in the clouds, the sun and the bowels of the earth. Can you give it to me now?’ . . . Kāne turned to Kanaloa saying ‘Be patient, thirsty one.’ [Bouslog et al. 1994:134–135]

Kāne struck his staff into the soil and the water flowed so that the sand washed off their bodies. The white sand is still found in the area today. The spring is Kānewai, “the waters of Kāne,” and the stretch of sand is Kanaloa (Bouslog et al.1994:134). Kāne and Kanaloa traveled further up the valley and Kanaloa suggested Kāne again use his stick to produce water. Kāne struck the cane deep into the earth to bring forth a crystal water. Kāne commanded that a spirit guard the water gourd bottle Hualani, meaning “dug up by heaven.” The name given to this land was Maka‘īlio, “the dog’s watchful eye” (Bouslog et al. 1994:134).

Kāne and Kanaloa then traveled to the northwest, near to the present-day athletic field of the Mid-Pacific Institute. Kāne struck the ground so forcefully that the water came flying up, so it was called *wailele*, or “flying water.” This spring became a fishpond filled with *‘o‘opu* (mud fish), mullet, and *‘awa*. Kāne put a *kapu* (taboo) on this spring so that no woman should bathe in it, and he commanded that a sacrifice at Wailele should always be a yellow dog, “*he ‘īlio ka mōhai puakea*.”

The next stop of the gods was at Punahou, or Kapunahou, meaning “new spring,” or “the new spring,”

> On their way they rested on the Keapapa hill (at the place now called Punahou) and again Kanaloa teased his brother for water and challenged his ability to produce it. Kāne smiled, for he could hear the noise of water within the hill, and he thrust his staff into the ground and the water gushed forth in abundance. It has been a great blessing to the natives of that region . . . This water of Kāne was called ‘The new spring,’ Ka-puna-hou. [Pukui and Curtis 1951:112–115]

Mauka from Kapunahou was the region known as Ka‘aipū, especially noted for the sweetness of its mountain apples. A great wizard who lived there was turned into stone (Dictionary of

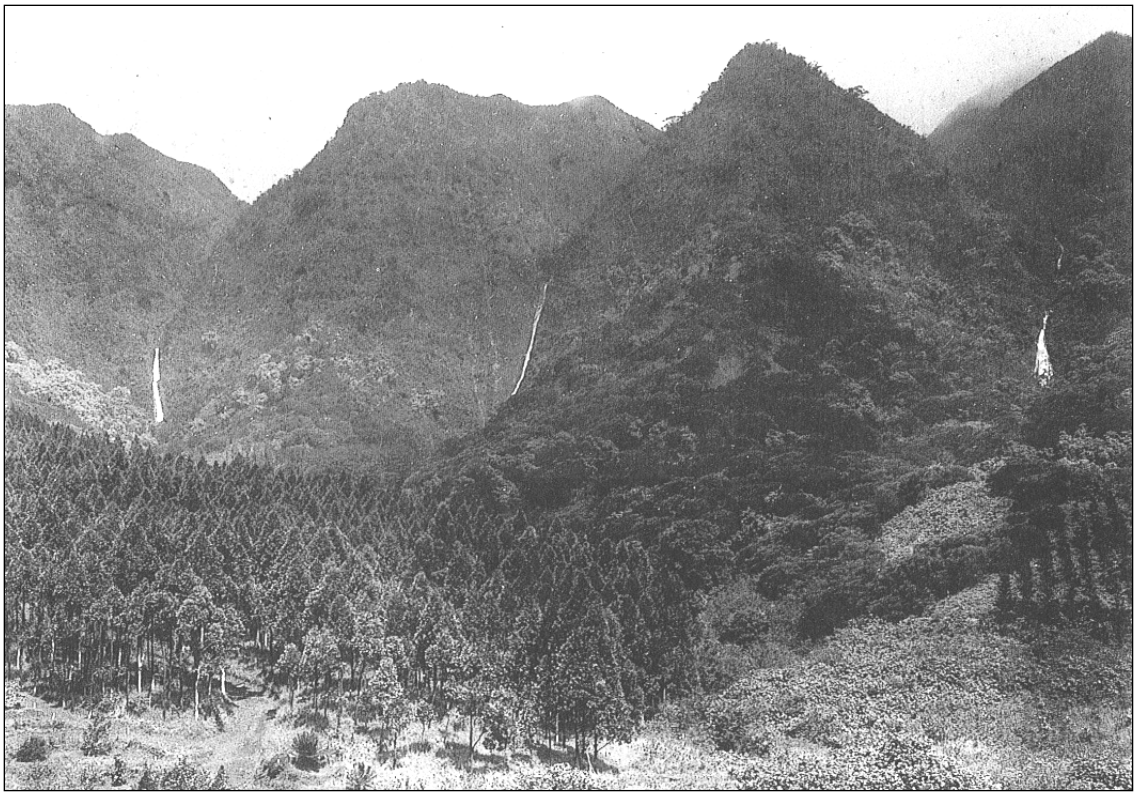


Figure 8. Early twentieth century photograph of waterfalls in the back of Mānoa Valley as seen from Kanānā (Original at Bernice Pauahi Bishop Museum n.d.; reprinted in Bouslog et al. 1994:4)

Hawaiian Localities, *Saturday Press*, 15 December 1883). This stone was in the *‘ili* of Ka‘aipū, which was later owned by a farmer Carlos A. Long, who used the land for a fruit orchard, then owned by the Montanos who used it to graze the cows for their business, the Ka‘aipū Dairy. It later became the site for the Salvation Army’s Wai‘oli Tea Room.

After Kāne created the spring at Kapunahou, Kanaloa suggested they return to their home at Kōnāhuanui. They traveled through Mānoa over ‘Aihualama to the heights of Pu‘u o Mānoa (Rocky Hill), onto the plains to the land of Kaulumalu (where the Castle family later built their home on ‘Ulumalu Hill), which means “the shade of the breadfruit”:

> Kaulumalu was *o‘io‘ina o nā akua*, the rest temple of the gods and the place where the food for the gods was cooked. Kanaloa, as usual, complained of being thirsty and Kāne answered gently, ‘Wait, thirsty one, until we get to Kala‘i’ . . . [now the site of the Salvation Army’s Mānoa headquarters]. . . Kāne struck his magic cane into the ground and there burst forth the spring of Ka‘aipū, ‘the girdle of the cluster,’ meaning a gateway. Kāne then created a supernatural guardian called Ka‘aipū, who was formed into a stone fish with its mouth wide open to guard the spring. This spring was the first gateway to the home of the Kihanuilanilūlūmoku, the Mo‘o or lizard goddess of Mānoa, who lived in the upper springs with her other fairy companions. [Bouslog et al. 1994:135–136)]

This spring is also called Pū‘ahu‘ula (O‘ahu Place Names, *Hōkū o Hawai‘i*, 11 February 1930, in Sterling and Summers 1978:288). The famous female *mo‘o*, Kihanuilūlūmoku (*lit.* “great island-shaking *mo‘o*”), lived here; she had eel, lizard, and woman forms and made plants thrive in Wa‘aloa Ravine. Pū‘ahu‘ula means “feather-cloak spring” (Pukui et al. 1974:190–191), or “spring of the feather cape” (Pukui quoted from 16 March 1954 in Sterling and Summers 1978:288).

3.1.1.2 Wa‘aloa Springs

After leaving the Pū‘ahu‘ula springs of the *mo‘o* Kihanuilanilūlūmoku (variant spelling), Kāne and Kanaloa traveled up the valley, past Puka‘oma‘oma‘o (spelled Puka‘ōma‘o in Pukui et al. 1974), later the residence of Queen Ka‘ahumanu:

> They traveled on to Kaho‘iwai, where again the petulant Kanaloa said, ‘Where are your waters, Kāne? Your waters do not follow you!’ Then Kāne gently said to Kanaloa, ‘Thirsty one, why not drink from this stream of rushing water?’ The mischievous Kanaloa answered, ‘I do not want these waters. I want the waters that you profess to bring forth by your magic power. I am wandering with the god of bubbling springs and still do not have water to mix my *‘awa* [kava (Piper methysticum); the root is utilized to create a narcotic drink often used in ceremonies].’
>
> Kāne turned to Kanaloa for the last time and said most kindly, ‘Wait a little longer, thirsty one, and I will give you of the life-giving water of Wa‘aloa, or “long canoe,” at the garden of Kihanuilanilūlūmoku, where she happily spends her hours near the falls of *nāniu a pō*, the coconut trees of night. At this place her retinue cultivates the *kalo, hō‘i‘o* [edible ferns] and sweet potato in our canoe for food.’ [Bouslog et al. 1994:136]

The gods entered a ravine shaped like a canoe and Kanaloa struck his cane into the bowsprit of the canoe, creating Wa‘aloa Springs. Kāne and Kanaloa stayed awhile in this place in the company of the mermaids at the garden of Kihanuilanilūlūmoku.

3.1.1.3 Waiakeakua Springs

According to the “Legend of the Waters of the Gods,” Waiakeakua (“water [used] by god”) is one of the many springs in Mānoa associated with the brother gods, Kāne and Kanaloa. When Kanaloa was weary of his stay with the mermaids at Wa‘aloa, he journeyed into the next ravine:

> As he traversed along the steps of the *menehune*, the legendary race of small people, and stood on the fern-clad slopes running down to the edge of the stream, he saw for the first time the beautiful virgin Kameha‘ikana sitting on a rock next to a nearby spring, accompanied by her stubborn old nurse. Rogue that Kanaloa was, he immediately made up his mind to possess her and began to chant to her of her beauty. Although she was somewhat flattered by Kanaloa’s attention, Kameha‘ikana resented his boldness. Her watchful, stubborn old nurse, seeing his attitude, called out in anger. ‘You cannot have this water,’ meaning the young virgin. Whereupon Kanaloa became very angry at being repulsed and suddenly rolled a huge boulder down upon them and covered up this spring. This stone is called the sensitive stone of Waiakeakua, the waters of the gods Kāne and Kanaloa. During the season when the *‘ōhi‘a ‘ai* mountain apple, is in bloom, the stone’s color

> changes to a brownish red. Delicate wild flowers called ‘Kameha‘ikana’s tresses’ grow around this rock. Upon being closed with the boulder, the water of the spring was forced up onto the moss-grown boulders, which form the basin at the base of the ravine. Two little trickling streams issue from this rock, which is known as the breast of the beautiful goddess Hina. These two streams then fall into the basin below, which is also known as Waiakeakua, the water of the gods. [Bouslog et al. 1994:136–137]

Kameha‘ikana, meaning “a multitude of descendants,” is one of the alternate names of Haumea, the goddess of childbirth (‘Ī‘ī 1959:44). Another name for Haumea is Walinu‘u (Beckwith 1940:281–283), who was a *mo‘o* goddess.

A third version of this *mo‘olelo* names Kawaiakeakua, or Waiakeakua, as the pool associated with this legend. Kāne and Kanaloa found excellent *‘awa* in Mānoa Valley, but Kanaloa wished to know where they could find water:

> Kane replied, ‘Here in this hill side is water.’ So he took his staff and struck it fiercely against the precipice by which they had found awa. Rapidly the rocks were broken off. The precipice crept back from the mighty strokes of the god and a large pool of clear, cool water nestled among the great stones which had fallen. There they mixed awa and water and drank again and again until the sleep of the drunkard came and they rested by the fountain they had made. This pool is still at the head of Manoa Valley, and to this day is called Ka-Wai-a-ke-Akua (The water provided by a god). [Westervelt 1963a:41]

The waterfall above the pond is also known as Waiakeakua:

> *He ua paa unau iluna o keia kuahiwi ma kona moolelo ma kona moolelo oia wahi e iini ni o na malihini e makaikai ai he wai hi lele mailuna mai, a hokio keia wai a nona keia inoa Kawaiekeakua he ui ke nana aku laia e kaulana nei. O kahi keia o ka poe menehune e hiamoe a i ke ao, a po hele nui e hana i na heiau a loko ia a o ke ano ae a lakou e ike ai.* [Hōkū o Hawai‘i, 11 February 1930]
>
> <u>Translation:</u>
>
> Visitors like to go and see a certain waterfall that drops from above into a pool. The name of this famous place is Kawai-a-ke-akua and is beautiful to see. This was where the menehunes slept in the day time and when night came they went to build heiaus, ponds or whatever they chose. [English translation in Sterling and Summers 1978:288]

The pond was formerly a favorite place for picnics, drinking water, and swimming for the *ali‘i* (chiefs) visiting and living within the valley (Mrs. Marie H. Brown, Informant, J.F. Stokes, Sites Notes, in Sterling and Summers 1978:288). It was known as *wai hui a Kanaloa*, and wives were supposed to drink from the life-giving waters (Bouslog et al. 1994:137). The servants of King Kamehameha filled calabashes of water from here, using a stalk of *kī* or a banana leaf to funnel the water on the rock to a gourd. They then traveled down the valley swinging the gourds from the ends of sticks laid over their shoulders: “When they came near any individual or group of Hawaiians they had to call out loudly, giving warning so that all by whom they passed could fall prostrate before the gift of the gods to the great king” (Westervelt 1963a:41).

3.1.2 Kāne and the Fish of Mānoa

After Kāne had created all of the springs of Mānoa, Kāne and Kanaloa were at Waikāne (on the northeastern shore of O‘ahu), when Kanaloa asked Kāne to provide fish to the people of Mānoa. Kanaloa called upon his fish god Pōhakukū‘ula to go out and drive the fish up Mānoa Stream. He also commanded Kukalia, the daughter of the *kahuna* (priest) of the *heiau* (temple) Kulumalu to wave her *lepa* (flag) as a signal to the fishermen when to lower the *‘upena* or fishnet. Pōhakukū‘ula first drove the fish up through the lands of Waikīkī, dropping the fishnet for the first time at Akuakekau to feed the people of Akuakekau and Kanaloa, and then to Makawiliwili where the net was dropped for the second time. This fish god continued to drive the fish inland into the lands of Mānoa to Kapilipili (see Figure 6 for place names mentioned in this legend):

> Then the fish came up to Kūkana, where Kukalia again signaled to drop the fishnet. When Kanaloa drew the net up, the fish were given to the chiefs of Kumu‘ulu and their people. The fourth net was put down at Hipawai—that catch of fish being for the people of Pāmoa. Still the fish came, following the water course. When they arrived at Halelena, Kukalia, the ever-watchful sentinel, signaled to drop the fishnet; and that catch went to the people of Ka‘aipū. The sixth catch was at Kalehua just as the evening star Hōkūloa was rising and the fish were given to Wa‘aloa and the Kaululā‘au chiefs. The number of fish had decreased, for the waterway was getting narrow, but Kukalia, the beautiful sentinel, kept signaling to Kanaloa to put down the seventh net. This was at Kukuio, a part of the Mānoa Stream where the fish came one by one. The fish came to Kahakiamano, then to Hopenui, where they began to be bewildered and excited. They swished back and forth and started up again in the excitement. They stayed there overnight and at dawn, just as the first red cloud broke over the mountain, the fish followed the water course up to Niuapō, then they spread, some going to Wa‘aloa and Waiakeakua, others turning to the swamp, called Lua‘alaea, or the Gulch of the Mud Hen, and on to Waihī, where most of the fish disappeared.
>
> After having provided the people of Mānoa with fish, the two gods traveled back to Kōnāhuanui to rest. They started for home at Waihī, climbing the pathway of the ‘Opihi at ‘Aihualama and ascending the heights to Kōnāhuanui, where they sailed for the east and above the clouds. [Bouslog et al. 1994:137–138]

All of these *mo‘olelo* note the importance of not only the streams but natural springs, which could be used for drinking water and to irrigate crops. Prominent *wahi pana* described within these *mo‘olelo* include the *pūnāwai* (fresh water spring) of Wa‘aloa in the *‘ili* of Kahoiwai, and a *pūnāwai* and *wai lele* (waterfall) in Waiakeakua. None of these springs, however, are known to exist within the present project area.

3.1.3 *Mo‘olelo* Associated with Hills and Peaks in Upper Mānoa

There are numerous hills, mountain peaks, and caves in Mānoa Valley with legendary associations. On the *mauka* border in the Ko‘olau Mountain range are the peaks Pu‘u Lepalepa, Awāwaloa (Mount Olympus), and Kōnāhuanui. The word *lepalepa* means “to hang in fringes or tatters” (Pukui and Elbert 1986:203). Awāwaloa means “long valley or gulch” (Pukui and Elbert 1986:35, 209). Kōnāhuanui, the home of the gods Kāne and Kanaloa, is the highest peak in the Ko‘olau Mountains. The place name literally means, “large, fat innards” (*kona hua nui*) and refers

to a story about a giant who threw his testicles at a woman who escaped from him (Pukui et al. 1974:117):

> Konahuanui, pali of O-ahu, was named because when a man, probably a giant, chased a woman who escaped into a cave, he tore off his testes and threw them at her. (I heard Dr. Brigham give this explanation long ago).
>
> Though the sexual explanations may be revolting it is perhaps better to make them than to have future malihinis [foreigners] delving into the meanings, and securing wrong translations. . . . [Lyons 1916:936]

The peak of Kōnāhuanui is conceptualized in Hawaiian lore as the highest point of the ridgepole of a house; the house is a legendary burial cave for the high *ali‘i* believed to exist under the Ko‘olau Range between the districts of Kona and Ko‘olauloa:

> *Hookahi anahuna kaulana ma Oahu. O Pohukaina ka inoa, aia ma ka pali o Kanehoalani mawaena o Kualoa a me Kaaawa, aia ka puka i manao ia ma ka pali o Kuolo e huli la i Kaaawa, a o ka loa o ka puka, aia ma ka punawai o Keahuula-punawai. He anahuna alii keia, a he nui ka waiwai huna iloko a me na‘lii kuhiko.*
>
> *. . . kekahi puka, a o kauhuhu o kauaoku o keia hale anahuna, oie no ka mauna o Konahuanui a iho i Kahuku. Ua olelo ia ma ka moolelo a kanaka, ua nui ka poe i komo iloko me ua ihioho kukui, inui Kona aku nei a puka i Kahuku.*
>
> *A maloko a keia anahuna, he mau halokowai, he mau muliwai a mau kahawai, ua hana kinohinohi ia, a ma kauwahi aku, he mau aina palahalaha.* [Kamakau 1870, *Ke Au ‘Oko‘a*, 6 October 1870]
>
> <u>Translation:</u>
>
> There is only one famous hiding cave, *ana huna*, on Oahu. It is Pohukaina. The opening on Kalaeoka‘o‘io that faces toward Ka‘a‘awa is believed to be in the pali of Kanehoalani, between Kualoa and Ka‘a‘awa, and the second opening is at the spring Ka‘ahu‘ula-punawai. This is a burial cave for chiefs, and much wealth was hidden away there with the chiefs of old. . . The mountain peak of Konahuanui was the highest point of the ridgepole of this burial cave ‘house,’ which sloped down to Kahuku. Many stories tell of people going into it with kukui-nut torches in Kona and coming out at Kahuku. Within this cave are pools of water, streams, creeks, and decorations by the hand of man (*hana kinohinohi‘ia*), and in some places there is level land. [Kamakau 1991:38]

On the western border of Mānoa are four peaks, Kaumuhonu (*lit*. the turtle oven), Pu‘u Makani (*lit*. windy hill), Pu‘u Laulā (*lit*. broad hill), and ‘Ualaka‘a, or Round Top. Pu‘u ‘Ualaka‘a, which is on the boundary between Makiki and Mānoa valleys, has many legendary associations and alternate versions of the origin of its name, which translates literally as “rolling sweet potato hill.”

On the eastern border of Mānoa, within Wa‘ahila Ridge, are six peaks: Keanapoi, Pu‘u Pia (*lit*. arrowroot hill), Pūkele (*lit*. muddy), Akāka, Kūmauna, and Paliluahine. Pūkele is also called Palikū, which means “vertical cliff.” Akāka, or Aka‘aka (meaning “laughter” or “clearness”), and Kūmauna are mentioned in the Legend of the Princess of Mānoa. Paliluahine, meaning “cliff of the old woman,” has associations with Kamehameha I and older legends. In the central area of the

western valley are a series of peaks and hills, Sylvas, Puka‘ōma‘oma‘o, Pu‘u Ahula, ‘Ulumalu, Pu‘u Pueo, and Pu‘u o Mānoa (Rocky Hill or Keapapa).

3.1.4 Akāka and Kūmauna Peaks and the Princess of Mānoa, Kahalaopuna

Several places in Mānoa are mentioned in the legend of Kahalaopuna, the Princess of Mānoa, including the peaks Akāka (“clearness” or “laughter”), Kūmauna, and Keawa‘awaki‘ihelei (“gulch of the image-with-drawn-down-eyelids”) at the back of the valley. This *mo‘olelo* tells of the beautiful woman Kahalaopuna (Kaha), also called Kaikawahine ‘Ānuenue, meaning “the Rainbow Maiden” (Westervelt 1963b:84); there are several versions with different place names emphasized and different endings.

