UNIVERSITY of HAWAI'I®
HILO

February 13, 2023

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

Dear Ms. Evans:

HRS Chapter 343 Draft Environmental Assessment
and Anticipated Finding of No Significant Impact (DEA-AFONSI)
USGS Hilo Research Facility
Waiakea, South Hilo, Island of Hawai'i
TMK (3) 2-4-001:122 (por)

The University of Hawai'i, through the University of Hawai'i at Hilo, hereby transmits the Draft Environmental Assessment and Anticipated Finding of No Significant Impact (DEA-AFONSI) for a research facility proposed by the U.S. Geological Survey (USGS) in Hilo, Hawai'i Island.

The proposed action considered is the USGS Hilo Research Facility which will support the USGS Hawaiian Volcano Observatory (HVO) and the Pacific Island Ecosystem Research Center (PIERC). The proposed action will be located on real property owned by the University of Hawai'i.

The DEA-AFONSI has been prepared in accordance with both HRS Chapter 343 and its implementing rules, and the National Environmental Policy Act (NEPA) (43 CFR Part 46, Implementation of the National Environmental Policy Act of 1969).

Please publish notice of availability in next available edition of the Office of Planning and Sustainable Development's *The Environmental Notice*. A PDF copy of the DEA-AFONSI (searchable) and a Project Location Map have been submitted via ERP's online portal.

Should you have any questions, please contact our EA consultant, HHF Planners, attention: Leslie Kurisaki at lkurisaki@hhf.com, or (808) 457-3182.

Sincerely,

Carla L. Hoʻā
Vice Chancellor for Administrative Affairs

From: webmaster@hawaii.gov
To: DBEDT OPSD Environmental Review Program
Subject: New online submission for The Environmental Notice
Date: Wednesday, February 15, 2023 11:13:05 AM

Action Name

U.S. Geological Survey (USGS) Hilo Research Facility

Type of Document/Determination

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

HRS §343-5(a) Trigger(s)

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

Judicial district

South Hilo, Hawaiʻi

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

(3) 2-4-001:122 (por)

Action type

Agency

Other required permits and approvals

National Environmental Policy Act (NEPA) and HRS Chapter 343 Hawaiʻi Environmental Policy Act compliance; Use and Occupancy Agreement (University of Hawaiʻi); NPDES (Department of Health); Section 106 NHPA/Chapter 6E compliance (DLNR SHPD); County site plan approval (application) (County Planning Department); grading, grubbing and stockpiling permits (County Dept. of Public Works)

Proposing/determining agency

University of Hawaii

Agency contact name

Jordan Sizemore

Agency contact email (for info about the action)

jsizemore@usgs.gov

Email address or URL for receiving comments

USGS-Hilo-HVO-PIERC@hhf.com

Agency contact phone

(603) 730-7743

Agency address

USGS Environmental Management Branch
P.O. Box 25046, MS205
Lakewood, CO 80225
United States
Map It

Was this submittal prepared by a consultant?

Yes

Consultant

HHF Planners

Consultant contact name

Scott Ezer

Consultant contact email

USGS-Hilo-HVO-PIERC@hhf.com

Consultant contact phone

(808) 457-3182

Consultant address

HHF Planners
733 Bishop Street, Suite 2590
Honolulu, HI 96813
United States
Map It

Action summary

The U.S. Department of the Interior, U.S. Geological Survey (USGS) proposes a new research facility on 6.8 acres of State-owned land near Komohana Street and Nowelo Road in Hilo. The project provides a replacement facility for the Hawaiian Volcano Observatory (HVO) whose existing facilities in Hawaiʻi Volcanoes National Park were irreparably damaged by the 2018 Kilauea volcano eruption. The facility will also accommodate the Pacific Islands Ecosystem Research Center (PIERC), currently located in Hawaiʻi Volcanoes National Park.

The project site is near the University of Hawaiʻi at Hilo campus and other federal research institutions. This location allows HVO and PIERC to work collaboratively with university faculty and students and strengthen academic and research partnerships. The site is part of a larger parcel granted to the University of Hawaiʻi by Executive Order 3814 in 2000. The UH Hilo fully supports the project and will execute a Use and Occupancy Agreement with USGS.

Reasons supporting determination

Refer to Draft EA-AFONSI Chapter 5, Anticipated Determination for reasons supporting the determination of no significant impact.

Attached documents (signed agency letter & EA/EIS)

- Draft_USGS-Hilo-Research-Facility-EA-Appendices_2022-February-151.pdf
- USGS-Hilo-Research-Facility_transmittal-to-ERP-VCA-2302131.pdf

Action location map

- USGSHRF_ProjectParcel1.zip

Authorized individual

Leslie Kurisaki

Authorization

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

U.S. GEOLOGICAL SURVEY HILO RESEARCH FACILITY

Draft Environmental Assessment – Anticipated Finding of No Significant Impact

The U.S. Department of the Interior, U.S. Geological Survey (USGS) and State of Hawai'i

FEBRUARY 2023

Prepared By

HHF PLANNERS
places for people

ahl.

U.S. GEOLOGICAL SURVEY
HILO RESEARCH FACILITY

Draft Environmental Assessment – Anticipated Finding of No Significant Impact

The U.S. Department of the Interior, U.S. Geological Survey (USGS) and State of Hawai'i

FEBRUARY 2023

Prepared By

1 Project Summary

PROJECT NAME	USGS Hilo Research Facility
PROPOSING AGENCY/APPLICANT	United States Department of the Interior, U.S. Geological Survey (USGS)
LANDOWNER/APPROVING AGENCY	State of Hawaiʻi, University of Hawaiʻi at Hilo (UH Hilo)
PROPOSED ACTION/PROJECT DESCRIPTION	The USGS proposes to construct a new 60,000 square foot facility to provide offices and a consolidated science hub for the Hawaiian Volcano Observatory (HVO) and the Pacific Island Ecosystems Research Center (PIERC). The new facility will include office spaces, conference rooms, laboratories, warehouse and storage, and an operations/monitoring center.
LOCATION	Waiakea, South Hilo, Island of Hawaiʻi
TAX MAP KEY (TMK) PARCELS	(3) 2-4-001:122 (por)
PROJECT SITE	6.82 acres
STATE LAND USE DISTRICT	Agricultural District
COUNTY GENERAL (DP) DESIGNATION	University (UU)
ZONING	A-1a, Agriculture (Agriculture, minimum 1 acre site)
SPECIAL MANAGEMENT AREA (SMA)	Not within SMA
FLOOD ZONE DESIGNATION	Zone X, Outside 100-year and 500-year floodplain

PERMITS AND APPROVALS REQUIRED	Chapter 343 HRS, Hawaiʻi Environmental Policy Act (HEPA) compliance National Environmental Policy Act (NEPA) compliance Use and Occupancy Agreement, University of Hawaiʻi Section 6E-8 Historic Preservation Review; and Section 106, National Historic Preservation Act (NHPA) review National Pollutant Discharge Elimination System (NPDES) (if required during construction) Coordination/review by Disability Communication Access Board (DCAB), County Dept. of Water Supply, County Dept. of Environmental Management, Wastewater Division; County Fire Department County of Hawaiʻi: Grading permit, Grubbing permit, reviews by Dept. of Water Supply, Fire Department **Note: Federal buildings are exempt from County Building Permit per Hawaiʻi County Code Chapter 5, Section 5-1(3(1)2* Federal Aviation Administration (FAA): Form 7460-1, Notice of Proposed Construction or Alteration (due to proximity to airport)
DETERMINING AGENCIES	NEPA: USGS Chapter 343 HRS/HEPA: UH Hilo
ANTICIPATED CHAPTER 343 HRS/NEPA DETERMINATION	Finding of No Significant Impact (FONSI)
USGS CONTACT	Jordan D Sizemore Environmental Protection Specialist P.O. Box 25046, MS 205 Lakewood, CO 80225 jsizemore@usgs.gov

Contents

Project Summary S-1
1 Introduction 1-1
1.1 Project Location and Physical Setting 1-1
1.2 Project Background 1-4
1.2.1 Hawaiian Volcano Observatory (HVO) 1-4
1.2.2 Pacific Island Ecosystem Research Center (PIERC) 1-4
1.3 Purpose and Need for Action 1-5
2 Proposed Action and Alternatives 2-1
2.1 Alternatives 2-1
2.2 No Action Alternative 2-1
2.3 Proposed Action (Preferred Alternative) 2-2
3 Affected Environment and Environmental Consequences 3-1
3.1 Introduction 3-1
3.1.1 Issues and Resources Considered for Analysis 3-1
3.1.2 Issues and Resources with Minimal to No Impacts 3-2
3.2 Natural Hazards 3-3
3.2.1 Existing Conditions 3-3
3.2.2 Potential Impacts and Mitigation 3-4
3.3 Climate Change and Sea Level Rise 3-5
3.3.1 Existing Conditions 3-5
3.3.2 Potential Impacts and Mitigation 3-7
3.4 Biological Resources 3-9
3.4.1 Botanical Resources 3-9
3.4.2 Avifauna and Mammals 3-11
3.4.3 Compliance with Section 7, Endangered Species Act 3-13
3.4.4 Compliance with Executive Order 13112, Invasive Species 3-14
3.5 Existing and Surrounding Land Uses 3-15
3.5.1 Existing Conditions 3-15

3.5.2 Potential Impacts and Mitigation 3-15
3.6 Historic and Archaeological Resources 3-15
3.6.1 Historic Background 3-16
3.6.2 Existing Conditions 3-17
3.6.3 Potential Impacts and Mitigation 3-19
3.7 Cultural Resources 3-23
3.7.1 Background 3-23
3.7.2 Existing Conditions 3-24
3.7.3 Potential Impacts and Mitigation 3-26
3.8 Infrastructure and Utilities 3-26
3.8.1 Potable Water 3-26
3.8.2 Wastewater 3-27
3.8.3 Storm Water Drainage/Water Quality 3-28
3.8.4 Sitework/Grading 3-28
3.8.5 Electrical and Telecommunication Facilities 3-29
3.9 Transportation and Roadways 3-30
3.9.1 TIAR Study Methodology 3-30
3.9.2 Existing Conditions 3-31
3.9.3 Potential Impacts and Mitigation 3-34
3.10 Cumulative Impacts 3-36
4 Relationship to Land Use Plans, Policies and Controls 4-1
4.1 Federal 4-1
4.2 State of Hawaiʻi 4-2
4.2.1 State Land Use 4-2
4.2.2 Hawaiʻi State Plan, HRS Chapter 226 4-4
4.2.3 Hawaiʻi Coastal Zone Management Program 4-5
4.3 County of Hawaiʻi 4-8
4.3.1 County General Plan 4-8
4.3.2 Community Development Plan 4-11

4.3.3 Zoning 4-12
4.3.4 Special Management Area 4-12
4.4 Permits and Approvals 4-14
5 Anticipated Determination 5-1
6 Agencies and Organizations Consulted 6-1
6.1 Pre-Assessment Consultation 6-1
6.2 Agencies and Organizations Consulted 6-1
7 References 7-1

Appendices

Appendix A: Project Alternatives and Environmental Issues and Resources with Minimal to No Impacts
Appendix B: Natural Resources Assessment & Section 7 Consultation Correspondence
Appendix C: Revised Draft Archaeological Literature Review and Field Inspection & Section 106 Consultation Correspondence
Appendix D: Cultural Impact Assessment
Appendix E: Traffic Impact Analysis Report
Appendix F: Draft Noise Impact Report
Appendix G: Comment Summary and Letters Received During Pre-Assessment Consultation

Figures

Figure 1-1: Project Location Map 1-2
Figure 1-2: TMK Map 1-3
Figure 2-1: Site Plan 2-3
Figure 3-1: Volcanic Hazard Zones 3-4
Figure 3-2: Historic Properties in the 13-acre Study Area 3-18
Figure 3-3: Current Site Plan and Existing Historic Properties 3-20
Figure 3-4: TIAR Study Intersections 3-32
Figure 4-1: State Land Use Districts 4-3
Figure 4-2: Hawaiʻi County Zoning Districts 4-13

Tables

Table 2-1: Project Alternatives 2-1
Table 3-1: Issues and Resources with Potential Impacts 3-1
Table 3-2: Issues and Resources with No or Minimal Impacts 3-2
Table 3-3: Historic Properties Within the Study Area 3-17
Table 3-4: Peak Hour Project Trip Generation 3-35
Table 4-1: Applicable Federal Laws and Executive Orders 4-1
Table 4-2: Potential Permits and Approvals 4-14
Table 6-1: Agencies and Organizations Consulted 6-1
Table 6-2: Overview of Agency Comments 6-3

Acronyms and Abbreviations

ABA	Architectural Barriers Act
AFONSI	Anticipated Finding of No Significant Impact
ahupuaʻa	land division usually extending from uplands to the sea
AIS	Archaeological Inventory Survey
ALISH	Agricultural Lands of Importance to the State of Hawaiʻi
APE	Area of Potential Effect
ASEA	Aquifer Sector Area
AQI	Air Quality Index
BMP	Best Management Practice
CAA	Clean Air Act
CDP	Census Data Place
CEQ	Council on Environmental Quality
CFE	carbon pollution-free electricity
CFR	Code of Federal Regulations
cfs	cubic feet per second
CIA	Cultural Impact Assessment
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Area
CWA	Clean Water Act of 1972
CWRM	Commission on Water Resource Management
dB	decibel
dBA	Sound pressure level (“A” weighting filter)
DCAB	Hawaiʻi Disability and Communication Access Board
DBEDT	State of Hawaiʻi Department of Business, Economic Development and Tourism
DHHL	Department of Hawaiian Home Lands
DLNR	State of Hawaiʻi Department of Land and Natural Resources
DOE	State of Hawaiʻi Department of Education
DOFAW	Division of Forestry and Wildlife
DOH	State of Hawaiʻi Department of Health
DOI	U.S. Department of the Interior
DWS	Hawaiʻi County Department of Water Supply
EA	Environmental Assessment
EDH	EnVision Downtown Hilo
EIS	Environmental Impact Statement
EISPN	Environmental Impact Statement Preparation Notice
E.O.	Executive Order
EOC	County Emergency Operations Center
EPA	Environmental Protection Agency
ERP	Environmental Review Program
ESA	Environmental Site Assessment

ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
GHG	greenhouse gas
gpd	Gallons per Day
gpm	Gallons per Minute
HAR	Hawaiʻi Administrative Rules
HECO	Hawaiian Electric Company
HCC	Hawaiʻi Community College
HCEI	Hawaiʻi Clean Energy Initiative
HCM	Highway Capacity Manual
HMC	Hilo Medical Center
HDOA	State of Hawaiʻi Department of Agriculture
HDOT	State of Hawaiʻi Department of Transportation
HICRIS	Hawaiʻi Cultural Resource Information System
HIDOH	Hawaiʻi Department of Health
HIEMA	Hawaiʻi Emergency Management Agency
HRHP	Hawaiʻi Register of Historic Places
HRS	Hawaiʻi Revised Statutes
HT	Hawaiian Telcom
HVO	Hawaiian Volcano Observatory
ICU	intensive care unit
IAL	Important Agricultural Lands
IBC	International Building Code
IPCC	Intergovernmental Panel on Climate Change (United Nations)
ISWMP	Integrated Solid Waste Management Plan
ITE	Institute of Transportation Engineers
JBPHH	Joint Base Pearl Harbor Hickam
Ka Paʻakai	*Ka Paʻakai v. Land Use Commission* (Hawaii Supreme Court)
kapu	taboo, prohibited, forbidden
kō	sugar cane
kV	kilovolt
LBSP	Land Based Sources of Pollution
Ldn	day-night average sound level
LEED	Leadership in Energy and Environmental Design
$L_{eq(h)}$	Maximum hourly equivalent sound levels
LID	low impact development
LOS	Level-of-Service
LRFI	Literature Review and Field Inspection
LSB	Land Study Bureau

LUC	Hawaiʻi Land Use Commission
LUPAG	Land Use Pattern Allocation Guide (Hawaiʻi County General Plan)
mahi ʻai	farmers
makai	on the seaside, toward the sea
mālama ʻaina	caring for and honoring the land
mauka	inland, upland, towards the mountain
MBTA	Migratory Bird Treaty Act
mgd	million gallons per day
moʻolelo	story, tale, myth, history, tradition, legend
MOU	Memorandum of Understanding
mph	miles per hour
MSL	mean seal level
NAAQS	National Ambient Air Quality Standards
NAC	Noise Abatement Criteria
NFIP	National Flood Insurance Program
NHO	Native Hawaiian Organization
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Services
NREM	Natural Resources and Environmental Management
NRHP	National Register of Historic Places
OEQC	Office of Environmental Quality Control
OHA	Office of Hawaiian Affairs
OHWM	ordinary high water mark
OP	Hawaiʻi Office of Planning
PBARC	Pacific Basin Agricultural Research Center
PER	Preliminary Engineering Report
PI	Principal investigator
PIERC	Pacific Island Ecosystems Research Center
PV	photovoltaic
RCRA	Resource Conservation and Recovery Act
REC	recognized environmental condition
ROD	Rapid Ohia Death
SCS	Soil Conservation Service
SF	Square Feet or Square Foot
SHPD	State Historic Preservation Division
SIHP	State Inventory of Historic Places
SLR	sea level rise
SLH	Session Laws of Hawaiʻi
SMA	Special Management Area

TCP	traditional cultural properties
TEZ	Tsunami Evacuation Zone
TIAR	Traffic Impact Analysis Report
TN	total nitrogen
TMDL	Total Maximum Daily Load
TMK	Tax Map Key
TP	total phosphorus
TSS	total suspended solids
UH	University of Hawaiʻi
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VMT	vehicles miles traveled
wahi pana	legendary places
WQR	water quality rules
WQS	water quality standards
WQV	water quality volume
WSC	Water Science Center
WWTP	Wastewater Treatment Plant

1 Introduction

The U.S. Department of the Interior (DOI), U.S. Geological Survey (USGS) is preparing an Environmental Assessment (EA) for a new research facility in Hilo (Proposed Action), Hawaiʻi Island to support the USGS Hawaiian Volcano Observatory (HVO) and Pacific Island Ecosystems Research Center (PIERC). This Draft EA and Anticipated Finding of No Significant Impact (AFONSI) is prepared in compliance with the State of Hawaiʻi Environmental Policy Act (HEPA) and National Environmental Policy Act (NEPA).

The State of Hawaiʻi's Chapter 343 Hawaiʻi Revised Statutes (HRS), as amended, and Title 11, Chapter 200.1, Hawaiʻi Administrative Rules (HAR), Environmental Impact Statement Rules, require that an EA be prepared due to the use of state or county lands. Per Section 11-200.1-9(a)(2)(A), an EA is triggered by the use of State-owned land. The project is federally funded by USGS and also considered a federal action. Therefore, this EA is also prepared in accordance with Section 102(2)(C) of NEPA, as amended, CEQ regulations implementing NEPA (40 Code of Federal Regulations [CFR] 1500-1508, and DOI procedures for implementing NEPA.

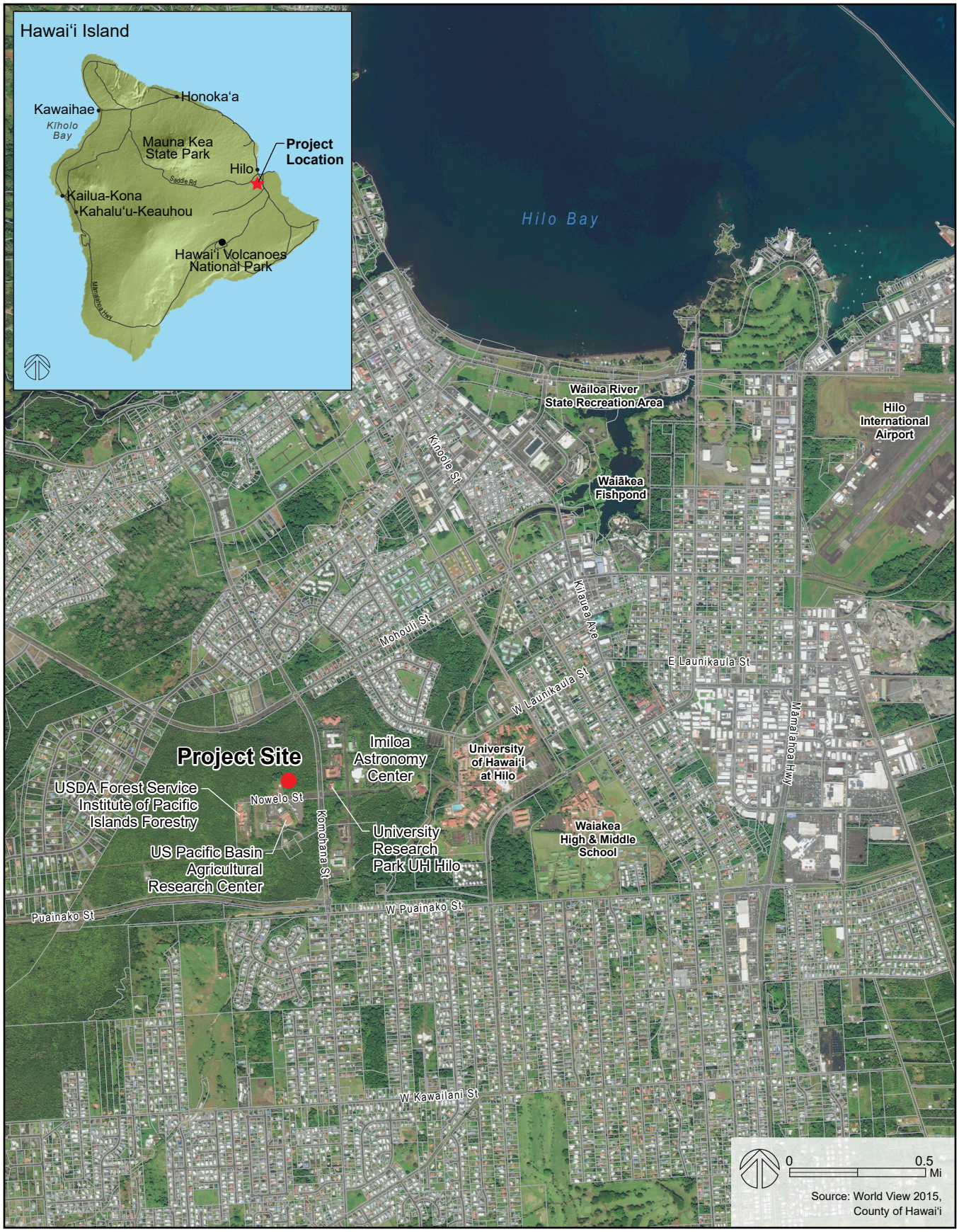
This Draft EA analyzes the potential environmental consequences of the Proposed Action and reasonable alternatives considered. The intent of the Draft EA is to provide sufficient analysis to determine whether the Proposed Action will have a significant effect on the environment, thereby requiring preparation of an environmental impact statement, or a Finding of No Significant Impact (FONSI). A FONSI determination is anticipated.

1.1 Project Location and Physical Setting

As shown in Figure 1 1, the proposed USGS Hilo Research Facility will be located at the north corner of the intersection of Komohana Street and Nowelo Road, one mile west of the University of Hawaiʻi at Hilo (UH Hilo) campus. The State-owned property will be available to USGS under a long-term use and occupancy agreement with the University of Hawaiʻi.

Figure 1 2 shows a 13-acre "Study Area" that was initially investigated for the proposed facility. The Study Area is undeveloped and covered with vegetation including trees, tall grass, brush, and bushes. Elevation ranges from about 343 feet mean sea level (MSL) along Nowelo Street at the site's southwest corner to about 302 feet at the northeastern corner.

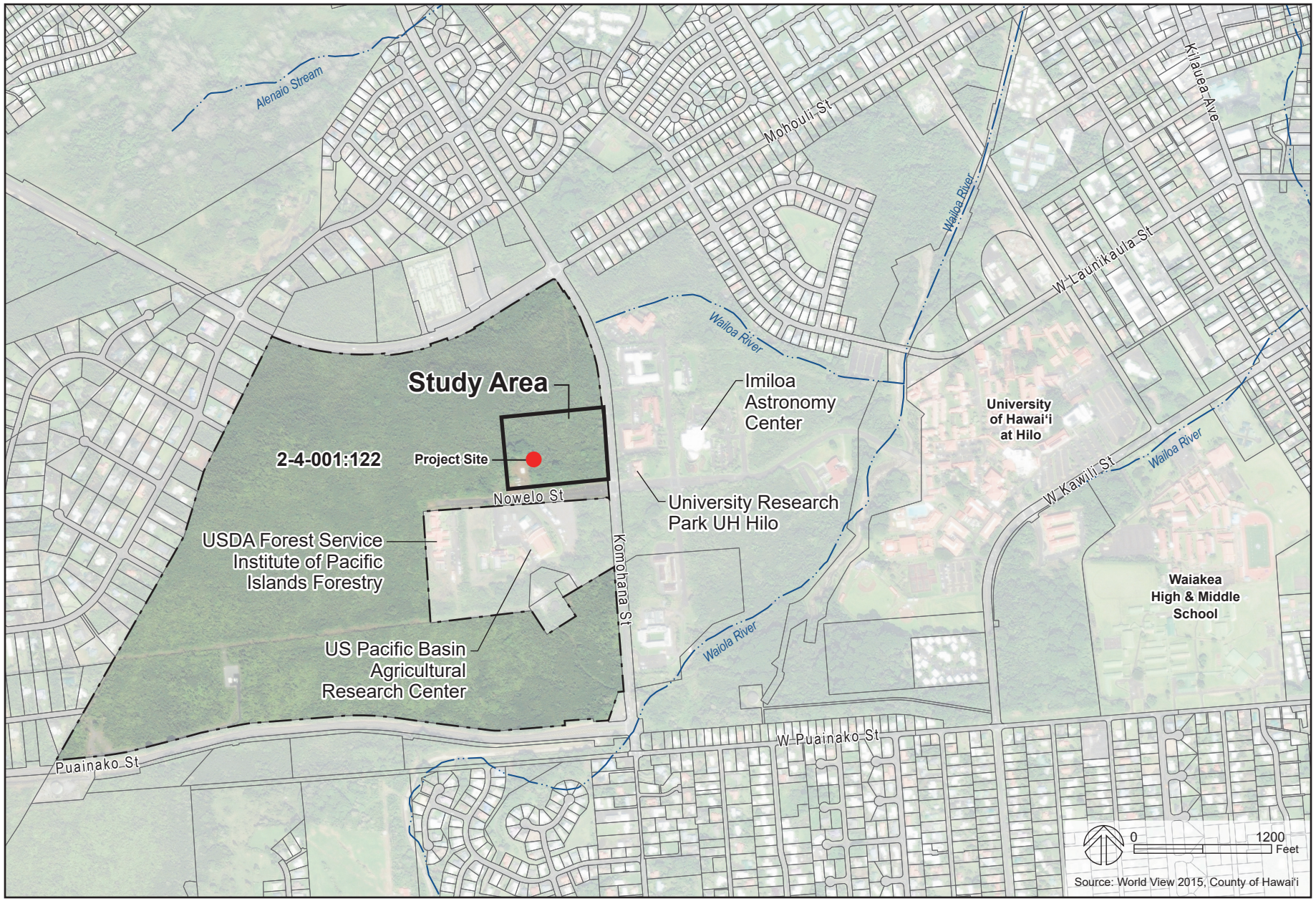
The 6.83-acre Project Site was identified within this Study Area based on its compatibility with existing topography to minimize the amount of cut and fill required. The selected site also minimizes impact to known historic features. Both the Study Area and Project Site are part of TMK [3]2-4-001:122 (por). This 267-acre tax map parcel is part of the UH Hilo's Mauka Lands Master Plan; a long-range plan for the expansion of UH Hilo's research facilities that includes a future Hawaiʻi Community College, Komohana Campus. Hawaiʻi Governor Linda Lingle accepted the UH Hilo's Environmental Impact Statement (EIS) for the Mauka Lands Master Plan in 2005.



Project Location Map **Figure 1-1**

USGS Hilo Research Facility

Draft Environmental Assessment – Anticipated Finding of No Significant Impact
Hilo, Hawai'i



TMK Map

Figure 1-2

USGS Hilo Research Facility

Draft Environmental Assessment – Anticipated Finding of No Significant Impact

Hilo, Hawai'i

1.2 Project Background

1.2.1 Hawaiian Volcano Observatory (HVO)

The mission of the Hawaiian Volcano Observatory (HVO) is to monitor, investigate, and assess hazards from active volcanoes and earthquakes in Hawaii, and communicate the results of this work to the public, emergency managers, and the scientific community.

HVO's current location in the Hawaiʻi Volcanos National Park provides proximity to Hawaiʻi Island's active volcanoes of Kīlauea, Mauna Loa, Lōʻihi, and Hualālai, attracting geoscientists from all over the world. HVO scientists conduct cutting edge research and frequently interact with community groups to provide education on volcanology, hazards, and earth science.

The HVO has a long history in the Hawaiʻi Volcanoes National Park. From 1912 to 1947, it was located near the present-day Volcano House Hotel, and in 1948 moved into what is now the Thomas A. Jaggar Museum. In 1986, the HVO moved next door to the Jaggar Museum, into a two-story structure that included office and lab space, an observation tower and basement storage. Other HVO structures in the area include a radio tower, a radio/data building, and a vault across the Crater Rim Drive that house monitoring instrumentation.

Beginning in May 2018, the eruption and a series of partial summit collapses of Kīlauea Volcano prompted the evacuation of HVO's facilities. The buildings sustained significant damage due to ground deformation and repeated earthquakes. Since then, 30 existing HVO staff have been using temporary facilities in Hilo for office, lab, and warehouse functions, as well as working from home during the COVID-19 pandemic.

The HVO buildings cannot be repaired for cost and safety reasons, and HVO needs a new permanent base of operations and field station. A small station for HVO field staff is being planned in Hawaiʻi Volcanoes National Park as a separate project with multiple facilities on National Park Service property. The field station is not dependent on or part of this Proposed Action. This field station environmental review is included in the July 2022 EA prepared by the NPS.

1.2.2 Pacific Island Ecosystem Research Center (PIERC)

The Pacific Island Ecosystems Research Center (PIERC) was established in 1994 from the consolidation of researchers previously working for the U.S. Fish and Wildlife Service (USFWS) and the NPS. PIERC conducts research to support and implement sound management and conservation of biological resources in Hawaiʻi and other Pacific locations. PIERC research on imperiled species, invasive species, plant diseases (e.g., Rapid ʻŌhiʻa Death), and ecosystem processes informs management decisions made by the U.S. Department of Interior and other federal and state agencies. This research is of tremendous value to island communities seeking to live in harmony with changing climate, ecosystems, and invasive threats, and its importance continues to grow.

PIERC currently occupies four buildings in the "Research Area" of Hawaiʻi Volcanoes National Park. There are approximately 25 to 30 federal employees and 15 to 20 UH employees. Although their buildings did not sustain damage during the 2018 eruption, PIERC has long sought to relocate closer to resources and

colleagues in Hilo. PIERC scientists work collaboratively with both government and academic partners, including scientists affiliated with the UH Hilo. The organization also has an active volunteer program and interfaces with public stakeholders.

1.3 Purpose and Need for Action

The Proposed Action is needed to provide permanent research facilities for HVO and PIERC that are safe, physically adequate, and ideally, close to the UH Hilo. The temporary facilities in Hilo that HVO has used since the 2018 evacuation do not provide sufficient space for personnel or equipment to allow HVO to meet its mission over the long-term, and a permanent facility is needed. Existing PIERC facilities in the park are also substandard and have long needed upgrade. Due to the nature of its research and regular interface with government agencies and university researchers, PIERC has needed an efficient location that could facilitate these collaborative relationships. Cumulatively, these conditions prompted USGS to propose a consolidated HVO-PIERC science hub in Hilo. Both programs require a modern facility to support ongoing research, field operations, laboratory, and community education activities.

The proposed location provides proximity to Hawaiʻi Volcanoes National Park and UH Hilo, fostering collaboration with university research facilities, faculty and students. Both HVO and PIERC already work collaboratively with UH Hilo faculty and students, and the proposed facility near the main campus is supported by university administration and staff. Proximity to campus will be beneficial to students and faculty, increase student interaction with scientists, and allow shared use of laboratory and other equipment. It is expected that the Proposed Action will strengthen academic and research partnerships, create learning opportunities, and provide continued community service to Hawaiʻi Island and the State. A new Hilo facility will also provide necessary emergency response capability as required by the State of Hawaiʻi Emergency Management Agency (HIEMA).

The Project Site is part of a larger parcel of land that was granted to the University of Hawaiʻi by Executive Order No. 3814, dated April 11, 2000, “for the University of Hawaiʻi and its allied purposes[.]” The UH Hilo administration has indicated that the Proposed Action is *“solidly in-line with the purpose and intent of the set aside by Executive Order No. 3814”* (letter dated October 2, 2020 from Kalei Rapoza, Interim Vice Chancellor for Administrative Affairs, UH Hilo to Suzanne Case, Chair, Board of Land and Natural Resources).

2 Proposed Action and Alternatives

2.1 Alternatives

The USGS initially evaluated seven (7) alternatives to satisfy the purpose and need for the project. The alternatives considered, including No Action, are listed below in Table 2-1. The USGS has identified Alternative 6, Construct New Research Facility in Hilo, as the Preferred Alternative. The other five alternatives and their environmental impacts are described in Appendix A, Project Alternatives Dismissed from Further Consideration.

Table 2-1: Project Alternatives

Alt	Description	Action	Reason for Dismissal
1	No Action	Maintained for comparison to the Proposed Action	N/A; Does not meet the purpose and need for the project.
2	Consolidate with USGS/NPS Field Center at Current PIERC Site	Dismissed	Substandard facilities and lack of space at PIERC site; potential volcanic hazard.
3	Relocate to USDA Research Campus in Hilo	Dismissed	No space in existing campus buildings; potential archaeological issues.
4	Find Permanent Space to Lease in Hilo	Dismissed	No commercial/ office space with adequate size and configuration.
5	Relocate to NOAA Facility on Ford Island	Dismissed	O‘ahu location presents logistical challenge for HVO field technicians & scientists.
6	Construct New Research Facility in Hilo (Preferred Alternative)	Proposed Action	N/A
6a	Alternative Building Site within the Current Study Area	Dismissed	More grading/ earthwork than Preferred Alt; greater impact to identified historic sites.

2.2 No Action Alternative

Under a No-Action scenario, the Proposed Action would not occur and replacement facilities for HVO and PIERC would not be constructed. Since returning to the Hawai‘i Volcanoes National Park facility damaged by previous volcanic eruptions is not an option for HVO, staff would continue operating out of temporary facilities in Hilo. These facilities are undersized and located in the tsunami hazard zone. Due to the shortage of space, other staff would continue working from home as they have been doing since the start of the COVID-19 pandemic in early 2020. PIERC would continue to operate out of their aging facilities in the park.

With No Action, HVO would function with inadequate office, lab, and storage space, making it difficult and inefficient to meet its federal mission. The long-term use of temporary space is not a sustainable option. In summary, the No Action Alternative would not meet the purpose and need for the Proposed Action. However, the "do-nothing" option is always an alternative to consider and as required by the State's Chapter 343 HRS, it is carried forward for analysis to assess the consequences of not undertaking the Proposed Action and to establish a comparative baseline for analysis.

2.3 Proposed Action (Preferred Alternative)

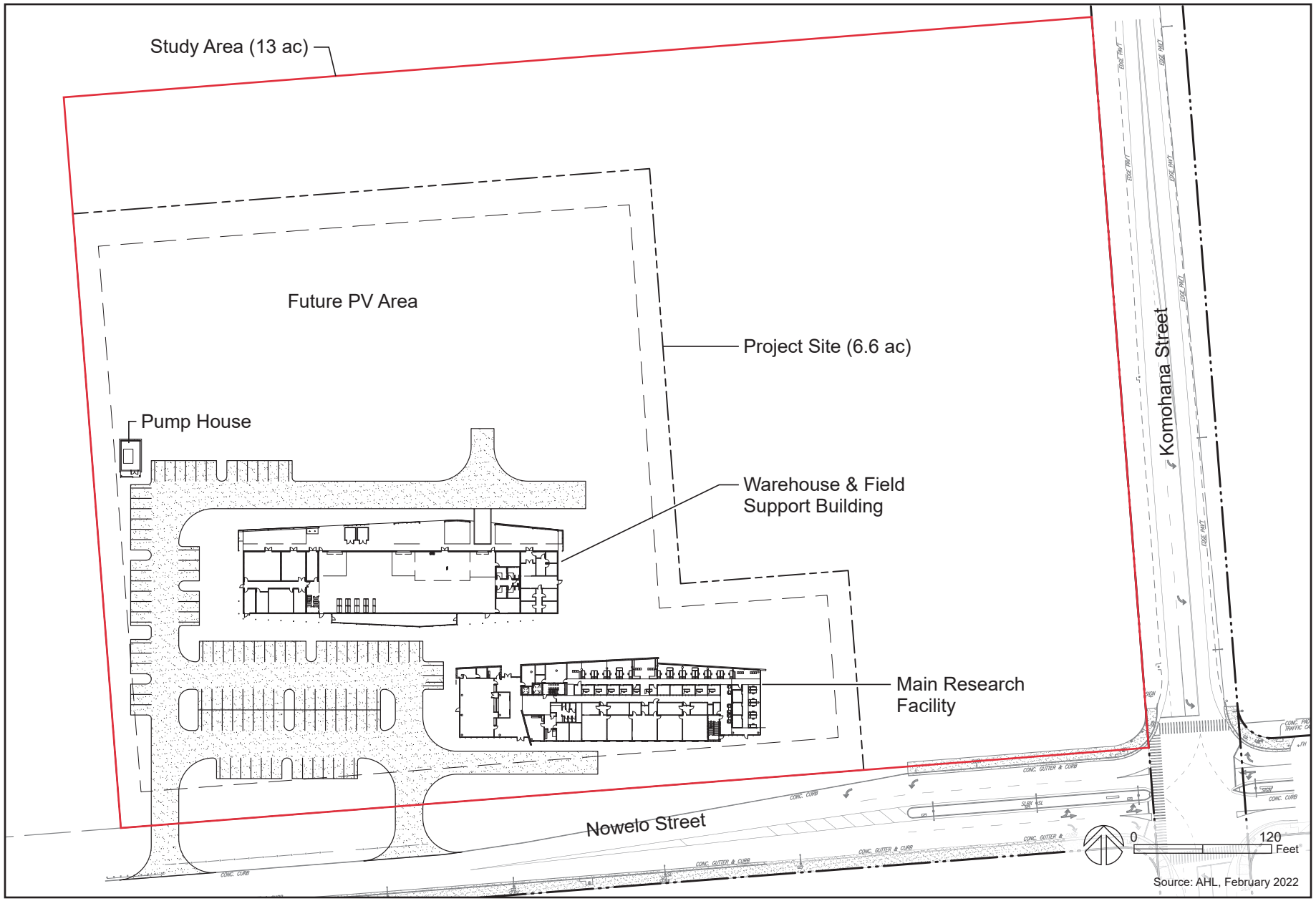
The Proposed Action will construct a permanent replacement facility in Hilo for the HVO and PIERC. The USGS Hilo Research Facility will support approximately 50 staff and volunteers from HVO and 53 staff and volunteers from PIERC. HVO researchers and administrative staff will be able to move out of their temporary facilities and PIERC staff will relocate from their current facilities at Hawai'i Volcanoes National Park.

Figure 2-1 illustrates the proposed site plan for the research facility. The facility includes two main structures and parking within a campus-like setting. The main vehicular access will be from Nowelo Street where an existing driveway is located. A new secondary access on Nowelo Street is also proposed. Convenience parking will be provided in front of the main building and staff parking will be mostly located behind the warehouse building.

The main Research Facility will be a three-story building fronting Nowelo Street. The first floor will include laboratory bays, private and open offices, conference rooms, work areas, and a main lobby. The ground floor will be occupied by HVO. The second floor includes similar laboratory bays, offices, and work areas, and will be occupied by PIERC. The third floor of the building included mechanical space and an open observation deck.

The Warehouse and Field Support building will support HVO and PIERC operations and serve as a bridge between laboratory and field functions. Most of the interior will be an open plan warehouse with 18-foot minimum clearance and a high loading access bay. The building will include administrative spaces, a climate-controlled room for the USGS archives; field gear storage and maintenance areas, and lockers/restrooms/showers. At the far east end of the building there will be labs and lab support spaces for PIERC, an insectary and animal housing area separated from the main building. A 11 ft x 99 ft linear greenhouse will be situated along the southern side of the warehouse and under the large overhanging roof.

The entire north side of the warehouse will provide covered field support and will include spaces that are either fully outdoors or semi-enclosed. This field support area will have a large roof overhang extending 22 feet from north façade of the warehouse with vertical screening. There will be areas for field staging prep, hazardous materials storage, loading, battery charging enclosures and an open-air field shop all located under the overhang. A small CMU Pump House is proposed west of the parking access off Nowelo Street. There will also be an emergency generator in this area.



Site Plan

Figure 2-1

USGS Hilo Research Facility

Draft Environmental Assessment – Anticipated Finding of No Significant Impact

Hilo, Hawai'i

3 Affected Environment and Environmental Consequences

3.1 Introduction

A range of issues and all resource areas related to the natural, physical, and human-made environment potentially affected by the project were evaluated to assess potential impacts of the Proposed Action and alternatives. This chapter addresses aspects of the environment that have the potential to affect or be affected by the Proposed Action and No Action Alternative. The chapter describes existing conditions, potential project impacts (direct, indirect, and cumulative), and proposed mitigation. Direct impacts are those caused by the Proposed Action and occur at the same place and time. Indirect effects may occur later in time or farther in distance but are still reasonably foreseeable.

Cumulative impacts are defined as the results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over time. Cumulative impacts are discussed at the end of this chapter in Section 3.10.

3.1.1 Issues and Resources Considered for Analysis

The issues and resources potentially impacted by the Proposed Action are listed in Tables 3-1 and discussed further in this chapter. These issues and resources were considered to have potential impacts if:

- the environmental impacts associated with the issue are central to the Proposed Action or of critical importance;
- a detailed analysis of environmental impacts related to the issue is necessary to make a reasoned choice between alternatives;
- the impacts associated with the issue have a high level of interest by the public, policy makers or regulatory agencies;
- there are potentially significant impacts to the resources.

Table 3-1: Issues and Resources with Potential Impacts

Issue/Resource Area	EA Section	Rationale for Potential Impacts
Natural Hazards (volcanic and hurricane)	3.2	Presence of volcanic and hurricane hazard in project vicinity; risk level affects choice between project alternatives.
Climate Change and Sea Level Rise	3.3	High level of interest by public, policy makers and regulatory agencies.
Biological Resources (botanical, avifauna, terrestrial fauna)	3.4	Presence of native plant species, potential impact to protected seabirds and native bat. Regulatory requirement for Section 7, Endangered Species Act consultation.

Issue/Resource Area	EA Section	Rationale for Potential Impacts
Existing and Surrounding Land Use	3.5	Adjacent to UH Hilo Mauka Lands planned for future development. High level of public interest.
Historic and Archaeological Resources	3.6	Presence of previously identified historic sites, proposed demolition of portion of site. Regulatory requirement for Section 106, NHPA and 6E consultations.
Cultural Resources	3.7	Native Hawaiian culture; high level of public interest; HRS Chapter 343 requirement for Cultural Impact Assessment;
Infrastructure and Utilities	3.8	Public and governmental interest in potential impact.
Transportation and Roadways	3.9	Public and governmental interest in potential impact.

3.1.2 Issues and Resources with Minimal to No Impacts

Table 3-2 below lists the issues and resources that were evaluated for impacts but did not meet the criteria above, were not present in the project area, or the impacts could be minimized and mitigated with the implementation of standard and best management practices (BMPs). These issues and resources are described in more detail in Appendix A. In some cases (e.g., noise), detailed studies were conducted to identify project impacts and determine if mitigation was needed.

Table 3-2: Issues and Resources with No or Minimal Impacts

Issue/Resource Area	Reason for Dismissal
Climate	Minimal risks to and impact from the Proposed Action; may impact employees living in area affected and, thereby impacting USGS operation. The Department will work with the affected employees to alleviate the hardship caused by such events.
Soils and Agriculture	Site soils have low agricultural productivity/importance per Land Study Bureau (LSB) and Agricultural Lands of Importance to the State of Hawai‘i (ALISH); not an Important Agricultural Land (IAL).
Water Resources	No streams or wetlands on site; no impact to nearby surface water resources. No impact to groundwater resources.
Air Quality	Net increase in vehicles comparing existing and new facility is negligible; minimal impact from emission of hazardous air pollutants and GHG from construction and operation
Noise	Insubstantial increase in vehicles/traffic noise; temporary construction noise can be mitigated; no adjacent residential areas (see Appendix F, Noise Impact Report).
Socio-Economic/ Environmental Justice (EJ)	No increase in existing HVO & PIERC personnel or operations. No disproportionately high and adverse effect on low-income or minority populations from the facility or operations; EJ populations indices for diesel particulate matter and air toxics respiratory is high from elevated air and road transportation from visitors. Some of the measures for health and equity leading to equitable development are described in Appendix A.

Issue/Resource Area	Reason for Dismissal
Solid and Hazardous Waste	Negligible change in solid and hazardous waste generated compared to existing operations. Solid Waste Management Plan to be submitted to DEM Solid Waste Division on or before project advertised for bidding whenever feasible, solid waste generated from construction and demolition, we will strive to meet or exceed the Department's recycling goal of 50%.
Public Services (Police, Fire, EMS, Schools, Parks)	Negligible change in number of HVO & PIERC personnel and operations; no change in demand for public services.

3.2 Natural Hazards

3.2.1 Existing Conditions

3.2.1.1 Flood and Tsunami

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) the project site is in Zone X, an area determined to be outside the 500-year floodplain. No base flood elevation or depths are shown in this zone. The project site is over 1.5 miles from Hilo Bay, and not located within the State of Hawaiʻi Emergency Management Agency's tsunami evacuation zone.

3.2.1.2 Volcanic Hazard

The U.S. Geological Survey (USGS) volcanic hazard zone map for the Island of Hawaiʻi divides the island into zones ranked from 1 through 9 (with 1 being the area of greatest hazards and 9 being the area of least hazard) based on probability of coverage by lava flows (Figure 3-1).

The entire Hilo area, including the project site, is within Zone 3. This hazard rating indicates that the zone is gradationally less hazardous than Zone 2 because it is a greater distance from active vents and the topography makes it less likely to be covered by lava flows. Zone 3 has been covered by lava from one to five percent of its total land area since 1800, and 15 to 75 percent in the last 750 years.

On November 27, 2022, Mauna Loa erupted for the first time in 38 years. The eruption began when lava broke the surface within Mokuʻāweoweo, the summit caldera. Within hours, several lava flows were confirmed at fissures on the Northeast Rift Zone within Hawaiʻi Volcanoes National Park. Over the next several days, lava flows extended 12 miles from the vents in a north/northeast direction before the eruption ended two weeks later on December 10, 2022. Lava flows came to within 1.7 miles of the Daniel K. Inouye Highway (Saddle Road), but there were no recorded injuries or fatalities.

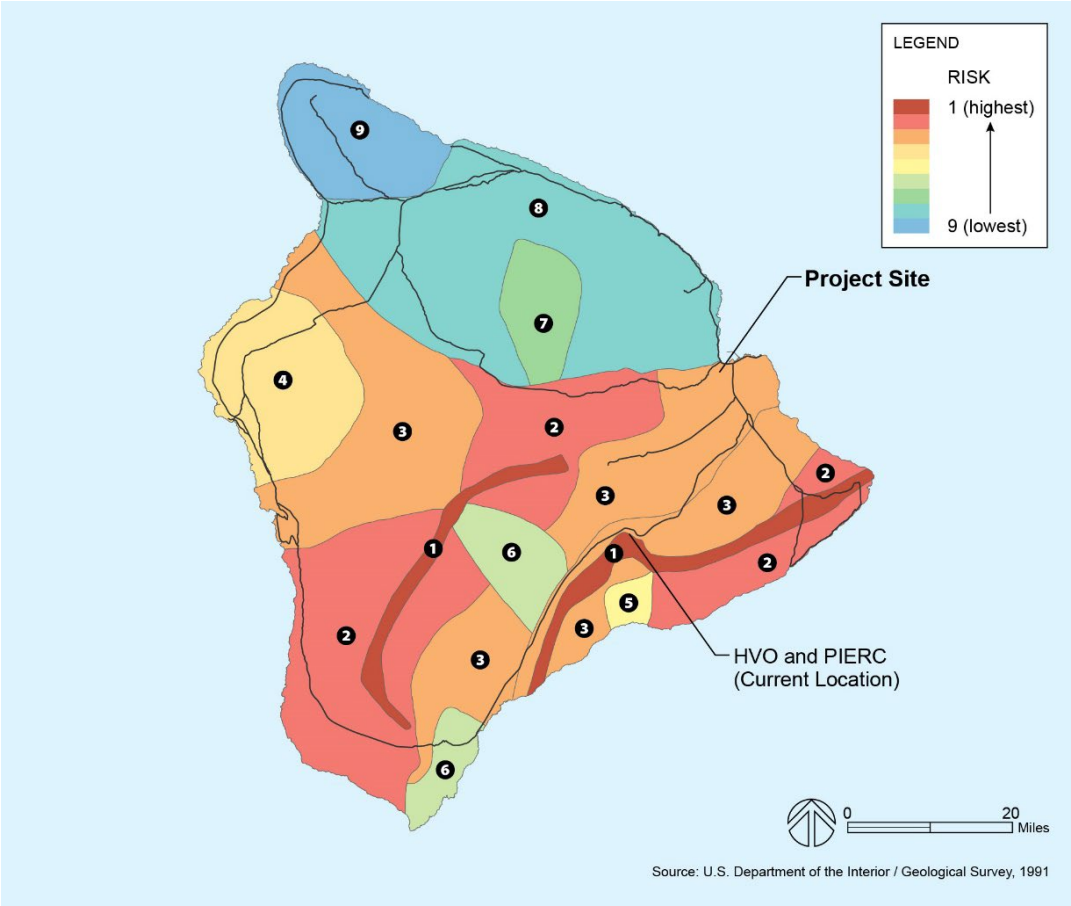


Figure 3-1: Volcanic Hazard Zones

3.2.1.3 Hurricanes

Hurricanes are part of a family of storms known as "tropical cyclones." These storms can be quite large and produce three life-threatening effects: high winds, storm surge, and heavy rains. Each of these effects in a singular manner could pose a serious threat to life and property. Taken together, they can cause widespread destruction, especially to older homes and residences that could be impacted by coastal storm surge (an abnormal rise of water generated by a storm).

The Island of Hawaiʻi has historically received less threat and damage from hurricanes compared to the Island of Kauaʻi. However, the proposed structures could potentially be damaged by high winds and heavy rainfall from a hurricane passing over the island.

3.2.2 Potential Impacts and Mitigation

The Proposed Action will not increase the risk of human health or property damage due to natural hazards. The project is not within the coastal area or an area vulnerable to flooding, tsunami, or storm surge. Like all of Hilo, there is some volcanic hazard risk and potential for earthquakes and hurricanes.

To mitigate damage due to earthquake and hurricanes, the facility will be designed and constructed in compliance with the seismic standards in the County of Hawaiʻi building code, International Building Code and other State and County standards. There would be poor air quality during and following eruptions that could potentially affect people in the surrounding area and to a greater extent people with poor health. The proposed site has a lower volcanic hazard rating than HVO and PIERC's current location, reducing the risk to personnel and equipment from natural hazards.

3.2.2.1 Potential Impact of No Action Alternative

The No Action alternative would not provide replacement facilities for HVO and PIERC. The lack of a permanent research facility would adversely affect HVO's operations and their ability to respond to future emergency events. PIERC personnel would remain at the park in a location vulnerable to volcanic hazard and health risks associated with air quality.

3.3 Climate Change and Sea Level Rise

3.3.1 Existing Conditions

Climate change is a long-term global shift in patterns of temperature, precipitation, humidity, wind, and seasons. Scientific data show that earth's climate has been warming, mostly attributable to rising levels of carbon dioxide and other "greenhouse gases" generated by human activity. The largest source of greenhouse gas emissions from human activities in the United States is from burning fossil fuels for electricity, heat, and transportation.

The State of Hawaiʻi currently relies on import of oil which in turn is used to power electrical generating stations (approximately 66% of the electrical generating mix is oil) and is the most petroleum-dependent state. According to U.S. EPA's Power Profiler, for the Hilo area (HIMS e-grid within zip code 96720), carbon pollution-free electricity (CFE) only makes up about 25.7% of the e-grid's generation mix (solar: 5.1%; wind:16.2%; hydro: 4%; and geothermal: 0.4%. This is below the DOI's existing building inventory average CFE consumption of 40%. Additionally, because of its reliance on imported oil, Hawaiʻi has the highest average electricity rates in the U.S. Climate changes are already impacting Hawaiʻi and the Pacific Islands through rising sea levels, increasing ocean acidity, changing rainfall patterns, decreasing stream flows, and changing wind and wave patterns.