The Princess of Mānoa was the daughter of Kahaukani (the *hau* tree wind of Mānoa) and Kauakuahine (the sister rain of Mānoa), who were the twin offspring of the mountain peaks ‘Aka‘aka (the peak now called Akāka), meaning “laughter,” and Nalehua‘aka‘aka, meaning “the *lehua* bushes of ‘Aka‘aka,” the neighboring promontory (Kalākaua 1990:511). In commemoration of this union, “the growth of *lehua* [*lehua ‘ōhi‘a*] bushes crowning the spur of ‘Aka‘aka, is said to still attest” (Thrum 1891:111). Foster parents raised the twins, who were kept apart in their youth; the chief Kolowahi took the boy and his wife, Pōhakuakalā, took the girl. When the wind and rain twins of Mānoa were later married, it brought to Mānoa Valley “an inheritance of rainbows and showers for which it has since been distinguished” (Kalākaua 1990:512).

The union of the twin sister and brother resulted in a concentration of *mana* (spiritual power) in Kahalaopuna, so that she always gave off a rosy light:

> Her cheeks were so red and her face so bright that a glow emanated from them and shone through the thatch of her house when she was inside; a rosy light seemed to envelop the house, and bright rays constantly played over the house. When she went to bathe in the spring below her house, the rays of light surrounded her like a halo. The natives maintain that his bright light is still occasionally seen at Kahaiamano indicating that the spirit of Kahalaopuna is revisiting her old home. [Thrum 1998:119]

Kahalaopuna lived in a grove of sandalwood trees at Kahaiāmano on the road to Waiakeakua, a pool within the tributary stream to Mānoa Stream. She often bathed at the sacred spring called Lua‘alaea. Kahalaopuna was betrothed in infancy to Kauhi, a young chief from Kailua (or Waikīkī in some versions). She was famed for her beauty and one day, two lesser chiefs named Kumauna (or Kūmauna) and Keawaawakiihelei claimed they had been intimate with her. Her fiancée, hearing this rumor and believing she had been untrue to him, went to Kahaiāmano and led her away from her house to Hualea, where he killed and buried her. An owl god, her personal guardian spirit, or *‘aumakua*, dug her up and resuscitated her. Kahalaopuna sang a lament of her cruel fiancée, who heard it and returned to Hualea, telling Kahalaopuna to follow him again.

Kauhi killed her twice more, each time telling her to follow him, then killing and burying her; each time the owl resuscitated her and brought her back to the living. On the third time, Kauhi buried his fiancée under the roots of a tree and the owl could not free the girl; instead, two spirits revived the girl. A young man, in some versions called Mahana, found her and took her back to his home in Kamō‘ili‘ili (old name for Mō‘ili‘ili, a land area in Mānoa). Kauhi was eventually punished for his cruelty and Kahalaopuna married her young rescuer (Thrum 1998). The lands and

fishponds of Kauhi were given to Mahana, who ruled as a chief of these lands, with the beautiful Kaha as his wife for many years (Skinner 1971:220–222).

Fornander’s version of the story tells of Kahalaopuna (the sweet-scented *hala*-flower of Puna), called the princess of Mānoa (*ka u‘i-o-Mānoa*). She was the beautiful daughter of Kauakuahine (the rain of the mountain ridge) and Kahaukani (the Mānoa wind), who were the twin sister and brother born to ‘Aka‘aka and Nalehua‘aka‘aka, which are the names of a projecting spur of the ridge and the red *lehua* bushes that grow upon it. Kahalaopuna was so beautiful that rainbows always played about her home (Kahaiāmano), which was on the trail to the spring Kawaiakeakua. Mānoa girls later born in this area were also known for their beauty (Beckwith 1940:152–153), so much so that Mānoa was also called *ka ui o Manoa*, the “valley of beauties” (Nakuina 1904:42).

Kahalaopuna was affianced to Kauhi, a man from a powerful family of Ko‘olau or Waikīkī. Two mischievous men said they had enjoyed her favor, which drove her fiancée into a jealous rage. Kauhi went to Kahalaopuna’s house and asked her to follow him. He led her to the uplands of Pōhākea (area between ‘Ewa and Wai‘anae), where he struck her. Kahalaopuna chanted the following lines:

Kuu kane mai ka uka o Kahoiwai,	My husband from the uplands of Kahoiwai,
Mai ka uka laau hihi i ka nahele	From the uplands where the creeping trees grow,
Kuu kane o Kahaiamano e! Auwe!	My husband from Kahaiamano, alas!
Me he mano la no ka lili ia‘u,	Like unto a shark is your jealousy of me,
Ka hoi koke mai no nanahu ia‘u	Quickly returning to bite at me,
O kuu nui aloha, ua hai iho nei e! Auwe!	My great love for you is, however, broken, alas!
[Fornander 1918:5:190–191]	

Kauhi then beat her to death, and her spirit flew to the top of the tree and chanted her story, where passersby heard her and informed her parents. The parents dug up the body, found it still warm, and revived her to life (Beckwith 1940:152–153).

After Kahalaopuna’s final death, her mother melted into the rain called Luahine-o-Mānoa. Her father became two things, a *hau* tree, and the wind in the valley. This *hau* tree supposedly could still be found up to the time of Queen Emma, and would groan and sigh whenever an *ali‘i* died. According to Mary Kawena Pukui (16 March 1954 in Sterling and Summers 1978:289), the property was later acquired and the tree was destroyed.

Kaho‘iwai was the name of the home of Kahalaopuna and the name of the area where she still is supposed to be “mourning and wailing her death in consequence of her husband’s rash anger” (Dictionary of Hawaiian Localities, *Saturday Press*, 1 December 1883). A stream and adjoining land at the head of Mānoa Valley near Kaho‘iwai, is known as Kahaiāmano (Dictionary of Hawaiian Localities, *Saturday Press*, 1 December 1883), and is mentioned in the legend of Kahalaopuna.

In a third version of the “Legend of the Princess of Mānoa,” the two men who accused Kahalaopuna of infidelity were Kumauna, who had a humped back, and Keawaawaki‘ihelei (“gulch of image-with-drawn-down-eyelids”), who had a disfigurement called *maka-helei*, in which the eyelid is turned in such a way as to display the inner red membrane. These men were mountaineers, dwelling with a few retainers in the eastern corner of Mānoa Valley, in a place called the Canyon of the Makaweli. In this version, Kauhi leads Kahalaopuna first up the slopes

of ‘Aihualama‘iki adjoining Kahaumakaawe. *Koa* and *lama* trees formerly covered this slope. Near a large rock half way up the slope, Kauhi killed his fiancée with a blow to the head with a bunch of *hala* nuts:

> It was the belief of the mountaineers of the olden time that the spirit of the murderer Kauhi haunted the trail between Manoa and Nuuanu, and that often maile and fern gatherers were startled by a faint and mournfully sweet song changed by the spirit of Kahalaopuna, and the answering despairing wail of Kauhi, ‘O, my wife, come back to me! I was wrong.’ ‘*E ku‘u wahine-e, hoi ma-i. Ua hewa wa-u*.’
>
> In the eastern corner of Manoa Valley can be the seen the peak of Kumauna, with a hump on the back of the ridge leading up the peak, and alongside of it the ravine of Keawawa-Kiihelei. These places belong to and are called after the two wicked men who were the cause of the sad death of Kahalaopuna.
>
> And when the gods realized that their favored maiden had been murdered, they decreed that the rains would fall daily about the valley of beauty, their tears in memory of her graces. [Nakuina 1904:45]

3.1.5 Puka‘ōma‘o, or Puka‘ōma‘oma‘o and Ka‘ahumanu’s House

Puka‘ōmao‘o means “green apertures or openings” (Pukui et al. 1974:190), and probably referred to the green shutters on Queen Ka‘ahumanu’s house in Mānoa Valley (Sterling and Summers 1978:287). The longer name Puka‘ōma‘oma‘o can mean “green gateway” and may refer to this point as the access point to the head of the valley. Ka‘ahumanu’s estate was large and extended across the upper valley, including the *‘ili* of Pu‘ulena, which in 1845 became the old Chinese burial ground. On her estate, there was a “kind of village of forty of fifty huts, the houses of the chiefs, a schoolhouse and a chapel” (diary of Elisha Loomis in Bouslog et al. 1994:153). In 1829, Charles Stewart, a chaplain on the American naval vessel, the *Vincennes*, described the location as in the back of the valley of East Mānoa:

> The valley of Manoa, you recollect, was always a favorite resort of mine—this afternoon Mr. Bingham drove me in a wagon to it. There is now a good carriage road, in that direction, as far as the country house of Kaahumanu, nearly five miles from Honolulu. Her residence is beautifully situated, and the selection of the spot quite in taste. The house is an inferior building, but stands on the height of a gently swelling knoll, commanding, in front, an open and extensive view of all the rich plantations of the valley; of the mountain streams meandering through them, and the humble habitation of the farmer sprinkled around; of the district of Waititi; and of Diamond Hill, and a considerable part of the plain, with the ocean far beyond. On the right, the ground rises rapidly for a few rods, to a thicket of hibiscus and Eugenia, at the foot of a magnificent mountain, exhibiting from the base to its summit a perpendicular height of a thousand feet—as rich a variety of projecting cliff and wild recess, of dripping rocks and mantling foliage, of graceful creeper, pendant shrub, and splendid flower, as Arcadia itself can boast. On the left, there is a gradual descent, from the house, of two or three hundred feet to the depth of the valley. Here this is a half a mile wide, and bounded at that distance, by a spur of mountain, which, commencing at the entrance of the valley on the plain two or three miles in front, rises first in uncovered swellings, but rapidly assumes, as it runs

> inland, a boulder formation, till in several places it presents a succession of broad based and regularly defined pyramids, beautifully verdant and tufted with wood; giving a most peculiar character to that section of the scenery.
>
> Immediately behind the house, and partially flanking it on either side, is a delightful grove of the dark leaved and crimson blossomed Ohia, so thick and so shady as insensibly to remind one of Cowper’s Wilderness at Olney—filled with cool and retired walks and natural retreats, and echoing to the cheerful notes of the little songsters, who find security in its shades to build their nests and lay their young. The view of the head of the valley inland, from the clumps and single trees edging this copse, is very rich and beautiful; presenting a circuit of two or three miles delightfully variegated by hill and dale, wood and lawn, and enclosed in a sweep of splendid mountains, one of which in the centre rises to a height of three thousand feet. [Stewart 1831:140–141]

Ka‘ahumanu retired to her estate in Mānoa to get away from the heat, dust, and political enemies that she made in Honolulu. In 1826, Ka‘ahumanu ruled against a libel charge made by a British whaling man, Captain Buckle, in favor of the Lahaina missionary Mr. Richards. Mr. Richards had spread the news that the captain had purchased a Hawaiian woman for money, breaking the law against prostitution. This ruling by Ka‘ahumanu caused great anger among the critics of the missionaries, including the British Consul to Hawai‘i:

> The queen by this decision made enemies for herself of the consul and the foreign merchants and of Boki and Manuia of her own people. . . . The consul beat up one of her [Ka‘ahumanu’s] keepers who had chased away the consul’s cattle which roamed at large all the way to Pawa‘a and were eating Ka-‘ahu-manu’s plantings at Kapuka‘oma‘oma‘o in Manoa. [Kamakau 1992:283]

Ka‘ahumanu died in this house. She was moved to Mānoa in 1832 from her house in Honolulu “in hope that the salubrious air would prove beneficial, but which terminated fatally June 5th of that year” (Thrum 1891:113). John Papa ‘Ī‘ī (1959:158) stated, “Kaahumanu died on June 5, 1832, at her house with the green shutters in Manoa valley, close to Kawaihoolana. Because of her love for Manoa she went there during her last illness after having been sickly for four or five years.” The place name Kawaiho‘olana could not be found on the 1883 Bishop map, but a long-term resident of the valley, Maka Woolsey, placed this area *mauka* of the *‘ili* of Kukuio, as just *makai* of the *‘ili* of Komoawa‘a, shown on an 1882 Baldwin map (Figure 9). Samuel Kamakau reported,

> Late that night she became ill and at daylight was removed to her rest house up Manoa Valley at Puka-‘oma‘oma‘o on the edge of the *‘ohi‘a* and *kukui* groves. A week and a half later in the early hours of Tuesday, June 5, 1832, Elizabeth Ka-‘ahu-manu died in her sixty-fourth year, while her body showed no look of age and her bearing was still impressive. Early in the morning she was brought into the city on a covered litter and it shook so much that her niece, Ka-manele, occupied it with her. [Kamakau 1992:308]

Thrum (1891:113) places her residence in the *‘ili* of Komoawa‘a:

> The locality where the good queen passed away shows little evidence now of ancient royal residence. It was situated well in the valley at a place known as

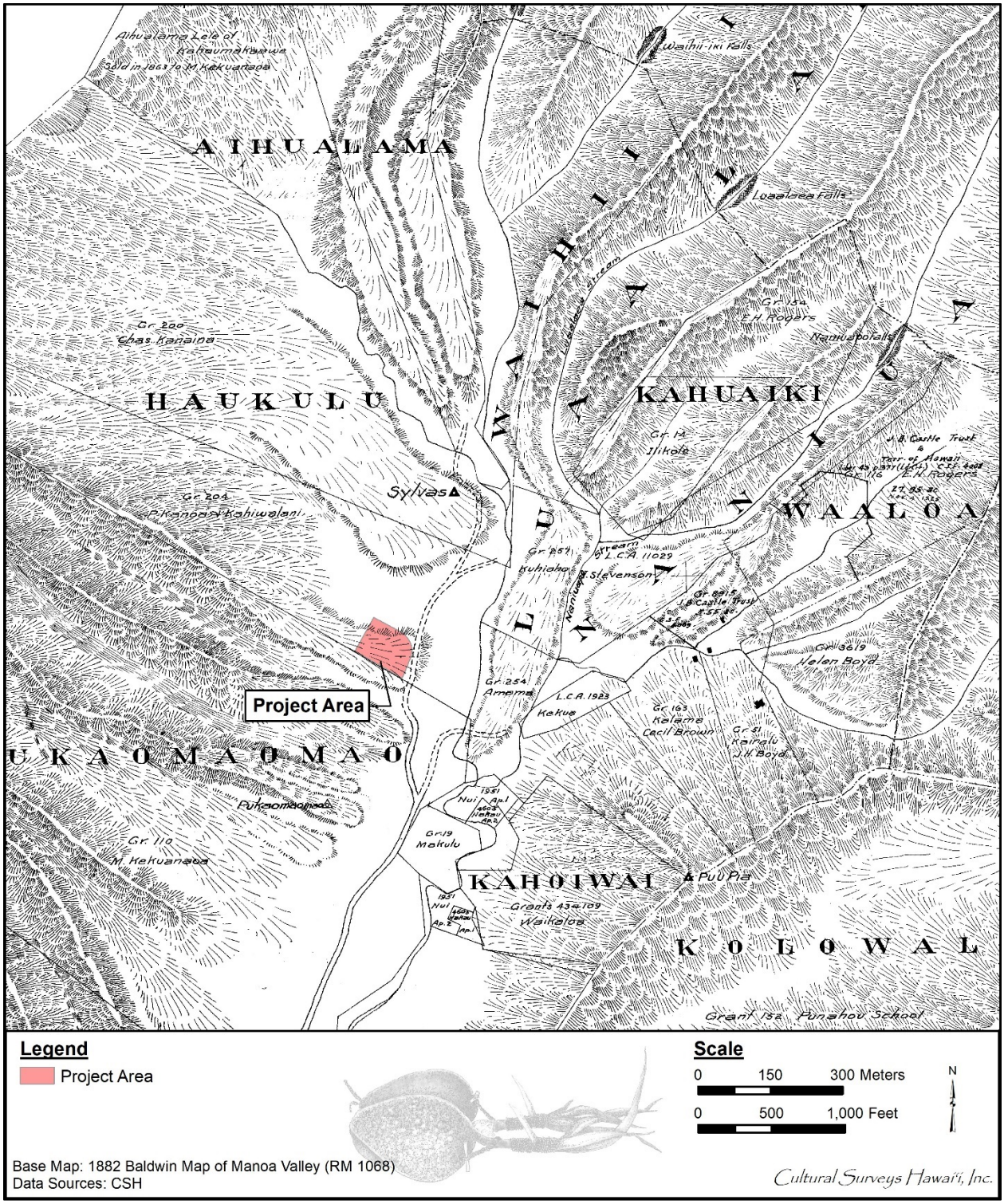


Figure 9. 1882 Baldwin map of Mānoa Valley showing the project area

> Komoawaa; the residence itself being called Pukaomaomao, from its green painted doors and blinds. Puulena, the old Chinese burial ground, from the year 1845, situate at the head of the central road of the valley, is said to have been part of Kaahumanu‘s estate. [Thrum 1891:113]

An 1872 reminiscence in the Hawaiian newspaper, *Ka Nūpepa Kū‘oko‘a*, implies Ka‘ahumanu’s residence is at or near Kaho‘iwai, an *‘ili*:

> *He aina maikai no o Manoa, oia ka helu elua o ke awawa a ka olu i noho ai, ua hoopulu mau ia oia e ka noe a me ka ohu, a he uliuli lipolipo hoi in na lauu, mai kona piko honua a i kona mau kuemaka pali; a nona hoi ka ua kaulana, he Kauhine a ka mahani kulakulei kauhale, he Kakea. A ma keia wahi no i luana mau iho ai ka Makuahine Alii Kaahumanu, e walea ana i ka olu o ka wai o Kahoiwai, a me ka huihui momona o ka wai peepee, palapalai o Waiakeakua , a no ka honi mau paha i na ea oluolu o ka uka; a na kona a i alii no hoi a lei mau na lehua puakea o Naniuapo, a kuu aku la kona luhi.* [Kaualilinoe, *Ka Nūpepa Kū‘oko‘a*, 16 November 1872]
>
> <u>Translation:</u>
>
> Manoa is a fine land and one of the two vallies where coolness dwells. It is constantly kept moist by fog and mist and it is green with trees from the base to the top of the cliffs. To it belongs the famous Kuahine rain and the wind that pushes over houses, the Kakea. Here the Queen Mother, Ka‘ahumanu spent the time, enjoying the cool waters of Kaho‘iwai; the refreshing water of Waiakeakua where the palai ferns hide [by the banks] and to inhale the cool air of the upland. Aroundher royal neck was always a lei of the white lehua of Naniuapo until she was released from this weary life. [translation from Hawaiian Ethnological Notes, Bishop Museum Archives n.d.:605]

By 1932, only the stone foundation of the house remained. This newspaper article also places Ka‘ahumanu’s residence in the *‘ili* of Kaho‘iwai:

> Just past the junction of Manoa Road and Oahu Avenue in upper Manoa valley, surrounded by market gardens and where automobiles whiz past, a green overgrown path leads off the highway to a tiny clearing, shaded by fine old hau trees and bushes in which there is a stone foundation of a former house. The stones are moss covered and the structure which once covered them has long since disappeared. Yet this is historic ground, the homesite of one of the islands’ greatest queens.
>
> Kaahumanu, queen of Kamehameha the Great, had her summer house on this cool spot. It was doubtless the same sort of grass house which was in general use, although probably more spacious and elaborate as befitted a queen. The dimension in one direction is 60 feet. The place was known as Kahoiwai, or ‘Returning Waters.’ [Sterling and Summers 1978:287]

As can be seen from the preceding citations, there is some confusion about the exact location of Ka‘ahumanu’s house within her large estate. ‘Ī‘ī placed the house “near Kawaihoolana,” but this place name could not be found on any historic maps.

The 1932 newspaper article places the house near the junction of Mānoa Road and O‘ahu Avenue. Bouslog et al. (1994:198) used this reference to suggest Ka‘ahumanu’s house may have been in the general location of the Salvation Army’s Wai‘oli Tea Room in the *‘ili* of Ka‘aipū, where Mānoa Road and O‘ahu Avenue cross. This seems to contradict the 1932 article, which places the house in the *‘ili* of Kaho‘iwai, *mauka* of Ka‘aipū.