Sea level has risen over the last century on each island at rates varying from 0.5 to 1.3 inches per decade (UH Sea Grant, 2014). For the foreseeable future, the planet's warming atmosphere will cause increased melting of ice sheets and snow, in addition to thermal expansion of ocean water, resulting in sea level rise. The Hawaiʻi Sea Level Rise Vulnerability and Adaptation Report provides a statewide overview of vulnerability to sea level rise and the potential impacts from chronic flooding based on modeling coastal flooding with sea level rise due to passive flooding, annual high wave flooding, and coastal erosion in the Sea Level Rise Exposure Area (SLR-XA) with up to 3.2 feet of sea level rise, and depicts flood hazards that may occur in the mid- to latter-half of this century. According to the report, this "timeframe is within the expected lifespan of most new construction and much of our existing development. It should be noted that sea level rise projections greater than 3.2 feet are "physically plausible" by the end of the century, based on the latest climate science…" (Hawaiʻi Climate Change Mitigation and Adaptation Commission,

2017). In addition to sea level rise, human-driven climate change will result in warmer air temperatures, a decrease in prevailing northeasterly trade winds, a decline in rainfall and resulting decline in water resources and aquatic ecosystems, warming and acidifying seawater, and stress to human health (UH Sea Grant, 2014).

3.3.1.1 Federal Sustainability Plan

Executive Order (E.O.) 14057, Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability and accompanying Federal Sustainability Plan (collectively referred to as "The Federal Sustainability Plan") sets out to reduce U.S. greenhouse gas emission by 50–52 percent from 2005 levels by 2030 and limit global warming to 1.5 degrees Celsius, as the science demands. To help achieve these critical goals, the plan states, it is the policy of the United States and the federal government (with its very large building and fleet inventory) to use its procurement power and lead by example to achieve a carbon pollution-free electricity sector by 2035 and net-zero emissions economy-wide no later than 2050. In implementing the policy set forth in the EO, DOI and USGS are developing targets to meet identified goals for carbon pollution-free electricity; zero-emission vehicle acquisition; net-zero emissions buildings; reduction in greenhouse gas emissions; and climate resilient infrastructure and operations.

3.3.1.2 State and County of Hawaiʻi Policies and Initiatives

Hawaiʻi Clean Energy Initiative

The State of Hawaiʻi has committed to reduce its dependence on fossil fuels and achieve the goal of 100 percent clean energy by 2045. In 2008, the State of Hawaiʻi and the U.S. Department of Energy signed a groundbreaking Memorandum of Understanding to collaborate on reducing Hawaiʻi's dependence on fossil fuels. In 2014, a second MOU was signed building upon this earlier foundation and launching the Hawaiʻi Clean Energy Initiative (HCEI). The HCEI is led by the Hawaiʻi State Energy Office which spearheads statewide energy security and resilience initiatives. The intent is to reduce Hawaiʻi's dependence on fossil fuels, strengthen self-sufficiency, energy resilience and security, with a goal of 100% renewable energy by 2045.

County of Hawaiʻi Integrated Climate Action Plan

The County of Hawaiʻi is developing an Integrated Climate Action Plan to identify how to address climate change causes and impacts to Hawaiʻi Island. The goal is to develop strategies to reduce the island's greenhouse gas (GHG) emissions to create a more sustainable and healthier Hawaiʻi Island that is more self-sufficient and independent. A first draft Climate Action Plan (CAP) was released in 2020.

The County's plan identifies two main targets: 1) to generate power and electricity from 100% renewable energy sources by the year 2045; and 2) to become carbon neutral by 2045 through absorbing/sequestering more carbon than is emitted. To reach carbon neutrality by 2045, the County has set specific targets for reducing emissions from 2015 levels. The target goals include a 35% reduction by 2025, a 70% reduction by 2035, and 100% reduction by 2045.

The plan identifies mitigation strategies and measures for various sectors of the economy. Energy sector strategies include investing in more green buildings and infrastructure and promoting renewable energy growth. Transportation strategies include improving infrastructure design and development, improving

mass transit, and use of multi-modal transportation and clean vehicles. Other strategies include waste reduction, recycling, promoting green and biodegradable products, and reducing the amount of wastewater generated.

3.3.2 Potential Impacts and Mitigation

Construction of a new research facility with up to 100 staff and volunteers has the potential to generate greenhouse gas and hazardous air pollutants (HAP) emissions from operations, vehicles used by its personnel, and during construction through the operation of construction equipment. However, because most, if not all, personnel are currently living and working in east Hawai‘i, the net increase in vehicle emissions will be negligible. Construction vehicles and equipment will contribute to greenhouse gas emissions although this will be minimal and temporary.

3.3.2.1 Greenhouse Gas Emissions

Greenhouse Gas Emissions were estimated based on the CEQ’s January 9, 2023 *Interim National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change* issued by CEQ and consistent with EO 13990, *Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis*. The methodology and results of GHG emissions modeling and associated social cost is included in Appendix A. The GHG (CO2e) emission during the construction phase ranges from 210 lb/day to 322 lb/day during the construction phase and 855 lb/day during the operation phase. The associated social cost ranges from $5.10/day to $7.50/day during the construction phase and $19.92/day during the operation phase. The costs are representative of what the society experiences in relation to quantiles of GHG. These concentrations and cost estimates are extremely low in comparison to the state’s reporting requirements.

3.3.2.2 E.O. 14057

DOI, in compliance with EO 14057, is developing policies and plans with targets for clean renewable electricity (referred in the Sustainability Plan as Carbon Pollution-Free Electricity (CFE)) and greenhouse gas emissions reductions starting in FY 2023. The USGS Hilo Research Facility is subject to the reporting requirements for the interim targets, CFE milestones, and final CFE targets as part of the USGS facility portfolio. The construction funding for this project is limited since the design was initiated in 2021 and construction budgeted prior to EO 14057. However, the Proposed Action incorporates CFE and GHG reduction features, including measures to meet the federal targets in the future as funding becomes and will:

- Design to be a net zero emission (NZE)[1] facility by 2030, and where feasible, designed to be net zero water and waste by 2030;

[1] E.O. 14057 requires all new building/facility projects > 25,000 gsf entering the design phase after January 31, 2022, to be designed as a net zero emission (NZE) building/facility by 2030. A NZE building is an efficient, all electric building that is designed and operated so scope 1 and scope 2 GHG emissions from all facility energy use equal zero on an annual basis, when connected to on-site renewable energy or a regional grid that provides 100% CFE on a net annual basis.

- Utilize100% carbon pollution-free electricity (CFE)[2] (on a net annual basis) by 2030, including 50% CFE consumption on a 24- hour/7 day per week;
- Achieve 100 percent light-duty vehicle zero-emission vehicles (ZEV) by 2027 and 100% medium and heavy-duty ZEV acquisitions by 2035;
- Promote sustainable land use for conservation of natural resources, reduced GHG emissions, and increased resilience to the impacts of climate change;
- Use efficient integration with existing local infrastructure; and
- Expand use of and broad access to public transportation.

The Proposed Action includes equipment that is electrically powered, except for backup generators, which will be tracked for emissions and metered separately. The Proposed Action includes two vehicle charging stations. Additional charging stations will be required for 100 percent of the USGS fleet to be zero-emission by 2035. Space for electrical panels to accommodate the additional EV charging stations will be needed, and to achieve a net-zero emission building by 2030, there will need to be energy generated onsite. The project includes infrastructure and planning for renewable energy systems. The project includes roof top and canopy mounted photovoltaic panels for electricity generation. Provisions will be in place for future additional ground mounted solar arrays north of the building footprint. Solar panel domestic water heating is also considered, which will require additional photovoltaic or other renewable energy production, possibly a co-generation plant producing power and steam or chilled water. With future retrofits and additional equipment, the goal of 100 percent carbon free energy is achievable by the federal (2030) and the State of Hawai‘i (by 2045) target dates.

3.3.2.3 Guiding Principles for Sustainable Federal Buildings

In addition to the NZE and CFE requirements, the Federal Sustainability Plan requires all new construction and modernization projects >25,000 gross square feet to be designed, constructed, and maintained to meet and, as practicable, exceed Federal sustainable design and operations principles within CEQ’s *Guiding Principles for Sustainable Federal Buildings* (Guiding Principles).The facility design is proposed as a Platinum level LEED certified building, which will save operation costs, improve efficiency, lower carbon emissions and create healthier places for people. The following are a few design measures from the *Basis of Design Development -Hilo Research Facility* (USGS, October 2022), meeting the six major sections of the Guiding Principles:

- The location of the building is oriented with the long axis is east to west and will be surrounded by open landscaped areas with walkways for pedestrians and bike access.

[2] Carbon pollution-free electricity” or “CFE” means electrical energy produced from resources that generate no carbon emissions, including marine energy, solar, wind, hydrokinetic (including tidal, wave, current, and thermal), geothermal, hydroelectric, nuclear, renewably sourced hydrogen. A NZE building/facility can be met with electrified buildings, e.g., HVAC systems, that procure CFE from the grid and on-site CFE. Onsite CFE generation and storage is strongly encouraged, as is purchasing CFE via Power Purchase Agreements and/or purchase of Energy Attribute Credits.

- Storm Water Management will be maintained with shallow drywells on the project site to reduce storm water runoff and discharges of polluted water offsite.
- Parking on project site can be designed with 5% going towards parking for green vehicles. The project will provide electric vehicle charging stations and will meet a minimum of 2% of total parking spaces created.
- CFC-based refrigerants in HVAC systems shall not be used. Refrigerants must meet the requirements of ASHRAE 189.1 Section 9.3.3 (Refrigerants)
- The construction of the proposed project will include requirements to reduce and divert construction and demolition debris from treatment and disposal facilities, landfill, combustion and incineration, and track diversion.
- Once the Hilo Research Facility is operational, E.O. 14057's solid waste goals will apply: annually divert from landfills non-hazardous solid waste, including food and compostable material, and construction and demolition waste and debris by at least 50% by 2025, and 75% by 2030.

3.3.2.4 Potential Impact of No Action Alternative

The No Action Alternative would not provide new or energy efficient facilities, but the HVO-PIERC mission work would continue at their current locations. In comparison to the Proposed Action Alternative, is it anticipated that overall GHG emissions for operations would be higher for the No Action Alternative given the improved efficiencies proposed with the new facilities. The No Action Alternative will not have direct, indirect, or cumulative impact on sea level rise but there could be indirect impacts to operations since employees could be affected from sea level rise and coastal flooding.

3.4 Biological Resources

A natural resources assessment was prepared for the 13-acre Study Area (AECOS Inc., 2022) and is included as Appendix B. The primary purpose of the surveys was to determine if there are any botanical, avian, or mammalian species currently listed, or proposed for listing under either federal or Hawai‘i endangered species statutes within or adjacent to the site. If present, impacts on listed species will be determined.

3.4.1 Botanical Resources

The botanical survey was conducted in March 2022. Plant species were identified as they were encountered during wandering transects that covered the property.

3.4.1.1 Existing Conditions

Vegetation

The Study Area is mostly covered with secondary forest typical of this part of Hilo. A prior botanical study conducted for the UH Hilo Mauka Lands Master Plan (Char 2003) recognized three vegetation types in what was called "University Park of Science and Technology area": (1) ‘ōhi‘a / uluhe forest; (2) strawberry guava thickets; and (3) ruderal vegetation. All three vegetation types are represented on the

site. Most of the property is a mixture of guava thickets and more open areas dominated by uluhe fern with scattered trees. Ruderal (weedy wayside) vegetation is found on the verges of the roads bordering the site as well as in a small, cleared area with several shipping containers.

Flora

The AECOS Natural Resources Assessment recorded 56 plant species on the project site. Of these, six (11%) are native species (3 indigenous; 3 endemics). The native plant species include: four ferns (uluhe (*Dicranopteris linearis*), palaʻā (*Spenomeris chinensis*), niʻaniʻau (*Nephrolepis exaltata hawaiiensis*), and pākahakaha (*Lepisorus thunbergianus*)); and two eudicot trees: nenelau (*Rhus sandwicensis*) and ōhiʻa lehua (*Metrosideros polymorpha*). All are common species in the Hilo area as well as the Project site.

Larger trees species are scattered across the site. Most notable are the ʻōhiʻa (*Metrosideros polymorpha*), Alexander palm (*Archontophoenix alexandrae*), Melochia, gunpowder (*Trema orientalis*), autograph (*Clusia rosea*), African tulip (*Spathodea companulata*), mango (*Mangifera indica*), and strawberry guava (*Psidium cattleianum*). The strawberry guava is the only species growing in thickets. The ʻōhiʻa lehua are scattered over the site and many are dead or dying. Symptomatically, these ʻōhiʻa specimens appear to be afflicted with Rapid Ohia Death (ROD) fungus. Uluhe fern (*Dicranopteris linearis*) covers large open areas around the taller vegetation.

All stand-alone trees are encroached upon by uluhe fern growing close against the trunks of the larger trees. In a few instances, the fern has managed to climb high into the trees. Broomsedge grass, Clide imia hirta and a few other shrubs grow within the uluhe tangle and add to the encroachment on the tree species. The uluhe does not penetrate the strawberry guava thickets. Within these thickets, several smaller ferns are found as understory. Feral pig activity is evident and the rooting so thorough that there are areas of exposed soil and disturbed rocks.

Much of the observed plant diversity is associated with disturbed areas such as the cleared area where the shipping containers are located and along the maintained roadway verges. The exposed ground supports both grasses and woody weed species.

3.4.1.2 Potential Impacts and Mitigation

The Proposed Action will not impact any plants listed by either state or federal statute as threatened or endangered, as none were found on the Project parcel (HDLNR, 1998; USFWS, nd-a). There will be no adverse impact on native plants. Native plant species are present, but none is considered especially rare in the Hilo area. Due to human and wild animal activity, the site is unremarkable and dominated by common, naturalized plant species.

The natural resource assessment indicated agreement with the recommendation of a previous survey (Char 2003) conducted for the UH Hilo:

> "Hawaiʻi [s]tate law, Act 71, mandates that any new or renovated landscapes for any building, housing, or other facility developed with [s]tate funds incorporate native Hawaiian plants wherever and whenever feasible. It is recommended that wherever possible the existing ʻōhiʻa

trees [and, we might add, neneleau] be incorporated into the landscaping plan; some of the smaller trees can be transplanted."

If the ʻōhiʻa in this location are found to be infected with the ROD, their disposition might be different from that recommended above.

Potential Impact of No Action Alternative

This alternative will have no direct, indirect, or cumulative impact on botanical resources.

3.4.2 Avifauna and Mammals

An avifauna survey of the 13-acre Study Area was conducted in March 2022. Birds were identified by species by visual observation at four count-stations distributed evenly across the site. A single eight-minute avian point-count was made at each of the count stations. Weather conditions were ideal, with unlimited visibility, no precipitation, and light winds up to 3 miles per hour.

3.4.2.1 Existing Conditions

Avian Fauna

A total of 88 individual birds of 12 species, representing 9 separate families, were recorded during station counts. The list can be found in Table 2 of Appendix B. One of the species detected—Pacific Golden-Plover (*Pluvialis fulva*) or kōlea—is an indigenous migratory shorebird species. The remaining 11 species recorded are alien to the Hawaiian Islands.

Avian diversity and densities were in keeping with the location and vegetation on the site. Three species—Warbling White-eye (*Zosterops japonicus*), Northern Cardinal (*Cardinalis cardinalis*) and House Finch (*Haemorhous mexicanus*)—accounted for 47% of all birds recorded during station counts. The most frequently recorded species was Warbling White-eye, accounting for 25% of the total number of individual birds recorded.

Mammals

Three terrestrial mammalian species were detected during this survey. Several small Asian mongoose (*Herpestes javanicus*) were sighted. Domestic dog (*Canis lupus familiaris*) was heard barking from locations outside of the survey area. Considerable pig (*Sus scrofa*) sign (trails and scat) was encountered across the site.

3.4.2.2 Potential Impacts and Mitigation

Avian Resources

Only one of the species detected in the biological survey is a native species: Pacific Golden-Plover. This indigenous migratory shorebird nests in the high Arctic during the late spring and summer months, returning to Hawaiʻi and the tropical Pacific to spend the fall and winter months. The birds usually leave Hawaiʻi and return to the Arctic in late April or the very early part of May. Pacific Golden-Plover is a commonly encountered shorebird throughout the Hawaiian Islands during late summer through mid-spring months.

Seabirds

It is possible that the endangered Hawaiian Petrel (*Puffinus sandwichesis*), Band-rumped Storm-Petrel (*Hydrobates castro*), and the threatened Newell's Shearwater (*Puffinus newelli*) over-fly the Study Area between April and the middle of December each year in small numbers. The primary cause of mortality in Hawaiian Petrels and Newell's Shearwaters in Hawaiʻi is thought to be predation by alien mammalian species at the nesting colonies (USFWS, 1983; Simons and Hodges, 1998; Ainley et al., 2001). Collision with man-made structures is considered the second most significant cause of mortality of these seabird species in Hawaiʻi. Nocturnally flying seabirds, especially fledglings on their way to the sea in the summer and fall, can become disoriented by exterior lighting. Disoriented seabirds may collide with man-made structures and, if not killed outright, become easy targets of opportunity for feral mammals (Hadley, 1961; Telfer, 1979; Sincock, 1981; Reed et al., 1985; Telfer et al., 1987; Cooper and Day, 1998; Podolsky et al., 1998; Ainley et al., 2001; Hue et al., 2001; Day et al., 2003). No suitable nesting habitat exists within or close to the Study Area for any of the three seabird species discussed here.

The principal potential impact that the project poses to protected seabirds is the increased threat that birds will be downed after becoming disoriented by lights associated with the project during the nesting season. Outdoor lighting can pose a threat to nocturnally flying seabirds if: 1) during construction it is deemed expedient or necessary to conduct night-time construction activities; or, 2) following build-out, security lighting is operated during the seabird nesting season.

Recommendation

- If night-time construction activity or equipment maintenance is proposed during the construction phases of the project, all associated lights should be shielded, and large flood/work lights should be placed on poles high enough to be pointed directly at the ground (Reed et al., 1985; Teller et al., 1987). Deleterious impacts to transiting seabirds can be avoided if construction occurs during daylight hours and all outdoor lighting installed is fully "dark sky compliant" (HDLNR-DOFAW, 2016). The Hawaiʻi Department of Land and Natural Resources (DLNR) recommends avoiding construction-related night-time lighting between September 15 and December 15 (DLNR, 2016).

Hawaiian Hawk

No Hawaiian Hawk (*Buteo solitarius*) was recorded during the survey. This state listed species is regularly seen in the greater Hilo area (David, 2022). Several large trees occur on the property that might be used by nesting Hawaiian Hawk, although these lack the open edge effect preferred by this species for nesting sites.

Recommendation

- Prior to the initiation of clearing and grubbing a qualified biologist should conduct a Hawaiian Hawk nesting survey to ensure that no active nest is disturbed during removal of trees.

Pueo

The Hawaiian endemic sub-species of Short-eared Owl (pueo or *Asio flammeus sandwichensis*) inhabits forests and grasslands, but nests on the ground in grasslands. Although pueo might forage in the area,

the site does not have suitable nesting habitat. No pueo were observed during the survey. This bird is state-listed on Oʻahu only.

Mammalian Resources

The findings of the mammalian survey are consistent with the location of the property and habitats present on that property. Although no rodents were recorded it is likely that some of the four established Muridae found on Hawaiʻi Island—roof rat (*Rattus rattus*), brown rat (*Rattus norvegicus*), Polynesian rat (*Rattus exulans hawaiiensis*), and European house mouse (*Mus musculus domesticus*)—use resources found within the general project area on a seasonal basis. All these introduced rodents are deleterious to native ecosystems and native faunal species. Feral pigs are not expected to have an impact on the natural resources within the property nor pose a threat to humans on site. The project includes a perimeter fence that will minimize entry of feral pigs.

No mammalian species currently protected or proposed for protection under either the federal or State of Hawaiʻi endangered species programs were detected during this survey (DLNR, 2015; USFWS, nd-a).

Hawaiian hoary bat

It is probable that the Hawaiian hoary bat overflies the Study Area on a seasonal basis as they are regularly recorded in the greater Hilo area (David, 2022). The removal of vegetation within the Study Area could temporarily displace individual bats using trees for roosting. As bats use multiple roosts within their home territories, the potential disturbance resulting from the removal of the vegetation is likely to be minimal. However, during the pupping season, females carrying their pups may be less able to vacate a roost site as the tree is felled. Further, adult female bats sometimes leave their pups in the roost tree while they forage. Very small pups may be unable to flee a tree that is being felled.

Recommendation

- Potential adverse impacts from such disturbance can be avoided or minimized by not clearing woody vegetation taller than 4.6 m (15 ft) between June 1 and September 15, the period in which bats may have pups.

Other Resources of Potential Concern

Critical Habitat

No federally delineated Critical Habitat for any species occurs within the Study Area (USFWS, nd-b). There is no equivalent designation under State of Hawaiʻi endangered species statutes.

Potential Impact of No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no impact to biological resources on or near the site.

3.4.3 Compliance with Section 7, Endangered Species Act

Section 7 of the Endangered Species Act (ESA) requires federal agencies to ensure their activities are not likely to jeopardize the continued existence of federally listed species or destroy or adversely modify

designated critical habitat. Informal consultation with the U.S. Fish and Wildlife Service (USFWS) has been initiated through a request for technical assistance. Documentation is included in Appendix B.

Section 7 of the Endangered Species Act (ESA) requires federal agencies to ensure their activities will not jeopardize the continued existence of federally listed species or destroy or adversely modify designated critical habitat. As provided in Appendix B, USGS initiated informal consultation with the U.S. Fish and Wildlife Service (USFWS) on February 10, 2023 with a request for technical information and conducted a biological assessment. Based on the findings of the May 2022 biological assessment and preliminary discussions with USFWS, USGS anticipates the Proposed Action is not likely to adversely affect (NLAA) listed specifies and/or critical habitat. USGS is continuing informal consultation with USFWS regarding this NLAA finding and will complete the Section 7consultation process prior to publishing the Final EA

3.4.4 Compliance with Executive Order 13112, Invasive Species

The purpose of E.O. 13112, Invasive Species (1999) is to prevent the introduction of invasive species and provide for their control and to minimize economic, ecological, and human health impacts. Invasive species are defined in the E.O. as “an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health.” Federal agencies whose action may affect the status of invasive species are mandated to prevent the introduction, provide for control, and minimize economic, ecological and health impacts of invasive species. In Hawaiʻi, the introduction of invasive plants and animals have had negative impacts on quality of life, safety, health and the environment.

The proposed project will incorporate native and non-invasive plants in its landscaping to the extent possible, with a preference for those propagated on Hawaiʻi Island. Local native plant specialists will be consulted in the selection of appropriate native and non-invasive plants.

The project site includes several ʻōhiʻa lehua trees, many of which appear to be afflicted with Rapid Ohia Death (ROD), an invasive fungal disease afflicting thousands of trees on Hawaiʻi Island. To prevent its spread, accepted procedures will be followed prior to site work, including testing wood samples and employing accepted procedures for decontamination and tree removal.

During site clearing and construction, contractors will utilize best management practices to avoid the introduction and spread of invasive plant or animal species. Best management practices include being familiar with invasive species, learning how to report invasive plants and animals, and cleaning vehicles and equipment after arriving at the worksite and after working in infested areas. Vehicles, tires, and equipment may be cleaned with tools such as brushes, brooms, air compressors, vacuums, and high-pressure water guns to remove soil and mud. (Billig, 2012). Clothing and shoes should also be cleaned after working in infested areas.

Once the research facility is completed, its operation will indirectly support the objectives of E.O. 13112. PIERC’s mission focuses on management and conservation of biological resources, and its research includes topics such as pests and invasive species, threatened and endangered species, introduced disease, habitat destruction and the effects of climate change. PIERC research data is available to the

scientific and educational community as well as to the public. Providing needed facilities for this federal agency supports its mission and the important scientific work it conducts.

3.5 Existing and Surrounding Land Uses

3.5.1 Existing Conditions

The project Study Area is surrounded by existing research and university-related uses to the east and south, and undeveloped lands to the north and west. As shown previously in Figures 1-1 and 1-2, the Study Area is bordered on its east side by Komohana Street and on its south side by Nowelo Street. Directly across Komohana Street to the east is the University Park of Science and Technology which includes a cluster of astronomy-related facilities, including the Institute for Astronomy, the Subaru Telescope Hilo Base Facility, East Asian Observatory, and the Imiloa Astronomy Center. The main UH Hilo campus is located less than a half mile east on Nowelo Street.

Across Nowelo Street to the south is a campus with two federal research facilities--the U.S. Pacific Basin Agricultural Research Center and the U.S. Department of Agriculture (USDA) Forest Service Institute of Pacific Islands Forestry.

As shown in Figure 1-2, the Study Area is part of a single, 267-acre TMK parcel, 2-4-001:122 under the control of University of Hawaiʻi (UH) Hilo and referred to as the UH Hilo Mauka Lands. These lands have been identified for the expansion of the University Park research facilities, relocation of Hawaiʻi Community College (HCC) campus, and other University-related functions. The Mauka Lands were the subject of a master plan and 2005 Environmental Impact Statement (EIS) prepared by the university (UH Hilo, 2005).

3.5.2 Potential Impacts and Mitigation

The proposed USGS Hilo Research Facility is compatible with existing and future uses identified in the UH Hilo Mauka Lands Master Plan. Existing lands to the east include research and educational activities. Surrounding land uses to the south, affiliated with the USGS and USDA are focused on scientific research in a campus like setting. Future uses proposed by UH Hilo to the north and west are also education related, including a future community college. Overall, the proposed project is compatible with existing uses and proposed uses as expressed in the Mauka Lands master plan.

3.5.2.1 Potential Impact of No Action Alternative

The No Action Alternative would have no immediate impact on existing and surrounding land uses. Because the site is part of the UH Hilo Mauka Lands, it is possible that the site would be developed for another use in the future.

3.6 Historic and Archaeological Resources

An Archaeological Literature Review and Field Inspection (ALRFI) was prepared to assess potential impacts of the construction of the proposed facility (Honua Consulting, September 2022) and is included as Appendix C. Compliance with Hawaiʻi Revised Statutes Chapter 6E and the National Historic Preservation Act (NHPA) are required for this project and are discussed in detail in the ALRFI in Appendix

C. The Proposed Action is a federal undertaking under the NHPA and requires USGS, as the lead federal agency, to follow the NHPA - Section 106 consultation process as defined by the U.S. Advisory Council on Historic Preservation (ACHP). Each of the Hawai'i Statutes and the NHPA have specific review processes and consultation requirements to determine the effects on historic and cultural resources.

Under Section 106, the Area of Potential Effects (APE) is the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking. In this case, the APE is near the north corner of the intersection of Komohana Street and Nowelo Street near the UH Hilo campus, directly across Nowelo Street from the U.S. Department of Agriculture's Daniel K. Inouye U.S. Pacific Basin Agricultural Research Center (PBARC).

3.6.1 Historic Background

The discussion below is excerpted from the 2022 ALRFI (Appendix C), and provides the cultural, historic, and archaeological context for the Study Area.