Several other references place the house in the *‘ili* of Pū‘ahu‘ula, which is the land adjacent to and *mauka* of Ka‘aipū:

> *Mahope iho oia noho ana, ua hoi aku ka Aliiwahine Kaahumanu uo uka a noho he hale pilimauu Hawaii nui o ka ui i Puu ahuula ma Manoa, he uluhau ie wahi o keia aina.* [*Hōkū o Hawai‘i*, 18 February 1930]
>
> Translation:
>
> After a while Kaahumanu went to Manoa to Puahuula to live in a large Hawaiian grass hut. There was a hau grove there. [Sterling and Summers 1978:288]

According to legends concerning the gods Kāne and Kanaloa’s journey through Mānoa Valley, Laura Green and Mary Kawena Pukui state that:

> *Hoomau no laua i ka laua huakai hele, a i Manoa, i Puahuula (I Puahuula i noho ai o Kaahumanu, ka wahine a Kamehameha naiaupuni).*
>
> The two continued their journey up Manoa to Puahuula (the place where Kaahumanu lived, wife of Kamehameha the conqueror of the islands). [Green and Pukui 1936:114–115]

Mary Kawena Pukui describes the home of the queen within a grove of guava trees near a pool and spring:

> Queen Kaahumanu lived in Manoa. Her home was called Pukaomao. The first guavas and the first goldfish were brought there by the queen. Mrs. Malia Kakoi Kamana remembers her mother telling her that a tapu was placed on the guava; no one could have any unless the queen gave them to her. But the birds pecked the fruit, and soon the guava spread all over the island. [Mrs. Mary Kawena, Hawaiian Ethnological Notes, Vol. 1:1378]
>
> Pu-ahu‘ula (Pu here is short for Puna) ‘Spring-of-the-Feather-Cape.’ There was a mo‘o who lived there. Somewhere mauka of Pukaoma‘o. [M. Pukui, 16 March 1954 in Sterling and Summer 1978:288]

A book on Ka‘ahumanu’s death mentions such a feather cape associated with this location:

> . . . Realizing that the end was near, Ka-ahumanu asked to be taken to Pukaomaomao, her mountain home far up in Manoa Valley. . . .
>
> The couch upon which Kaahumanu was to rest had been prepared with loving care. Spread first with sweet-scented maile and ginger leaves, it was then covered with a golden velvet coverlet. At the head and foot stood towering feather kahilis. Over a chair nearby was draped the Kamehameha feather cloak which had been worn by Kaahumanu since the monarch’s death. [Mellen 1952:270, 272]

Mary Kawena Pukui believed Ka‘ahumanu’s house was near the end of Huelani Drive in the *‘ili* of Pū‘ahu‘ula, where there was once a spring called Huelani. She believed that the name, *huelani*, the royal gourd, referred to the well that was once near Ka‘ahumanu’s home. This would place the house in the *‘ili* of Pū‘ahu‘ula, *mauka* of the hill known as Pu‘u Ahula. Princess Victoria Kamāmalu, the granddaughter of Kamehameha I, was said to have had a home on a hill in Pū‘ahu‘ula, *makai* of Ka‘ahumanu’s house (Bouslog et al. 1994:198). This seems to confirm that Ka‘ahumanu’s house was *mauka* of Pu‘u Ahula.

A 1940 article by Ethel Damon also placed the house in Pū‘ahu‘ula, at the end of Olopua Street:

> On the north slope of the valley, leading the way for present-day roads and houses, Kaahumanu built a home where she often retired for quietness, she said, and freely moving air. Here she planted choice *lehua* trees and the tiny red Hawaiian hibiscus which still grew there not so long ago. Her Green Gateway she called this home, Pukaomaomao, through which she looked out over the valley below. Until very recently one could clamber up to the foundations stones of Pukaomaomao, in a little Japanese flower garden above Olopua Street, a short mile mauka of the Waioli Tea room, and today a thicket of hau trees still twists itself protectingly about some of those stones. [Damon 1940:5–6]

Most of the recent research on this question has placed the house in the *‘ili* of Puka‘ōma‘oma‘o. As noted previously, the 1932 newspaper article stated the house was at the junction of Mānoa Road and O‘ahu Avenue. Mānoa Road and O‘ahu Avenue actually merge at a second point farther up the valley. This location is within the *‘ili* of Puka‘ōma‘oma‘o, just *makai* of the *‘ili* of Kaho‘iwai. This location is also west of the border of the *‘ili* of Komoawa‘a, where Thrum (1891:113) placed the house.

Bouslog (1983:13) believes the question has finally been answered. On the 1882 map of Mānoa Ahupua‘a (see Figure 9), there is a triangulation station marked “Pukaomaomao,” which is south and *makai* of the current project area. This map was drawn by Erdman D. Baldwin, the grandson of the missionary Dwight D. Baldwin, who had personally visited the queen’s house. Thus, E.D. Baldwin would have known exactly where the queen’s house was located. This mapped point is near the modern junction of Kumuone and Loulu streets in the *‘ili* of Puka‘ōma‘oma‘o. Of all the suggested locations, this last is the most *mauka*, which would agree with the descriptions of Ka‘ahumanu’s house as at the “head” of the valley.

3.1.6 Interview with Maka Woolsey, Storied Places in West Mānoa Valley

Maka Woolsey, a Chinese-Hawaiian businesswoman, was the granddaughter of Nāholowa‘a, who had moved to O‘ahu from Maui during the reign of Kamehameha II and received a 3-acre *kuleana* parcel in Mānoa Valley called Keaulana. With her second husband, George Woolsey, she became involved in the growing of taro and the sale of *poi*, becoming the proprietor of the Mānoa Woolsey Poi Factory. During the writing of the book *Mānoa, the Story of a Valley* (Bouslog et al. 1994:99–104), she was interviewed about *wahi pana* (legendary places) in the valley. The interview is written as if one is walking up the western valley on the old trail, now covered by Mānoa Road. In the upland area, near the project area, Mrs. Woolsey begins with Puka‘ōma‘oma‘o, the *‘ili* of the O‘ahu Avenue and Kumu Street portions of the project area.

Next was Puka‘ōma‘oma‘o, the home of Queen Ka‘ahumanu. *Makai* of the residence were the waters of Waiakeakua and a pool called Kawaiho‘olana, which means “to float.” Only the Queen could use this pool; it was *kapu* to everyone else. On the mountainside of Puka‘ōma‘oma‘o was Pukakomo, a natural opening into Pālolo Valley, which was used as a trail to this neighboring *ahupua‘a*. At Lili‘uokalani’s death in 1917, this opening was closed off by rocks. This may be the cave inhabited by Kamehameha and his troops during their invasion of O‘ahu (Bouslog et al. 1994:113):

> Maka also knew many other mysteries of Mānoa. Along the cliffs of the left side she could point out where the burial caves were located. From many of these caves, fragments of *tapa* waved ever so gently as a sign of remembrance. She spoke of Poki, the guardian dog of the valley, who if seen was a warning to the people of *kapu*. When you saw this dog, it was best to keep away from Mānoa. ‘Oloki‘i, the pig and dog *akua* [god], who had no hair, was also known to Maka. This god lived in upper Mānoa at the site of *‘aki‘aki* (rushes). [Bouslog et al. 1994:113]

3.2 Mānoa Historical Background

3.2.1 Mānoa Valley Description

In 1892, before the expansion of urbanization into the area, Thomas Thrum described the beauty of Mānoa Valley:

> Manoa is both broad and low, with towering hills on both sides that join the forest clad mountain range at the head, whose summits are often hid in cloud land, gathering moisture from there to feed the springs in the various recesses that in turn supply the streams winding through the valley, or watering the vast fields of growing taro, to which industry the valley is devoted. The higher portions and foot hills also give pasturage to the stock of more than one dairy enterprise.
>
> . . . For nearly a mile the road leads by or along pasture fields with no vestige of tree or shrub other than the lantana pest and an occasional algeroba (kiawe), and passes along Round top or Ualakaa . . .
>
> At this summit of the road the whole valley opens out to view, the extensive flat area set out in taro, looking like a huge checker-board, with its symmetrical emerald squares in the middle ground, surrounded by pasture fields on the slopes at the base of the guarding hills. Here and there ‘mid sheltering trees, humble dwellings dot the scene around, while up the rugged slopes the almost endless shades of green with black worn seams of rock oft times lightened by ‘silvery thread of torrent,’ forms the background to one of the most charming pictures, either in the clear sunlight, heightened as it often is by cloud shadows chasing rifts of sunshine down the mountain sides; or, as frequently, may be, to watch the drifting mist or rain sweep down one side of the valley, while the other basked in the sun, throwing over its weeping neighbor a “bow of promise” so radiant and bright that its double, or even triple, reflection is no rarity. [Thrum 1891:110–111]

Mānoa Valley was a favored spot of the *ali‘i*, including Kamehameha I, Ka‘ahumanu, Chief Boki (Governor of O‘ahu), Ha‘alilio (an advisor to King Kamehameha III), Princess Victoria

Kamāmalu, Kana‘ina (father of King Lunalilo), Lunalilo, Ke‘elikōlani (half-sister of Kamehameha IV), and later Queen Lili‘uokalani:

> The site of the various houses that once sheltered Haalilio and his retinue is pointed out just above the old Ehu homestead, known later as the ‘Charley Long’ premises and, till very recently, part and parcel of Montana’s Kaipu Diary. Rev. H. Bingham, of early Hawaiian Mission fame, is also referred to by old timers as having had a residence adjoining the Haalilio premises, though his history makes no mention thereof. [Thrum 1891:114]

3.2.2 Agriculture in Mānoa Valley

Handy describes the agricultural abundance of Mānoa:

> In upper Manoa the whole of the level land in the valley bottom was developed in broad taro flats. The terraces extended along Manoa Stream as far as there is a suitable land for irrigating. . . . About 100 terraces are still being cultivated, but these do not constitute more than one tenth of the total area capable of being planted.
>
> Bennett described the upper valley as ‘Checquered with taro patches.’ [Handy 1940:77]

An 1855 map of O‘ahu (Figure 10) shows the extent of these taro patches suggesting the majority were well *makai* of the present project area. It may have been that the project area land was too high above the stream to support irrigation. Legends indicate *‘awa* was grown near pools and springs in this upland area (Handy and Handy 1972:480).

That Mānoa was the residence of kings and commoners is well attested to in legends, land records, and early maps of Honolulu. The “Indices of Awards” lists 74 Land Commission Awards (LCA) in 21 named localities at Mānoa, which attests to the substantial population of the area. King Kamehameha I was attracted to the land for the cultivation of food for his invading army. He had one house near Pu‘u Pueo below Pu‘u ‘Ualaka‘a:

> The places Kamehameha farmed and the houses he lived in at those farms were show places. His farmhouses in Nuuanu stood several hundred fathoms away from the right side of Kapaehala, a knoll on the western side of Nuuanu Street and Hanaiakamalama House. Perhaps the location was chosen to enable him to look both inland and seaward to his food patches. Some elevated houses seem to have been for that purpose. So it was with Puupueo, directly below Ualakaa. [‘Ī‘ī 1959:69]

Thrum also reported that Kamehameha often stayed in Mānoa Valley:

> It is evident that Manoa has for several generations past, been held in high esteem by Hawaiians of rank. Kamehameha I was no stranger to the valley, and it early became the favorite resort of his immediate household and followers. [Thrum 1891:113]

Figure 10. 1855 LaPasse map of the South Coast of O‘ahu (portion), showing relationships of taro fields (rectangles) to the project area

3.2.3 Early Ownership and Use of Mānoa Valley

Kamehameha I gave Mānoa to the Maui chief Kame‘eiamoku, after the conquest of O‘ahu. After Kame‘eiamoku’s death, the land was inherited by his son Ulumāheihei (or Hoapili), who became the governor of Maui during the reigns of Kamehameha II and Kamehameha III. Liliha, the daughter of Hoapili, inherited the lands in 1811 and brought them to her marriage with the high chief Boki, governor of O‘ahu. They had a residence at Punahou in Mānoa Valley, which they often used (Bouslog et al. 1994:14–15).

Ka‘ahumanu had a great estate in the upper valley, which included the lands of Pu‘ulena, shown on an 1881 map of O‘ahu (see Figure 9). After the deaths of Boki, Liliha, and finally Ka‘ahumanu in 1832, many of these royal lands were given to Charles Kana‘ina, the father of King William Lunalilo. Kamehameha II (Liholiho) was also said to have maintained a summer house in Wai‘oli and Ka‘aipū. Lunalilo gave some of these lands to Kapōkini, who gave them to Ha‘alilio. When Ha‘alilio went on a diplomatic mission to England, he returned the lands to Kamehameha III (Bouslog et al. 1994:16).

The well-watered, fertile and relatively level lands of Mānoa Valley supported extensive wet taro cultivation well into the twentieth century. The type of taro cultivation in Mānoa was described in a 1932 article:

> The part of the valley used for taro is the flat land on the floor along both sides of Manoa Stream. This land is irrigated by diverting water from the upper reaches of the stream to taro patches which are set out in terraces from the lower land to the higher. The patches vary in size from a few hundred to a few thousand square yards and are so arranged that the water flows from one to an adjoining area. There are six terrace levels from the lower part of the valley to the higher.
>
> Much of the taro land has remained as such since the early history of Manoa Valley when the area was occupied exclusively by Hawaiians. In preparing the land to raise taro, a section of the valley was divided into small inclosures. Banks bordering the patches were built with excavated soil and made water-tight . . .
>
> At the foothills just above Kaipu, is the reputed location of the first Coffee nursery of the islands, also the work of John Wilkinson, with plants brought by him in the Blonde, from Rio de Janeiro. All the shady recesses and glens at the head of the valley show evidences, to-day, of this early agricultural effort, but to no pecuniary or commercial advantage, for it is all neglected and overgrown. [Thrum 1891:114]

An 1855 map by LaPasse (see Figure 10) shows the dense concentrations of taro fields extending to the upland areas of Mānoa Stream, although not up to the present project area. In 1836, French missionaries visited Mānoa, counting 50 houses. If each house contained five people, this would put the population at 250 Hawaiians. The general, the population of Honolulu and the coastal plain was about 6,000-7,000 people, which probably represented only a small percentage of the total population of the area that existed before Hawaiians were decimated by war, exotic diseases, and the disruption caused by the influx of Westerners and Asians and their influence on the economy and culture of Hawai‘i. An 1847 record lists 34 eligible landowners; only two were non-Hawaiian. An 1849 tax list lists 195 Hawaiian names, meaning the population was probably about 1,000 (Coulter and Serrao 1932:109).

3.2.4 Mid-Eighteenth Century and the Māhele

The Organic Acts of 1845 and 1846 initiated the process of the Māhele, the division of Hawaiian lands, which introduced private property into Hawaiian society. In 1848, the crown and the *ali‘i* (chiefs) received their land titles. *Kuleana* awards for individual parcels within the *ahupua‘a* were subsequently granted in 1850. These awards were presented to tenants, Native Hawaiians, naturalized foreigners, non-Hawaiians born in the Islands, or long-term resident foreigners who could prove occupancy on the parcels before 1845 (Chinen 1958).

However, some early experiments in selling land grants directly to commoners had been conducted in Makawao on Maui and in Mānoa on O‘ahu as early as 1846 (Moffat and Fitzpatrick 1995:49). Theophilus Metcalf made a map of the 30 parcels sold in Mānoa in 1847 (Figure 11). This map shows the O‘ahu Avenue and Kumu Street portions of the project area were held by Mataio Kekūanāo‘a, a high ranking *ali‘i* who was governor of O‘ahu from 1839–1864. The project area lies in the lower portion of Land Grant 204, which was awarded to Kahiwalani and P. Kanoa.

A survey of Land Commission documents suggests most of the agriculture and habitation at Mānoa was in the east central part of the valley (along Mānoa Stream) between the current Mid-Pacific Institute and the Chinese cemetery *makai* of the present project area. The distribution of Land Commission Awards in the vicinity of the project area is shown in Figure 12. It appears there were no *maka‘āinana* (commoner) LCA awards in or in the immediate vicinity of the project area.

3.2.5 1900 to Present

Hawaiians and Chinese continued to grow taro on the floor of Mānoa Valley into the late nineteenth century (Figure 13). By the end of the century, Chinese cultivated half of the taro lands in Mānoa Valley; they also planted other vegetables and bananas. For a time, pineapples were raised on the lower slope between Pu‘u Pia and Wa‘ahila Ridge (the eastern boundary of the *ahupua‘a*) (Emery 1956:57).

Farmers also attempted rice cultivation in Mānoa Valley by 1882, but the project was unsuccessful:

> Though the valley is under almost complete cultivation of taro, largely by Chinese companies, an effort was made by them in 1882 to divert it to the growth of rice, but after two years struggle with high winds, cold rains and myriads of rice birds it was abandoned. In the spring of 1884 a north wind, with the local appellation of Kakea, visited the valley, which blasted all the taro, withered all the growing rice, moved a number of houses bodily and demolished several entirely. This is said to have terminated the rice industry of Manoa, since which time its fields have been devoted to taro, as it had been for many preceding generations. Sweet potatoes and bananas are also cultivated in a limited measure, and some attention is being given to fruit culture . . . [Thrum 1891:116]

In the early part of the nineteenth century, Japanese entrepreneurs began to move into the upper valley to start truck farms, growing strawberries, vegetables such as Japanese dry-field taro, Japanese burdock, radishes, sweet potatoes, lettuce, carrots, and soybeans, and flowers to sell to the Honolulu markets. Farmers grew bananas on the northeastern slopes of the valley. Several groups opened dairies in the area, including the first, which was operated by William Harrison

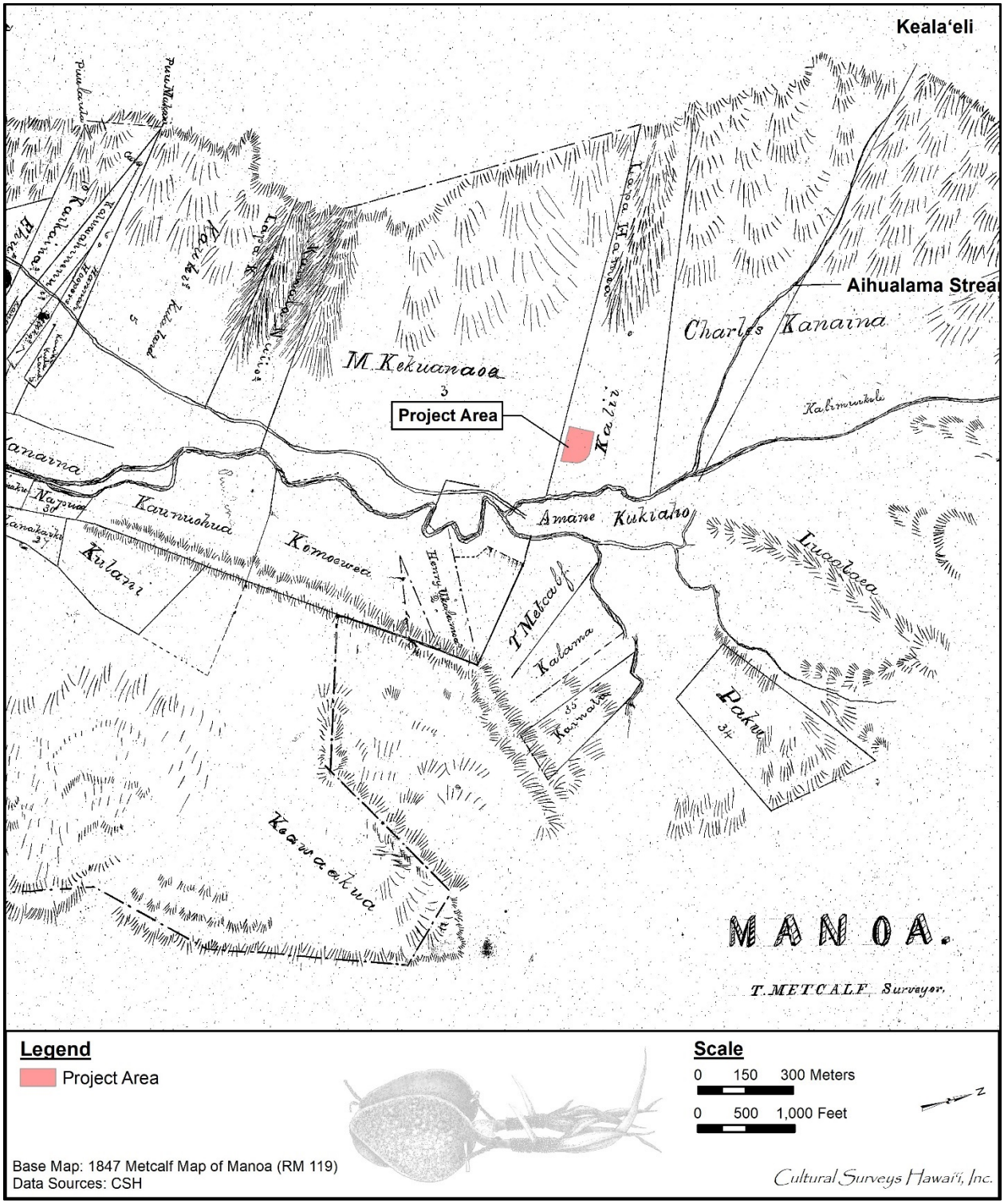


Figure 11. 1847 Hawaiian Government Survey Metcalf map of Mānoa, surveyed by Theophilus Metcalf showing project area

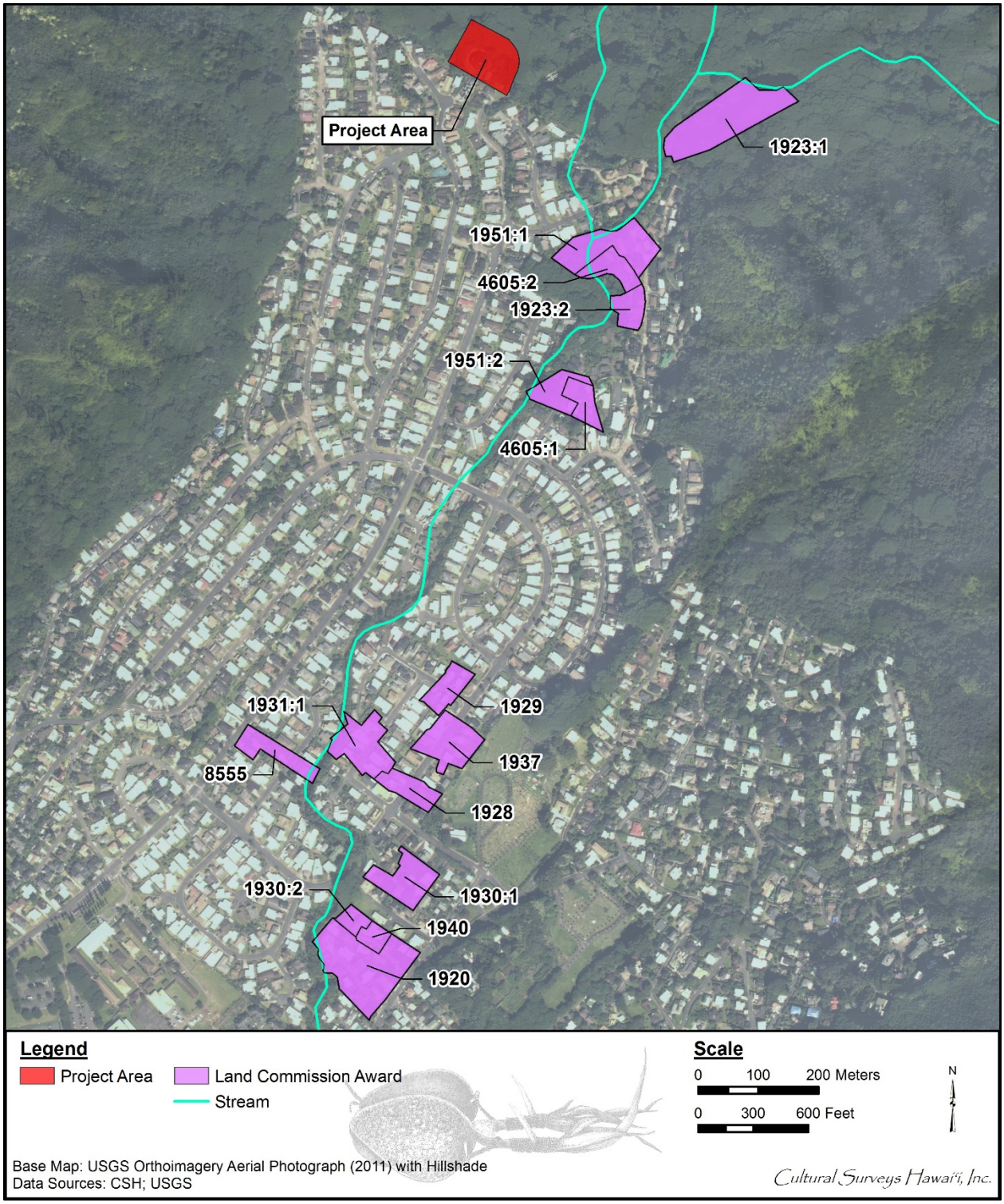


Figure 12. Land Commission Awards near the project area shown on a 2011 USGS orthoimagery aerial photograph with hillshade

Rice in 1844. Because of the dairies, grazing cattle denuded many previously forested slopes (Emery 1956:57, 62).

In the 1903-1904 Honolulu City Directory, 148 names are listed, 107 *haole* (non-Native Hawaiian; Caucasian), 11 Chinese, nine Japanese, and 21 Hawaiians. In 1932, the valley had 1,000 homes (with an estimated population of 5,000), about 300 Caucasian, 173 Japanese, ten Chinese, ten Portuguese, six Hawaiian, five Puerto Rican, two Filipino, and one Spanish (Coulter and Serrao:1932:109). By 1944, the population of Mānoa was 15,000. By the year 2000, Mānoa had a population of 21,112 (City and County of Honolulu 2000).

A series of U.S. Army and USGS topographic maps and aerial photographs (Figure 14 through Figure 19) shows the slow development of upper Mānoa Valley in the twentieth century. On a 1919 map (see Figure 14), an unpaved road (denoted by double dashed lines) extends along the east side of the project area and structures are shown to the east near the stream. To the south, many houses are depicted, particularly along the alignment of present day Mānoa Road. A large livestock paddock (denoted by dot and dashed lines) is to the southwest.

The 1933 and 1944 maps (see Figure 15 and Figure 16) show a structure within the project area. The maps show the addition and extension of several roads and a few more structures throughout the valley. More of the roads are shown as being paved (solid lines).

By 1959 (see Figure 17), Mānoa Valley is beginning to be transformed into a more suburban environment. The convention of red coloration for dense suburban development suggests the areas to the south of the project area are quite built out in single-family homes. There are two additional structures in the northeast portion of the project area as well as the BWS water tank.

Both the 1969 map and 1978 aerial photograph (see Figure 18 and Figure 19) show the project area much as it is today. The areas to the north and east are more developed and Mānoa Valley is nearly entirely denoted as a dense suburban area. One less structure is shown in the project area.

3.2.6 Prominent Structures and Areas in Upper Mānoa

The following prominent places serve as memory markers for the twentieth and twenty-first centuries and remain significant to the community of Mānoa. Although not traditional Hawaiian, these prominent places remain significant to Hawai‘i’s unique, multi-ethnic *kama‘āina* culture (Figure 20 through Figure 23).

3.2.6.1 Waioli Tea Room

George N. Wilcox donated funds to the Salvation Army in 1922 for the purchase of land in Mānoa Valley. A tea room (see Figure 20) and bakery were built to be operated by the Salvation Army’s girls’ school. The bakery delivered to downtown stores and operated until 1987. The tea room offered “High Tea” and later luncheons and Sunday brunch. In 1987, when the Salvation Army discussed closing down the tea room, a group called “Friends of Wai‘oli” organized to save the structure for a while, but the place finally shut down in 2013.

A prominent feature of the grounds is a replica of the grass house that Robert Louis Stevenson lived in at Waikīkī during a visit to the Islands in 1889 (see Figure 21). The original grass house was located on the ‘Ainahau Estate of Archibald Cleghorn, his wife Princess Likelike, and their daughter Princess Ka‘iulani, heir to the Hawaiian throne during the reign of the last Hawaiian monarch, Queen Lili‘uokalani. After Cleghorn’s death in 1910, the grass house was moved to the

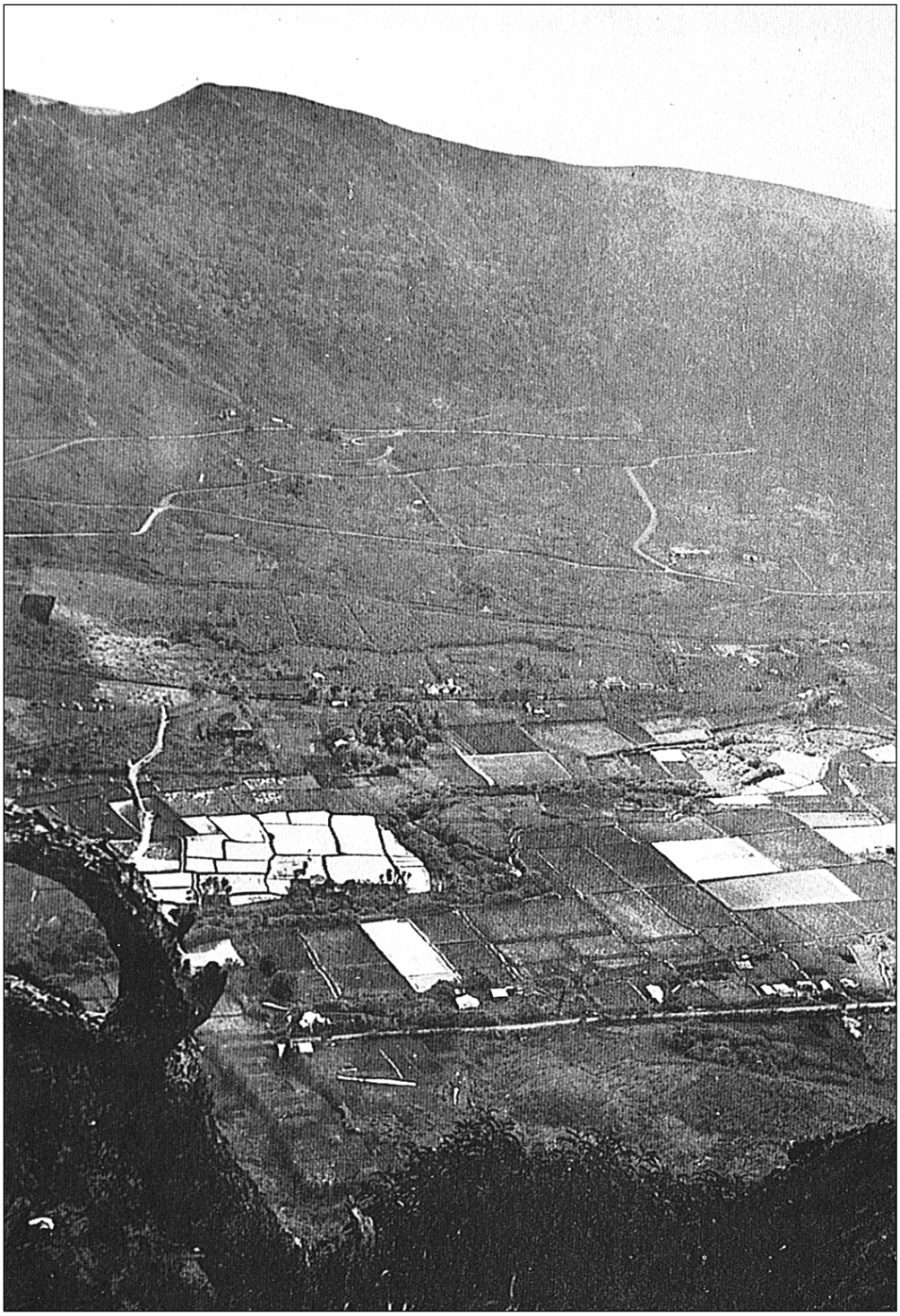


Figure 13. Early twentieth century photograph of checkerboard taro fields on the floor of Mānoa Valley just *makai* of the project area (Original photograph from Hawai‘i State Archives; reprinted in Bouslog et al. 1994:9)

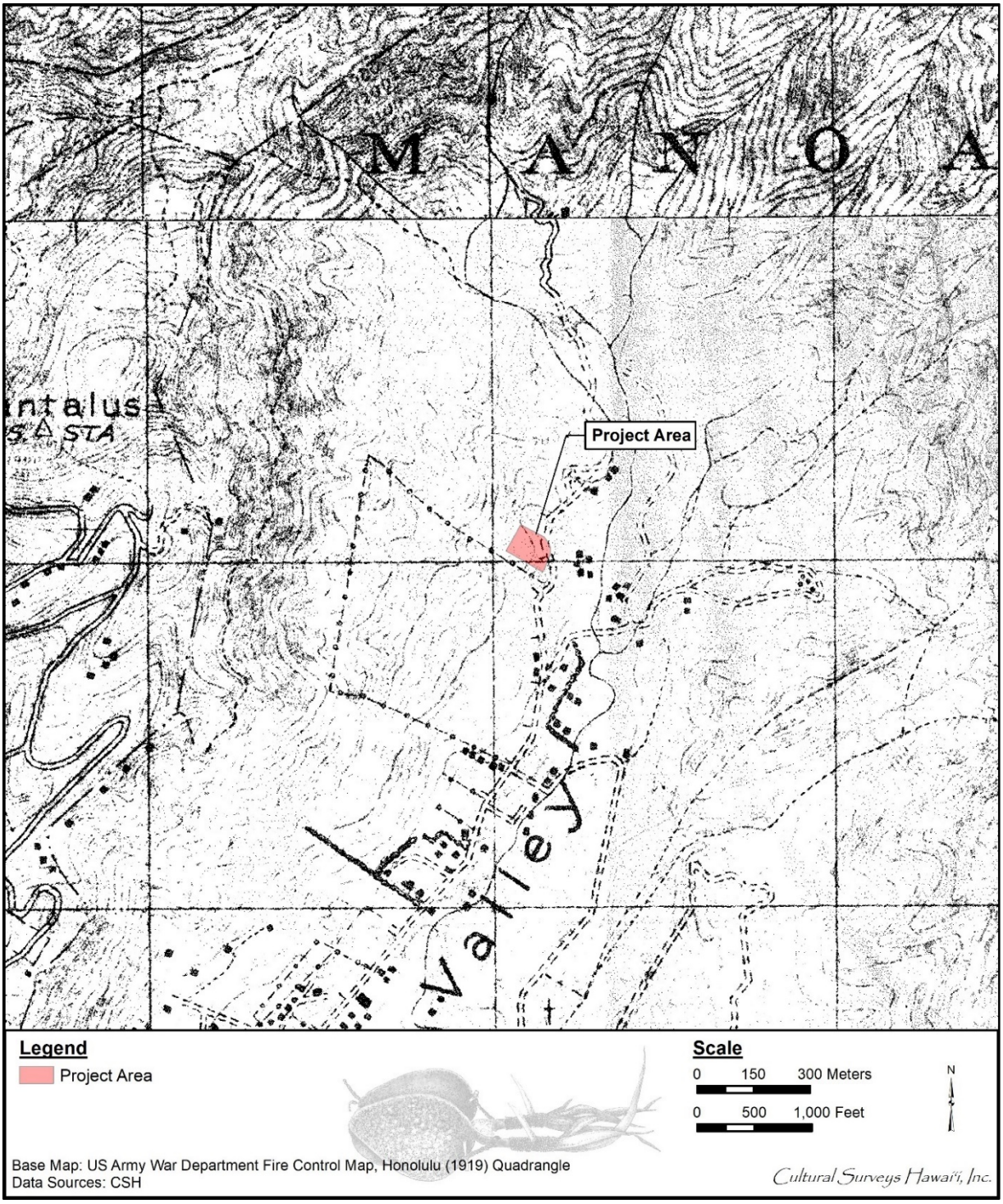


Figure 14. 1919 U.S Army War Department fire control map (Honolulu quadrangle), showing unpaved roads (double dotted lines), cattle paddocks (dot and dashed lines), and scattered residences (black boxes) in upper Mānoa Valley (note several houses near the cross-country 12-inch water main portion of the project area)

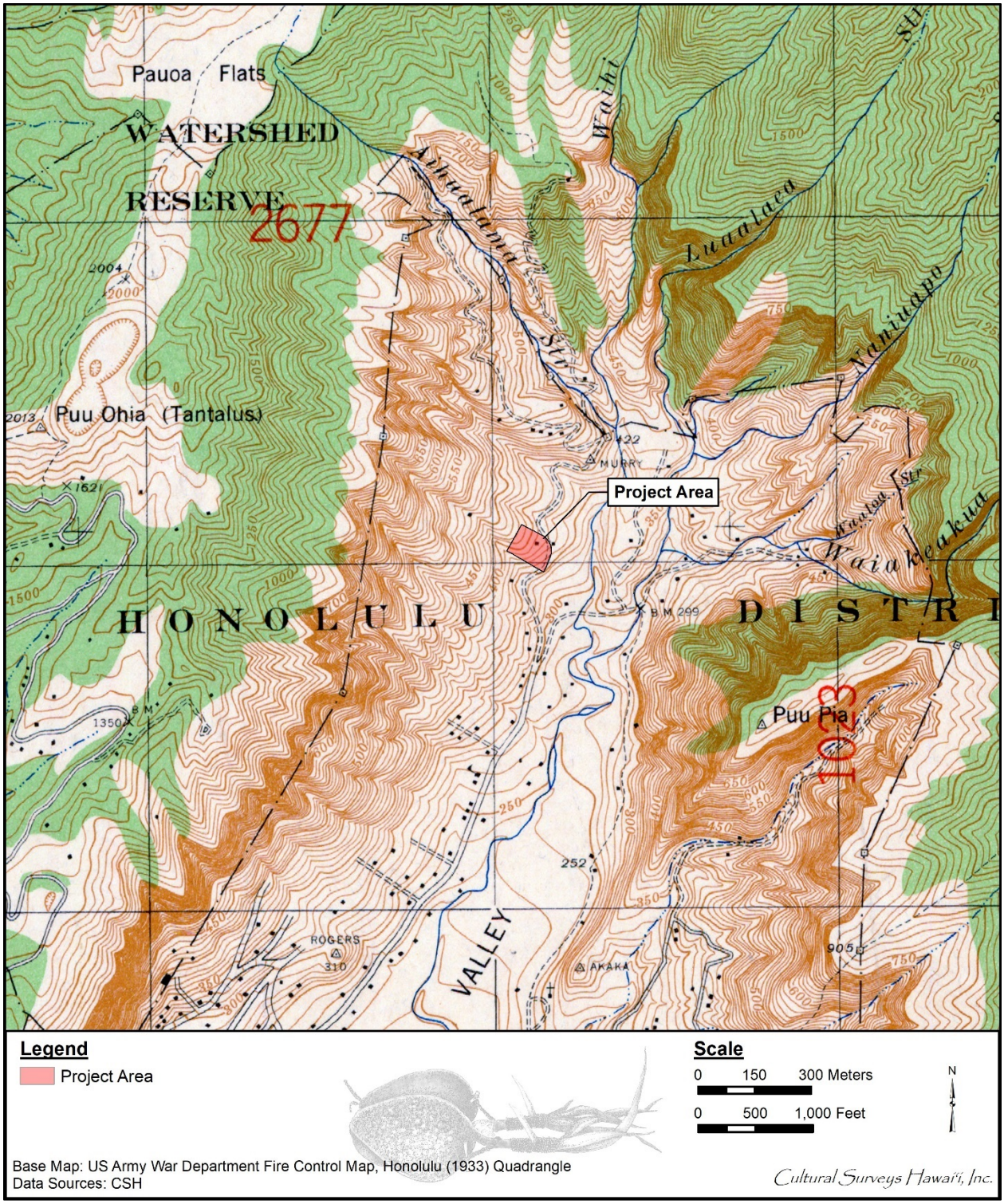


Figure 15. 1933 U.S. Army War Department fire control map (Honolulu quadrangle); Mānoa Road has now been paved (double solid lines) up to the project area and the upper valley

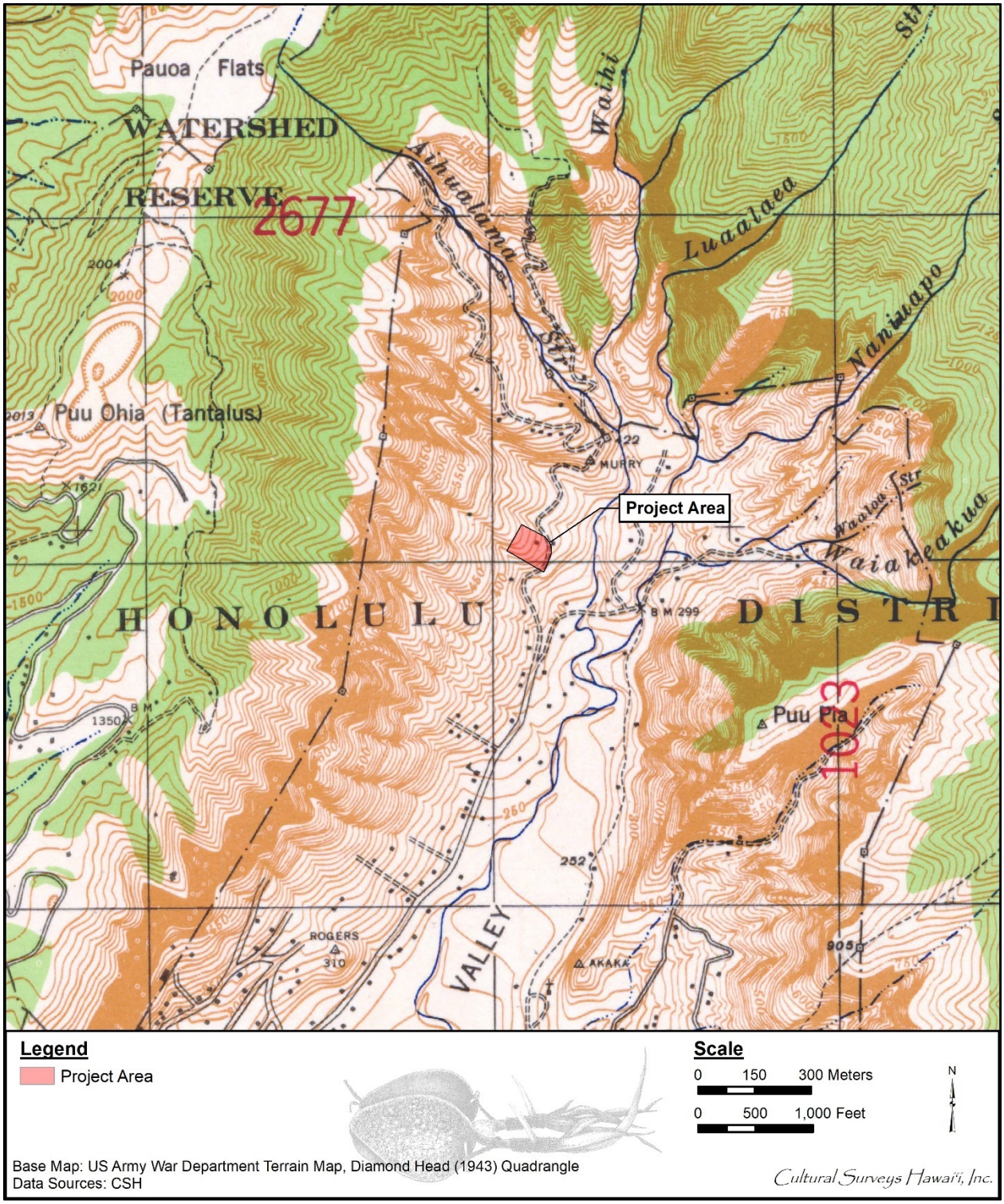


Figure 16. 1943 U.S. Army War Department terrain map (Honolulu quadrangle), showing the still undeveloped nature of project area