3.6.1.1 Cultural and Historic Context

Hawaiian Cultural Landscape

Both the greater Hilo and Waiākea Ahupuaʻa, where the Study Area is located, have been documented as having an unusually rich and diverse cultural landscape that is full of wahi pana (legendary places), named locations, natural resources, and archaeological sites that are of interest and value to Hawaiians. Waiʻakea is a relatively large ahupuaʻa (~95,000 acres) that includes much of the southern shoreline of Hilo Bay, considered to be one of the initial favored places where the first Hawaiians would have settled. References to the current project vicinity, situated between about 300 and 340 feet above mean sea level, indicate that Hawaiians practicing a traditional subsistence lifestyle would have used this area for rain-fed cultivation. Scattered house sites, shelter and work areas would have been in this zone for periodic use when fields were tended.

Historic Period

Missionaries came to the Hilo area starting as early as 1822, and by 1825, a meeting house and missionary school began operating near Hilo Bay. Around the turn of the 19th century, the estimated population of the Hilo Bay area was about 2,000 people. Kelly et al. (1981:51) refer to the years between 1840 and 1898 as the period of the Americanization of Hilo—a time when U.S. businessmen's economic interests came to dominate the windward side of Hawaiʻi Island—especially the advent of commercial sugar cane operations.

During the historic period, from as early as the middle 1860's, the Study Area was part of a vast commercial sugar cane operation known as "Waiākea Mill company." The Study Area was located just north of commercial sugar cane fields.

3.6.1.2 Archaeological Context

Previous archaeological studies in and near the current Study Area have tended to identify large numbers of commercial sugar cane agriculture site-features dating from the historic period. Studies have shown a complete absence of pre-Contact Hawaiian sites in or near the Study Area. Testing (archaeological excavation) in the vicinity has also demonstrated a lack of subsurface deposits with pre-Contact soil or cultural materials due to the ravages of more than a century of mechanized ground disturbance (plowing) associated with commercial sugar cane operations. Military training sites have also been found in the subject Study Area.

3.6.2 Existing Conditions

3.6.2.1 Historic Properties Within the Study Area

The most relevant previous archaeological work for the purposes of the ALRFI is an Archaeological Inventory Survey (AIS) by Escott (2004). This AIS was done for the UH Hilo Mauka Lands and included the current 13-acre Study Area. The 2004 AIS was conducted as part of a 2005 Environmental Impact Statement (EIS) for the University of Hilo Mauka Lands Master Plan (PBR, February 2005). The AIS identified 16 historic properties comprising 80 components features within its study area. Five (5) of these historic properties are within the USGS Hilo Research Facility Study Area and APE and are listed in Table 3-3. Escott (2004) completed data recovery as mitigation for two of these sites.

Table 3-3: Historic Properties Within the Study Area

SIHP #50-10-35	Description	Function	Mitigation
-24243	Complex of 12 features (foxholes, kerbstone footpaths, concrete bldg. foundation)	WWII era military training site (later possibly used by dairy)	Data Recovery (completed 2006)
-24244	WWII-era military anti-aircraft gun emplacement overlooking Hilo Bay	WWII Military defense	Data Recovery (completed 2006)
-24245	3 isolated iron fence posts	Ranching/pasture	No further work
-24247	Dirt Road traversing Study Area (appears on 1965 aerial)	Military and Ranching	No further work
-24248	Portions of Dirt Road providing access to eastern portion of -24243 (appears on 1965 aerial)	Military and Ranching	No further work

Figure 3-2: Historic Properties in the 13-acre Study Area

3.6.2.2 Archaeological Literature Review and Field Inspection

The 2022 ALRFI includes the results of literature review and a field inspection. Specifically, it includes descriptions of the parcel's land-use history in the context of both its traditional Hawaiian character as well as its historic-period changes, identifications of any historic properties or component features in the project area; and information relevant to the likelihood of encountering historically significant cultural deposits in subsurface context during future construction.

The fieldwork component was conducted to locate and assess the condition of the five previously recorded sites (State Inventory of Historic Places [SIHP] #s 50-10-35-24243, -24244, -24245, -24247 and -24248). Fieldwork also included a pedestrian survey of the Study Area to see if additional sites might be present.

Fieldwork Findings

The 2022 ALRFI field work inspected previously identified sites, which showed little to no change in condition since their original documentation, except for some damage from overgrown vegetation. Except for the shipping container area in the southwestern corner, the western half of the Study Area is a mix of graded/impacted basalt rock with thin soil deposits and areas of intact, gently undulating pāhoehoe lava flows. A very shallow (dry) ephemeral drainage was noted traversing east to west in the central area of the western half of the Study Area. The 2022 pedestrian survey did not identify any new or additional historic properties or potential historic properties.

3.6.3 Potential Impacts and Mitigation

A small portion of SIHP #s 50-10-35-24243 (Site -24243) will be impacted by the proposed undertaking. Site -24243 is described as a WWII military training site, associated with military defense and training in the upland area of Hilo during WWII. It is comprised of 12 features, including several "foxholes" constructed of stacked and piled rocks, kerbstone footpaths, and the concrete foundation of a small building.

In the 2004 AIS, this site, along with Site -24244 (WWII era gun emplacement) were assessed as significant under both [National Register of Historic Places] Criterion D (yielding information important in prehistory or history) and Criterion A as associated specifically with World War II training activities.

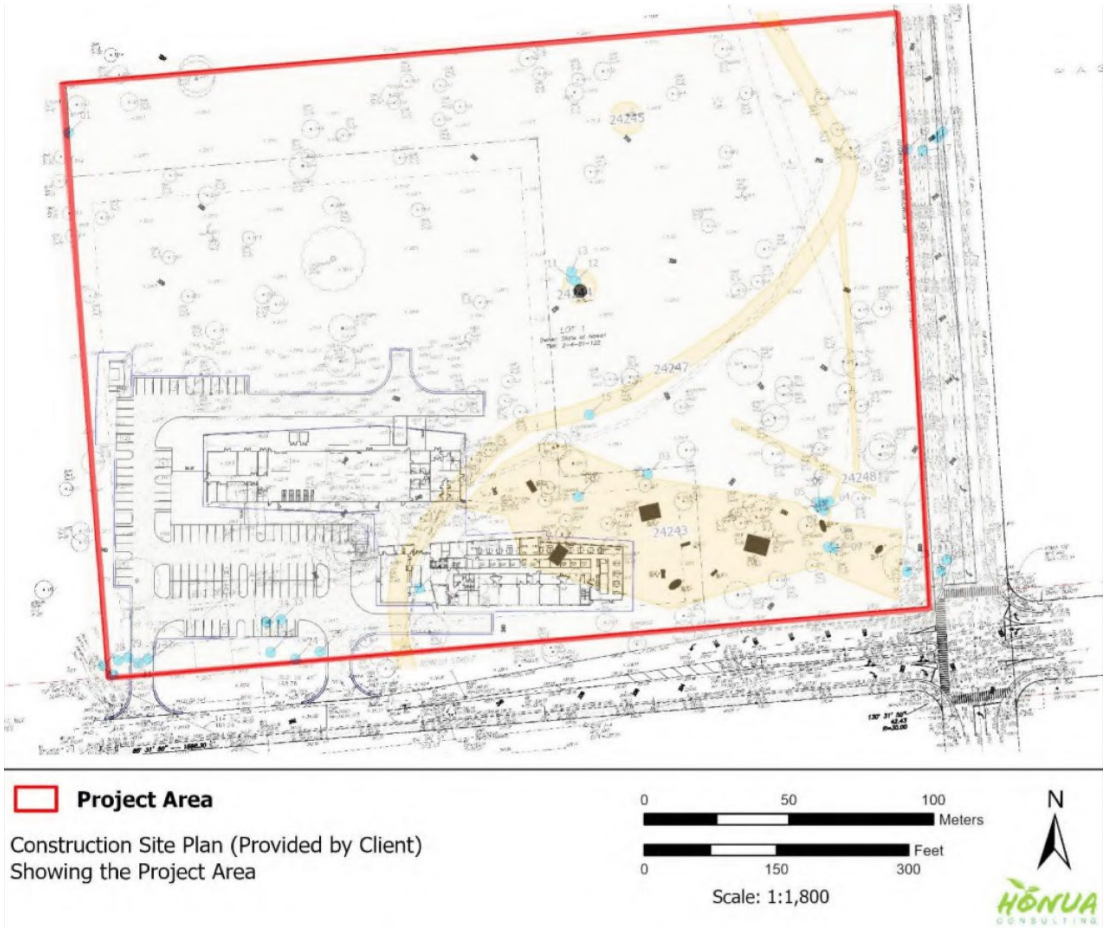


Figure 3-3: Current Site Plan and Existing Historic Properties

In a November 17, 2004 SHPD letter referring to both sites, the SHPD noted that data recovery mitigation was warranted and appropriate even if the sites are not preserved. Data recovery for both sites was subsequently completed in 2006 to the satisfaction of the SHPD, and no further work was required. Documentation of this correspondence with SHPD is included in the 2022 ALRFI.

In a separate HRS 6E review for a grading permit for the University of Hawaiʻi in 2012, SHPD confirmed that the 2006 data recovery for SIHP No's. 50-1035-24243 and 50-10-35-24244 was and no further work is required for any of the five historic properties in the APE.

Although none of the historic properties within the Study Area are recommended for preservation, site planning for the USGS Hilo Research Facility attempted to avoid the sites to the extent possible. The proposed facility was sited at the western end of the 13-acre Study Area to try and avoid the five historic sites. However, the removal of a portion of Site -24243, which underwent data recover in 2006, is unavoidable.

3.6.3.1 ALRFI Conclusions and Recommendations

The ALRFI made the following conclusions and recommendations:

- The historic preservation process for the known historic properties in the Study Area has been completed (see SHPD letters dated 2004 and 2006 referenced above, included in Appendix A of ALRFI); however, we recommend that SHPD needs to make this final determination; and
- The SHPD-Archaeology Branch should be consulted on archaeological matters associated with ground disturbance associated with the proposed development project given the potential for encountering subsurface finds.

3.6.3.2 HRS Chapter 6E Consultation

The Hawaiʻi Constitution recognizes the value of conserving and developing the historic and cultural property within the State for the public good. The SHPD reviews projects for impacts to historic properties to lessen or mitigate those impacts.

Previous Chapter 6E Consultations

Chapter 6E consultation with the State Historic Preservation Division (SHPD) was conducted for the identified historic properties at the time of the 2004 AIS. Mitigation in the form of Data Recovery at two sites was completed in 2006 (Escott 2006). There is an extensive record of formal decisions by the State Historic Preservation Division (SHPD) regarding the larger parcel (TMK [3] 2-4-001:122) of which the current Study Area is a part. At that time, the historic preservation process was determined to be complete. Documentation of previous consultation and correspondence with SHPD is included in the ALRFI.

In 2012, the SHPD commented on a grading permit for the University of Hawaiʻi – Hilo's water infrastructure improvements including ground disturbance in the subject TMK parcel (TMK [3] 2-4-001:122). In its letter, SHPD stated:

Our records indicate that an archaeological inventory survey was conducted of Parcel 122 in 2003 and 19 historic properties consisting of over 80 features were documented (Escott 2004). The report was accepted as final by our office in December 2004 (Log 2004.3367, Doc 0412MM07). Recommended data recovery field work was completed at two World War II era sites in 2005; no sites were recommended for preservation.

Current Chapter 6E Consultation

The Proposed Action is currently undergoing consultation with the SHPD in accordance with HRS Chapter 6E (Historic Preservation), simultaneously with the federal Section 106, NHPA consultation discussed below.

3.6.3.3 Conclusions and Recommendations

The historic preservation process for the known historic properties in the Study Area has been completed (see SHPD letters dated 2004 and 2006 referenced above, included in Appendix A of ALRFI); however, SHPD will review to make their determination. USGS will continue to coordinate with the SHPD-Archaeology Branch on archaeological matters associated with ground disturbance associated with the proposed action given the potential for encountering subsurface finds.

3.6.3.4 NHPA Section 106 Consultation

Section 106 consultation with the SHPD, Native Hawaiian Organizations and other stakeholders is currently ongoing, concurrent with the Draft EA prepared in accordance with the National Environmental Policy Act (NEPA) and Hawaiʻi State guidelines. USGS provided a Section 106 initiation letter to SHPD on July 21, 2022 defining the project's Area of Potential Effect (APE) and five historic sites previously identified and recorded in the APE. The letter, included in Appendix C, explained that data recovery was completed in 2005 on two of the sites within the with a data recovery report (DRR) submitted to SHPD in 2006. SHPD reviewed the DRR in 2006 (Log No. 2006.1822, Doc No. 0606JT11) and noted that no further work was indicated. In addition, the July 21, 2022 letter noted that a separate HRS 6E review by SHPD in 2012 indicated the data recovery for SIHP Nos. 50-10-35-24243 and 50-1035-24244 was complete (Log No. 2012.1281, Doc No. 1207TD01). This 2012 record indicates that no further work is required for any of the five historic properties in the APE.

The Proposed Action will remove portions of a previously identified historic site within the APE as part of the development of the USGS facility. The site has already completed the historic preservation process and preservation was not required. The USGS finds that based on prior investigation, these sites fail to embody distinctive characteristics of a type, period, or method of construction that would make them eligible for the National Register of Historic Places (NRHP). The USGS has determined that past SHPD findings on these same properties support this finding.

The USGS will make a final Section 106 determination once the Section 106 consultation process and the Draft EA comment period are complete. Currently, the anticipated Section 106 determination is "no adverse effect" per 36 CFR §800.5(d)(1).

3.6.3.5 Potential Impact of No Action Alternative

No Action involves no development and therefore has no impact on historic or archaeological resources on the site or in surrounding areas.

3.7 Cultural Resources

A Cultural Impact Assessment (CIA) for the proposed USGS Hilo Research Facility was prepared by Honua Consulting (September 2022) for the proposed project to comply with the State of Hawaiʻi's environmental review process under HRS Chapter 343 and HAR §11-200.1. The CIA is included as Appendix D.

The CIA is intended to assess the project's potential impacts on historic and cultural resources and, at a minimum, describe a) any valued cultural, historic, or natural resources in the area in questions, including the extent to which traditional and customary native Hawaiian rights are exercised in the area, b) the extent to which those resources – including traditional and customary native Hawaiians rights – will be affected or impaired by the Project; and c) the feasible action, if any, to be taken to reasonably protect native Hawaiian rights if they are found to exist.

3.7.1 Background

3.7.1.1 Regulatory Background

Articles IX and XII of the Hawaiʻi State Constitution, other state laws, and the courts of the state require government agencies to protect and preserve cultural beliefs, practices, and resources of Native Hawaiians and other ethnic groups. To assist decision makers in the protection of cultural resources, Chapter 343, HRS and Hawaiʻi Administrative Rules (HAR) §11-200.1 rules for the environmental impact assessment process require project proponents to assess proposed actions for their potential impacts to cultural properties, practices, and beliefs.

This process was clarified by Act 50, Session Laws of Hawaiʻi (SLH) 2000. Act 50 recognized the importance of protecting Native Hawaiian cultural resources and required some environmental review documents include the disclosure of the effects of a proposed action on the cultural practices of the community and state, and the Native Hawaiian community. Specifically, the Environmental Council suggested the CIAs should include information relating to practices and beliefs of a particular cultural or ethnic group or groups. Such information may be obtained through public scoping, community meetings, ethnographic interviews, and oral histories.

3.7.1.2 Compliance

The State of Hawaiʻi and its agencies have an affirmative obligation to preserve and protect Native Hawaiians' customarily and traditionally exercised rights to the extent feasible. State law further recognizes that the cultural landscapes provide living and valuable cultural resources where Native Hawaiians have and continue to exercise traditional and customary practices, including hunting, fishing, gathering, and religious practices.

In the 2000 Hawaiʻi Supreme Court case *Ka Paʻakai v. Land Use Commission* ("*Ka Paʻakai*"), the Court provided government agencies an analytical framework to ensure the protection and preservation of traditional and customary Native Hawaiian rights while reasonably accommodating competing private development interests. This is accomplished through:

- The identification of valued cultural, historical, or natural resources in the project area, including the extent to which traditional and customary Native Hawaiian rights are exercised in the project area;
- The extent to which those resources—including traditional and customary Native Hawaiian rights—will be affected or impaired by the proposed action; and
- The feasible action, if any, to be taken to reasonably protect Native Hawaiian rights if they are found to exist.

3.7.2 Existing Conditions

3.7.2.1 Historic Background

The CIA (Appendix D) includes detailed information concerning the ahupuaʻa of Waiākea (South Hilo, Island of Hawaiʻi), focusing on areas near or adjacent to the Study Area and Project Site. The CIA characterizes the Hawaiian cultural landscape in the traditional period, i.e., prior to the arrival of westerners on island shores in 1778 and describes the changes in the general land use patterns in the historic period, i.e., following the arrival of American Protestant missionaries, the death of Kamehameha I, and the disintegration of the traditional kapu system (circa 1820).

The commercial cultivation of sugar cane has had a significant impact on land use in the general Hilo and Waiākea areas. The CIA notes that the vicinity of the proposed project was considered marginal land of little use for sugar cultivation and was part of a large parcel referred to as "Waiākea Pasture Land." With the outbreak of World War II, the pasturage parcel was used for training by the United States Military (U.S. Army Corps Agreement RE-4761, July 10, 1942) during World War II. Following the war, nearby lands were used for grazing cattle and horses.

3.7.2.2 Ethnographic Data (Interviews)

Ethnographic data is utilized to supplement the other research methods utilized in the CIA. Honua Consulting was tasked with gathering information from individuals with lineal and cultural ties to the area and its vicinity regarding regional biocultural resources, potential impacts to these biocultural resources, and mitigation measures to minimize and/or avoid these impacts.

Interviews were conducted with five (5) individuals and additional moʻolelo from a sixth individual was included. Summaries of the interviews are included in the CIA. None of the interviewees identified cultural resources of concern in or near the project area. A couple mentioned the presence of native plants such as ʻōhiʻa lehua (*Metrosideros polymorpha*), but the only concern expressed was that measures be taken to prevent the spread of rapid ʻōhiʻa death (ROD), if present. Two of the interviewees

mentioned flooding in surrounding areas during heavy rains. None of the interviewees expressed concern regarding the removal of historic properties by the proposed project.

3.7.2.3 Ka Paʻakai Analysis

The Hawaiʻi Supreme Court's *Ka Paʻakai* decision requires the following factors be considered to ensure the protection and preservation of traditional and customary Native Hawaiian rights:

- The identification of valued cultural, historical, or natural resources in the project area, including the extent to which traditional and customary Native Hawaiian rights are exercised in the project area;
- The extent to which those resources—including traditional and customary Native Hawaiian rights—will be affected or impaired by the proposed action; and
- The feasible action, if any, to be taken to reasonably protect Native Hawaiian rights if they are found to exist.

Identification of Valued Cultural, Historical or Natural Resources

The first test related to the *Ka Paʻakai* decision- "The identification of valued cultural, historical, or natural resources in the project area, including the extent to which traditional and customary Native Hawaiian rights are exercised in the project area" – consists of two separate elements: a) the simple identification and existence of valued cultural, historical, or natural resources; and b) access to the resource, both physical access and cultural protocols.

The CIA shows there are potentially resources within the project's Study Area, but they are limited to native plants in the area. While there are historic sites in the Study Area, they are not traditional (pre-contact) or significant. None of the interviewees expressed concern with their removal. Access to the resource does not appear to an issue.

Extent of Effect or Impairment by Proposed Action

The second test– "The extent to which those resources—including traditional and customary Native Hawaiian rights—will be affected or impaired by the proposed action" – also looks at two separate elements. The first, does the proposed action and its alternatives have an adverse impact on the existence of resources? Any adverse impact or harm to resources is alone an affect or impairment caused by the proposed action.

Under this element, adverse impacts to significant, traditional historic sites or culturally utilized plants would all be identified adverse impacts. In this case, there are no potential adverse effects due to the post-contact dating of the historic sites. There is also no indicator that native plants in the Project Area are currently accessed by practitioners.

Feasible Action to Protect Native Hawaiian Rights

The third part of the *Ka Paʻakai* framework aims to identify "[t]he feasible action, if any, to be taken to reasonably protect Native Hawaiian rights if they are found to exist." Determining if an action has been

suitably "feasible" is a matter for the State. These feasible actions could include continued access to the project as needed to conduct cultural practices.

The third part of the test is moot in this case, as there is minimal potential for impact to traditional or customary practices. While the USGS Hilo Research Facility may result in the removal of native plants, in this case, the removal of diseased ʻōhiʻa would have a net benefit for the region which has been severely impacted by ROD. The CIA recommends that the project incorporate native plants in its landscaping as feasible.

3.7.3 Potential Impacts and Mitigation

The CIA concludes that based on the information gathered and the ethnographic data, the proposed project has minimal potential to adversely impact cultural resources and traditional or customary practices in the area.

Recommendation: The use of native plants in the landscaping is recommended to restore the native flora that would have traditionally existed in the area. Careful consideration should be given to remove any ʻōhiʻa trees afflicted with ROD and potentially replace them with healthy ʻōhiʻa trees. Prior to and during construction, it is recommended that the project team work with Ka Haka ʻUla O Keʻelikōlani, which is located down the street from the Project Site, regarding nomenclature and other programming to the extent feasible. In addition, the CIA recommends also working with the ʻImiloa Astronomy Center to develop public programs and educational opportunities that could support the public benefits of the facility.

3.8 Infrastructure and Utilities

The information in this section is based on the Preliminary Engineering Report (PER) for the Proposed UH Hilo Mauka Parcel (Engineering Concepts, September 2004).

3.8.1 Potable Water

3.8.1.1 Existing Conditions

According to the 2004 PER for the UH Hilo Mauka Lands parcel, the area is served by a 1.0MG reservoir located along Puainako Street as the primary reservoir, and a 0.5MG reservoir as a secondary reservoir. The Study Area is served by a 12-inch line on Nowelo Street, under the County Department of Water Supply (DWS) system.

3.8.1.2 Potential Impacts and Mitigation

Based on Table 100-18 from the County of Hawaiʻi's Water System Standards, the average daily demand for a commercial use would be 3,000 gallons/acre. The developed site is approximately 8.0 acres. Therefore, the average daily demand will be 24,000 gallons per day. Preliminary domestic water calculations have been performed and show water demand at 135 gpm. These calculations will continue to be updated as the design progresses and will be submitted to DWS for confirmation and final decision on the water availability for domestic and fire demand.

Water system improvements consist of a new water connection at Nowelo Street to provide domestic water service for the building. Based on the preliminary water demand, the proposed waterlines sizes and domestic meter size will be a minimum of 2-inch. Additional water sub-meters will be installed within the property to ensure water efficiency and conservation efforts which will help the project achieve its sustainability goals. All new waterlines will be marked by electronic markers for locating the underground piping. The proposed demand will fall within the demand previously estimated for the UH Hilo Mauka Lands PER by Engineering Concepts.

Fire flow requirements are based on Table 100-19 from the County's Water System Standards. A fire flow test was performed by the fire protection engineer and based on the test results a diesel-powered fire booster pump is required to support the fire suppression system. The fire booster pump will connect to the emergency generator to provide power during a power outage.

A dedicated fire line will be provided via a new connection to the existing waterline on Nowelo Street. Detailed design for the firefighting system will be developed as design progresses. Design of the waterlines will comply with the *Water System Standards*, Board of Water Supply, County of Hawaiʻi, dated 2002.

Potential Impact of No Action Alternative

No Action would have no impact on utility use or demand.

3.8.2 Wastewater

3.8.2.1 Existing Conditions

There is an existing public sewer system along Nowelo Street serving the property. The system consists of an 8-inch sewer line and associated manholes. The lot has been provided with a lateral service connection for future use. There is no sewer system along Komohana Street.

3.8.2.2 Potential Impacts and Mitigation

The HVO-PIERC facility will consist of two buildings: the main building, closer to Nowelo Street, and a warehouse, parallel to the main building, but lower in elevation and on the north side. Onsite sewage for both buildings will be disposed of via sewer lines connected to the existing sewer system along Nowelo Street. A small lift station will be needed.

Sewer system design shall comply with County of Hawaiʻi Department of Environmental Management Wastewater Standards for the connection to the existing sewer system. Detailed sewer calculations will be submitted to the County Department of Environment Management for approval.

Potential Impact of No Action Alternative

There will be no impact on existing utility demand or infrastructure.

3.8.3 Storm Water Drainage/Water Quality

3.8.3.1 Existing Conditions

According to the EIS prepared for the UH Mauka Lands, the existing Waiākea (Wailoa) Stream which traverses the southern and eastern boundaries of University Park is a major drainageway in the area. The other drainageway is a ditch along the northern boundary of University Park. There are four drainage crossings along Komohana Street, including a lined channel under the bridge over Waiākea (Wailoa) Stream. There are currently no existing drainage structures within the Study Area.

3.8.3.2 Potential Impacts and Mitigation

No adverse drainage impacts are anticipated due to the Proposed Action. Storm water runoff within the site will be collected via the new onsite drainage system, which consists of inlets and drain lines, before discharging into shallow drywells [2 cubic feet per second (cfs) capacity] or swales. Downspouts from the new buildings will connect underground and piped to the on-site drywell system and/or discharged at grade and sheet flow to the onsite drainage system. There will be no net increase in storm water runoff off site by the proposed facilities and related improvements with the use of shallow drywells and best management practices.

County of Hawaiʻi Storm Drainage Standards will apply to this project. Rainfall Intensity Plate Maps from the drainage standards will be used to calculate rainfall intensities. These intensities will be used to estimate peak flows for a 10-year and 50-year return period event for both the existing and proposed conditions. The Rational Method will be used to calculate peak flows, based on a 1-hour rainfall duration with rainfall intensities. Times of concentration will be estimated for each drainage area, based on the individual overland slopes and lengths.

The drainage system provided on Nowelo Street shall be used for roadway drainage only. Any drainage improvements needed for the site shall be contained on the proposed site.

Potential Impact of No Action Alternative

There will be no impact on drainage.

3.8.4 Sitework/Grading

The placement of the structures on the site was chosen to be compatible with the existing topography and to minimize earthwork. The building area perimeters will be graded to provide positive drainage for storm water runoff to be directed away from the building. Site grading shall follow the Geotechnical Engineer's recommendations. All grading and construction work shall comply with *Construction Best Management Practices Field Manual,* State of Hawaiʻi, Department of Transportation, Highways Division, October 2021, to control soil erosion and ensure that the discharge of pollutants from the construction site will be reduced to the maximum extent practicable. A National Pollutant Discharge Elimination System (NPDES) permit for construction activities will be obtained from the State of Hawaiʻi Department of Health as the disturbed construction area will exceed one acre.

New walkways and a plaza will connect the new buildings and parking lots. This project will extend the sidewalk on the northern edge of Nowelo Street from its current terminus to the project site. Layout,

dimensions, longitudinal and cross slopes of accessible walkways and ramps shall comply with the Architectural Barriers Act (ABA), which applies to facilities designed, built, altered, or leased with federal funds. All plans and drawings will demonstrate compliance with ABA. The State Disability and Communication Access Board (DCAB) will review all plans. The design of the pavement structure, foundation, slab on grade and footing, and the amount/extent of excavation and type of fill materials will follow the Geotechnical Engineer's recommendations.