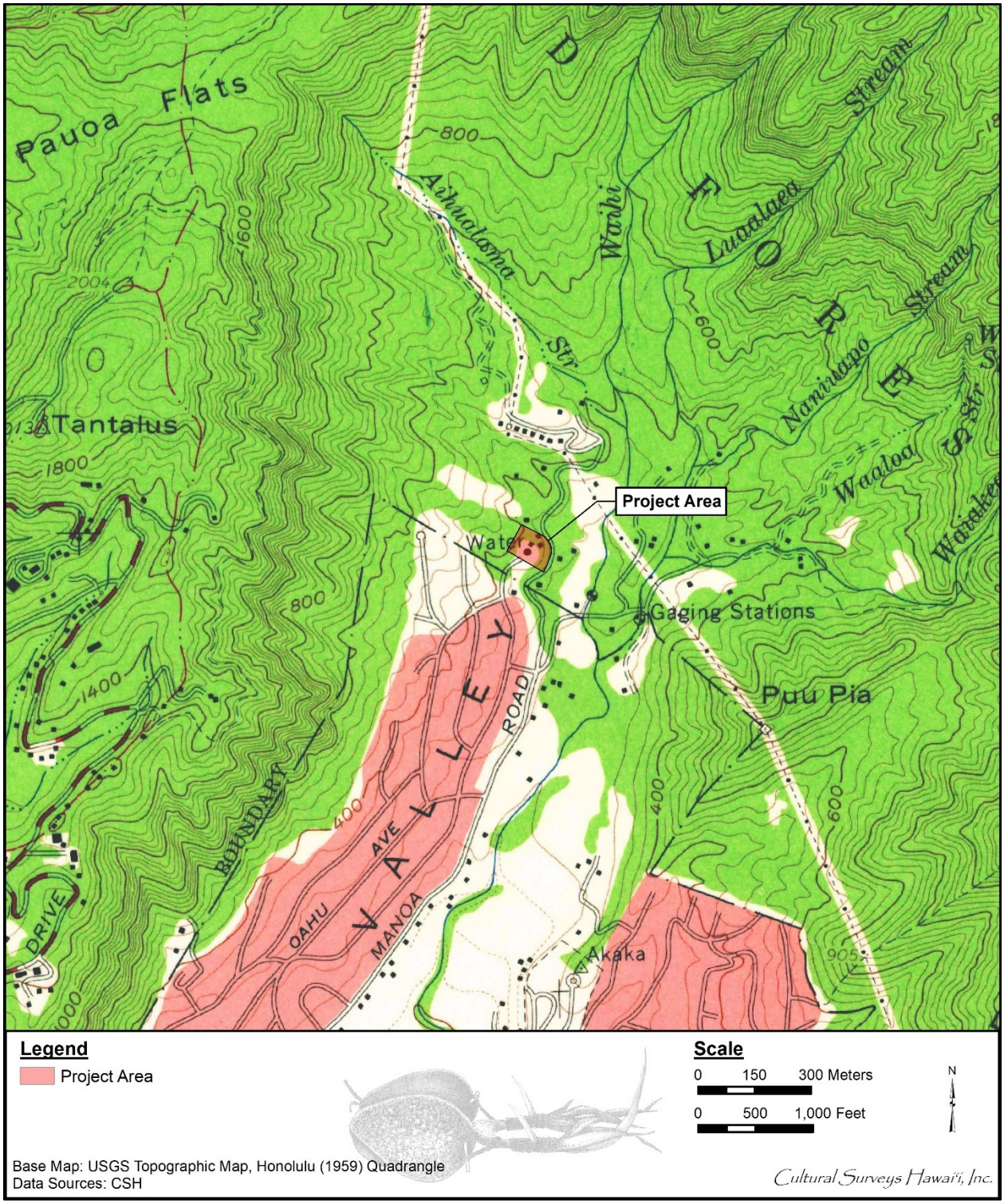


Figure 17. Portion of 1959 Honolulu USGS topographic quadrangle; paved roads now extend into the west portion of the project area

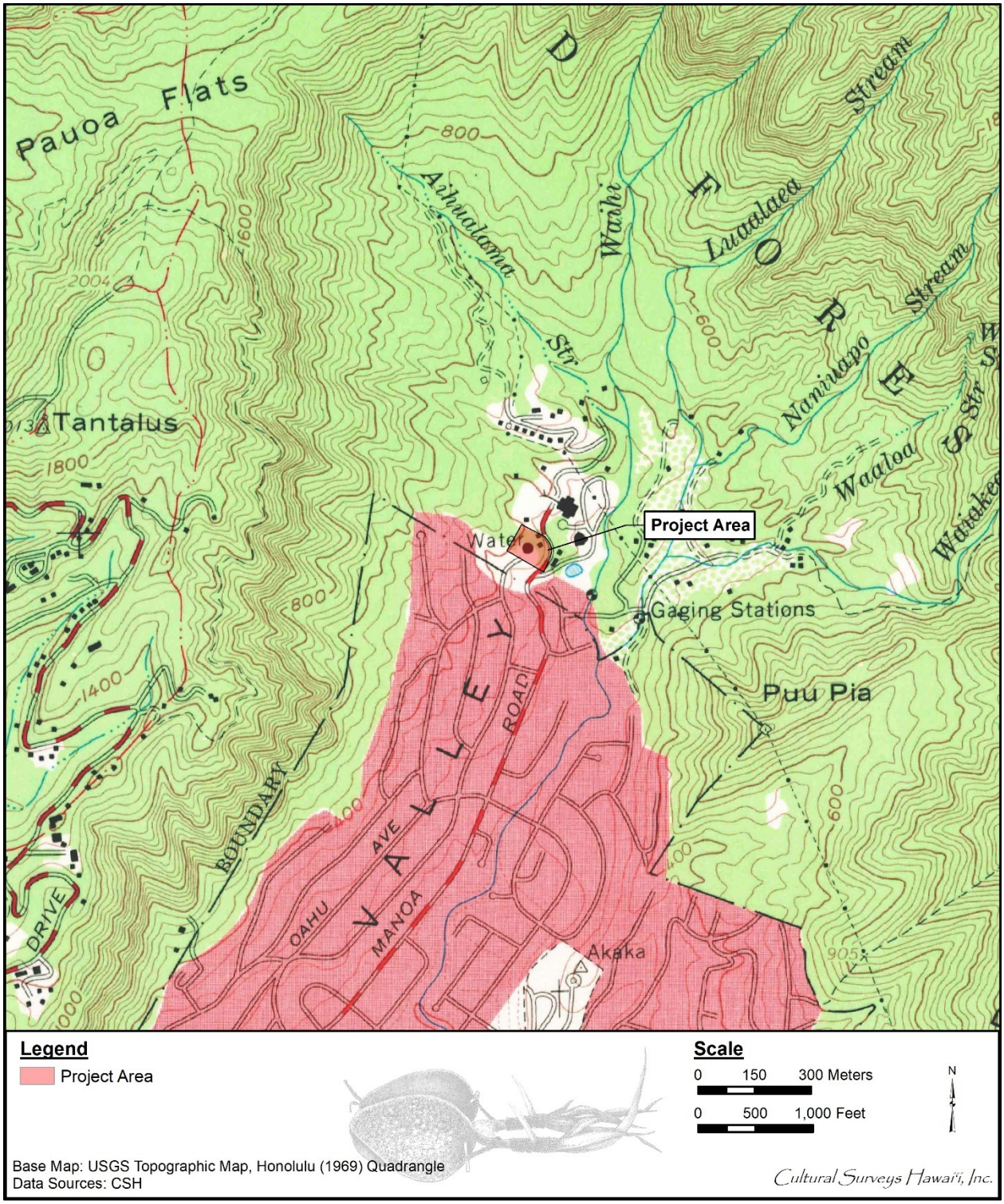


Figure 18. Portion of 1969 Honolulu USGS topographic quadrangle, showing the final development of the paved roads (Pāwaina Street) of the project area

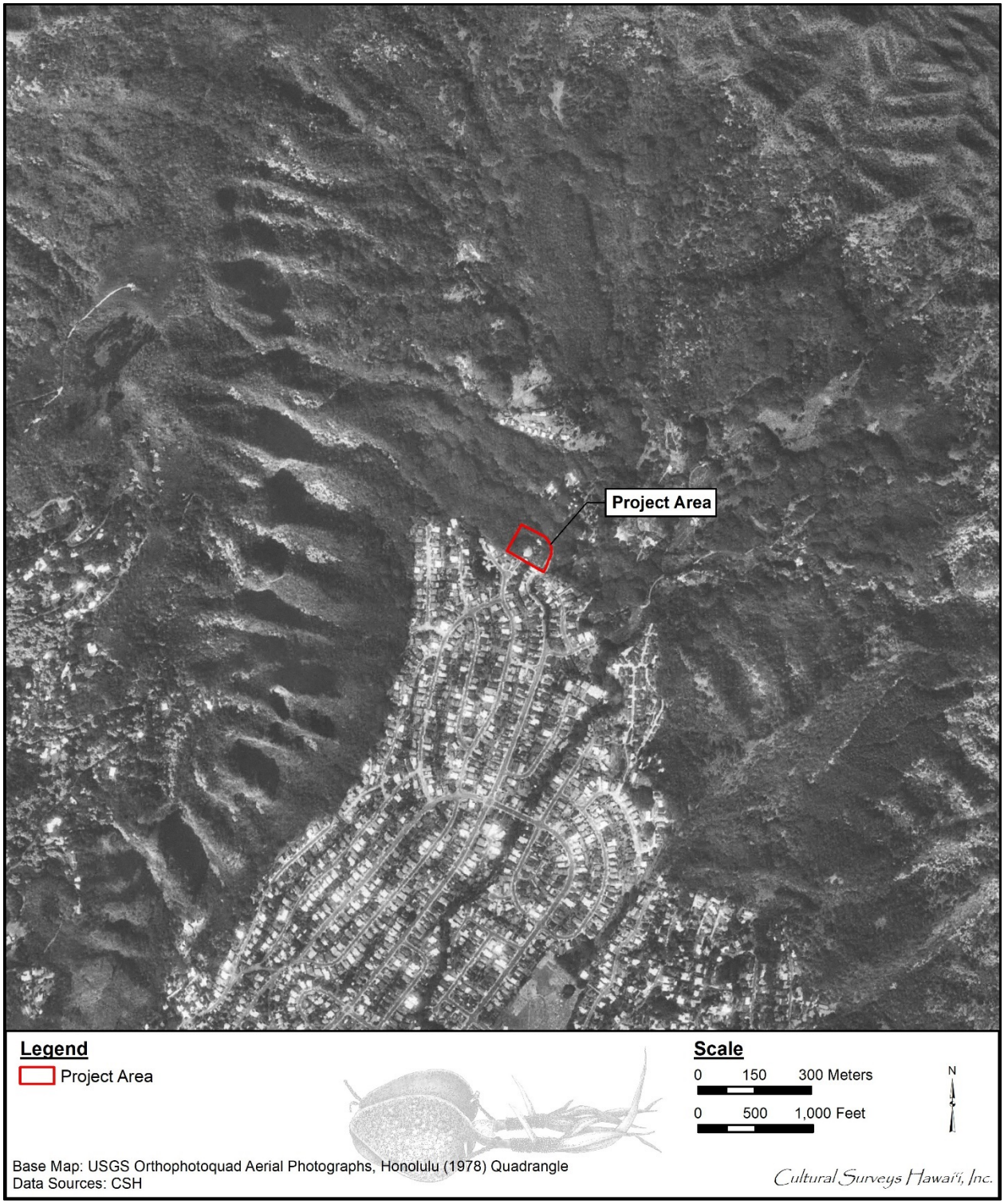


Figure 19. 1978 aerial photograph of upper Mānoa Valley (USGS Orthophoto), showing project area in undeveloped uplands above main residential area

Figure 20. Waioli Tea Room 1920s (Bouslog et al. 1994:101)

Figure 21. Robert Louis Stevenson Memorial Grass Shack (Wikipedia 2017)

Figure 22. Chinese Cemetery, section on east side of East Mānoa Road, view to the west (CSH photograph from O’Hare et al. 2010)

Figure 23. Lyon Arboretum 1920s (photograph from Wikimedia Commons; public domain)

grounds of the Waioli Tea Room. The old hut was rebuilt in 1983, destroyed by high winds in 2003, and restored again in 2012 (Wikipedia 2017)

3.2.6.2 Chinese Cemetery

Chinese residents organized the Lin Yee Chung society in 1851 to buy burial land for Chinese residents, to conduct Chinese funeral rites, and to arrange for the return of bodies to China for final burial, if requested. In 1852, a group purchased the first lot of land, surrounding Akāka Peak (see Figure 22) in Mānoa from a Hawaiian called Moehonua. A section of the land, in the *‘ili* of Pu‘ulena, was once part of the estate of Queen Ka‘ahumanu (Mānoa School PTA 1952:6). In 1854, a practitioner of “kum yee hok,” or geomancy (the art of divination by means of lines and figures), visited Mānoa Valley.

This land, however, had been used even before the society’s purchase for burial. In fact, the earliest known Chinese grave in the Hawaiian Islands, dating to 1835, is in the Mānoa Chinese Cemetery. According to Thom (1985:6), in the early years of the cemetery, “no plots were mapped out. Burial certificates were sold for completely undesignated locations within the cemetery’s boundaries.” It was only around World War I that the cemetery was “laid out in orderly fashion and plots were numbered” (Thom 1985:7). The cemetery is not exclusively for Chinese descendants, but is for residents of other ethnicities as well. There is a section of the cemetery called “The White Mound”:

> Beside the Grave of Tai-Ju at the top of the hill is the White Mound, a common grave of over 300 remains, each placed in individual urns. It is also called the Grave of White Bone Ancestors. These remains, buried during the early years of the cemetery when plots were picked at complete random, were dug up at the time plots were finally mapped. All were unclaimed and untraceable. *It is not even certain that they were all Chinese* [italics added]. [Thom 1985:16]

3.2.6.3 Lyon Arboretum

In 1919, the Hawaiian Sugar Planters’ Association (HSPA) purchased a 124-acre land parcel called Haukulu (see Figure 23), an *‘ili* once owned by Charles Kana‘ina, and later by Fred Harrison, who built his country home and a stable here. Dr. Harold L. Lyon was the plant pathologist for the HSPA and head of the Department of Botany and Forestation for the Territory of Hawaii. He leased 325 adjoining acres of land from the Territory and the Bishop Estate to use as a reforestation area and as an experimental station for growing sugarcane varieties. The HSPA gave the 124-acre arboretum to the University of Hawai‘i in 1953 for the purposes of research, education, and public service (Bouslog et al. 1994:200–201).

3.2.6.4 “The Pen” and the 1895 Battle of Mānoa

Near the Lyon Arboretum, above ‘Aihualama Stream, is a cul-de-sac known as “The Pen” which became famous after the overthrow of the Hawaiian monarchy. Several businessmen established the Republic of Hawaii in 1894. Revolutionists, who wished to restore the monarchy, soon began to stockpile weapons. Robert W. Wilcox, a former member of the government, and his associates planned to form an army large enough to attack Honolulu, capture ‘Iolani Palace, and restore Queen Lili‘uokalani to her throne. The new government found out the Royalists had an arms cache in Waikīkī and sent government police to secure the weapons and arrest the rebels. Some of the Royalists escaped to Diamond Head where they held out for several days, even under

artillery fire. The night of 8 January 1895, the forces retreated into Pālolo Valley, and then finally climbed through a pass into Mānoa Valley, ending at “The Pen.” “The end of Manoa valley is what is called the ‘pen.’ From a distance it has the appearance of three great walls. While it is somewhat broken, escape from it is extremely difficult” (Towse 1895:25).

The rebel forces, under Robert Wilcox, camped out Tuesday night (8 January) behind a knoll on the right side of “The Pen” at two summer residences owned by Wilcox and Robert Boyd (Towse 1895:28).

> Just in the pen of Manoa is a place owned by John Ena. Here Captain Smith [of the Republican soldiers] established headquarters for his company and the Sharpshooters [Wednesday, 9 January 1895]. It was within firing distance of some of the rebels. The artillery was placed on a prominent knoll about a thousand yards beyond the Ena house and well to the left. The firing from the sides of the pen had been quite sharp until the field piece [artillery] arrived. The rebels had acquired a holy horror of shelling, and did not invite any of it. [*Hawaiian Star*, 10 January 1895:3]

> The fighting was going on at the head of the valley near the [Mānoa] falls. The rebel party consisted of Wilcox’s men. They were hiding in brush and were returning fire for fire until after the cannon arrived. The gun was placed in the bullock pen [at the Ena homestead] and a shell sent in the direction of the rebel camp. The aim was too low to do any damage but the loud report scared the natives who immediately took to the trail leading to Pauoa Valley. Their forms could be seen between openings in the trees. [*Pacific Commercial Advertiser*, 10 January 1895:1]

These early reports in Hawaiian newspapers suggest it was the cannon placed in a bullock pen at the Ena homestead that decided the day, but Wilcox later said he instructed his forces to flee the valley once he realized his men had been outflanked by Company A and the sharpshooters. In fact, other historians say the one cannon at the battle was never used (Judd 1975:226).