The grading plan will follow the general criteria:

- Building pads will be flat
- Parking lots will be graded 0.5-5% for drainage purposes, except at ADA stalls where slopes are at maximum 1.8%
- Driveways will be graded less than 5%, and shall be a maximum 8%
- Walkways will be ADA compliant (less than 1.5% longitudinally, less than 7.75% for ramps)

Since the grading plan is still preliminary, efforts to further balance the earthwork will occur during final design. Grading operations shall be in conformance with Chapter 10 of the County of Hawai'i County Code. More detailed soils investigations for grading will be performed as needed as planning of the project proceeds.

The USGS does not anticipate any unusual site work and does not anticipate impacts associated with sitework or grading activities.

3.8.5 Electrical and Telecommunication Facilities

3.8.5.1 Existing Conditions

Electrical

Electrical service is provided to the Study Area by Hawaiian Electric Company (HECO). There is a HECO 12.47 KV overhead circuit that runs along the east side of Komohana Street.

Telecommunications

Telecommunications service is provided by Hawaiian Telcom (HT). There is existing overhead commercial utility telecommunications distribution routed along the east side of Komohana Street.

A mid-span riser pole will likely be required to transition aerial communications distribution to underground distribution. New underground distribution ductline will then need to extend across Komohana Street and up Nowelo Street to the project site. Additional telecommunications maintenance holes and handholes will need to be provided along the run to facilitate cable pulling. Exact location/installation of utility riser pole will need to be coordinated with the utility service provider once utility service requirements have been confirmed with USGS.

3.8.5.2 Potential Impacts and Mitigation

It is anticipated that existing electrical and telecommunication service in the area is adequate to support the proposed project. It is anticipated that for the proposed Hilo Research Facility, electrical service can be provided by tapping the 12.47 kV overhead circuit along Komohana Street and providing new poles and overhead lines along Nowelo Street. Lines would then transition to underground to feed a new HECO pad-mounted transformer to provide power to the facility. When drawings that meet HECO Service Application requirements are available, a New Electrical Service Application will be submitted to HECO to confirm electrical service requirements. Plans for telecom improvements will be coordinated with and approved by HT.

The USGS does not anticipate any unusual electrical or telecommunications requirements nor any associated project impacts.

Potential Impact of Alternatives

There will be no impact on electrical demand or infrastructure.

3.9 Transportation and Roadways

A Traffic Impact Analysis Report (TIAR) for the project was prepared by Austin, Tsutsumi & Associates (August 2022) and is included as Appendix E. The TIAR estimates that by Future Year 2025, the Proposed Action will generate 83 new vehicle trips during the AM peak hour and 81 new trips during the PM peak hour. The Proposed Action will only increase traffic along Komohana Street by 1 to 2% from Base Year 2025 conditions, or as much as 5 to 35 vehicles/hour/direction. These will have a minimal impact to the overall study roadway network.

The following section describes the TIAR methodology, existing conditions, projected future conditions, anticipated project impacts and conclusions.

3.9.1 TIAR Study Methodology

The methodology used in the TIAR analysis includes the following:

- Assess existing traffic operating conditions during the weekday AM and PM peak hours of traffic within the study area.
- Traffic Projections for Base Year 2025 (without the Project), including traffic generated by other known developments in the vicinity of the project, in addition to an ambient growth rate.
- Trip generation and traffic assignment characteristics for the proposed Project.
- Traffic projections for the Future Year 2025 (with Project).
- Provide recommendations for roadway improvements or other mitigative measures, as appropriate, to reduce or eliminate the adverse impacts resulting from traffic generated by the Project.

Level of Service (LOS) is a qualitative measure used to describe the conditions of traffic flow at intersections, with values ranging from free-flow conditions at LOS A to congested conditions at LOS F. The Highway Capacity Manual (HCM), 6th Edition, includes methods for calculating volume-to-capacity (v/c) ratios, delays, and corresponding LOS that were used in this study.

The TIAR study area, shown in Figure 3-4, included six intersections due to their proximity to the Study Area:

- Komohana Street/Kukuau Street (unsignalized)
- Komohana Street/Mohouli Street (signalized)
- Mohouli Street/Kumukoa Street (signalized)
- Komohana Street/Nowelo Street (signalized)
- Komohana Street/Puainako Street (North) (signalized)
- Komohana Street/Puainako Street (South) (signalized)

3.9.2 Existing Conditions

3.9.2.1 Roadway System

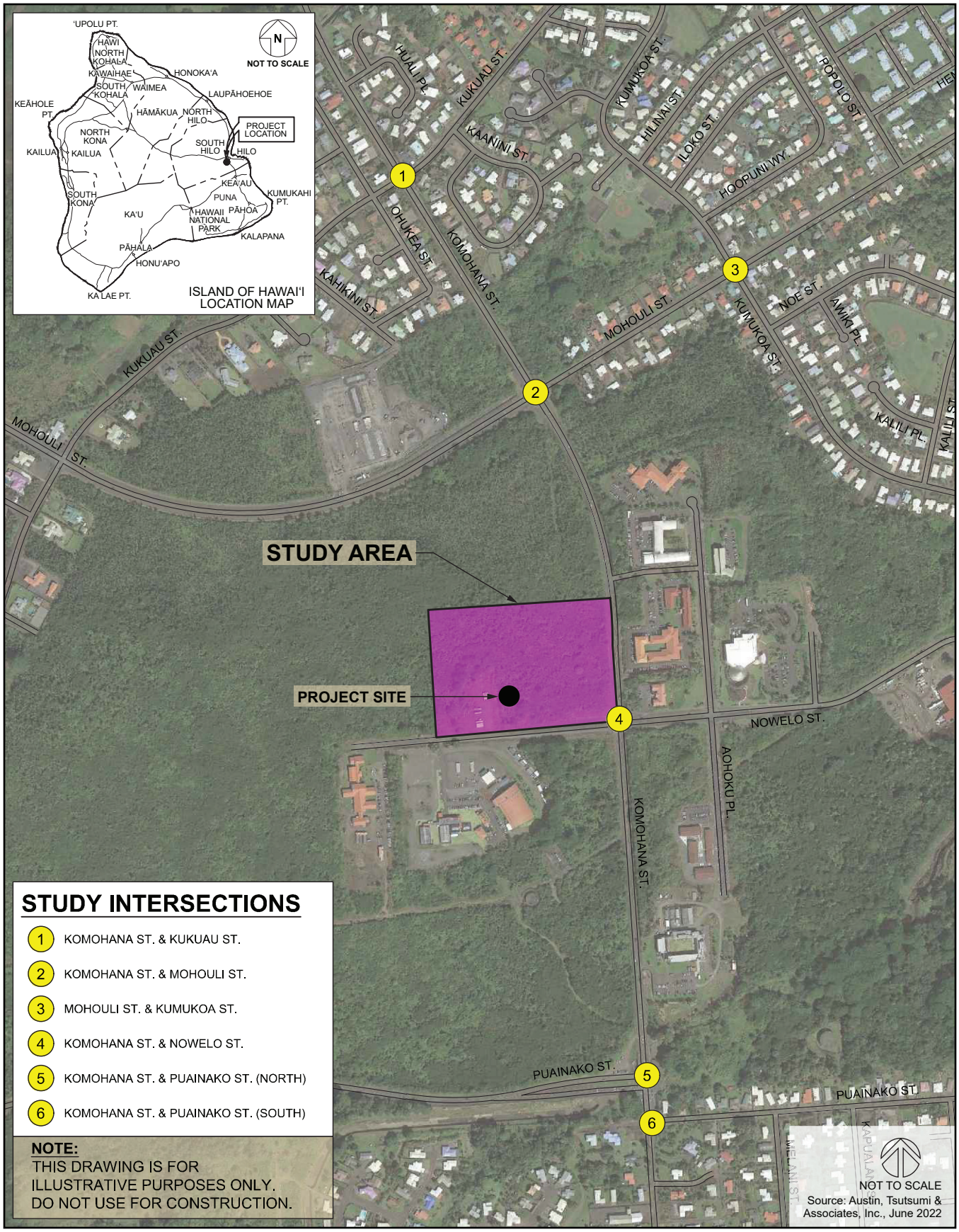
The following are descriptions of the existing roadways studied within the vicinity of the proposed project:

Komohana Street is generally a north-south, two-way, two lane, undivided County roadway, beginning to the north at its intersection with Waianuenue Avenue and terminating to the south at its intersection with Ainaola Drive. In the study area, Komohana Street has a posted speed limit of 45 miles per hour (mph) and reduces to 35 mph further south of Puainako Street.

Kukuau Street is generally an east-west, two-way, two lane, undivided County roadway with a posted speed limit of 25 mph. Kukuau Street begins to the northeast at its intersection with Kīlauea Avenue providing access through Downtown Hilo, continuing to the southeast until it terminates just past its intersection with Kimokimo Place.

Mohouli Street is generally an east-west, two-way, two lane, undivided County roadway with a posted speed limit of 35 mph within the study area. Mohouli Street begins to the east at its intersection with Kīlauea Avenue near Chiefess Kapiolani Elementary School and Café 100, continuing to the southwest until it becomes Ainako Avenue at its intersection with Kaumana Drive.

Kumukoa Street is generally a north-south, two-way, two lane, undivided County roadway with a posted speed limit of 25 mph. Kumukoa Street begins to the north at this intersection with Kukuau Street and continues to the south where it becomes Lanikaula Street near its intersection with Kalili Street. Kumukoa Street provides access to Mohouli Park as well as residential neighborhoods.



Traffic Impact Analysis Report Study Intersections **Figure 3-4**

USGS Hilo Research Facility

Draft Environmental Assessment – Anticipated Finding of No Significant Impact
Hilo, Hawai'i

Nowelo Street is generally an east-west, two-way, two-lane, divided County roadway. Nowelo Street begins to the east at its intersection with Lanikaula Street and traverses through the UH Hilo campus before intersecting with Komohana Street. Further west of Komohana Street, Nowelo Street provides access to the USDA Pacific Basin Agricultural Research facility and the USDA Institute of Pacific Islands Forestry facility. The posted speed limit is 20 mph.

Puainako Street is generally an east-west, two-way, two-lane, undivided State roadway with a posted speed limit of 35 mph. Puainako Street begins to the west at its intersection with Saddle Road and Kaumana Drive and continues to the east, terminating at its intersection with Railroad Avenue. Puainako Street provides access to Saddle Road, Waiākea Intermediate School, Waiākea Elementary School, and Prince Kuhio Plaza, as well as residential neighborhoods.

3.9.2.2 Existing Multimodal Facilities

Pedestrian Facilities

Continuous sidewalks are generally provided along the entire stretch of Nowelo Street since it primarily services the UH Hilo campus. West of Komohana Street, the sidewalk continues on the south side of Nowelo Street, servicing both USDA facilities. There is no sidewalk along the Project's north frontage on Nowelo Street.

Along Komohana Street, sidewalks are only provided on a short segment between Waianuenue Avenue and Punahele Street before transitioning to paved shoulder space on both sides of Komohana Street. Shoulder widths vary along the entire stretch but generally provide between 6 to 8 feet of paved shoulder space from Punahele Street to Puainako Street. Further south along Komohana Street, paved shoulders slim down, but there are non-continuous long segments of roadways that provide wide striped paved shoulder space.

Marked crosswalks across Komohana Street are provided at all signalized study intersections except the Komohana Street/Puainako Street (South) intersection.

Bicycle Facilities

There are currently no designated bike markings or routes in the TIAR study area.

Transit Facilities

Hawaii County operates the Hele-On Bus, which provides 13 different routes in the East Hawaiʻi region. Service is provided Monday through Saturday with limited service on Sundays and holidays. There is one bus route, Intra-Hilo Mohouli (Route 104), that travels through the study area along Mohouli Street, Komohana Street, and Kukuau Street. There are two bus stops along Mohouli Street in the vicinity of the project.

3.9.2.3 Existing Traffic Conditions

Vehicle turning movement counts were collected on Thursday, March 23-24, 2022. At the time of the traffic count, all Department of Education (DOE) schools and UH Hilo were in session. However, based on a comparison of peak hour counts taken by the Hawaiʻi State Department of Transportation (HDOT)

in September 2019 along Komohana Street, between Puainako Street and Nowelo Street, HDOT's 2019 counts yielded 166 (314) more total AM(PM) peak hour vehicles along Komohana Street. While 2022 conditions may be the "new normal," the TIAR added the 166 (314) AM(PM) vehicles to Komohana Street to remain conservative and reflect pre-COVID conditions. These additional trips were distributed based on existing traffic patterns.

At the Komohana Street intersections with Kukuau Street and Mohouli Street, various movements operate at LOS E but below capacity conditions, due to heavy through traffic along Komohana Street. These LOS E movements service relatively low volumes, so no lengthy queues occur. Based on observations, some congestion occurs on the east and west through lanes along Mohouli Street during both peaks, occasionally requiring two cycles to clear.

At the Komohana Street/Nowelo Street intersection, mainline turn movements and eastbound/westbound approach volumes along Nowelo Street are very low, resulting in no observed issues.

At the Komohana Street/Puainako Street (North and South) intersections, heavy northbound commuter traffic occurs during the AM peak hour, resulting in the northbound through movement operating at LOS E and over-capacity conditions, and the westbound approach on Puainako Street operating at LOS E conditions. Based on observations northbound and westbound queues generally lasted from 6:55 to 8:15 AM at varying lengths. Northbound Komohana Street vehicles queued as far back about 0.85 miles to Uilani Place and westbound Puainako Street vehicles queued as far back about 0.25 miles to Kapualani Street. During the PM peak hour, some slowdowns occurred on the southbound Komohana Street approach, but no lengthy congestion was observed.

3.9.3 Potential Impacts and Mitigation

3.9.3.1 Base Year Traffic Conditions

The TIAR assessment of project impacts and mitigation involved estimating traffic for a base year (without the project), and then comparing it to conditions with the project. The TIAR selected Base Year 2025 to reflect the anticipated completion year for the proposed USGS Hilo Research Facility. Base Year 2025 represents the traffic conditions within the study area without the Project. Traffic conditions were estimated by applying a defacto growth rate (1.0%) to the existing traffic count volumes, and adding trips generated by known future developments in the project vicinity.

Projected background traffic from other future developments were added to the existing AM and PM peak hour volumes to reflect Base Year conditions. The TIAR (Appendix E) includes a description of these known future projects, their location, and their estimated generated traffic. The future projects include residential projects including the Wailani Development master planned community; the County's Fire Administration Support Complex; the Hilo Medical Center's Cancer Center expansion and a separate two-phase expansion of the Hilo Medical Center.

3.9.3.2 Base Year 2025 Analysis

For Base Year 2025, the TIAR projected that traffic will increase over existing conditions; Komohana Street 20-30% (110-170 vehicles/hour/direction), Mohouli Street 10% (15-35 vehicles/hour/direction), and Puainako Street 15% (25-50 vehicles/hour/direction). Some side street movements along Kukuau Street at its intersection with Komohana Street will worsen to LOS E/F conditions primarily from increased through traffic along Komohana Street.

The TIAR provides more detail, including the Base Year 2025 lane configuration, traffic volumes, and LOS for each study intersection and LOS worksheets.

3.9.3.3 Future Year 2025 Traffic Conditions

Trip Generation and Distribution

The ITE Trip Generation Manual, 11th Edition was used to estimate the number of vehicular trips generated by the Project. The ITE rate was selected based on the Project's proposed land use description for Research and Development Center (ITE 760) – A research and development center is a facility or group of facilities devoted almost exclusively to research and development activities. Research and development centers may contain offices and light fabrication areas.

The Project is expected to generate 83(81) new trips during the AM(PM) peak hours of traffic. Based on a comparison of employees, the existing USDA facilities on Nowelo Street employ approximately 87 employees and generate an existing 44(42) vehicle trips. The proposed HVO-PIERC facility is forecast to employ approximately 103 employees and ITE trip rates calculate vehicle trips that are about double that of the existing USDA facilities. Therefore, Project trips are comparable but conservative when compared to existing USDA land uses.

Forecast Project trips were distributed based on existing traffic patterns, with approximately 50% north of Nowelo Street and 45% south of Nowelo Street. Table 3-4 shows the vehicle trip projections for the Project.

Table 3-4: Peak Hour Project Trip Generation

Land Use (ITE Code)	Units	Variable	AM Enter (vph)	AM Exit (vph)	AM Total (vph)	PM Enter (vph)	PM Exit (vph)	PM Total (vph)
Research & Development Center (760)	65.45	1,000 SF GFA	68	15	83	13	68	81

Future Year 2025 Conditions

The projected 83(81) new trips during the AM(PM) peak hours of traffic will have minimal impacts to the overall study roadway network. By Future Year 2025, the Project will only increase traffic along Komohana Street by 1 to 2% from Base Year 2025 conditions, or as much as 5-35 vehicles/hour/direction.

All intersection movements that are forecast to operate at LOS E/F or over-capacity conditions for Base Year 2025 scenario will continue to operate at similar conditions with the Project. The Project will not worsen any additional movements to LOS E/F conditions from Base Year 2025. The Project minimally increases most individual movement delays by one (1) second or less and a couple movements by only four (4) seconds. Since the Komohana Street/Nowelo Street intersection is currently underutilized, the additional Project turning movement volumes will not significantly worsen operations at this intersection.

3.9.3.4 Potential Impact of Alternatives

No Action will not impact existing or future traffic conditions.

3.10 Cumulative Impacts

Cumulative impacts are most likely to arise when a relationship or synergism exists between a proposed action and other actions expected to occur in a similar location or during a similar time period. Actions overlapping with or in proximity to the proposed action would be expected to have more potential for a relationship than those more geographically separated. Similarly, concurrent actions would tend to offer a higher potential for cumulative impacts.

Construction-related impacts such as generation of dust, emissions from mechanical equipment and vehicles, and construction noise were determined to be minor and temporary. The 6.83-acre Project Site is surrounded by undeveloped, State-owned lands that are designated for future urbanization in the UH Hilo Mauka Lands master plan. However, there are no other actions in geographic proximity or within a similar time frame. which could contribute to a cumulative impact in the foreseeable future. Development of the UH Hilo Mauka Lands will occur independent of the Proposed Action. The number of native plants on the property that will be lost is insignificant, and none are considered rare.

Relative to the overall state requirements, the GHG emissions from the facility operations and will have minimal cumulative impact associated with generation of greenhouse gases. Emissions by construction vehicles and equipment will be temporary. Because HVO and PIERC are already operating on-island, there will be no increase in population or vehicles, or intensity of research activity.

There will be no cumulative impact on archaeological or historic resources, including cultural practices. Although the Proposed Action will increase water, wastewater and electrical demand at the site and require new on-site infrastructure, existing utility systems have adequate capacity to accommodate the project. No other actions are currently proposed in the geographic vicinity or in a similar time frame. Because there will be increase in population, there will be no increase in demand, nor cumulative impact on public services such as police, fire, emergency services, schools, and parks.

The traffic study considered other known future projects in the Hilo region in its assessment of traffic impacts. This included several residential projects and planned expansion of the Hilo Medical Center. The traffic study concluded that the number of new trips generated by the USGS Hilo Research Facility will have minimal impact on the overall study roadway network.

4 Relationship to Land Use Plans, Policies and Controls

This chapter discusses the proposed project's relationship to and conformance with relevant federal, state, and county land use plans, policies, and controls. The principal laws and regulations that are applicable to the Proposed Action are discussed below.

4.1 Federal

Table 4-1 lists federal laws and Executive Orders that are applicable to the Proposed Action.

Table 4-1: Applicable Federal Laws and Executive Orders

Law/E.O.	Project Compliance
National Environmental Policy Act (NEPA) of 1969; CEQ NEPA implementing regulations	Complies, Draft EA and Anticipated FONSI prepared
Clean Air Act, 1970	Project area complies with NAAQS; project has no adverse impacts on air quality; negligible increase in vehicles.
Clean Water Act, 1972	No impact to surface or groundwater resources. NPDES Construction Storm Water General Permit to be obtained from Hawaii Dept. of Health.
Coastal Zone Management Act, 1972	Project consistent with State CZM program. See EA Section 4.2.3.
National Historic Preservation Act, 1966	Section 106 consultation underway, determination pending. Anticipated determination of no adverse effect. See EA Section 3.6.
Endangered Species Act, 1973	Section 7 consultation underway. Project not likely to adversely affect listed species or critical habitat. See EA Section 3.4.
Migratory Bird Treaty Act, 1918	No significant impact. Mitigation to limit night lighting during nesting season. See EA Section 3.4.
Executive Order (E.O.) 11988, Floodplain Management, 1977 as amended by E.O. 13690, 2015	Not applicable; site not within flood prone area. No off-site impacts on floodplain.
E.O. 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, 1994	No adverse effects on human health, economic or social conditions including on minority or low-income populations and native Hawaiian populations. No existing land uses displaced. No cultural or traditional practices adversely impacted.
E.O. 13112, Invasive Species, 1999	No significant effects. Mitigation to be implemented to limit spread of invasive Rapid Ohia Death fungus. See EA Section 3.4.
E.O. 14057, Federal Sustainability Plan	Project is consistent. DOI is developing policies and plans with targets for clean renewable electricity and reduction in GHG emissions starting FY 2023.
E.O. 13990, Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis	Project is consistent. GHG emissions estimated based on CEQ guidance. No significant project impacts.

4.2 State of Hawaiʻi

4.2.1 State Land Use

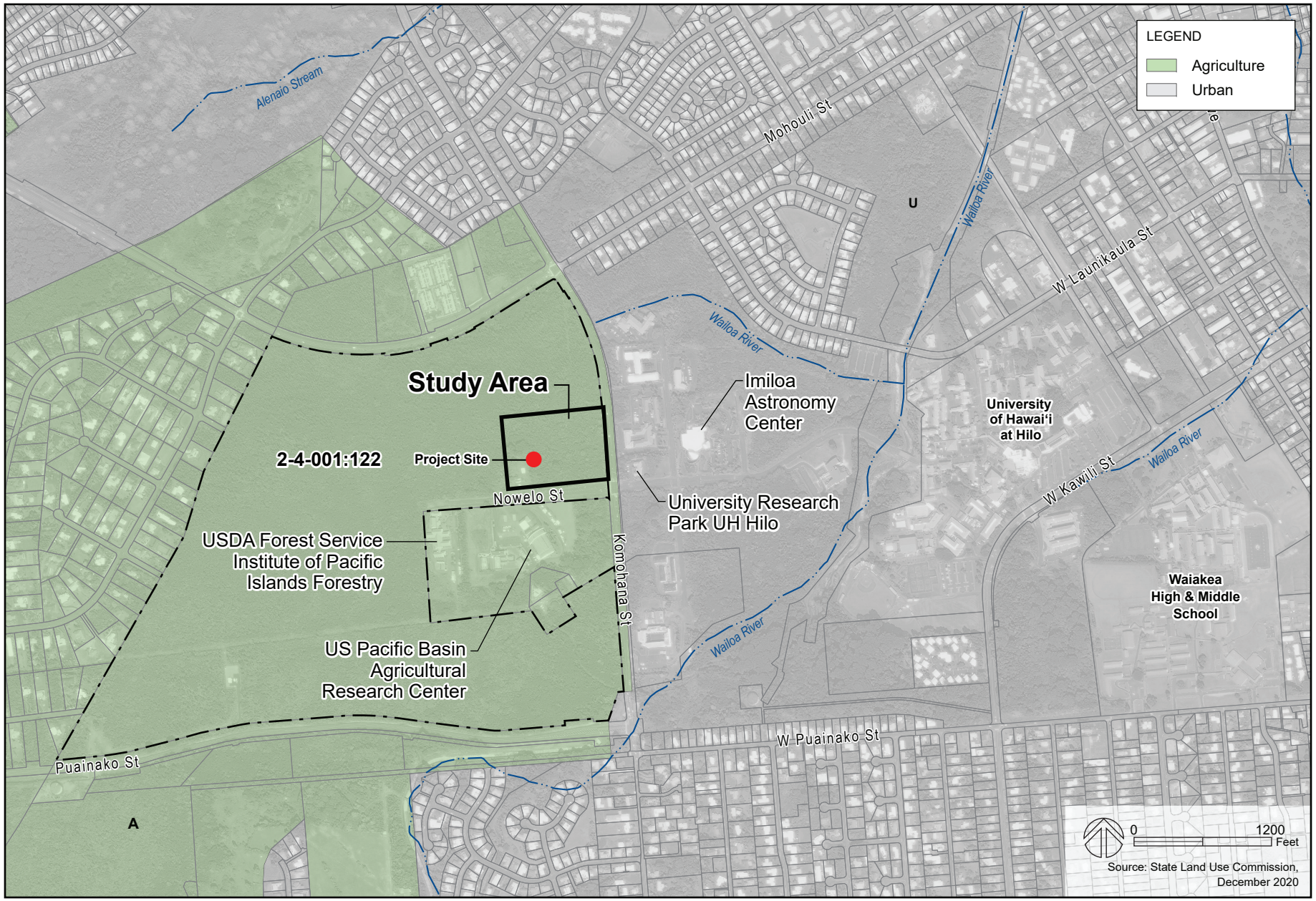
The State Land Use Commission, pursuant to Chapter 205 and 205A, Hawaiʻi Revised Statutes (HRS) and Chapter 15-15, Hawaiʻi Administrative Rules (HAR), is empowered to classify all lands in the State into one of four land use districts: urban, rural, agricultural and conservation. The Project Site is within the State Agricultural District (Figure 4-1).

Hawaiʻi Revised Statutes (HRS) §205-2(d) specifies that Agricultural Districts shall include:

> *(1) Activities or uses as characterized by the cultivation of crops, crops for bioenergy, orchards, forage, and forestry; (2) Farming activities or uses related to animal husbandry…; (3) Aquaculture…; (4) Wind generated energy production…; (5) Biofuel production…; (6) Solar energy facilities; (7) Bona fide agricultural services and uses that support the agricultural activities of the owner of the property; (8) Wind machines and wind farms; (9) Small-scale meteorological, air quality, noise, and other scientific and environmental data collection and monitoring…; (10) Agricultural parks; (11) Agricultural tourism conducted on a working farm…; (12) Agricultural tourism activities; (13) Open area recreational facilities; (14) Geothermal resource exploration and resources development; (15) Agricultural-based commercial operations…; and (16) Hydroelectric facilities.*

Discussion: The proposed project does not meet the definition of an agricultural use as defined in HRS §205-2(d). However, the proposed research facility is a permissible use within the agricultural district as defined in HRS §205-4.5(5), which allows "Public institutions and buildings that are necessary for agricultural practices."

The Proposed Action is necessary for the continued operation of HVO and PIERC, whose research directly and indirectly supports agricultural practices throughout the state. HVO's research on volcanic hazards and earth science inform scientific understanding of the local environment, local and regional climate, and soils, which determine appropriate agricultural practices. PIERC research includes topics such as invasive species, plant disease, and ecosystem processes. HVO and PIERC activities address challenges such as adaptation to climate change, biological threats, and provide insight into the Hawaiʻi's unique geological and environmental conditions. This knowledge directly benefits and supports agriculture throughout the state.