> They [Republic soldiers] pushed ahead constantly firing wherever there was any sign of the enemy in the lantana and guava bushes . . . The continuance of firing for two or three hours shows more than anything else the determination of the enemy. They sent probably three hundred bullets at the squads of the combined skirmish line. Company A and the Sharpshooters used about twenty rounds to the man. A few of Wilcox’s braves had either Springfield or heavy Winchester guns. [*Hawaiian Star*, 10 January 1895:3]

A map in the *Pacific Commercial Advertiser* (10 January 1895:1), reprinted in Loomis (1976:165) (Figure 24) shows the location of the rebel forces, moving from the Boyd homestead at the east side of “The Pen” toward ‘Aihualama Stream at the west side of “The Pen,” with the forces of Company A on the south side of the stream, and the sharpshooters on the north bank, flanking the rebels. Once Wilcox recognized his forces had been flanked, he ordered his men to try to make their way to the west to Makiki Valley. One exit from “The Pen” was a trail that led along the left bank of ‘Aihualama Stream (Ball 2012:205) to a pass at the Mānoa/Makiki boundary near a peak called Keala‘ela (Loomis 1976:164). Some of the rebels surrendered in the valley, and the rest scattered and fled along the trail. Eventually all of the 1895 rebels were captured or

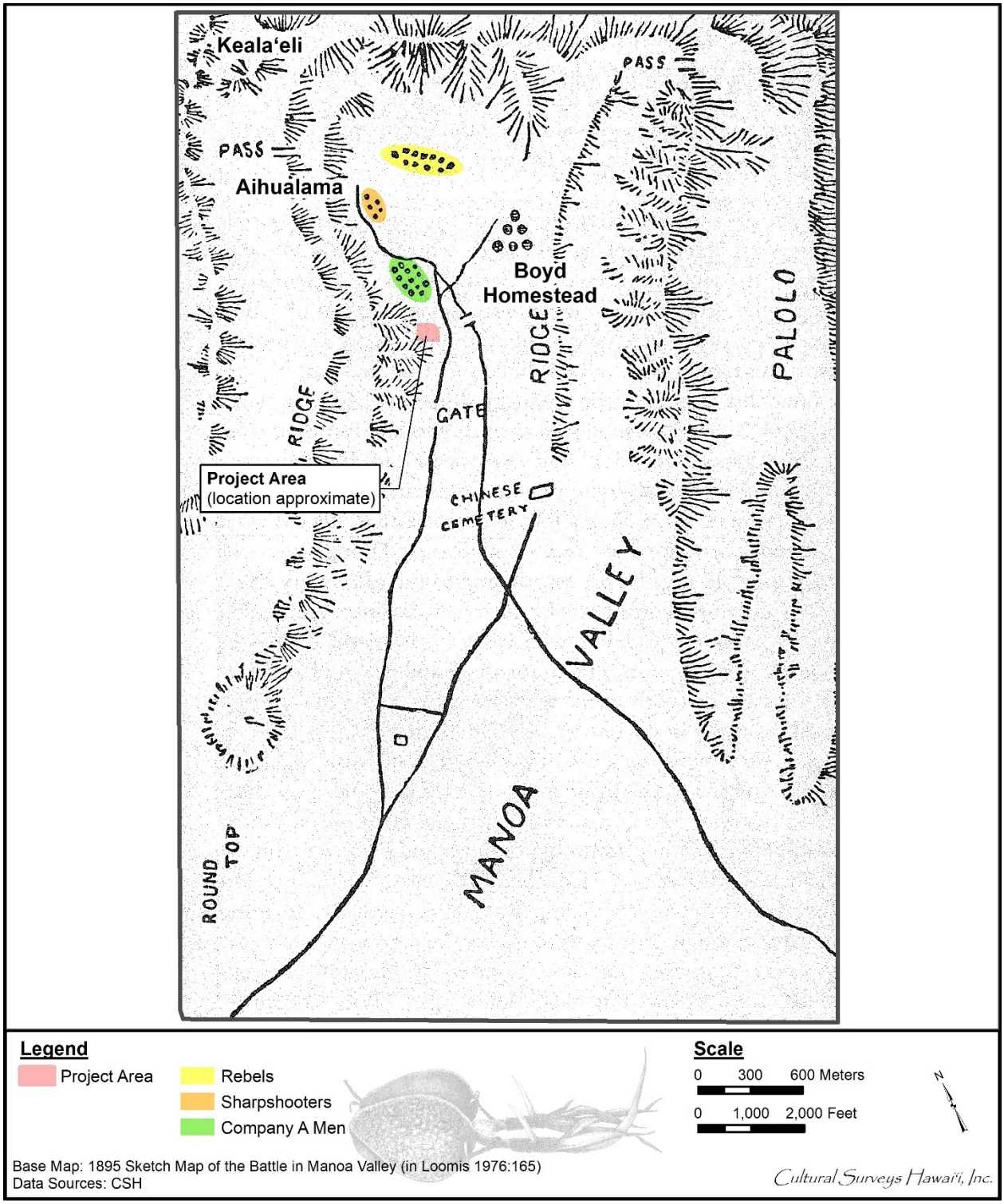


Figure 24. Map showing locations mentioned in the battle at “The Pen” at the head of Mānoa Valley; this map is not to scale, so the location of the project area in relation to the Republican and rebel forces is approximate (map from Loomis 1976:165)

surrendered, including Wilcox, who surrendered on 14 January 1895 (Towse 1895:45). The 1895 map (see Figure 24) suggests no fighting actually took place in the immediate vicinity of the present project area, although some of the Company A men might have been stationed in the general area. The shooting would have occurred *mauka* and to the north of the project area, along the banks of ‘Aihualama Stream. Photographs of the Republican soldiers show the march up the valley with the cannon (Figure 25), and the subsequent search at the head of the valley after the battle for stragglers (Figure 26).

3.3 Previous Archaeological Research

The list of historic properties in upper Mānoa includes historic sites nominated or listed on the Hawai‘i Register of Historic Places (HRHP) and the National Register of Historic Places (NRHP). Many of these historic places within 1.25 km or greater from the project area are houses built in the twentieth century that have notable architectural features or were designed by noted architects. These NRHP and HRHP “listed” historic properties are presented in Table 2. Two of the historic properties on this list, the Chinese Cemetery and the Waioli Tea Room, have been described in Section 3.2.6 of this report.

Relatively little archaeological work has been conducted in upper Mānoa Valley. Previous archaeological studies in the vicinity are depicted in Figure 27 and are summarized in Table 1. Previously identified historic properties in the vicinity are depicted in Figure 28 and are summarized in Table 2. A more detailed discussion of germane archaeological studies and finds follows.

Thomas Thrum, an early historian and ethnographer, detailed some special sites in Mānoa, one a sacred stone located in the *‘ili* of Kaipu.

> Kaipu figures also in the valley legends as possessing a stone of peculiar merit and power, from which the land takes its name, and was believed by the natives to bring good or ill-fortune to its possessor according to the honor bestowed upon it. The stone is about four feet in length, somewhat tapering toward one end, and having a rather smooth bore of about three inches in diameter running through its entire length. The larger end has sufficient irregular regularities to furnish those superstitiously inclined with the idea of a face, the bore mentioned serving for its mouth, into which sacrifices of food used to be placed. Thus the god Kaipu held power over Manoans in days gone by. [Thrum 1891:115–116]

3.3.1 McAllister 1933

J. Gilbert McAllister conducted an island-wide survey of O‘ahu in 1930. He tried to confirm many of the sites such as *heiau* and sacred stones mentioned by Thrum in his publications. He was able to confirm one *heiau*, Kūkaō‘ō Heiau, in central Mānoa. The rest of the sites in Mānoa are grouped under his Site 65 (McAllister 1933:79–80), and include three other specified *heiau*, a cave, and the Kaipu Stone. McAllister does not give any information on these other sites, so it is probable he did not confirm them during his survey.

3.3.2 Soehren 1963

In 1963, Lloyd Soehren (1963) described several sites in Mānoa for the Bishop Museum. These site descriptions are not in a published report, but are listed in field notebooks and in the Bishop

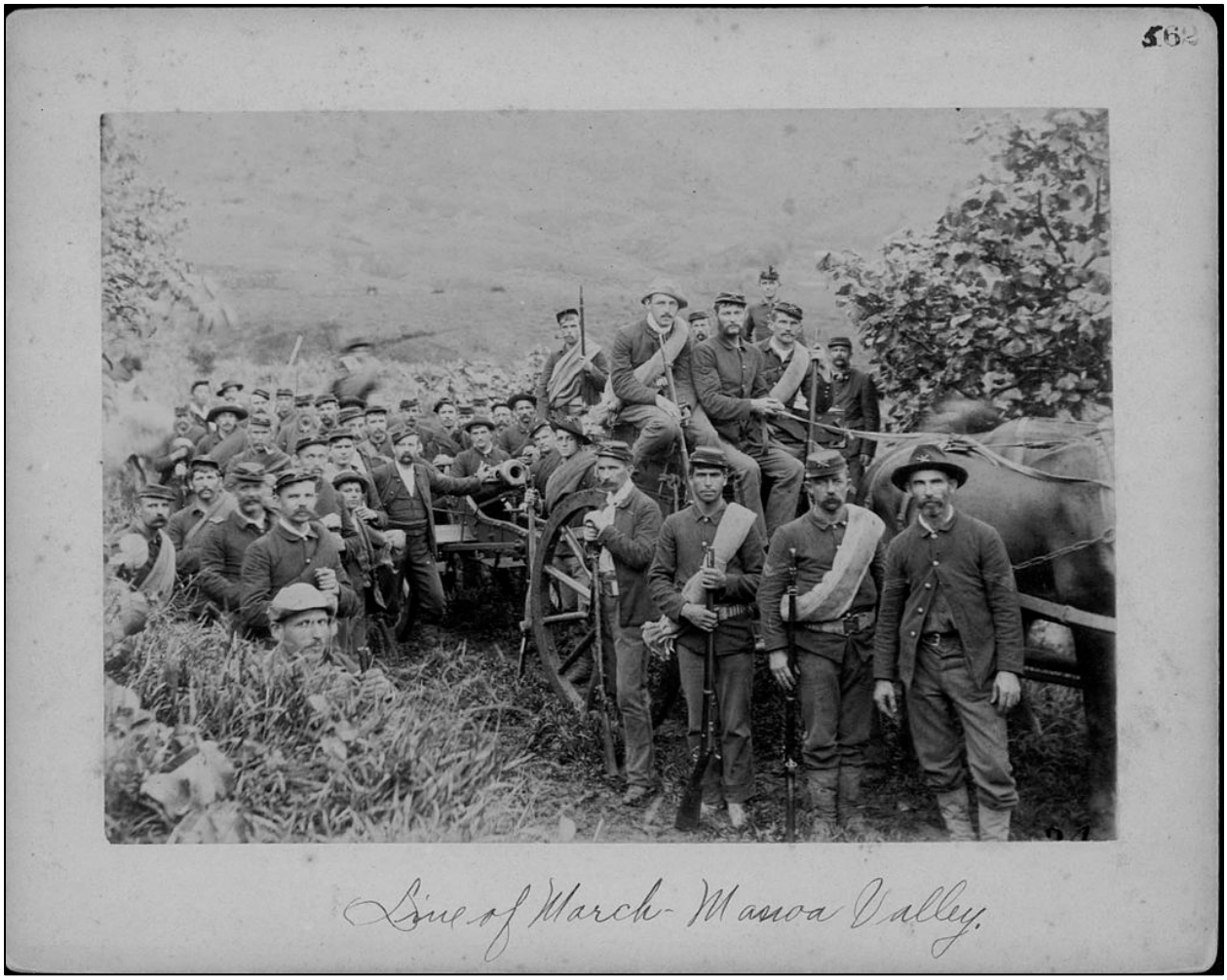


Figure 25. 1895 Rebellion line of march of Republican forces with cannon (Hawai‘i State Archives 1895)

Figure 26. Search for rebels at the head of Mānoa Valley (Grant 2000:168–169)

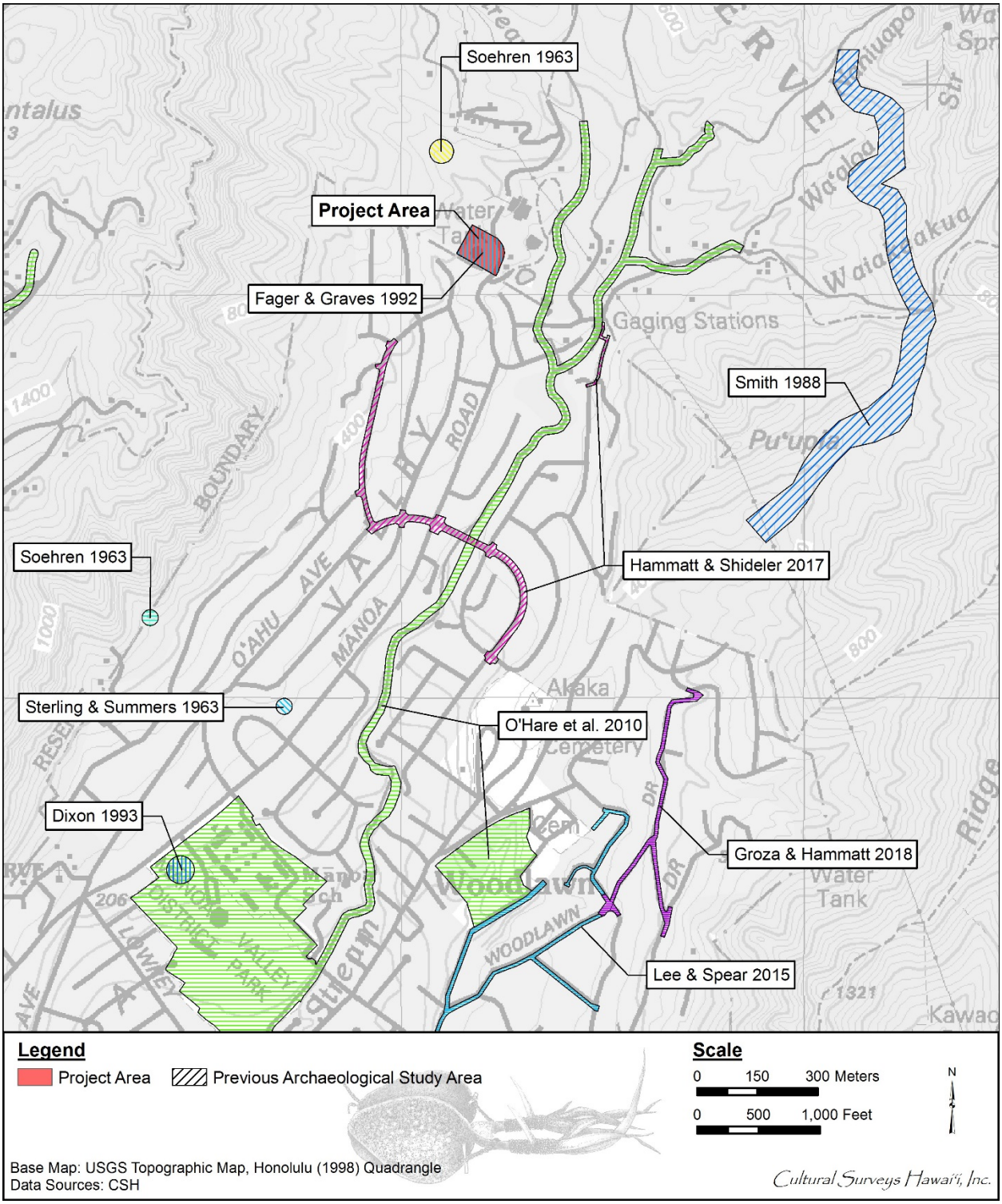


Figure 27. Portion of the 1998 Honolulu USGS 7.5-minute topographic quadrangle showing the project area and previous archaeological projects in Upper Mānoa

Table 1. Previous archaeological studies in upper Mānoa Valley

Reference	Type of Investigation	Location	Results (SIHP # 50-80-14)
Thrum 1911	Ethnographic survey	Mānoa	Kaipu Stone (within SIHP # -65)
McAllister 1933	Reconnaissance survey	Island of O‘ahu	Designates Mānoa Valley as Site 65 (SIHP # -65) including Kaipu Stone
Soehren 1963	Site descriptions	Upper Mānoa Valley	Description of historic house site and features probably associated with historic plantations (SIHP #s -2295 and -3953)
Sterling and Summers 1963	Site description	Upper Mānoa Valley	Description of Queen Ka‘ahumanu’s home Puka‘ōmao‘mao‘o and map of possible location (SIHP # -2289)
Smith 1988	Site description, reconnaissance	Inspection of Pu‘u Pia trail alignment	Description of a new site with a platform and mound (SIHP # -3726)
Fager and Graves 1992	Archaeological inventory survey	Prospective well site project area upper Mānoa Valley	No surface archaeological features noted
Dixon 1993	Archaeological reconnaissance	Five BOW wells on O‘ahu, including a well within Mānoa Valley Park	Absence of cultural remains noted at proposed BOW well within Mānoa Valley Park
O’Hare et al. 2010	Cultural resources and ethnographic study	Makiki, Mānoa and Pālolo Ahupua‘a	Survey of lower Mānoa watershed recorded 22 sites, six near current project area SIHP #s -3874, -4498, -6727 through -6748
Lee and Spear 2015	Archaeological monitoring	Woodlawn Dr 8-Inch Water Mains project, TMKs: [1] 2-9-038-043, 047, 048	No new or previously identified archaeological sites identified during archaeological monitoring
Hammatt and Shideler 2017	Archaeological literature review and field inspection	Mānoa Estates Water System Improvements project	Noted a general absence of previously identified historic properties in the vicinity, Land Commission Awards, and evidence of early post-Contact habitation
Groza and Hammatt 2018	Archaeological monitoring	Woodlawn Drive Water System, TMKs: [1] 2-9-041, 042, 047-049, 059, 070	No new historic properties observed, although the project area is adjacent to SIHP # -1373, the Lloyd Case Residence

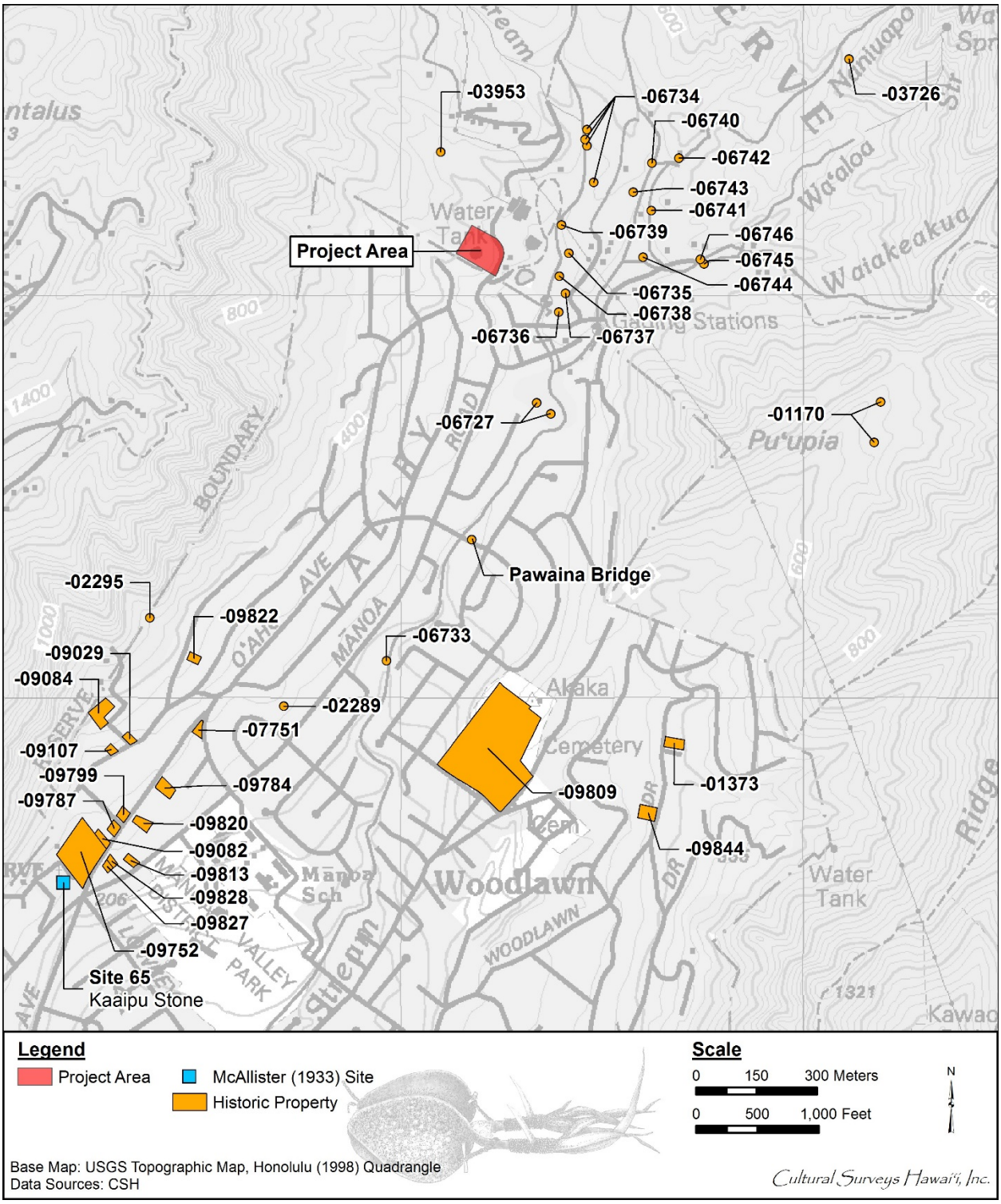


Figure 28. Location of previously identified historic properties (archaeological and historic sites) in the vicinity of the project area (base map: 1998 Honolulu USGS topographic quadrangle)

Table 2. Previously identified archaeological historic properties near the project area

SIHP # 50–80–14–	Site Type	Age	Source
-065	Mānoa Valley, including Kaaipu Stone	Pre-and post-Contact	McAllister 1933
-1170	Mounds	Undetermined	Smith 1988
-2289	Ka‘ahumanu’s summer home	Early post-Contact	Sterling and Summers 1963 (one of many proposed locations)
-2295	House site	Undetermined	Soehren 1963
-3726	Platform	Undetermined	Smith 1988
-3953	Agricultural complex	Undetermined	Soehren 1963
-6727	House site	Historic	O’Hare et al. 2010
-6733	Water control rock feature	Historic	O’Hare et al. 2010
-6734	Mound and wall complex; possible burial mounds	Historic	O’Hare et al. 2010
*-6735	Terrace complex	Pre-/early post-Contact	O’Hare et al. 2010
-6736	Stone and mortar dam	Historic	O’Hare et al. 2010
-6737	House site	Historic	O’Hare et al. 2010
-6738	House site	Historic	O’Hare et al. 2010
-6739	Retaining wall, trash dump	Historic	O’Hare et al. 2010
-6740	Terrace	Pre-/early post-Contact	O’Hare et al. 2010
-6741	House site	Historic	O’Hare et al. 2010
-6742	House site	Historic	O’Hare et al. 2010
-6743	Terrace complex	Historic	O’Hare et al. 2010
-6744	Bridge foundation	Historic	O’Hare et al. 2010
-6745	Bridge foundation	Historic	O’Hare et al. 2010
-6746	House site	Historic	O’Hare et al. 2010

Table 3. Historic properties in Upper Mānoa listed on the HRHP and NRHP (see Figure 28 for locations)

SIHP # 50-80-14	Description of Listed Historic Property	Comment	Listing
-1373	3581 Woodlawn, English Tudor/French Norman cottages (1920s) designed by architect Hart Wood	Thematic group of 15 residences	NRHP, HRHP
-7751	Harold and Estella Everett Residence, 3209 O‘ahu Ave	Historic home, 1946	HRHP
-9029	3162 Huelaniu Drive Hale Huelani, a Craftsman style bungalow	Historic home; built in 1929	HRHP
-9082	3038 O‘ahu Avenue, Alvin Melim Residence	Historic home	HRHP
-9084	3150 Huelani Place Paul and Constance Withington Residence, a Tudor Revival-influenced, Hawaiian Regional style lava rock bungalow	Historic home	HRHP
-9107	Dr. Vasco E.M. and Olga Marion Osorio investment property	Historic home; built in 1931	HRHP
-9752	Waioli Tea Room; a replica of the grass house once occupied by Robert Louis Stevenson at the ‘Ainahau estate of the Cleghorn family; the grass house was moved to Waioli in 1926	Historic home; built 1922	NRHP and HRHP
-9784	3137 O‘ahu Ave; George Fred Wright residence, Colonial Revival style	Historic home; built 1927	HRHP
-9787	3060 O‘ahu Ave; Herbert Austin residence, Hart Wood, architect	Historic home; built 1925-1926	HRHP
-9799	3104 O‘ahu Ave; Paul Merle Scott residence, Hawaiian-style architecture	Historic home; built 1927	HRHP
-9809	Mānoa Chinese Cemetery	Historic cemetery; founded 1852	HRHP
-9813	3034 Mānoa Rd; Francis and Janetta Peterson residence, Craftsman style	Historic home; built 1926	HRHP
-9820	3107 O‘ahu Ave, Leroy Bush residence, Hart Wood, architect	Historic home; built 1924	HRHP
-9822	3255 Huelani Dr, Alfa Hatch residence, Craftsman style house	Historic home; built ca. 1930	HRHP
-9827	3029 O‘ahu Ave, Craftsman style house	Historic home; built 1935	HRHP
-9828	3033 O‘ahu Ave, Bungalow type house	Historic home; built 1928	HRHP
-9844	Robert L. Lukens residence, Tudor Revival style	Historic home; built 1929	HRHP

Museum database. Near the project area, Soehren described SIHP # 50-80-14-2295, a historic house site, with a stone terrace, a wall, and a possible well. SIHP # -3953 is a complex of agricultural structures, with mounds, terraces, and drainage ditches around several coffee trees.

3.3.3 Sterling and Summers 1978

Sterling and Summers (1978:287–288) provide several references to Queen Ka‘ahumanu’s last home, “Pukaomaomao.” They used the location of a 60-ft stone foundation at the junction of Mānoa Road and O‘ahu Avenue as the proposed location although, as noted previously, there are many competing claims as to the actual location of the queen’s home. When the site was given a SIHP identification number (SIHP # -2289) in the Bishop Museum Hawaiian Archaeological Survey database (Bishop Museum 2017), this location (331 Halelani Drive) was used to mark the location of Ka‘ahumanu’s home.

3.3.4 Smith 1988

In 1988, Marc Smith (1988) of the SHPD surveyed sites along the proposed Pu‘u Pia Trial, connecting Mānoa Falls to the Kolowalu trails. Smith recorded two sites, SIHP #s -1170 and -3726. SIHP # -1170 had two components, several mounds located on opposite sides of the trail. No function or age for these features was provided by Smith, but he did note the features were near rows of eucalyptus trees, planted for early watershed protection. SIHP # -3726, a platform and a stone mound, were found near a *ti* (*Cordyline fruticosa)* plantation. Smith suggested the features were historic, related to the *ti* plantation.

3.3.5 Fager and Graves 1992

In 1992, archaeologists from Paul H. Rosendahl, Ph.D., Inc. (PHRI) (Fager and Graves 1992) conducted an archaeological inventory survey of the 14,850-sq-ft prospective well site near the end of Kumulani Street. No archaeological surface features were noted, but the archaeologists noted numerous indications of extensive soil erosion, which may have destroyed any pre-Contact/early historic features.

3.3.6 Dixon 1993

Boyd Dixon (1993) produced an archaeological reconnaissance report for five BOW well locations on O‘ahu including a well located within Mānoa Valley Park just *makai* of Mānoa School. The study concluded “[t]he Manoa well site, in turn, has been completely modified by landscaping associated with the construction of tennis courts adjacent to the Manoa Elementary School” (Dixon 1993:13).

3.3.7 O’Hare et al. 2010

CSH conducted a field survey of the Mānoa Watershed for the Ala Wai Watershed project (O’Hare et al. 2010). In the Mānoa Watershed, 22 sites (SIHP #s -6727 through -6748) were described. Two sites had been previously identified. SIHP # -3874 is an agricultural complex on Mānoa Stream, which was identified by Kawachi (1988). SIHP # -4498 consists of the restored *lo‘i* at the Kānewai Cultural Garden (Liston and Burtchard 1996).

Additional agricultural sites of traditional Hawaiian construction consisted of one agricultural terrace on Mānoa Stream (SIHP # -6728), one terrace (possibly agricultural) on Mānoa Stream (SIHP # -6729), one agricultural complex on Waihī Stream (SIHP # -6735), one agricultural

terrace on Lua‘alaea Stream (SIHP # -6740), and one agricultural complex on Nāniu‘apo Stream (SIHP # -6743). Historic sites consisted of a house foundation on Mānoa Stream (SIHP # -6727), a series of stacked rock walls, dams, and bridges along Mānoa Stream (SIHP #s -6730, -6731, -6732, -6733), a stone/mortar dam across Waihī Stream (SIHP # -6736), two historic house sites on Waihī Stream (SIHP #s -6737 and -6738), a stone retaining wall and historic dump at Waihī Stream (SIHP # -6739), three house sites on Nāniu‘apo Stream (SIHP #s -6741 and -6742), two bridge foundations on Waiakeakua Stream (SIHP #s -6744 and -6745), and a house site on Waiakeakua Stream (SIHP # -6748).

In addition, a complex of walls, rock platforms, and mounds was recorded on Waihī Stream and designated SIHP # -6734. The formal construction of the platforms and mounds is similar to traditional Hawaiian features that sometimes contain burials.

While many of these O’Hare et al. (2010)-identified historic properties are in the general vicinity of the cross-country 12-inch water main north of the Mānoa Estates development, none are regarded as very close (see Figure 28)

3.3.8 Lee and Spear 2015

Erica Lee and Robert L. Spear (2015) reported on archaeological monitoring during approximately 7,600 linear ft of subsurface construction work for the Woodlawn Drive Water Mains project. No historic properties were identified during the project. Soil deposition across the project area consisted of one to eight stratigraphic layers (depending on depth and location), most if not all of which appeared to have been subjected to previous disturbance. “All observed sediment and trench profiles were sterile” (Lee and Spear 2015:22).

3.3.9 Hammatt and Shideler 2017

In 2017, CSH (Hammatt and Shideler 2017) prepared an archaeological literature review and field inspection study for a Mānoa Estates Water System Improvements project (TMKs: [1] 2-9-052, 061, 062, 067, 068, and 069). The study noted the general absence of previously identified historic properties in the vicinity, the general absence of Land Commission Awards, and the indication of a general absence of early post-Contact habitation.

3.3.10 Groza and Hammatt 2018

CSH monitored the installation of a 12-inch water main from January 2014 to January 2016. The stratigraphy consisted of recent fill deposits overlying naturally deposited alluvium. The project area is steep and all roadways are cut and terraced into the hillside. The entire sloped area has been heavily modified by construction of these roadways and adjoining residences. No cultural layers or other historic properties were noted during the subsurface monitoring. One architectural historic property, the ca. 1930 Lloyd Case residence at 3581 Woodlawn Drive, is adjacent to the project area. This home is part of SIHP # -1373, an English Tudor/French Norman Cottage theme group of 15 houses, listed on the Hawai‘i and National Register of Historic Places.

3.4 Background Summary and Predictive Model

Legends and *mo‘olelo* of Mānoa focus on the many springs and streams in the well-watered valley of Mānoa. Hawaiian traditions hold that these springs were created by the gods Kāne and Kanaloa and that many of them were connected by underground passages. Many of the springs

were *kapu* and could only be used by the high chiefs. Legendary *pōhaku* (stones) have been located in some springs and streams.

The fertile lands of Mānoa Valley supported extensive wet taro cultivation well into the twentieth century. Handy and Handy (1972:480) estimated that in 1931 “there were still about 100 terraces in which wet taro was planted, although these represented less than a tenth of the area that was once planted by Hawaiians.” In the upper Mānoa Valley, plants such as *‘awa* and bananas were harvested (Handy and Handy 1972:480)

Mānoa Valley was a favored spot of the *ali‘i*, including Kamehameha I, Queen Ka‘ahumanu, Chief Boki, Governor of O‘ahu, Ha‘alilio, an advisor to King Kamehameha III, Princess Victoria, Charles Kana‘ina (father of King Lunalilo), King Lunalilo, Ruth Ke‘elikōlani (half-sister to Kamehameha IV), and Queen Lili‘uokalani. Chief Boki was involved in the first sugarcane plantation on O‘ahu which was set up in Mānoa. In 1836, French missionaries visited Mānoa and counted 50 houses, with an estimated population of 250 Hawaiians. The Hawaiian people were then decimated by war, exotic diseases, and the disruption caused by the influx of westerners and their influence on the economy and culture of Hawai‘i.

Few archaeological projects have been conducted in upper Mānoa Valley. The few surveys that have been conducted have recorded mainly historic house sites, or stone mounds and terrace walls associated with historic planting areas near streams for *ti* plants and bananas. However, it is possible some of these rock features are associated with earlier agricultural areas, possibly for *‘awa* cultivation or other traditional crops.

Legendary accounts, historical background research, and previous archaeology have indicated many sites associated with agriculture and habitation should be found in Mānoa Valley. Land Commission Awards show a concentration of *kuleana* in the lower valley adjacent to the main Mānoa Stream. In the upper valley, large land grants were given to high *ali‘i*, such as land owned by Queen Ka‘ahumanu and King Lunalilo. Archaeological reports have focused on the remains of several *heiau* in the area and burials found in caves and in residential areas. Mānoa was densely populated in the pre-Contact times which suggests there should be many archaeological agricultural and habitation features; however, since Mānoa was also quickly inhabited by new residents such as Chinese and Japanese farmers, it is probable that many of these features were modified or destroyed.

Section 4 Results of Fieldwork

CSH archaeologists conducted fieldwork, consisting of a 100% coverage pedestrian inspection, on 24 July 2018 by under the general supervision of Hallett H. Hammatt, Ph.D (Figure 29).

In general, ground visibility was good with denser ground cover in the east portion of the project area. The project area consists of the current Manoa Wells II site and an above ground water tank in the south portion of the project. The water tank likely dates to the construction of the neighborhood to the south and the Manoa Wells II structure has a plaque with the date “1987”. Surrounding the water tank is an asphalt paved roadway and fence that secures the current BWS structures. The cut slope on the northwest side of the structure is steep and appears to have been heavily modified. Vegetation in the upslope area consists of grasses and bamboo with some large Albiza trees. There is no evidence of prior use on the surface in this area.

In the north corner of the project area, the topography turns from gently sloping to steep near the project area northeast boundary. This appears to be the southwest slope of a drainage swale or natural gully. To the south of the gully is an earthen ditch that extends southwest-northeast and meets a drainage culvert crudely constructed of mortared basalt headwall and wingwalls and a corrugated metal pipe. The pipe appears to extend toward the northeast, however, the end of the pipe was not observed in the project area and the pipe may extend under Mānoa Road. The culvert’s headwall is approximately 1.5 m in length and the wingwalls slope upward and away from the headwall approximately 2.0 m northwest. This is likely for water control and drainage as opposed to agricultural purposes. No inscriptions were observed, and the age of the culvert is unknown.

To the south of the culvert is an abandoned house and associated infrastructure and trash. The partially collapsed one-story wooden structure with corrugated metal roof is likely one of the structures that appears on the 1959 Honolulu USGS topographic quadrangle map (see Figure 17).

In the southwest corner of the project area, a garden is present. It is not clear who maintains the garden. The garden contained various plants such as varieties of heliconia (*Heliconiaceae*), Latundan banana (apple banana, *Musa sapientum*), gardenia (*Gardenia jasminoides*), papaya (*Carica papaya*), and *kabocha* (Japanese pumpkin; *Cucurbita maxima*).

No evidence of pre-Contact and early post-Contact use of the project area was observed. Structures in the east corner of the project area first appear in the 1930s; however, there was no evidence of historic use observed in the north and northwest portions of the project area.

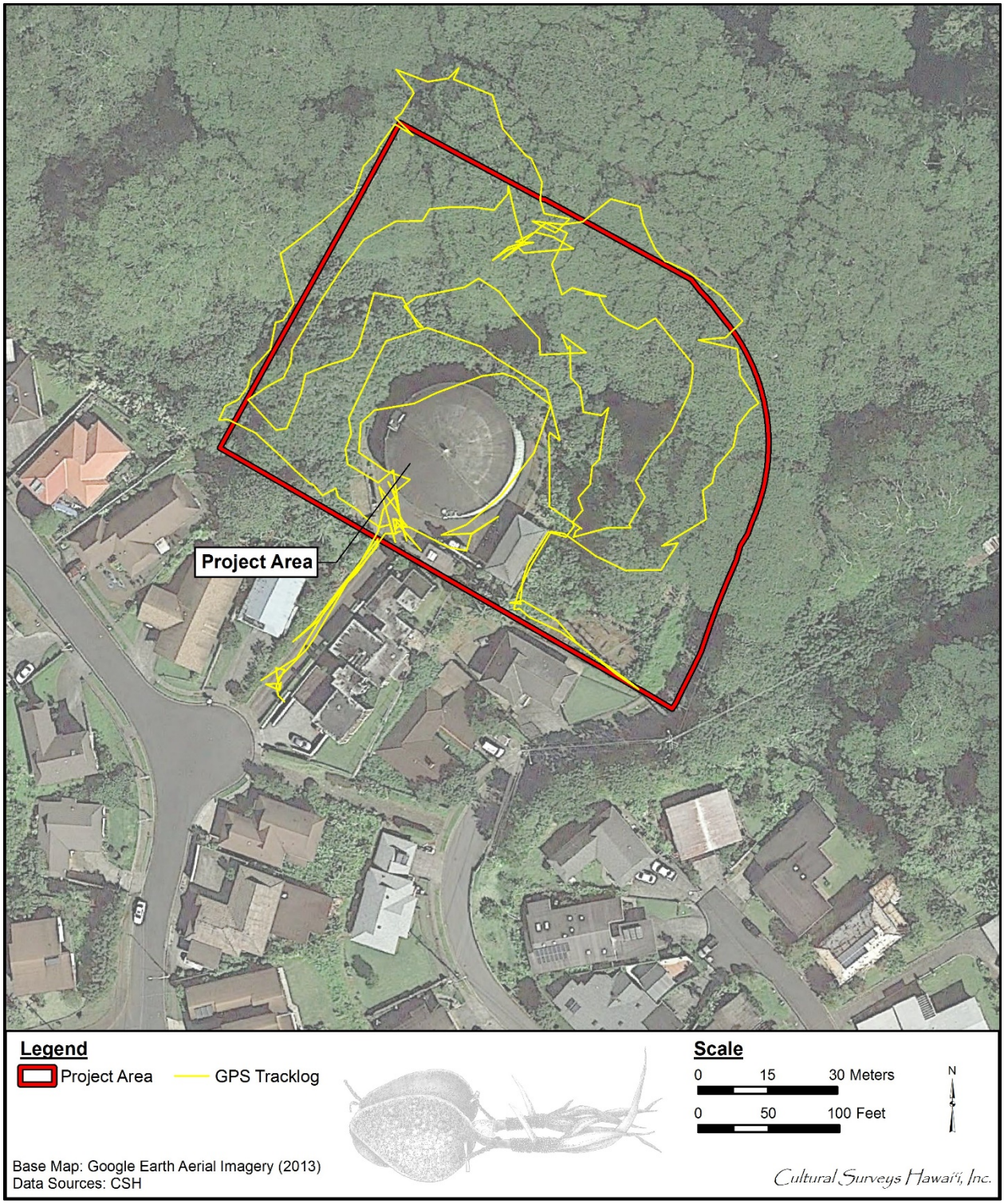


Figure 29. GPS track log showing coverage of one of two archaeologists during the field inspection (Base Map: Google Earth 2013)

Section 5 Cultural Assessment

This cultural assessment was designed—through detailed historical, cultural, and archaeological background research—to determine the likelihood that cultural resources may be affected by the project and, based on findings, consider cultural resource management recommendations. Through document research only, this report provides information compiled to date of the pre- and post-Contact human environment within and around the project area. The human environment shall be interpreted comprehensively to include the natural and physical (built) environment and the relationship of people with that environment (40 CFR 1508.14).

Cultural resources identified within this report may also constitute significant historic properties under State of Hawai‘i significance Criterion e, pursuant to HAR §13-275-6 and §13-284-6. 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 and §13-284-6). No community consultation was conducted for the current study, thus ongoing cultural practices were not identified. Because this study does not assess current cultural practices occurring within the project area, determination of the presence of cultural resources or cultural sites was informed by document research only.

5.1 Results of Background Research

Background research for this study yielded the following results:

1. Given its abundant natural resources—including several tributary streams that feed into the main stream and several *pūnāwai* (fresh-water springs)—Mānoa Valley has been an attractive place to settle and garden for as long as people have lived on O‘ahu (i.e., well over a millennium). Lower Mānoa Valley, within which the campus is located, represents the prime wet-taro-growing area and agricultural heartland of the entire valley.
2. Mānoa is exceedingly rich in places names, *wahi pana* (legendary or storied places) and associated *mo‘olelo* (oral histories), reflecting the valley’s elevated cultural and historical significance to Hawaiians, in particular. Important *mo‘olelo* focus on Mānoa’s many *pūnāwai*, which are directly associated with the exploits of two primary Hawaiian gods, Kāne and Kanaloa. These springs include Kānewai (location of the current Kānewai Cultural Garden), Hualani, Wailele—located near the present day athletic field of the Mid-Pacific Institute and associated with Kūka‘ō‘ō Heiau, Punahou (a.k.a. Kapunahou), Ka‘aipū, Wa‘aloa, and Waiakeakua. The valley is also home to many *pu‘u* (hills, mountains), peaks, ridges and caves—all with associated *mo‘olelo*; these include Wa‘ahila Ridge (which defines the eastern border of the valley) and its numerous peaks. Finally, Mānoa is also associated with a variety of famous events and people of the early historic era, including Kamehameha I, Ka‘ahumanu, and Boki.
3. The project area was part of an early experiment to sell land directly to Hawaiians and resident foreigners, and in 1846 was sold to a man named Kalii.
4. It is through records for Land Commission Awards generated during the Māhele that the first specific documentation of life in Hawai‘i as it had evolved up to the mid-nineteenth century comes to light. A total of 15 land claims were awarded to *maka‘āinana* within

upper Mānoa Valley, in the vicinity of the current project area. No *kuleana* LCA claims were awarded within the present project area, nor does there exist testimony for the use of this land during the mid-nineteenth century.

5. The earliest archaeological survey of the project area and its environs was undertaken in 1911 by Thomas George Thrum. Thrum identified a sacred stone located in the *‘ili* of Kaipu. In 1930, J. Gilbert McAllister designated Mānoa Valley as Site 65 (SIHP # -65) which included the Kaipu Stone as well. The Kaipu Stone is located approximately 1.8 km southwest of the project area.
6. No archaeological studies have been conducted within the current project area. Ten modern-era archaeological studies were conducted in the vicinity of the project area.
7. No burials have been documented within or in the vicinity of the current project area.
8. A recent field inspection of the project area (Section 4) by CSH encountered a mortared basalt culvert and abandoned wooden house. It is unknown if these are older than 50 years old (potential historic properties).

5.2 Cultural Resources in the Vicinity of the Project Area

This section evaluates the available data on archaeological resources, burials, faunal resources, plant resources, trails, and *wahi pana* near the project area.

5.2.1 Archaeological Resources

Relatively little archaeological work has been conducted in upper Mānoa Valley and no archaeological resources have been identified within the project area. Five archaeological historical properties are approximately 150 m (492 feet) west of the project area.

- SIHP #–6735, a Pre-/early post-Contact terrace complex (O’Hare et al. 2010)
- SIHP # -6736, a stone and mortar dam (O’Hare et al. 2010)
- SIHP # -6737, a post-Contact house site (O’Hare et al. 2010)
- SIHP # -6738, a post-Contact house site (O’Hare et al. 2010)
- SIHP # -6739, a post-Contact retaining wall and trash dump (O’Hare et al. 2010)

5.2.2 Burials

No traditional Hawaiian burials have been identified within the project area. Surprisingly few burials have been identified in this general area (see Figure 28 and Table 3) with no finds within a kilometer or more. It is unclear if this is indicative of a traditional Hawaiian practice of not using the surrounding area for human burials or if poor preservation in these uplands is a factor.