State Land Use Districts

Figure 4-1

USGS Hilo Research Facility

Draft Environmental Assessment – Anticipated Finding of No Significant Impact

Hilo, Hawai'i

4.2.2 Hawaiʻi State Plan, HRS Chapter 226

The Hawaiʻi State Planning Act, Hawaiʻi Revised Statutes (HRS) Chapter 226 was enacted in 1978 to "improve the planning process in this state, to increase the effectiveness of government and private actions, to improve coordination among different agencies and levels of government, to provide for wise use of Hawaii's resources and to guide the future development of the state." The Act sets forth the Hawaiʻi state plan, which is a long-range comprehensive plan that includes an overall theme, goals, objectives, policies, priority guidelines, and implementation mechanisms.

Thirteen functional plans set forth the policies, statewide guidelines, and priorities within specific fields of activity: Agriculture, Conservation Lands, Education, Employment, Energy, Health, Higher Education, Historic Preservation, Housing, Human Services, Recreation, Tourism, and Transportation.

Discussion: None of the 13 functional plans pertain directly to the proposed project, which is a research and educational facility. However, the research that will be conducted by HVO and PIERC will benefit the functional plan areas of agriculture, conservation, education, higher education, and health.

The Project Site is within the State Agricultural District. Although the Proposed Action is not an agricultural use, the research activities conducted by HVO and PIERC provide data that is beneficial to agricultural uses and the agriculture industry. The work of HVO and PIERC are most consistent with the following issue, objectives, and policies of the Agriculture Functional Plan:

Issue Area: Industry Research and Development

Objective D: Achievement of Optimal Contribution by Agriculture to the State's Economy.

Policy D(1): Encourage the conduct of basic and applied research on agricultural systems, technologies, practices, organisms, crops and products and encourage the transfer of research information to agricultural users.

Issue Area: Agricultural Pests and the Environment

Objective F: Achievement of Increased Agricultural Production and Growth through Pest and Disease Controls.

Policy F(1): Manage present populations, and prevent further introductions of destructive and harmful insects, plants, animals, plant and animal diseases and other pests in the State.

Objective G: Achievement of Effective Protection and Improved Quality of Hawaiʻi's Land, Water and Air.

Policy G(1): Ensure the effective, efficient and safe use of pesticides, and minimize their possible adverse impacts on the public and the environment.

Policy G(2): Minimize the adverse impacts on agricultural practices on Hawaii's ground water, surface water, air quality, and endangered species.

4.2.2.1 Hawaiʻi State Plan Update Phase 1

In the decades since the Hawaiʻi State Plan and functional plans were adopted by the State Legislature, there have been significant changes in Hawaii's economic, physical, social conditions, technology, and the global marketplace, as well as in the constraints and opportunities the State faces as it plans the future. The Hawaiʻi Office of Planning (OP) has completed Phase 1 of the comprehensive review of HRS Chapter 226, the State Planning Act, and findings and recommendations are included in a March 2018 report entitled *Hawaiʻi State Plan Update: Phase 1*. Phase II will include the Hawaiʻi State Plan update subject to the findings and recommendations from Phase I.

New State Plan priority guidelines have been added such as Sustainability and Climate Change. The Phase 1 report recommends a thorough update of state plan issues, noting the emergence of new cross-cutting issues such as homelessness, affordable housing, green practices, climate change, conservation and environmental stewardship, self-reliance/resiliency/security, local food production, and alternate finance mechanism including public-private partnerships. Nine sectors and visions were identified with associated key issues, core values, strategic goals, and implementation. The sectors include: mālama ʻaina; food security and sustainability; economic growth; energy; education; workforce development and innovation; community health; and government and infrastructure.

Discussion: The proposed research activities at the USGS Hilo Research Facility are consistent with and support the general direction of the ongoing state plan update. The Proposed Action directly supports the emphasis on sustainability, climate change, environmental stewardship, and conservation. Anticipated partnerships with other government agencies and the UH Hilo will further these goals.

4.2.3 Hawaiʻi Coastal Zone Management Program

Coastal Zone Management ("CZM") objectives and policies (Section 205A-2, HRS) have been developed to preserve, protect, and where possible, to restore the natural resources of the coastal zone of Hawaiʻi. All lands in Hawaiʻi and the area extending seaward from the shoreline are classified as valuable coastal resources within the State's CZM area.

HRS §205A-4(a) states that in implementing the objectives of the CZM program, agencies shall consider ecological, cultural, historic, esthetic, recreational, scenic, and open space values, coastal hazards and economic development. Additionally, HRS §205A-4(b) requires all state and county agencies to enforce the CZM objectives and supporting policies. Below is a discussion of the project's consistency with all ten (10) CZM objectives and their supporting policies, as outlined in HRS §205A-2, found at: https://www.capitol.hawaii.gov/hrscurrent/Vol04_Ch0201-0257/HRS0205A/HRS_0205A-0002.htm.

4.2.3.1 CZM Objectives and Policies

Recreational resources

Objective (A): Provide coastal recreational opportunities accessible to the public.

> *Policy (B)(vi) Adopting water quality standards and regulating point and nonpoint sources of pollution to protect, and where feasible, restore the recreational value of coastal waters.*

Discussion: The Project Site is not located on the coast and will not impact coastal resources or coastal recreational opportunities accessible to the public. There will be no nonpoint sources of pollution to coastal waters.

Historic Resources

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

> *Policy (A) Identify and analyze significant archaeological resources*
>
> *Policy (B) Maximize information retention through preservation of remains and artifacts…*
>
> *Policy (C) Support state goals for protection, restoration, interpretation, and display of historic resources.*

Discussion: The Proposed Action will remove a portion of a previously identified historic property which is associated with WWII era military training. Data recovery for this site was completed in 2006 to the satisfaction of the State Historic Preservation Division. No further archaeological work or preservation is required.

Scenic and open space resources

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

Discussion: The Proposed Action will have no impact to coastal scenic and open space resources.

Coastal ecosystems

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

Discussion: The project will have no impact on coastal ecosystems. Proposed best management practices will be utilized during construction and land uses on the site will avoid runoff into streams and coastal waters.

Economic uses

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

Discussion: The proposed land uses and activities at the USGS Research Facility will directly support the scientific research conducted by these federal agencies, as well as support the educational, and research activities of the UH Hilo and other federal agencies. None of the policies for this objective are applicable to the Proposed Action, as they pertain to coastal development.

Coastal hazards

Objective (A): Reduce hazard to life and property from coastal hazards.

Policy (C) Ensure that developments comply with requirements of the National Flood Insurance Program

Policy (D) Prevent coastal flooding from inland projects

Discussion: The proposed land uses and activities will have no impact on coastal hazards and is not within an area susceptible to flood hazard.

Managing development

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

Discussion: The project has no relationship to this objective or policy.

Public participation

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

Discussion: The CZM objectives and policies pertain to public involvement in coastal zone management issues, and do not directly apply to the Proposed Action. project has no relationship to coastal management education and public awareness of coastal management issues.

Beach and coastal dune protection

Objective (A): Protect beaches and coastal dunes for public use and recreation; benefit of coastal ecosystems; and use as natural buffers against coastal hazards.

Objective (B): Coordinate and fund beach management and protection.

Discussion: The project will have no impact on beach and coastal dune resources. Objectives and policies are not applicable.

Marine and coastal resources

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

Discussion: The project has no effect on the protection, use and development of marine and coastal resources. Objectives and policies are not applicable.

4.2.3.2 Special Management Area

Part II of Chapter 205A, HRS contains the general objectives and policies upon which all counties have established Special Management Areas (SMA). The Project Site and Study Area are outside the County's SMA. The project site is located inland or mauka of the coastal zone, and the proposed uses will not impact coastal recreation or coastal access, coastal ecosystems, or coastal hazards. Consistency with the County's SMA objectives and policies is discussed in Section 4.3.4 below.

4.3 County of Hawai‘i

Relevant County land use regulatory policy documents and guidance pertaining to the proposed action include the General Plan, LUPAG map, and Hawai‘i County Code (Comprehensive Zoning Ordinance). The Project Site is not located within the Special Management Area (SMA).

4.3.1 County General Plan

The County of Hawai‘i’s General Plan is the blueprint that guides the long-term development of Hawai‘i Island. It considers the needs of the entire island and provides a sound growth strategy that directs future opportunities related to land use, zoning amendments, and capital expenditures. The General Plan strives to position Hawai‘i Island for economic progress while preserving the environment and strengthening community foundations.

4.3.1.1 Land Use Pattern Allocation Guide (LUPAG)

The 2005 General Plan includes a series of Land Use Pattern Allocation Guide (LUPAG) maps, which indicate the general location of various land uses in relation to each other. The LUPAG designation for the entire Study Area and surrounding lands is University. While not affiliated directly with the UH Hilo, the proposed research facility is compatible with the adjacent research park, and its activities will complement the work of nearby university, federal, state, and private sector researchers, and scientists. The Proposed Action has the full support of the UH Hilo administration.

4.3.1.2 General Plan Study Elements

The 2005 General Plan includes several study elements, each with its own goals and policies. Goals indicate the desired long-range directions and situations and provide a cohesive and comprehensive framework for the coordination of social and economic programs and government effort. Policies state the methods of strategies to be undertaken to achieve the stated goals.

The following are General Plan goals and policies that are relevant to the Proposed Action.

ECONOMIC (Chapter 2)

Goals:

(b) Economic development and improvement shall be in balance with the physical, social, and cultural environments of the island of Hawai‘i.

(d) Provide an economic environment that allows new, expanded, or improved economic opportunities that are compatible with the County’s cultural, natural, and social environment.

(f) Strive for diversification of the economy by strengthening existing industries and attracting new endeavors.

(h) Promote and develop the island of Hawaii into a unique scientific and cultural model, where economic gains are in balance with social and physical amenities. Development should be reviewed on the basis of total impact on the residents of the County, not only in terms of immediate short run economic benefits.

Policies:

(b) Encourage the expansion of the research and development industry by working with and supporting the University of Hawai‘i at Hilo and West Hawai‘i, the Natural Energy Laboratory at Hawai‘i Authority and other agencies’ programs that support sustainable economic development in the County of Hawai‘i.

(d) Require a study of the cultural, social and physical impacts of large developments prior to approval.

(f) Support all levels of educational, employment and training opportunities and institutions.

(i) Continue to encourage the research, development and implementation of advanced technologies and processes.

(l) Identify and encourage primary industries that are consistent with the social, physical, and economic goals of the residents of the County.

Discussion: The proposed project will directly support existing federal research activity that is ongoing on Hawai‘i Island and facilitate links between these efforts and the UH Hilo. The project directly supports the economic goal of promoting the island as a unique scientific and cultural model. The project supports the research and development and educational industries in the County. These are clean industries that create jobs and provide educational opportunities for residents.

HISTORIC SITES (Chapter 6)

Goals:

(a) Protect, restore, and enhance the sites, buildings, and objects of significant historical and cultural importance to Hawai‘i.

Policies:

(c) Require both public and private developers of land to provide historical and archaeological surveys and cultural assessments, where appropriate, prior to the clearing or development of land when there are indications that the land under consideration has historical significance.

(g) Collect and distribute historic sites information of public interest and keep an inventory of sites.

Discussion: The USGS will comply with all applicable State regulations related to historic preservation. An archaeological LRFI report and a CIA have been conducted as part of the environmental review process. The Proposed Action will impact a small portion of a previously identified historic property (SIHP # 50-10-35-24243), which was used during the WWII era for training purposes. In 2006, data recovery for the site was completed to the satisfaction of SHPD, and no additional work or preservation was indicated.

PUBLIC FACILITIES (Chapter 10)

Goals:

(a) Encourage the provision of public facilities that effectively service community and visitor needs and seek ways of improving public service through better and more functional facilities in keeping with the environmental and aesthetic concerns of the community.

Policies:

(a) Continue to seek ways of improving public service through the coordination of service and maximizing the use of personnel and facilities.

(b) Coordinate with appropriate State agencies for the provision of public facilities to serve the needs of the community.

Discussion: The project supports these goals and policies by constructing a facility needed to support ongoing federal research activity. USGS researchers will partner with UH Hilo and local schools, and their research will benefit other scientists, resource managers, and emergency management personnel.

The Proposed Action is consistent with the General Plan's recommended Courses of Action for South Hilo (Section 10.2.4.2.2(d)) which states, "Support continued expansion of the University system…and encourage continuing education programs throughout the community. The transfer of State Lands to the University should be actively pursued."

It is also consistent with General Plan Section 10.2.4.2.2(g) "Encourage the implementation of existing State and University of Hawaiʻi plans for the continued development of the "Research and Technology Park" on the campus of the University of Hawaiʻi at Hilo."

LAND USE (Chapter 14)– OVERVIEW

Goals:

(a) Designate and allocate land uses in appropriate proportions and mix and in keeping with the social, cultural, and physical environments of the County.

Policies:

(a) Zone urban-types of uses in areas with ease of access to community services and employment centers and with adequate public utilities and facilities.

(b) Promote and encourage the rehabilitation and use of urban areas that are serviced by basic community facilities and utilities.

(j) Encourage urban development within existing zoned areas already served by basic infrastructure, or close to such areas, instead of scattered development.

Discussion: Although the Project Site is in the State Agricultural District and zoned for agriculture use by the County, the proposed project is a permissible use in the State Agricultural District. As discussed above in Section 5.2.1 (State Land Use), HRS §205-4.5(5) allows "Public institutions and buildings that are necessary for agricultural practices" within the State Agricultural District. The research and

educational activities that will be conducted by HVO and PIERC at the site directly and indirectly support agricultural practices.

The Project Site (and larger 13-acre Study Area) is identified in the General Plan land use plan as "University" and is within the UH Hilo Mauka Lands, which were identified for future research and educational use in a previously approved Mauka Lands EIS. The Study Area is surrounded by uses including the UH Hilo and research parks with uses similar to those that are proposed. There is no existing agricultural use of the site, and the soils have a low productivity rating.

Therefore, despite being in the State Agricultural District, the Proposed Action is compatible with surrounding land uses, consistent with the General Plan LUPAG, and consistent with the UH Hilo's approved plans for the area.

4.3.1.3 Status of General Plan Update

Hawai'i County is currently engaged in a comprehensive review of its 2005 General Plan. A draft General Plan 2040 was released for initial public review, but the plan has not been finalized, and the 2005 General Plan remains the County's guiding document. The new General Plan 2040 does not propose any land use change for the project site and surrounding areas; future land use remains designated for "University."

4.3.2 Community Development Plan

The 2005 General Plan established the Community Development Plan program to translate island-wide General Plan goals and priorities into action-items for specific geographical areas. CDPs are also intended to serve as a forum for community input into land use, delivery of government services and other matters relating to the planning area.

The Project Site and Study Area are in the Hilo Development Plan area. There have been several plans pertaining to this area. Hilo's first Community Development Plan was adopted by resolution of the Planning Commission in 1975. In 2004, a project called EnVision Downtown Hilo (EDH) 2025 was initiated, as a grassroots visioning process to guide revitalization and future sustainability efforts in Downtown Hilo.

The EDH2025 called for development of a master plan to include traffic circulation, parking, and pedestrian streetscape. In response, the County Planning Department worked with a consultant to develop the Downtown Hilo Multimodal Master Plan.

Another Hilo community plan was the Hilo Bayfront Trails, a three-phase project that will result in a comprehensive system of multi-use pathways along Hilo Bayfront from the Wailuku River to Hilo Harbor. Planned multi-use paths extend from the Bayfront to the UH Hilo campus, in the project vicinity.

Discussion: The Hilo Development Plan, 2004 EDH 2025 and Hilo Bayfront Trails efforts were focused on the downtown Hilo and bayfront areas, and their recommendations have limited applicability to the Project Site. However, the Proposed Action is compatible with these community planning efforts, including the Downtown Hilo Multimodal Master Plan and Bayfront Trails effort. For example, siting the research facilities within walking distance of the UH Hilo and other federal research campuses facilitates

use of non-vehicular modes of transportation and supports a walkable and bikeable environment, consistent with these planning efforts.

4.3.3 Zoning

As shown in Figure 4-2, the Project Area is within the A-1a agricultural zoning district. This is consistent with its State Land Use designation in the Agricultural District.

Discussion: The Study Area and surrounding lands are zoned A-1a, Agricultural with a one-acre minimum lot size. The agricultural district is consistent with their State Land Use designation of "Agricultural."

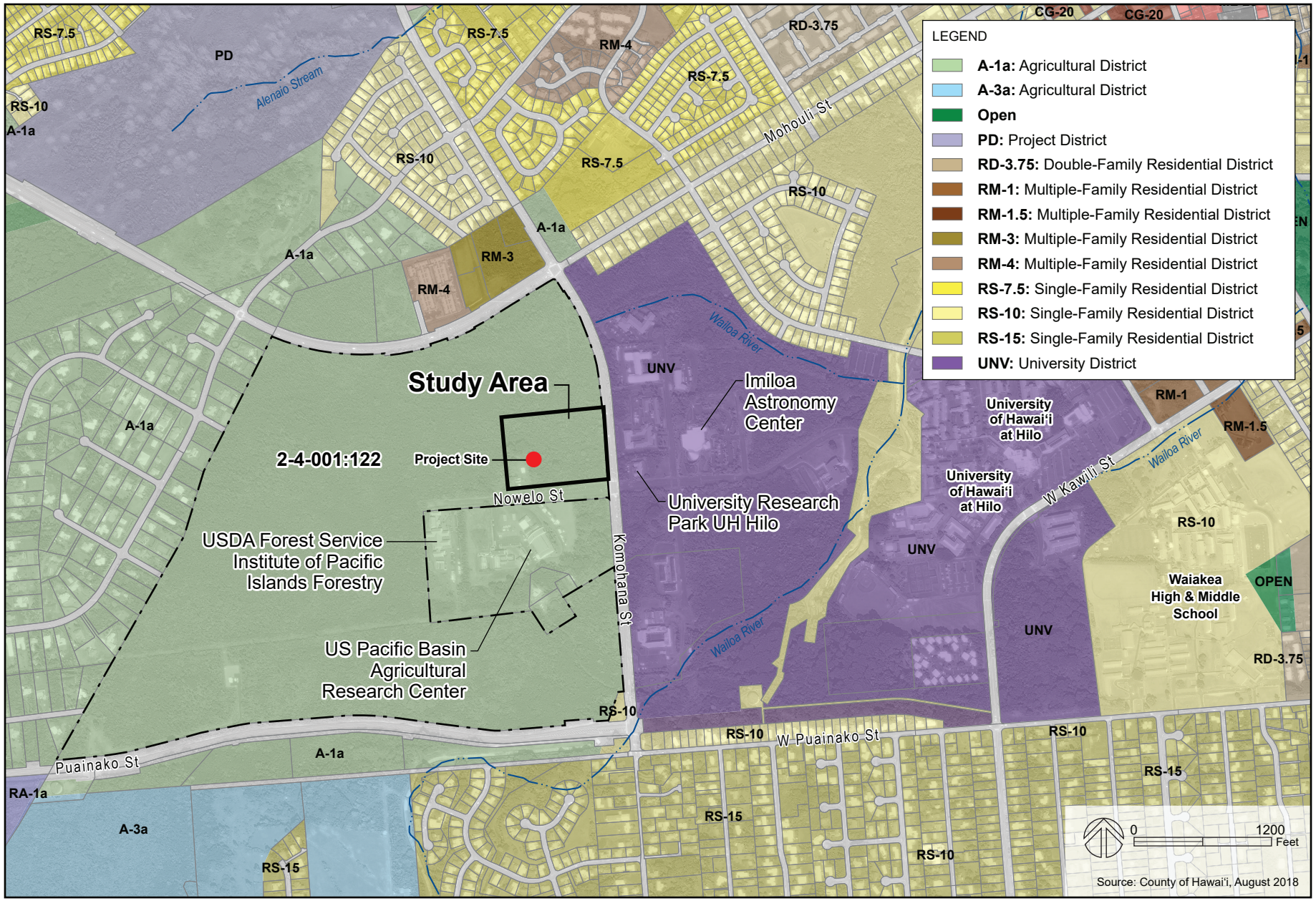
On May 25, 2022, USGS representatives met with representatives from the County of Hawaiʻi Planning Department, Administrative Permits Division. The Planning Department agreed that the proposed facility would be in accordance with Hawaiʻi County Zoning Chapter 25-5-72 Permitted Uses (a)(18), public uses and structures which are necessary for agricultural practices.

4.3.4 Special Management Area

Coastal Zone Management objectives and policies (Section 205A-2, HRS) and the Special Management Area Rule of the County of Hawaiʻi (Rule 9) have been developed to preserve, protect, and where possible, to restore the natural resources of the coastal zone of Hawaiʻi. Special controls on development within the area along the shoreline are necessary to avoid permanent loss of valuable resources and insure that public access is provided to public-owned or used beaches, recreation areas, and natural reserves.

Discussion: The project is outside the County's SMA area but is consistent with SMA objectives and policies and sound coastal management practices. Neither construction nor operation of the facility will cause runoff or other off-site impacts that could affect the coastal zone. There will be no irrevocable commitment or loss of any natural or cultural resources, or secondary impacts such as population changes or demand on public facilities.

Much of the research conducted by HVO and PIERC indirectly support sound coastal management practices, including understanding volcanic and geologic processes and natural hazards, coastal hazards, and ecosystem processes. This research supports sound management and conservation activities within the coastal zone.



Hawai'i County Zoning Districts **Figure 4-2**

USGS Hilo Research Facility

Draft Environmental Assessment – Anticipated Finding of No Significant Impact

Hilo, Hawai'i

4.4 Permits and Approvals

A list of the anticipated and potential permits, reviews, and approvals for the Proposed Action is presented in Table 4-2 below.

Table 4-2: Potential Permits and Approvals

Responsible/Approving Agency	Permit/Approval
U.S. Geological Survey (USGS) and University of Hawai'i	National Environmental Policy Act (NEPA) compliance and HRS Chapter 343 Hawai'i Environmental Policy Act compliance
University of Hawai'i	Use and Occupancy Agreement
State of Hawai'i, Department of Health-Disability and Communication Access Board (DCAB)	Formal document review by DCAB (per §103-50 HRS and DOJ 2010 ADA Standards for Accessible Design) Federal facilities must also comply with Architectural Barriers Act (ABA) (not included in the DCAB review process)
State of Hawai'i, Department of Health-Clean Water Branch	National Pollutant Discharge Elimination System (NPDES) (required during construction)
State of Hawai'i, Dept. of Land and Natural Resources-State Historic Preservation Division	Section 106, National Historic Preservation Act compliance and Chapter 6E, HRS compliance
County of Hawai'i Planning Department	County Site Plan Approval (application) required
County of Hawai'i Department of Public Works (DPW)	Grading, Grubbing, and Stockpiling permits (DPW Engineering Division). Will include reviews by SHPD, Planning, DPW Engineering. Work Within County Right-of-Way (DPW Engineering Division). Permit for construction of driveway. *NOTE: Federal buildings are exempt from County Building Permit (per Hawai'i County Code Chapter 5, Section 5-1-3.(1))*
County of Hawai'i Department of Environmental Management (DEM)	Required review and approval by DEM Wastewater Division & Solid Waste Division. Solid Waste Management Plan (on or before project advertised for bidding) Sewer study in accordance with applicable wastewater system design standards prior to approval to connect to County sewer system.
Hawaii Department of Health (DOH) – Clean Air Branch County Department of Water Supply (DWS)	Emergency Generator installation and operation may have to obtain either a noncovered source or covered source permit, if permit exemption conditions are not met. Plan review
County Fire Department, Fire Prevention Bureau	Plan review
Federal Aviation Administration (FAA)	Form 7460-1, Notice of Proposed Construction or Alteration (CFR Title 14, Part 77.9) due to proximity to Hilo International Airport. Submit at least 45 days prior to start of construction or alteration or date a construction permit is filed. If PV systems are installed, glint and glare analysis required.

5 Anticipated Determination

Under NEPA regulations (CFR 40 Parts 1500 – 1508) and HRS Chapter 343, Hawai‘i’s Environmental Impact Statement rules, to determine whether a proposed action may have a significant impact on the environment, the USGS and the State need to consider all phases of the action, the expected impacts, and the proposed mitigation measures. The agency’s review and evaluation of the action would result in a determination that either: 1) the action may have a significant effect on the environment, and issuance of an Environmental Impact Statement Preparation Notice is required; or 2) the action is not likely to have a significant effect and notice of a FONSI should be issued.

Based on the findings presented in this Draft Environmental Assessment, the Proposed Action is not expected to result in a significant impact on the environment, and a Finding of No Significant Impact (FONSI) is anticipated.

The anticipated determination was based on review and analysis of the significance criteria outlined in the NEPA regulations and specified in Section 11-200.1-13, HAR. An action shall be determined to have a significant effect on the environment if it meets any of the following criteria.

Irrevocably commit a natural, cultural, or historic resource.

The project will not irrevocably commit natural, cultural, or historic resources. There are no sensitive natural resources, species, or habitats within the project’s 13-acre Study Area. There are five previously documented historic properties in the Study Area. Data recovery for two of these sites was completed in 2006 to the satisfaction of the State Historic Preservation Division, and none are identified for preservation. No additional historic properties were found during a 2022 archaeological survey.

The UH Hilo Research Facility buildings and improvements will remove a portion of one of the previously identified sites which has already completed the historic preservation process. This site fails to embody distinctive characteristics of a type, period, or method of construction that would make it eligible for the National Register of Historic Places (NRHP).

Currently, consultation in accordance with both Section 106 of the National Historic Preservation Act and HRS Section 6E is being conducted for the Proposed Action. The consultations are being done concurrently with the public review for this Draft Environmental Assessment. Once the Section 106/6E consultations and environmental review processes are complete, a determination of effect will be made. Based on archaeology data and prior SHPD consultations, the USGS anticipates making a Section 106 determination of no adverse effect per 36 CFR §800.5(d)(1); and a Section 6E finding of no historic properties affected.

Curtail the range of beneficial uses of the environment.

The uses proposed in the Project Area are consistent with County land use plans which designate the area for “University” use. The research facility is compatible with surrounding educational and research activities. Construction of buildings and improvements will conform with applicable State and County

regulations to minimize impact to the natural environment. The Proposed Action will not curtail the beneficial uses of the environment.

Conflict with the State's environmental policies or long-term environmental goals established by law.

The Proposed Action does not conflict with the long-term environmental policies, goals and guidelines specified in HRS Chapter 344. The analysis of the individual resource areas presented in this EA demonstrates consistency with the State's policy to conserve natural resources and enhance residents' quality of life.

Have a substantial adverse effect on the economic welfare, social welfare, or cultural practices of the community and state.