5.2.3 Faunal Resources

There is no indication that there are any faunal resources within the project area as it is surrounded by a fence. While there may be native bird species present in the surrounding area, none were observed; the majority of birds are non-native and invasive species.

5.2.4 Plant Resources

The vegetation within and surrounding the project area consists largely of invasive and non-native species. Bamboo was also observed throughout the project area; bamboo may potentially be used for medicinal and non-medicinal uses such as *‘ohe hano ihu* (nose flute), *pu‘ili* (split-bamboo rattles), and *‘ohe kalapa* (stamps). During the field inspection, a small garden containing

varieties of heliconia, Latundan or apple banana, gardenia, papaya, and *kabocha* was also observed. It is unclear whether any individuals or organizations currently maintain this garden.

5.2.5 Trails

While there were several ancient trails in Mānoa, only one has been identified near the project area: one of the two *mauka-makai* trails on each side of the valley, now East Mānoa and Mānoa Road. The trail that ascended the western side of the valley, roughly corresponds to the present day Mānoa Road, which is approximately 70 m (230 feet) east of the project area.

5.2.6 Wahi Pana

There are several *wahi pana* near the project area. It is within the *‘ili* of Puka‘ōma‘oma‘o which may have been formerly part of Pū‘ahu‘ula (*lit.* feather-cloak spring, Pukui et al. 1974:190–191) and was a *wahi pana* on the old *makai-mauka* trail along the western side of the valley (Bouslog et al. 1994:99–104). Puka‘ōma‘oma‘o (*lit.* green opening) may also be named after Ka‘ahumanu’s home located there (the queen’s house had green shutters) (Pukui et al. 1974:193). A *wahi pana* associated with Puka‘ōma‘oma‘o, were the waters of Waiakeakua and the *kapu* pool called Kawaiho‘olana, restricted to only the Queen’s use.

The pass between Mānoa and Pālolo valleys and trail between the two was Pukakomo, possibly used by Kamehameha and his troops during their invasion of O‘ahu, but later closed off by rocks upon Lili‘uokalani’s death in 1917 (Bouslog et al. 1994:113). There were also many legendary and sacred figures associated with upper Mānoa Vallley: Poki, the guardian dog of the valley and Oloki‘i, the pig and dog *akua* (Bouslog et al. 1994:113).

While these *wahi pana* live on in Hawaiian traditions into the present day, the actual physical places have all mostly disappeared, especially those in and around the project area.

5.3 Conclusion

The closest LCAs to the current project area remain clustered around Waihī Stream (see Figure 12), the closest being approximately 200 m (656 ft) to the east and southeast. This small cluster of LCAs is also separate from the densely inhabited portions of Mānoa Valley, where parcels are generally clustered further down valley around streams. The lack of LCAs in the project area and the upper Mānoa Valley, in general, suggests the project area was not a foci of traditional Hawaiian habitation or agriculture. The general absence of previously identified historic properties in the vicinity of the project area may also suggest this region was not commonly used for resource extraction.

While the upper Mānoa Valley, in general, holds a high degree of cultural significance, the proposed project should not have any impacts to significant *wahi pana* or cultural resources known to exist within the project area. Additionally, due to the absence of LCAs, sensitive soils, or previous finds within the project area, the likelihood of encountering either burials or other historic properties remains low.

Section 6 Recommendations

Based on the archaeological background research and the field inspection, it is likely that the culvert and the collapsed house are not significant historic properties. There was no evidence of pre-Contact or early post-Contact agricultural use or habitation. It is likely that there is a low potential for subsurface historic properties in the project area. No further archaeological work is recommended.

Through documentary research only, the cultural assessment found that there are no cultural or historical resources within the project area. This cultural assessment is intended to facilitate the project’s planning and support the project’s historic preservation and environmental review compliance.

Section 7 References Cited

Baker, Ray Jerome

1929 Photograph of Mānoa Valley, by Ray Jerome Baker on the Inter-Island Airway's amphibian plane, *Hawaii*. Hawai‘i State Archives, Honolulu. Reprinted in *Hawaiian Yesterdays. Historical Photographs by Ray Jerome Baker*, by Robert E. Van Dyke and Ronn Ronck, 1982, p. 214. Mutual Publishing, Honolulu.

Baldwin, E.D.

1882 Manoa Valley. Hawaiian Government Survey map, by E.D. Baldwin. Registered Map 1068. Hawai‘i Land Survey Division, Department of Accounting and General Services, Honolulu.

Ball, Stuart M., Jr.

2012 *Native Paths to Volunteer Trials. Hiking and Trail Building on O‘ahu.* University of Hawai‘i Press, Honolulu.

Beckwith, Martha

1940 *Hawaiian Mythology*. University of Hawaii Press, Honolulu.

Bishop Museum

2017 Bishop Museum Anthropology Department Hawaiian Archaeological Survey database. Available online, http://data.bishopmuseum.org/has2/index.php?b=i

Bishop Museum Archives

n.d. Waterfalls in the back of Mānoa Valley as seen from Kanānā. Original photograph on file at Bishop Museum Archives, Honolulu. Reprinted in *Mānoa, The Story of a Valley*, by Charles Bouslog and other Mānoa residents, 1994, p. 4. Mutual Publishing, Honolulu.

Bouslog, Charles

1983 In Search of Ka‘ahumanu's Cottage with the Green Shutters. *Historic Hawai‘i News*, May 1983.

Bouslog, Charles and other Mānoa Valley Residents

1994 *Mānoa, The Story of a Valley*. Mutual Publishing, Honolulu.

Chinen, John

1958 *The Great Mahele*. University of Hawaii Press, Honolulu.

City and County of Honolulu

2000 City and County of Honolulu, Department of Planning and Permitting. Available online, http://honolulupp.org/planning/demographics/cp-toc.pdf.

Coulter, John Wesley and Alfred Gomes Serrao

1932 Manoa Valley, Honolulu: A Study in Economic and Social Geography. *Bulletin of the Geographical Society of Philadelphia* 30 (2):109–130.

Damon, Ethel M.

1940 From Manoa to Punahou. *Forty-ninth Annual Report of the Hawaiian Historical Society for the Year 1940*:5–11.

Dixon, Boyd
1993 *An Archaeological Reconnaissance of Five Board of Water Supply Wells on O‘ahu, Hawai‘i.* Anthropology Department, Bernice Pauahi Bishop Museum, Honolulu.

Emery, Byron Elwyn
1956 Intensification of Settlement and Land Utilization since 1930 in Manoa Valley, Honolulu. Master’s Thesis, University of Hawai‘i, Honolulu.

Fager, Mikele W. and Donna Graves
1992 *Archaeological Inventory Survey Prospective Well Site Project Area.* Paul H. Rosendahl, Ph.D. Inc., Hilo, Hawai‘i.

Foote, Donald E., Elmer L. Hill, Sakuichi Nakamura, and Floyd Stephens
1972 *Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii.* U.S. Department of Agriculture, Soil Conservation Service, in cooperation with the University of Hawai‘i Agricultural Experiment Station. U.S. Government Printing Office, Washington, D.C.

Fornander, Abraham
1918 *Fornander Collection of Hawaiian Antiquities and Folklore*. T.G. Thrum, editor. Memoirs of the Bernice Pauahi Bishop Museum (Vol. V, Part I). Bishop Museum Press, Honolulu.

Giambelluca, T.W., Q. Chen, A.G. Frazier, J.P. Price, Y.-L. Chen, P.-S. Chu, J.K. Eischeid, and D.M. Delparte
2013 Online Rainfall Atlas of Hawai‘i. *Bulletin of the American Meteorological Society volume 94, pp. 313-316, doi: 10.1175/BAMS-D-11-00228.1.* University of Hawai‘i at Mānoa, Honolulu. Electronic resource, http://rainfall.geography.hawaii.edu.

Google Earth
2013 Aerial photographs of Hawai‘i. Google Inc., Mountain View, California. Available online at www.google.com/earth.html.

Grant, Glen and Bennett Hymer
2000 *Hawai‘i Looking Back, An Illustrated History of the Islands.* Mutual Publishing, Honolulu.

Green, Laura C.S. and Mary K. Pukui
1936 *The Legend of Kawelo and other Hawaiian Folk Tales.* Territory of Hawaii, Honolulu.

Groza, Randy and Hallett H. Hammatt
2018 *Archaeological Monitoring Report for the Woodlawn Drive Water System Improvements (Part II) Project, Mānoa, Waikīkī Ahupua‘a, Honolulu (Kona) District, O‘ahu TMKs: [1] 2-9-041, 042, 047 through 049, 059, 070.* Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

Hammatt, Hallett H. and David W. Shideler
2017 *Archaeological Literature Review and Field Inspection for the Mānoa Estates Water System Improvements Project, Mānoa Ahupua‘a, Honolulu (Kona) District, O‘ahu, TMKs: [1] 2-9-052, 061, 062, 067, 068 and 069*. Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

Handy, E.S. Craighill

1940 *The Hawaiian Planter*, Volume 1. Bishop Museum Bulletin 161. Bishop Museum Press, Honolulu.

Handy, E.S. Craighill and Elizabeth G. Handy

1972 *Native Planters in Old Hawaii: Their Life, Lore, and Environment.* Bishop Museum Bulletin 233. Bernice Pauahi Bishop Museum, Honolulu.

Hawai‘i State Archives

n.d. Photograph of Mānoa Valley checkerboard taro fields, date unknown, photographer unknown. Hawai‘i State Archives, Honolulu. Reprinted in *Mānoa, The Story of a Valley*, Charles Bouslog and other Mānoa Residents, 1994, p. 9. Mutual Publishing, Honolulu.

1895 Photograph of “Line of March Manoa Valley” during 1895 rebellion. Hawai‘i State Archives, Honolulu.

Hawai‘i TMK Service

2014 Tax Map Key [1] 2-9-054. Hawai‘i TMK Service, Honolulu.

Hawaiian Ethnological Notes (HEN)

19- Unpublished material housed in the Bernice Pauahi Bishop Museum, Hawaiian Ethnological Notes file. Bernice Pauahi Bishop Museum, Honolulu.

Hawaiian Star

1894 Entrapped. Closing in on Garibaldi [*sic*] Wilcox and Party. *Hawaiian Star*, 10 January:3.

Hōkū o Hawai‘i

1930 Nā Anoai o O‘ahu nei (O‘ahu Place Names). *Hōkū o Hawai‘i*, 11 February.

1930 Nā Anoai o O‘ahu nei (O‘ahu Place Names). *Hōkū o Hawai‘i*, 18 February.

‘Ī‘ī John Papa

1959 *Fragments of Hawaiian History as Recorded by John Papa ‘I‘i.* Bishop Museum Press, Honolulu.

Irwin, Bernice Piilani (Cook)

1936 The Lady of the Moon. In *In Menehune Land*. Printshop Company, Ltd., Honolulu.

Judd, Walter F.

1975 *Palaces and Forts of the Hawaiian Kingdom: From Thatch to American Florentine.* Pacific Books, Palo Alto, California.

Ka Nūpepa Kū‘oko‘a

1872 Reminiscence by Kaualilinoe. *Ka Nūpepa Kū‘oko‘a* 16 November.

Kalākaua, His Hawaiian Majesty

1990 *The Legends and Myths of Hawaii. The Fables and Folk-Lore of a Strange People.* Mutual Publishing, Honolulu.

Kamakau, Samuel Mānaiakalani

1870 Ka Moolelo Hawaii Nei. Helu 43. *Ke Au ‘Oko‘a*, 6 October.

1991 *The People of Old. Ka Po‘e Kahiko.* Bishop Museum Press, Honolulu.

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

Kaualilinoe, J.W.K.
1872 Manoa and its Features. *Ka Nūpepa Kū‘oko‘a*, 16 November.

Kawachi, Carol
1988 *Field Check at St. Francis High School Campus, Mānoa, Honolulu, O‘ahu.* Department of Land and Natural Resources, State Historic Preservation Division, Kapolei, Hawai‘i.

La Passe, Henri de
1855 Plan du Mouillage D'Honolulu. Map by Henri de La Passe of the French ship *Eurydice*. On file at U.S. Library of Congress, Washington, D.C.

Landgraf, Anne Kapualani
1994 *Nā Wahi Pana O Ko‘olau Poko: Legendary Places of Ko‘olau Poko.* Fred Kalani Meinecke, translator. University of Hawai‘i Press, Honolulu.

Lee, Erica and Robert L. Spear
2015 *An Archaeological Monitoring Report for the Woodlawn Drive 8-Inch Water Mains Project, Manoa Ahupua‘a, Honolulu District, (Kona Moku), O‘ahu Island, Hawai‘i [TMK: (1) 2-9-038to 043, 047, 048].* Scientific Consultant Services, Inc. Honolulu.

Liston, Jolie and Greg C. Burtchard
1995 *FINAL: Kapapa Lo‘i ‘o Kānewai: Archaeology at the Center for Hawaiian Studies University of Hawai‘i at Mānoa.* International Archaeological Research Institute, Inc., Honolulu.

Loomis Albertine
1976 *For Whom are the Stars? Revolution and Counterrevolution in Hawai‘i, 1893-1895.* University of Hawaii Press, Honolulu.

Lyons, Curtis S.
1916 Place Names. *Hawaiian Ethnological Notes* I:930–946.

Manoa School PTA
1952 *History of Manoa School Manoa School PTA, Historical Committee.* Copy at University of Hawai‘i Hamilton Library, Honolulu.

McAllister, Gilbert J.
1933 *Archaeology of O‘ahu.* Bernice Pauahi Bishop Museum, Honolulu.

McGregor, Davianna Pomaika‘i
1996 *Nā Kua‘āina: Living Hawaiian Culture.* University of Hawai‘i Press, Honolulu.

Mellen, Kathleen (Dickenson)
1952 *The Magnificent Matriarch, Kaahumanu, Queen of Hawaii*. Hastings House, New York.

Metcalf, T. [Theophilus]
1847 Hawaiian Government Survey map of Manoa, surveyed by T. Metcalf. Registered Map 119. Hawai‘i Land Survey Division, Department of Accounting and General Services, Honolulu.

Moffat, Riley Moore and Gary L. Fitzpatrick
1995 *Surveying the Mahele: Mapping the Hawaiian Land Revolution.* Editions Limited, Honolulu.

Nakuina, Emma M.B.
1904 *Hawaii, Its People, Their Legends*. Hawaii Promotion Committee, Honolulu.

Ober, Gerald
1810 Map of Honolulu trails ca. 1810, as described by ‘Ī‘ī. In *Fragments of Hawaiian History as Recorded by John Papa ‘I‘i*, by John Papa ‘Ī‘ī, 1959, Bishop Museum Press, Honolulu.

Oceanit
2004 *DRAFT: Ala Wai Flood Abatement and Ecosystem Restoration; Ala Wai Watershed Riparian Survey, 2004.* Oceanit, Honolulu.

O’Hare, Constance R., Kūhiō Vogeler, Christopher M. Monahan, David W. Shideler, and Hallett H. Hammatt
2010 *Cultural Resources and Ethnographic Study for the Ala Wai Watershed Project: Makiki, Mānoa and Pālolo Ahupua‘a, Honolulu District, O‘ahu Island TMK: [1] 2-3, 2-4, 2-5, 2-6, 2-7, 2-8, and 2-9; [1] 3-1, 3-2, 3-3 and 3-4 Volume II: Cultural Resources of Kaka‘ako and Waikīkī Ahupua‘a*. Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

Pacific Commercial Advertiser
1895 Closing about Rebel Wilcox, His Men Penned In at Manoa Valley. *Pacific Commercial Advertiser*, 10 January:1–2.

Pukui, Mary Kawena and Caroline Curtis
1951 *The Water of Kane and Other Legends of the Hawaiian Islands.* Collected or suggested by Mary Kawena Pukui, retold by Caroline Curtis, illustrated by Richard Goings. Kamehameha Schools Press, Honolulu.

Pukui, Mary Kawena and Samuel H. Elbert
1986 *Hawaiian Dictionary.* Second edition. University of Hawaii Press, Honolulu.

Pukui, Mary K., Samuel H. Elbert, and Esther Mookini
1974 *Place Names of Hawaii.* University of Hawaii Press, Honolulu.

Saturday Press
1883 Dictionary of Hawaiian Localities. *Saturday Press*, 1 December.
1883 Dictionary of Hawaiian Localities. *Saturday Press*, 15 December.

Skinner, Charles M.
1971 *Myths & Legends of Our New Possessions & Protectorate.* Gryphon Books, Ann Arbor, Michigan.

Smith, Marc
1988 *Site 50–80–14–1170 Manoa Mound Complex Site (TMK 2–9–51:13), Kona, Honolulu Ahupua‘a. Site 50–80–14–3726, Pu‘u Pia Trail Site, Honolulu, Kona, Oahu.* Department of Land and Natural Resources, State Historic Preservation Division, Kapolei, Hawai‘i.

Soehren, Lloyd

1963 Hawaiian Archaeology Survey (HAS) Database. Bishop Museum Site Number:50-Oa-A04-021. State Site Number:50-80-14-3953. Tax Map Key:2-9-54. House site? Bishop Museum Site Number:50-Oa-A04-020. State Site Number:50-80-14-2295. Tax Map Key 2-9-34.

2017 *A Catalog of Hawaiian Place Names.* Compiled for the Records of the Boundary Commission and The Board Commissioners to Quiet Land Titles of the Kingdom of Hawaii. Collected and annotated by Lloyd J. Soehren. Online at the Ulukau Website, http://ulukau.org/cgi-bin/hpn?l=en.

Sterling, Elspeth and Catherine Summers

1963 *Hawaiian Archaeology Survey (HAS) - House site. Kaahumananu‘s summer home in Manoa. Bishop Museum Site Number:50-Oa-A04-009. State Site Number:50-80-14-2289. Tax Map Key 2-9-55:4*. Bernice Pauahi Bishop Museum, Honolulu.

Stewart, Charles S.

1831 *A Visit to the South Seas, in the U.S. Ship Vincennes, During the Years 1829 and 1830.* 2 Vols. Haven, New York.

Thom, Wah Chan

1985 *The Story of Manoa Chinese Cemetery with a Discussion of Ancestor Worship*. Lin Yee Chung Association, Honolulu.

Thrum, Thomas G.

1891 Manoa Valley, Descriptive, Historic and Legendary. *Hawaiian Almanac and Annual for 1892*. Thomas G. Thrum, Honolulu.

1911 *Hawaiian Almanac and Annual for 1912.* Thomas G. Thrum, Honolulu.

1923 *More Hawaiian Folk Tales. A Collection of Native Legends and Traditions*. A.C. McClurg & Company, Chicago.

1998 *Hawaiian Folk Tales, A Collection of Native Legends*. Mutual Publishing, Honolulu.

Towse, Ed

1895 *The Rebellion of 1895. A complete and concise account of the insurrection in the republic of Hawaii.* Hawaiian Star, Honolulu.

U.S. Army War Department

1919 U.S. Army War Department fire control map, Honolulu Quadrangle. USGS Information Services, Denver, Colorado.

1933 U.S. Army War Department fire control map, Honolulu Quad. USGS Information Services, Denver, Colorado.

1943 U.S. Army War Department terrainmap, Diamond Head Quad. USGS Information Services, Denver, Colorado.

USDA (U.S. Department of Agriculture)

2001 Soil Survey Geographic (SSURGO) database. U.S. Department of Agriculture, Natural Resources Conservation Service. Fort Worth, Texas. http://www.ncgc.nrcs.usda.gov/products/datasets/ssurgo/ (accessed March 2005).

USGS (U.S. Geological Survey)

1959 Honolulu USGS 7.5-minute topographic quadrangle. USGS Information Services, Denver, Colorado.

1969 Honolulu USGS 7.5-minute topographic quadrangle. USGS Information Services, Denver, Colorado.

1978 USGS Orthophotoquad, Honolulu Quadrangle. USGS Information Services, Denver, Colorado.

1998 Honolulu USGS 7.5-minute topographic quadrangle. USGS Information Services, Denver, Colorado.

2011 USGS Orthoimagery aerial photograph. USGS Information Services, Denver, Colorado.

Van Dyke, Robert E. and Ronn Ronck

1982 *Hawaiian Yesterdays. Historical Photographs by Ray Jerome Baker.* Mutual Publishing, Honolulu.

Waihona ‘Aina

2000 Waihona ‘Aina Māhele Database. Waihona ‘Aina Corporation, Honolulu. Online at http:///www.waihona.com.

Westervelt, W.D.

1963a *Hawaiian Legends of Old Honolulu*. Charles Tuttle Company, Rutland, Vermont.

1963b *Hawaiian Legends of Ghosts and Ghost-Gods*. Charles E. Tuttle, Tokyo.

Wikimedia Commons

1920s Photograph of Lyon Arboretum. Available online, https://commons.wikimedia.org/w/index.php?search=lyon+arboretum&title=Special%3ASearch&go=Go

Wikipedia

2017 Salvation Army Wai‘oli Tea Room. Online at https://en.wikipedia.org/wiki/Salvation_Army_Wai%CA%BBoli_Tea_Room