The Proposed Action will not have an adverse effect on the economic welfare, social welfare, or cultural practices. The project provides needed replacement facilities for two federal agencies whose mission involves monitoring and assessing volcanic hazards, working with emergency management agencies, and conducting research supporting the management and conservation of natural resources. The work of these agencies has a positive effect on the economic, social, and cultural welfare of the community and state.

Have a substantial adverse effect on public health.

The Proposed Action will not have an adverse effect on public health. The research conducted by HVO and PIERC have a positive impact on public health. The construction and operation of the proposed facilities will not have adverse environmental or health impacts.

Involve adverse secondary impacts, such as population changes or effects on public facilities.

The Proposed Action will not result in adverse secondary impacts such as population changes or effects on public facilities. HVO and PIERC are currently operating in the east Hawai'i area, and all personnel who will work at the new facilities are already residing on-island.

Involve a substantial degradation of environmental quality.

The proposed uses at the future research facility will be conducted in accordance with all applicable environmental rules and regulations. Research activities pertaining to volcanic hazards, imperiled species, invasive species, and ecosystems directly support the enhancement of environmental quality statewide.

Be individually limited but cumulatively have substantial adverse effect upon the environment or involves a commitment for larger actions.

There will be no cumulative adverse effect or commitment for larger action, as discussed in Chapter 3.

Have a substantial adverse effect on a rare, threatened, or endangered species, or its habitat.

There are no rare, threatened, or endangered species or habitats on or near the Project Area. There will be no impact on any of these species or habitats.

Have a substantial adverse effect on air or water quality or ambient noise levels.

There will not be a substantial adverse effect on air or water quality or ambient noise levels. Uses are low intensity and like surrounding university and research facilities. Operation of the facilities will follow all applicable environmental rules and regulations. During construction, best management practices will be used to minimize erosion and protect water quality. Low Impact Development (LID) measures will be incorporated into any development to mitigate impacts of runoff, including the incorporation of vegetated swales and vegetated buffer strips, harvest, or reuse of runoff, and bioretention basins. The increase in traffic noise associated with the facility was projected and determined to insubstantial (CENSEO, 2022).

Have a substantial adverse effect on or be likely to suffer damage by being located in an environmentally sensitive area such as a floodplain, tsunami zone, sea level rise exposure area, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters.

The Project Area is not in a floodplain, tsunami zone, sea level rise exposure or erosion prone area. As with all Hawai‘i Island, the Project Area is subject to earthquake, and as most of Hilo, at some risk of volcanic hazard. However, the project is intended to relocate HVO and PIERC out of their existing facilities at Hawai‘i Volcanoes National Park, an area subject to higher volcanic risk. Therefore, the Proposed Action will reduce risk to HVO and PIERC personnel.

Have a substantial adverse effect on scenic vistas and view planes, during day or night, identified in county of state plans or studies; or

Proposed land uses will be of low scale and intensity and will have no effect on scenic vistas or view plane.

Require substantial energy consumption or emit substantial greenhouse gases.

The proposed activities in the Project Area will not require substantial energy consumption or emit substantial greenhouse gases.

A final determination on the significance of the impacts will be made following the public meeting and receipt of comments received on this Draft EA. USGS welcomes comments throughout the lifecycle of the Proposed Action. If you would like to have your comments considered in the final determination and included in Final EA, please submit your comments within the 30-day public comment period of this Draft EA.

Please submit comments to: USGS-Hilo-HVO-PIERC@hhf.com.

6 Agencies and Organizations Consulted

6.1 Pre-Assessment Consultation

Pre-Assessment consultation, as required under HRS Chapter 343, was conducted prior to the initiation of the Environmental Assessment. A pre-assessment consultation letter from the U.S. Department of the Interior, U.S. Geological Survey was sent via email on March 29, 2022, to government agencies and other stakeholder organizations. The letter included a location map, preliminary site plan, an introduction to HVO and PIERC, the purpose and need for the action, and a brief description of the Proposed Action. Comments were requested by April 28, 2022.

6.2 Agencies and Organizations Consulted

Agencies and organizations that were consulted during preparation of the Draft EA are listed in Table 6-1 below. Out of the list of agencies and organizations consulted, 17 formal responses were received. They included two Federal agencies, ten State of Hawaiʻi agencies, four County of Hawaiʻi agencies, and one private citizen. The parties that provided formal response during the 30-day pre-assessment consultation period are identified with a check mark (✓) in Table 6-1.

Table 6-2 provides a brief overview of the substantive agency input. A more detailed summary of the comments received is provided in Table G-1 of Appendix G. Appendix G also includes copies of all letters received.

All comments, suggestions, and consultation responses have been addressed throughout this EA and in the Appendices and Technical Reports attached.

Table 6-1: Agencies and Organizations Consulted

Agency/Organization	Response
Federal	
U.S. Army Corps of Engineers, Honolulu District	
Oahu Natural Resource Conservation Service	
U.S. Fish and Wildlife Service, Pacific Islands Office	✓
U.S. Environmental Protection Agency	✓
U.S. National Park Service, Hawaiʻi Volcanoes National Park	
U.S. Department of Agriculture, Daniel K. Inouye U.S. Pacific Basin Agricultural Research Center	
U.S. Forest Service, Institute for Pacific Islands Forestry	
State of Hawaiʻi	
Department of Agriculture	
Department of Accounting and General Services	✓

Agency/Organization	Response
Department of Health (Clean Air Branch, Clean Water, Safe Drinking Water, Solid & Hazardous Waste, Wastewater Branches)	✓ (Safe Drinking Water & Solid & Haz Branches)
Disability and Communication Access Board	✓
Office of Planning and Sustainable Development	✓
Department of Business, Economic Development & Tourism	
Department of Defense	
Department of Education	
Department of Hawaiian Home Lands	✓
Department of Land & Natural Resources, State Historic Preservation Division	✓
Department of Land & Natural Resources, Land Division	✓
Department of Transportation	✓ (Hwy Div)
University of Hawaiʻi, Water Resources Research Center	
University of Hawaiʻi at Hilo, Chancellor	
University of Hawaiʻi at Hilo, Vice Chancellor for Administrative Affairs	
University of Hawaiʻi at Hilo, Daniel K. Inouye College of Pharmacy	
University of Hawaiʻi at Hilo, Ka Haka ʻUla o Keʻelikolani College of Hawaiian Language	
Office of Hawaiian Affairs	
Hawaiʻi County	
Hawaiʻi County Civil Defense Agency	
Department of Environmental Management	✓
Hawaiʻi County Fire Department	
Office of Housing and Community Development	✓
Department of Human Resources	
Department of Information Technology	
Department of Parks and Recreation	
Department of Planning	✓
Hawaiʻi County Police Department	
Department of Public Works	
Department of Research and Development	
Department of Water Supply	✓
Utilities	
Hawaiʻi Electric Light Company	
Hawaiian Telcom	

Agency/Organization	Response
Community	
Edith Kanaka ʻole Foundation	
ʻImiloa	
News Media	
Hawaiʻi Tribune Herald	
West Hawaiʻi Today	
Elected Officials	
U.S. Senator Mazie K. Hirono	
U.S. Senator Brian Schatz	
U.S. Representative Ed Case	
U.S. Representative Kaialiʻi Kahele	
Senator Laura Acasio, Senate District 1	
Representative Chris Todd, House District 2	
County Councilmember Susan Lee Loy	
Hawaiʻi County Mayor Mitch Roth	
Misc. Comments Received	
R. Scott Keeney, citizen	✓

Table 6-2: Overview of Agency Comments

Agency	Major Comments
U.S. Environmental Protection Agency	Provided detailed EA scoping recommendations, including list of applicable laws and Executive Orders to be addressed.
U.S. Fish and Wildlife Service, Pacific Islands Fish & Wildlife Office	See attached guidance on Information for Planning and Consultation (IPaC) online system.
Hawaiʻi Department of Hawaiian Homelands	No impact to DHHL lands or beneficiaries. Encourage consultation with native Hawaiian organizations.
State Disability Communication Access Board	Because project is a federal facility, will have to comply with Architectural Barriers Act and ADA Title II provisions.
Hawaiʻi Department of Land and Natural Resources (DLNR)	Address potential impacts on Hawaiian hoary bat, overflying seabirds and Hawaiian Nene. Take action to prevent spread of Rapid Ohia Death.
State Office of Planning & Sustainable Development (OSPD)	Need for consistency with Coastal Zone Management objectives and policies. Possibility of sharing or co-location with a future State Geological Survey office.
Hawaiʻi Department of Transportation (HDOT)	Airports Division—Project location relative to Hilo International Airport may require further design review and permits. Solar PV systems could require a Federal Aviation Administration (FAA) glint and glare analysis. Highways Division—Provided guidelines for EA traffic impact analysis.

Agency	Major Comments
County Department of Environmental Management	Solid Waste Division—submit Solid Waste Management Plan on or before project advertised for bid. Wastewater Division—conduct sewer study prior to connection to County system.
County Planning Department	Due to State Land Use Agriculture designation, EA should address how facility's mission and operations are necessary for agricultural practice.

7 References

AECOS, Inc. *A natural resources assessment for the USGS replacement building, Hilo*, Island of Hawaiʻi. May 31, 2022

Austin, Tsutsumi & Associates, Inc. *Traffic Impact Analysis Report, USGS Hilo Facility*. Final Draft. October 21, 2022.

Billing, Priscilla Perez. *"Trouble in Paradise."* Federal Highway Administration, Public Roads-July/August 2012. Issue No: Vol. 76 No. 1, Publication Number FHWA-HRT-12-005. URL= https://highways.dot.gov/public-roads/julyaugust-2012/trouble-paradise

CENSEO AV+ACOUSTICS. *Draft Noise Impact Report, USGS HVO+PIERC Research Facility*. June 22, 2022.

Char, Winona. *Botanical Survey, UH Hilo Mauka Lands Master Plan, South Hilo District*. 2003.

Council on Environmental Quality. *Guiding Principles for Sustainable Federal Buildings and Associated instructions*. December 2020. URL = https://www.sustainability.gov/pdfs/guiding_principles_for_sustainable_federal_buildings.pdf

Council on Environmental Quality. *Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas emissions and the Effects of Climate Change in National Environmental Policy Act Reviews*. URL = https://ceq.doe.gov/docs/ceq-regulations-and-guidance/nepa_final_ghg_guidance.pdf

Cite: Council on Environmental Quality. *Environmental Justice, Guidance Under the National Environmental Policy Act*. December 10, 1997. URL = https://ceq.doe.gov/docs/ceq-regulations-and-guidance/regs/ej/justice.pdf

County of Hawaiʻi, Department of Research and Development. Climate Action Plan, First Draft 2020. URL= https://www.rd.hawaiicounty.gov/home/showpublisheddocument/301933/637233445066030000

County of Hawaiʻi Department of Water Supply. Hawaiʻi County Water Use and Development Plan Update, Hawaiʻi Water Plan. Final Report August 2010. URL= https://www.hawaiidws.org/water-use-development-plan/

County of Hawaiʻi. Northeast Maunaloa Aquifer Sector Area, Hawaiʻi County Water Use and Development Plan update, August 2010 update

County of Hawaiʻi, Envision Downtown Hilo 2025. URL= https://www.planning.hawaiicounty.gov/hawai-i-island-vision/community-planning/envision-downtown-hilo-2025

County of Hawaiʻi. Downtown Hilo Multi-modal Plan. URL= https://www.planning.hawaiicounty.gov/hawai-i-island-vision/community-planning/community-development-plans/transportation-planning-initiatives

Dayton, Kevin. "Hilo has second-worst air quality study finds." Honolulu Advertiser, December 9, 2019. URL= https://www.staradvertiser.com/2019/12/09/hawaii-news/hilo-has-second-worst-air-quality-study-finds/

Engineering Concepts, Inc. *Preliminary Engineering Report for the Proposed UH Hilo Mauka Parcel*. September 2004.

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. URL = http://rainfall.geography.hawaii.edu/rainfall.html

Hawaiʻi Climate Change Mitigation and Adaptation Commission. *Hawaiʻi Sea Level Rise Vulnerability and Adaptation Report*. Prepared by Tetra Tech, Inc. and the State of Hawaiʻi Department of Land and Natural Resources Office of Conservation and Coastal Lands under the State of Hawaiʻi Department of Land and Natural Resources Contract No. 64064. 2017. URL = https://climateadaptation.hawaii.gov/wp-content/uploads/2017/12/SLR-Report_Dec2017.pdf

Hawaiʻi Health Systems Corporation. *Draft Environmental Assessment, Proposed Hilo Medical Center Expansion*. Prepared by Munekiyo Hiraga. March 2022.

Honua Consulting. *Cultural Impact Assessment for the proposed facility for the USGS Hawaiʻi Volcano Observatory (HVO) and Pacific Island Ecosystem Research Center (PIERC)*. September 2022

International Volcanic Health Hazard network (IVHHN), R.T. Holcomb, R.W. D, T.L. Wright, P.H. Stauffer. Eruptive history and long-term behavior of Kīlauea Volcano. US Geol. Surv. Prof. Pap., 1 (1350) (1987), pp. 261-350

Monahan, Christopher M., Ph.D., et al. Honua Consulting. *Archaeological Literature Review and Field Inspection of 13 Acres in Support of USGS Hilo Facility New Construction*. Revised Draft September 2022.

Office of the Federal Chief Sustainability Officer. Council on Environmental Quality. Federal Sustainability Plan. URL= https://www.sustainability.gov/federalsustainabilityplan/index.html

Parametrix. 2019 *Integrated Solid Waste Management Plan Update*. Prepared for Hawaiʻi County Solid Waste Division. August 2020. URL= https://records.hawaiicounty.gov/weblink/ElectronicFile.aspx?openfile=true&dbid=1&docid=110921

SSFM. *Basis of Design, Design Development Submittal, US Geological Survey Hilo Research Facility*. April 2022.

State of Hawaiʻi, Department of Health, Clean Water Branch. *2020 State of Hawaiʻi Water Quality Monitoring and Assessment Report: Integrated Report to the U.S. Environmental Protection Agency and the U.S. Congress Pursuant to §303(d) and §305(d), Clean Water Act*. July 30, 3030. URL= https://health.hawaii.gov/cwb/files/2020/08/Final-IR-2020.pdf

State of Hawaiʻi Department of Health. *State of Hawaiʻi Annual Summary 2016 Air Quality Data. 2016.* URL= https://health.hawaii.gov/cab/files/2019/07/aqbook_2016.pdf

State of Hawaiʻi. *Agriculture Functional Plan*. 1991. URL= https://files.hawaii.gov/dbedt/op/docs/Agriculture.pdf

State of Hawaiʻi, OEQC, *Guide to the Implementation and Practice of the Hawaii Environmental Policy Act, 2012 Edition*. URL = http://oeqc2.doh.hawaii.gov/OEQC_Guidance/2012-GUIDE-to-the-Implementation-and-Practice-of-the-HEPA.pdf

State of Hawaiʻi, Office of Planning. SSFM International. *Hawaiʻi State Plan Update: Phase 1 Final Report*. March 2018. URL= https://files.hawaii.gov/dbedt/op/spb/Hawaii_State_Plan_Update_Ph_1_Final_Report.pdf

State of Hawaiʻi, University of Hawaiʻi at Hilo. *University of Hawaiʻi Hilo Mauka Lands Master Plan Final Environmental Impact Statement*. Prepared by PBR Hawaiʻi. February 2005.

State of Hawaiʻi, Department of Health. 2001. *Total Maximum Daily Loads Estimated for Waimānalo Stream – Island of Oahu, Hawaii.* Report dated March 2001 prepared by the Hawaii State Department of Health Environmental Planning Office (June Harrigan and Susan Burr, authors).

State of Hawaiʻi, Commission on Water Resource Management. *Hawaiʻi Water Plan, Water Resource Protection Plan, 2019 Update*. URL= https://files.hawaii.gov/dlnr/cwrm/planning/wrpp2019update/WRPP_ALL_201907.pdf

State of Hawaiʻi Department of Health (John Peard); USGS Hawaiian Volcano Observatory (Tamar Elias); and International Volcanic Health Hazard Network (Claire Horwell). Fact Sheet Booklet 160914. Frequently Asked Questions on Vog from Kilauea Volcano. URL= https://vog.ivhhn.org/FAQ.pdf

State of Hawaiʻi Department of Health (DOH) – Clean Air Branch, Regulations: HAR 11-60.1-61 to 11-60.1-76 and HAR 11-60.1-81 to 11-60.1-104, URL= http://health.hawaii.gov/cab/

The White House. Executive Order on Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability. Dec 2021. URL= https://www.whitehouse.gov/briefing-room/presidential-actions/2021/12/08/executive-order-on-catalyzing-clean-energy-industries-and-jobs-through-federal-sustainability/

U.S. Environmental Protection Agency and State of Hawaiʻi Department of Health, Environmental Planning Office. *Waimānalo Stream TMDL Implementation Plan*. August 2001. URL = https://health.hawaii.gov/cwb/files/2013/05/Integrated_WaimanaloImplementation.pdf

U.S. Department of Agriculture, Foote, D. E., and Hawaiʻi Agricultural Experiment Station. *Soil Survey of Island of Hawaiʻi.* December 1973.

U.S. Census Bureau, Quick Facts 2022. URL= https://www.census.gov/quickfacts/fact/table/hilocdphawaii/INC110220

Wright, T.L., Chun, J.Y.F., Esposo, Joan, Heliker, Christina, Hodge, Jon, Lockwood, J.P., and Vogt, S.M., 1992, Map showing lava-flow hazard zones, Island of Hawaii: U.S. Geological Survey Miscellaneous Field Studies Map MF-2193, scale 1:250,000.

U.S. Census Bureau, Quick Facts 2022. URL= https://www.census.gov/quickfacts/fact/table/hilocdphawaii/INC110220

Cite: U.S. Department of the Interior. Environmental Justice Strategic Plan. November 2016. URL = https://www.doi.gov/sites/doi.gov/files/uploads/doi_ej_strategic_plan_final_nov2016.pdf

U.S. Geological Survey, Hawaiian Volcano Observatory. About Earthquakes in Hawaiʻi. URL= https://www.usgs.gov/observatories/hawaiian-volcano-observatory/about-earthquakes-hawaii.2022.

U.S. Department of the Interior. Environmental Justice Strategic Plan. November 2016. URL = https://www.doi.gov/sites/doi.gov/files/uploads/doi_ej_strategic_plan_final_nov2016.pdf

APPENDIX A

Project Alternatives and Environmental Issues
And Resources with Minimal to No Impacts

A Project Alternatives and Environmental Issues and Resources with Minimal to No Impacts

A.1 Alternatives Considered But Dismissed

As discussed in Chapter 2 (Project Description and Alternatives), USGS initially evaluated seven (7) alternatives to satisfy the purpose and need for the project. These alternatives are listed below. Alternative 6, Construct New Research Facility in Hilo, was selected as the preferred alternative and is the Proposed Action in this EA. The alternative for No Action was also included in the EA to assess the consequences of not undertaking the Proposed Action, and to establish a comparative baseline for analysis. The other alternatives are described in this appendix.

- Alt 1: No Action
- Alt 2: Consolidate With USGS/NPS Field Center at Current PIERC Site
- Alt 3: Relocate to USDA Research Campus in Hilo
- Alt 4: Find Permanent Space to Lease in Hilo
- Alt 5: Relocate to NOAA Facility on Ford Island, Oahu
- Alt 6: Construct Research Facility in Hilo (Preferred Alternative)
- Alt 6a: Alternative Building Site within the "Study Area"

A.2 Alternative 2: Consolidate With USGS/NPS Field Center at Current PIERC Site

This alternative would relocate HVO field staff to the "Research Area" of Hawai'i Volcanoes National Park, where the PIERC is located, creating a consolidated USGS field center. The benefit of this alternative is that HVO field operations could maintain a presence in the park, and creation of a consolidated field center (HVO and National Park Service) could facilitate cooperation between these agencies. However, because the existing Research Area facilities are limited, an alternate location outside Hawai'i Volcanoes National Park would still be needed for HVO administrative personnel, as well as PIERC functions displaced by incoming HVO functions.

Existing PIERC facilities in the park are in substandard condition and have long needed upgrade. Renovation would be required to accommodate HVO. Although the relocation of HVO staff could provide justification to upgrade the existing facilities, this alternative would still require an investment of resources in two places—at the Research Area facilities and a new facility in Hilo. Moreover, the long-term viability of the Hawai'i Volcanoes National Park location is questionable, given the ongoing volcanic hazards. For these reasons, this alternative was dismissed from consideration.

A.2.1 Alternative 3: Relocate to USDA Research Campus in Hilo

This alternative would co-locate HVO within the U.S. Department of Agriculture (USDA) research campus in Hilo, located about west of the of the proposed project site on the south side of Nowelo Street. Because the USDA campus has no existing vacant space, new facilities would be constructed for HVO.

This alternative has the benefit of consolidating multiple federal agencies in a campus that is close to UH Hilo. Like the Preferred Alternative, it offers the potential to optimize use of space and capabilities, presents opportunities for partnerships with the other federal agencies and the university, and provides proximity to County Emergency Operations Center (EOC).

A major disadvantage is that unlike the preferred site, archaeological conditions on site are unknown. Archaeological studies will be required, and presents some unknown risk, given that human remains were found in the vicinity during a 2000 Archaeological Inventory Survey for USDA PBARC. While the risk of burials or other historic resources is unknown, a situation similar to the USDA PBARC project could result in delays and extensive agency and stakeholder consultations. Given the urgency of providing permanent facilities for HVO and PIERC, the decision was made to avoid the risk. While this alternative may be viable, the unknown archaeological and historic conditions make it less desirable than the Proposed Action.

A.2.2 Alternative 4: Find Permanent Space to Lease in Hilo

An alternative that would not require new construction is to find permanent space for HVO to lease in Hilo. This alternative was investigated by USGS immediately after the 2018 volcanic eruption forced the relocation of HVO from the Park. A survey of commercial and office space found that the available inventory in Hilo is of limited size and does not provide the ideal physical configuration or support amenities that are required for research offices and laboratories. Moreover, most available office and commercial space does not provide proximity to the university and/or other research partners. While use of leased space is an unavoidable interim measure for HVO, it will not provide an adequate long-term solution for HVO. It will also not provide space for the relocation of PIERC. This alternative was eliminated from consideration.

A.2.3 Alternative 5: Relocate to NOAA Facility on Ford Island, Oʻahu

One alternative that was raised but dismissed is relocation of the main HVO office to Oʻahu, where it could co-locate with the National Oceanic Atmospheric Administration (NOAA) on Ford Island. Ford Island is part of Joint Base Pearl Harbor Hickam (JBPHH), and within the secured area of the installation, and USGS already has a close working relationship with NOAA.

This alternative could have some benefits, including an opportunity to eliminate administrative and IT redundancies and leverage technical expertise between NOAA and USGS. An Oʻahu location also offers the potential for partnerships with the University of Hawaiʻi at Mānoa, and other USGS entities in Honolulu, including the Water Science Center (WSC) and the Climate Adaptation Science Center (CASC).

Because the existing NOAA Ford Island facility does not currently have unused office space, some of its staff or functions would need to be relocated to accommodate HVO. The primary disadvantage of this alternative is its Oʻahu location, a significant logistical challenge for field technicians and scientists whose work requires ready access to Hawaiʻi Volcanoes National Park. Response activities and emergency management relationships with Hawaiʻi County will be hampered. Relocation to Oʻahu will result in hardship for existing HVO staff, many of whom will be unable to relocate. This may result in a sudden loss of experienced personnel, impacting operations. Overall, this alternative was found to be unsatisfactory and was eliminated from consideration.

A.2.4 Alternative 6a: Alternative Building Site Within the "Study Area"

Alternative 6a is a variation of the Preferred Alternative (Alternative 6) and would site the research facility buildings on the eastern-most end of the 13-acre "Study Area" near the intersection of Komohana Street and Nowelo Street. Alternative 6a was originally explored as a preferred alternative. However, based on archaeological surveys, the Study Area includes five WWII-era cultural sites associated with former military and ranching use. These sites are in the eastern portion of the Study Area, and Alternative 6a would have a greater impact on them than the Preferred Alternative. This alternative was therefore determined to be less favorable than the Preferred Alternative.

A.3 Environmental Issues and Topics With Minimal to No Impacts

A.3.1 Soils and Agriculture

A.3.1.1 Existing Conditions

USDA NRCS Soil Survey

The U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) (formerly Soil Conservation Service, SCS) 1973 Soil Survey of the Island of Hawaiʻi shows that the entire project site and surrounding area is comprised of Keaukaha soils, highly decomposed plant material, 2 to 10 percent slopes. This soil series consists of very shallow and shallow, well drained soils that formed in a thin mantle of organic material and small amounts of volcanic ash overlying pahoehoe lava. These soils are well drained with high runoff and permeability that is moderately high in the soil and very slow in the underlying bedrock. Keaukaha soils are found on the low elevation windward slopes of Mauna Loa and Kīlauea volcanoes.

Land Study Bureau (LSB) Detailed Land Classification

The University of Hawaiʻi Land Study Bureau (LSB) Master Productivity Rating System rates soil productivity on a scale from "A" (very good) to "E" (not suitable for agricultural use). The LSB has classified the project site as Class E, the least productive classification.

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

The Study Area is not identified as an agricultural land of importance to the State of Hawai'i by the ALISH classification system. The ALISH program was part of a national effort in 1977-1978 by the U.S. Department of Agriculture, Soil Conservation Service (SCS) and the University of Hawaiʻi to inventory

important agricultural lands nationwide. Three classes of agriculturally important lands were established for the State of Hawaiʻi: Prime Agricultural Land, Unique Agricultural Land, and Other Important Agricultural Land.

Important Agricultural Lands (IAL)

As a result of the State Legislature's passage of Act 183, Session Laws of Hawaiʻi (SLH) 2005 ("Act 183") and Act 233, SLH 2008 ("Act 233"), Chapter 205, HRS was amended to define the framework for the identification and designation of Important Agricultural Lands (IAL). Passed nearly 30 years after Hawaiʻi's voters ratified the 1978 constitutional amendments, Act 183 and Act 233 are hailed as landmark legislation that led to the establishment of additional incentives and regulations to support the agricultural industry and protect Hawaiʻi's agricultural lands for agricultural uses. The focus of these amendments to Chapter 205, HRS were privately owned agricultural lands.

Agricultural land owned by the State of Hawaiʻi was intended to follow a separate process of review which has yet to be initiated. The Study Area therefore has no adopted or recommended status regarding the IAL legislation. Given the Study Area's low productivity rating by both the LSB and ALISH rating systems, it is unlikely that it would be considered important under the IAL classification.

A.3.2 Potential Impacts and Mitigation

The Proposed Action will transform an overgrown, vegetated site into a developed urbanized site with structures, walkways, parking lot, and landscaping. Short-term construction activity as well as the long-term increase in impermeable surfaces have the potential to impact runoff and soil erosion. Potential impacts will be mitigated through appropriate design and best management practices during construction. Design plans will minimize the amount of earthwork to the extent possible, and site grading will minimize runoff and erosion potential.

Although the Study Area is within the State Agricultural District, its soils are not conducive for agriculture use and is classified as having low agricultural productivity. Overall, the proposed use of the property for a research facility/administrative building will not have an adverse impact on soils or agriculture and will not result in a loss of productive agricultural land.

A.3.3 Water Resources

A.3.3.1 Existing Conditions

Groundwater Resources

About 50 percent of the State's water supply comes from ground water sources. Ground water, which is also used for agricultural, industrial, and domestic purposes, is the principal source of municipal water supplies in Hawaiʻi'. Groundwater hydrologic units, or aquifers, have been established by the State's Commission on Water Resource Management (CWRM) to provide a consistent basis for managing ground water resources. An aquifer coding system identifies and describes ground water hydrologic units.

The Study Area is in the Northeast Mauna Loa Aquifer Sector Area (ASEA) (Sector 804), which is divided into the Hilo and Keaʻau hydrologic units or aquifers. This ASEA has a sustainable yield of 740 million gallons per day (mgd), the highest aquifer sector on the island, and reflecting the high annual rainfall and the infiltrability of the surface rocks. The Study Area is in the Hilo Hydrologic Unit (80401) of the ASEA. Groundwater resources associated with this aquifer system include basal water floating on salt water and water perched on ash, soil, or alluvium and underlain with basal water. According to the County Water Use and Development Plan update (August 2010), the Hilo Aquifer system has a sustainable yield of 349 mgd.

Surface Water Resources

Surface water generally occurs in areas that contribute to drainage systems that are confined by topographic divides, and are referred to as watersheds, drainage basins, or catchments. Streams, springs, ditches and canals, and reservoirs are the most common surface water settings in Hawaiʻi (CWRM, 2019).

Within the Northeast Mauna Loa ASEA, three streams are classified as perennial: Wailuku River, Wailoa River, and Kaʻahakini Stream (Hawaiʻi County Dept. of Water Supply, 2010). There are no streams or other aquatic resources such as wetlands within the Study Area.

In the project vicinity, Waiākea Stream, a tributary of the Wailoa River, crosses under Komohana Street about 2,000 feet to the south. The stream flows in a northeast direction, passing through the center of the UH Hilo campus and then into Waiākea Pond/Wailoa Estuary, which discharges into the south part of Hilo Bay. Along most of the stream course, portions of the channel have been modified with levees and revetments and a few sections are concrete-lined due to roadway crossings, including the Komohana Street crossing. However, the stream bed comprised of bedrock material, remains in a natural state.

Clean Water Act and Hawaiʻi Water Quality Standards

The goal of the 1972 federal Clean Water Act (CWA) is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (33 U.S.C §1251(a)). As part of the CWA, states establish water quality standards (WQS) for streams and marine waters within their borders. These waters must be evaluated and a list of (impaired) waters that do not meet the established WQS must be developed. The CWA requires priority rankings be established for waters on the list and that Total Maximum Daily Loads (TMDLs) be identified for every pollutant/waterbody combination on the list. A TMDL represents a calculation of the maximum amount of a pollutant that can be present in a waterbody and still meet WQS.

Hawaiʻi's WQS form a legal basis for controlling pollution entering waters within the State and are described in Hawaiʻi Administrative Rules (HAR), Title 11, Chapter 54. Hawaiʻi's WQS include classification of water bodies (e.g., embayment, open coastal, flowing stream, etc.), identification of designated uses, water quality criteria necessary to protect the designated uses, and a general policy of water quality antidegradation for all water types. The WQS categorize surface waters as inland (e.g.,

streams, estuaries, wetlands, etc.) or marine (e.g., embayments, coastal, oceanic) waters. Marine water body types are classified into class A and AA.

The Hawai‘i Department of Health (HIDOH) is responsible to report to the U.S. Environmental Protection Agency (EPA) on the State’s water quality, providing a list of impaired waters plus a priority ranking of these waters for development of a TMDL, i.e., water pollution reduction plan. Prioritization (low, medium, high) for TMDL development is based on the number of pollutants not attaining state WQS, severity of exceedances, resource availability, and realistic schedule of completion.

The HIDOH 2020 State of Hawaii Water Quality Monitoring and Assessment Report has been prepared to meet the requirements of the CWA. Nutrient pollutants assessed in the report include total nitrogen (TN); nitrate+nitrite-nitrogen (NO_3+NO_2); ammonium-nitrogen (NH_4); total phosphorus (TP); and where applicable, total dissolved nitrogen (TDN), total dissolved phosphorus (TDP), and orthophosphate (PO_4) (HAR Ch. 11-54-6(d)). Other parameters collected by the HIDOH Clean Water Branch (CWB) for assessment purposes include chlorophyll a, total suspended solids (TSS), and field parameters such as pH, temperature, turbidity, salinity, and dissolved oxygen. Water bodies that do not meet State water quality criteria constitute the CWA §303(d) list of impaired waters.

There are no streams or wetlands within the Study Area. Waiākea Stream is the nearest water body to the site, and this stream is included in the State’s 2020 §303(d) listing of impaired inland waters. Listed impairments for this stream including TN, NO3 + NO2, and TP. Its TMDL priority is “Low.” Wailoa Estuary near Hilo Bay, into which Waiākea Stream flows, is also on the §303(d) list for inland waters, with impairments listed as TN, NO3+NO2, TP, turbidity, and NH4. Its TMDL priority is “Medium” (DOH, 2020).

A.3.4 Potential Impacts and Mitigation

The project is not expected to have an adverse impact on groundwater or surface water resources. Construction activities will not impact streams or drainage patterns associated with nearby streams, and the project will not impact surface water resources. The project will not impact water quality of nearby Waiākea Stream/Wailoa River, Waiākea Pond or Hilo Bay.

The construction of the research facility on the undeveloped site will increase impervious surfaces, increasing the amount of surface runoff. Stormwater runoff within the site will be collected via the new onsite drainage system, and there will be no net increase in storm water runoff offsite, as required by County of Hawai‘i Storm Drainage Standards.

A.3.5 Air Quality

A.3.5.1 Existing Conditions

Federal and State Ambient Air Quality Standards

The U.S. Environmental Protection Agency (EPA) sets National Ambient Air Quality Standards (NAAQS) to protect public health and welfare from harmful effects of certain commonly occurring pollutants regulated by the federal Clean Air Act. An Air Quality Index (AQI) has been established for five major air pollutants, with each having a national air quality standard set by EPA to protect public health: 1)

ground-level ozone; 2) particle pollution (also known as particulate matter, including PM2.5 and PM10); 3) carbon monoxide; 4) sulfur dioxide; and 5) nitrogen dioxide.

An AQI value of 100 generally corresponds to an ambient air concentration that equals the level of the short-term national ambient air quality standard for protection of public health. AQI values at or below 100 are generally thought of as satisfactory. When AQI values are above 100, air quality is unhealthy: at first for certain sensitive groups of people, then for everyone as AQI values get higher. For example, an AQI value of 50 or below represents good air quality, while an AQI value over 300 represents hazardous air quality.

The County of Hawaiʻi, State Department of Health, USGS HVO and other federal agencies have worked together to form a short-term SO_2 color code advisory system, designed to alert people to volcanic SO_2 pollution on Hawaiʻi Island. The same color code system is used by EPA for PM2.5 24-hour advisories. The color code system indicates if air quality is good (green), moderate (yellow), unhealthy for sensitive groups (orange), unhealthy (red), very unhealthy (purple), or hazardous (maroon).

Air Quality

Vehicular traffic and volcanic emissions are the major sources of air pollutants in the Hilo vicinity. Air quality in Hilo is generally good and meets NAAQS standards but can vary significantly depending on the extent of volcanic activity. Kīlauea is one of three active volcanoes on Hawaiʻi Island, and one of the most active volcanoes on earth (Holcomb et al, 1987). Recent ongoing volcanic activity at the summit and east rift zones of Kīlauea volcano created the potential for airborne health hazards to residents and visitors. The November 2022 eruption of Mauna Loa, which lasted only 12 days, also contributed to localized air quality impacts during its activity.

At the levels of volcanic emissions occurring over recent years, individuals with pre-existing respiratory conditions are the primary group at risk of experiencing health effects from vog exposures, but healthy people may also experience symptoms.

The term “vog” refers to the hazy air pollution caused by the volcanic emissions which are primarily water vapor (H_2O), carbon dioxide (CO_2), and sulfur dioxide (SO_2) gas. As SO_2 is released from Kīlauea’s summit and east rift eruptive vents, it reacts in the atmosphere with oxygen, sunlight, moisture, and other gases and particles and, within hours to days, converts to fine particles, which scatter sunlight, causing the visible haze that is observed downwind of Kīlauea. Areas far downwind (e.g., the west side of Hawaiʻi Island and other islands in the state) are mostly affected by the fine particles; however, areas closer to the eruptive vents, including Hilo, can be exposed to both SO_2 gas and fine particles during periods of vog.

SO2 is a colorless, irritating gas that has an acrid odor like fireworks or a struck match. It is also emitted from other sources, such as fossil fuel power plants and motor vehicles. Fine particles consist of particulate matter less than 2.5 micrometers in diameter and are referred to as “$PM_{2.5}$”. These particles are smaller than the width of a human hair. PM2.5 in vog is composed of acid and neutral sulfate particles. Other sources of PM2.5 include vehicle exhaust and smoke from fires. Vog contains mostly SO_2

and acid particles, in contrast to urban, industrial, and other pollution sources, which also contain additional toxic contaminants, such as ozone and hydrocarbons.

In any location, vog concentrations are primarily dependent on the volume of volcanic emissions, the distance from the source vents, and the wind direction and speed on a given day. In the Hawaiian Islands, the predominant wind direction is from the northeast (trade winds). Consequently, the areas southwest of Kīlauea are most frequently affected by vog on Hawaiʻi Island. When trade winds are absent, which occurs most often during winter months, East Hawaiʻi, the entire island, or the entire state can be impacted by vog.

A 2019 analysis of U.S Environmental Protection Agency air pollution data concluded that Hilo has the "second-worst air quality in the nation" (Dayton, 2019). However, this analysis was based on data collected in 2018, at the height of the recent Kīlauea activity. The article cited data high PM2.5 particulate matter for 144 days, while air pollution reached "unhealthy levels" on 99 days.

Overall, air quality in the Hilo region can vary depending on time and location, prevailing wind conditions, and the level and nature of current volcanic activity.

A.3.5.2 Potential Impacts and Mitigation

Project-related vehicular traffic will generate emissions but will not cause a net change in air quality. Almost all of the vehicles associated with the new facility are already operating on-island. As with all of Hilo, the biggest ongoing influence on air quality will continue to be volcanic activity.

During the construction period, there may be temporary, localized air quality impacts. Site clearing, grading, and the operation of construction machinery and vehicles have the potential to generate dust and other air quality impacts in the immediate area. These short-term impacts will be mitigated through standard dust control measures during construction, in compliance with provisions of the State DOH Rules and Regulations (Chapter 43, Section 10) and Hawaiʻi Administrative Rules (HAR) Chapter 11-60.1, "Air Pollution Control," Section 11-60.1-33 on Fugitive Dust. Construction vehicles will be moved to and from the site during non-peak traffic hours to avoid unnecessary traffic delays.

A.3.6 Noise

A.3.6.1 Introduction

A Draft Noise Impact Report for the proposed USGS Hilo Research Facility was prepared by CENSEO AV+Acoustics in June 2022 (Appendix B). The purpose of the noise impact study is to assess the existing ambient noise environment on the project site, identify potential noise impacts to and from the surrounding area associated with the project, evaluate future sound levels and provide conceptual approaches to noise mitigation.

A.3.6.2 Sound Regulations and Guidelines

The Noise Impact Report utilized various State and Federal sound regulations in guidelines in determining the project's noise impacts. They included the following:

Hawai‘i Department of Health (HDOH)- Community Noise Control

Hawai‘i Administrative Rules, Title 11 – Department of Health, Chapter 46 – Community Noise Control regulates environmental noise limits within the State of Hawai‘i. Maximum permissible noise levels at the property line are identified for a specific class of land use, and apply to *“stationary noise sources, and equipment related to agriculture, construction, and industrial activities”.* The maximum permissible sound levels shall not be exceeded (at or beyond the property line) by more than 10% of the time for any 20-minute period.

The project property is considered Class B (multifamily dwellings, apartment, business, commercial, hotel, resort or similar) which has a maximum day (7 am-10 pm) noise limit of 60 dBA, and a maximum night (10 pm-7 am) noise limit of 50 dBA.

Hawai‘i Department of Health (HDOH)—Construction Noise Permit and Variance

The HDOH grants permits to operate noise sources, such as construction equipment, beyond the maximum permissible noise limits. Loud construction activities outside of normal construction hours require an approved Community Noise Variance.

Federal Highway Administration (FHWA) Traffic Noise

For highway projects, the Federal Highway Administration (FHWA) has developed Noise Abatement Criteria (NAC) for various land uses categories. The Land Use Categories and the corresponding NAC are expressed in terms of an hourly equivalent traffic noise level ($L_{eq(h)}$).

The Proposed Action would fall under NAC Category C for exterior ($L_{eq(h)}$ = 67 (exterior)) and Category D for interior ($L_{eq(h)}$ = 52 (interior)). A traffic noise impact occurs when the predicted future highway noise levels approach or exceed the NAC (i.e., 1 dB less than the NAC or greater). A traffic noise impact can also occur when predicted future highway traffic noise levels result in a “substantial increase” over the existing noise environment (i.e., an increase of 5 to 15 dB or greater).

Hawai‘i Department of Transportation (HDOT) – Traffic Noise

The Hawai‘i Department of Transportation has implemented the requirements of FHWA’s design goals for traffic noise exposure in its noise analysis and abatement policy. According to the policy a traffic noise impact occurs when the predicted traffic noise level approaches or exceeds the FHWA NAC (i.e., 1 dB less than the NAC or greater). A traffic noise impact can also occur when the predicted traffic noise level substantially exceeds the existing noise levels (i.e., an increase of 15 dB or greater).

A.3.6.3 Existing Conditions

The Noise Impact Report conducted long-term ambient noise level measurements to assess the existing acoustical environment, and short-term measurements to quantify vehicular traffic noise from the adjacent roadways. Two (2) long-term noise measurement locations and two (2) short term noise measurement locations were selected. Measurement locations, measurement session times and a description of the ambient environments are in the Noise Impact Report (Appendix B).

The measured 1-hour L_{eq} ambient sound levels at both long-term measurement locations were between 48 and 51 dBA throughout the day and night, which is typical of a rural environment. The primary noise

sources during the ambient noise measurements were environmental noise sources (e.g., birds and wind) and vehicular traffic on Komohana Street.

Vehicular traffic noise from Nowelo Street and Komohana Street was the primary noise source for each short-term measurement. Although the total measurement time was less than an hour long, it is representative of sound levels for the entire hour. Nowelo Street, with a speed limit of 20 mph, had a 1-hour measurement of 47.9 dBA. Komohana Street, with a speed limit of 45 mph, had a short-term measurement of 70.9 dBA.

A.3.6.4 Potential Impacts and Mitigation

The Noise Impact Report projected traffic noise for existing (Year 2022) and future conditions (Year 2025) using the FHWA Traffic Noise Model. The traffic noise analysis was based on peak hour AM and PM traffic volumes on Nowelo Street and Komohana Street, as well as the nearby residential streets of Mohouli Street and Puainako Street.

Peak hour traffic volume data was derived from the *Traffic Impact Analysis Report* from Austin Tsutsumi & Associates (see Appendix C). Additional input parameters included speed limit, estimates of traffic mix from on-site observations, and roadway and receiver locations. Vehicular traffic noise was calculated for eleven (11) receiver locations, including one (1) receiver at the project site and ten (10) noise sensitive receptors located in surrounding areas. The locations of the receivers are shown in the Noise Impact Report.

A.3.6.5 Impacts

Traffic Noise

A traffic noise impact can occur if the project traffic volumes result in a substantial noise increase, 5 dB or more. The estimated increase in non-project related traffic growth (i.e., Future Year 2025 minus Existing Year 2022) at all receptor locations is estimated to result in a traffic noise level increase of less than 2 dB, which is an insubstantial increase.

The additional increase in future traffic noise due to the project for both AM and PM peak hours is less than 2 dB for all receptor locations (except for the project site). This is considered an insubstantial increase which will be barely perceptible to the surrounding community. The project site itself will experience a traffic noise level increase of 5 dB due to the project generated traffic, but this increase is not considered an impact since the site is not currently developed.

On-Site Noise Sources

The project will incorporate stationary mechanical equipment that is typical for laboratory/office buildings. Noise from the stationary mechanical equipment will comply with the applicable HDOH maximum permissible noise limits at the project property line, which are 60 dBA (daytime hours) and 50 dBA (nighttime hours). Noise control measures will be incorporated into the design of the project.

General Construction Noise

Development of the project will involve excavation, grading, and other typical construction activities. Earthmoving equipment is typically the loudest equipment. Impact equipment such as pile drivers are not anticipated for the project. The construction contractor will obtain the appropriate permits for the operation of construction equipment that exceed the HDOH maximum permissible noise limits.

The various construction phases may generate noise levels that are substantially louder than the existing noise environment, especially during the initial site preparation phase. Construction noises will be audible at the neighboring properties, but the impact will be temporary and short term. Construction activities will occur only during permitted hours.

General Noise Mitigation Methods

Traffic Noise

Vehicular traffic noise is not expected to impact the project site or the nearest commercial and residential properties. Noise mitigation is not required.

Construction Noise

Construction noise will be mitigated with proper planning. Construction activities will comply with the conditions in the Construction Noise Permit issued by HDOH, specifically allowable construction hours. Although the project site is not immediately adjacent to any residential areas, surrounding land uses which may be noise sensitive will be notified in advance of noisy construction work.

Construction vehicles will spread out over the project area and not all work close to the property line simultaneously. Particularly noisy tasks will be separated throughout the work schedule when possible. Noisy stationary equipment, such as generators, will be moved away from noise-sensitive receivers to the extent possible. When possible, low noise equipment will be used, or mufflers installed to mitigate noise at the source. All equipment will be well maintained to avoid unnecessary noise.

On-Site Noise Sources

Stationary mechanical equipment on the project site will not generate significant noise complaints if noise control measures are taken into consideration during the design of the project. Stationary mechanical equipment will be placed away from the property line or be sited so that the future buildings block noise to surrounding properties. Equipment enclosures and other noise control will be included as appropriate to reduce mechanical equipment noise.

A.3.7 Solid and Hazardous Waste

A.3.7.1 Existing Conditions

The Hawaiʻi County Department of Environmental Management, Solid Waste Division is responsible for the operation and maintenance of the County's solid waste and recycling facilities. This includes the West Hawaiʻi Sanitary Landfill, the East Hawaiʻi Reload Facility (East Hawaiʻi Regional Sort Station), and 21 recycling and transfer stations. The former South Hilo Landfill was closed in 2019. Construction and demolition debris is disposed at the West Hawaiʻi Sanitary Landfill only.

No collection services are provided by the County, and residents and businesses either haul their solid waste to a transfer station or hire a private collection service. Island-wide hauling operations are conducted in accordance with local, State, and Federal regulations.

In December 2007, the County Council adopted Resolution 356-07 to "embrace and adopt the principles of zero waste as a long-term goal for Hawai'i County" and the County subsequently developed a Zero Waste Implementation Plan in 2008 that outlines suggested changes to solid waste management. The zero-waste philosophy promotes the efficient use of materials to eliminate waste and pollution by emphasizing a closed-loop system of production and consumption and moving in logical increments toward the goal of zero waste. The County recognizes that zero waste is a long-term goal, and County is committed to taking incremental steps toward achieving zero waste in the long-term with the understanding that the ability to truly achieve zero waste is challenging for an island.

In 2020, the County completed its update for the 2019 Integrated Solid Waste Management Plan (ISWMP), prepared in accordance with HRS Chapter 342G. The plan update evaluates solid waste management in the County, including waste reduction practices and programs, opportunities for recycling, implementation of zero waste policies and practices, the status of active and closed landfills, and options for increasing landfill diversion.

A.3.7.2 Potential Impacts and Mitigation

During construction, waste materials will be generated from site preparation and building construction activities. The design of the project has attempted to balance cut and fill during site work to minimize construction period waste. The project proponent will work with the County to find alternative ways of disposing demolition waste other than the landfill. Construction waste materials that cannot be recycled or reused will be properly disposed of at County disposal facilities.

During its operation, the Hilo Research Facility will support the priorities and recommendations of the County's ISWMP through source reduction (waste reduction) and through implementing mandatory reuse, recycle and composting policies for HVO and PIERC operations.

Operation and maintenance of the lab facilities will generate waste including paper, cardboard, plastic, solvents, glass, as well as small quantities of hazardous waste including combustible, corrosive, and toxic materials. Hazardous and/or flammable waste will be collected, sorted, stored, and disposed in accordance with all federal, state and County regulations. The principles of reduce, reuse, and recycle will be implemented through actions such as switching from plastic to glass containers; buying materials in bulk to avoid excess packaging; returning packaging for reuse; using leftover containers; and recycling plastics. The facility's proximity to other federal research agencies and the UH Hilo may result in beneficial economies of scale for waste reduction and recycling efforts.

The project will submit a Solid Waste Management Plan to the County Department of Environmental Management, Solid Waste Division on or before the project is advertised for bidding.

Potential Impact of No Action Alternative

There would be no impact on solid waste generation.

A.3.8 Socio-Economic

A.3.8.1 Existing Conditions

The population of Hawaiʻi County has exhibited strong growth over the past several decades. The resident population for the County increased by 24.5 percent between 2000 and 2010 but slowed to a 8.4 percent growth rate between 2010 and 2020. Population in 2020 was 200,629 (U.S. Census Bureau, 2020). Within the Hilo Census Data Place (CDP), the population increased from 43,263 persons in 2010 to 44,186 in 2020, about a 2 percent increase. Racial characteristics are shown in Table A-1 below. Median household income (2020 dollars) in the Hilo CDP for the period between 2016 and 2020 was $65,727, consistent with the County-wide median of $65,401.

Table A-1: 2020 Census: Racial Characteristics of Hilo CDP

	Hilo CDP	County of Hawaii
White alone	18.4%	34.3%
Black, African American	0.8%	0.9%
American Indian, Alaskan native	0.1%	0.6%
Asian alone	32.0%	20.1%
Native Hawaiian & Other Pacific Islander	10.0%	13.0%
Two or more races	38.1%	31.2%
Hispanic or Latino	13.0%	13.8%

Source: U.S. Census Bureau, Quick Facts, 2022

Agriculture, and specifically, sugar, was once the primary industry of Hawaiʻi County, peaking in the 1970s and 1980s. Hāmākua Sugar Mill was the last sugar mill on the island ceasing operations in 1990. In conjunction with decline of the sugar industry was the increase in the tourism and visitor industry.

The COVID-19 pandemic, which began in early 2000, had a significant impact on Hawaiʻi County's economy, as with the rest of the State. In March 2021, there were 59,800 non-agriculture wage and salary jobs in Hawaiʻi County, a decrease of 11,300 jobs (-15.9%) from March 2020, a year earlier. With COVID-19 travel restrictions and a sharp decrease in visitors, combined with stay-at-home regulations, many businesses were forced to shut down or drastically reduce operations. During the period between March 2020 and March 2021, the largest percentage decreases in jobs were in the Arts, entertainment, and recreation (-73.3%); Accommodation (-43.1%); and Food services (-26.5%) sectors.

(DBEDT, 2021. URL= https://files.hawaii.gov/dbedt/economic/data_reports/countyprofile/profile-HawaiiCo_2021-04-30.pdf)

With the introduction of vaccines and stabilization of the pandemic, the economy State-wide started to rebound by early 2022. In the first quarter of 2022, Hawaii County added 3,800 or 6.1 percent of non-agricultural wage and salary jobs over the same quarter of 2021. Jobs increased the most in Accommodation which added 1,600 jobs or 40.0 percent. This was followed by Food Services and Drinking Places which added 800 jobs or 15.1 percent, and Retail Trade which added 500 jobs or 5.4 percent in the quarter. The Government sector added 100 jobs or 0.7 percent in the quarter (DBEDT, 2022, URL = https://dbedt.hawaii.gov/economic/qser/county/).

In the first quarter of 2022, visitor arrivals by air increased in all counties in the State. Arrivals by air increased 153.0 percent in Honolulu, 87.5 percent in Maui, 129.3 percent in Hawaii County, and 957.1 percent in Kauai compared to the same quarter of 2021.

In the first quarter of 2022, the value of private building permits increased in Honolulu, Maui, and Hawaiʻi counties, but decreased in Kauaʻi County. In the first quarter of 2022, private building permits increased $21.8 million or 13.3 percent in Hawaiʻi County from the same quarter of the previous year.

A.3.8.2 Potential Impacts and Mitigation

The project will not impact population, as most, if not all the approximately 100 employees and volunteers of HVO and PIERC are currently living on-island, mostly in East Hawaiʻi. Some employees may relocate to be closer to the new Hilo offices. However, the project will not induce additional in-migration to Hilo or Hawaiʻi Island.

The overall economic impact of the proposed facility will be minimal, since these two federal agencies are already operating on-island at the Hawaiʻi Volcanoes National Park. With the new research facility adjacent to UH Hilo, there is an opportunity to expand research and educational partnerships, both with the university and other federal agencies. This could attract additional research dollars and employment, which would have an indirect positive impact on the local economy.

A.3.9 Public Services

A.3.9.1 Existing Conditions

Police, Fire and Emergency Services

The County of Hawaiʻi Police Department is divided into districts and beats, with the central headquarters in Hilo town. The Study Area is within the Police Department's South Hilo District, served by the Hilo Station which includes the central headquarters. The South Hilo District includes three foot-patrol beats, five motorcycle beats, and 25 motor-patrol beats.

The Hawaiʻi County Fire Department provides fire protection and suppression, pre-hospital emergency medical services, land and sea search and rescue, hazardous materials response, ocean safety, and fire prevention and public education for the County of Hawaiʻi. The County Fire Department has 20 fire stations island-wide, comprising two Battalions (East and West Hawaiʻi). In addition, there 18 volunteer fire companies and a federal fire department at the Pohakuloa Training Area.

In the Hilo area, the County Fire Department has four (4) 24-hour, full time companies. The Study Area is served by the Central Fire Station, which typically has 5-6 personnel assigned at any given time. For emergency medical services, the Fire Department has two ambulances that operate in the greater Hilo area. The County has contracted emergency medical services with the State Department of Health.

The East Hawaiʻi region is served by three (3) hospitals: Hilo Medical Center, Hale Hoʻola Hamākua and Kaʻu Hospital and Rural Health Clinic. Hilo Medical Center, located 2.5 miles northwest of the Study Area, is the largest hospital in Hawaiʻi County with 1,200 employees. The facility is currently licensed for 166 beds for acute care and 45 beds for long-term care with nine (9) outpatient clinics offering primary and specialty care.

In addition to these major health care facilities, there are multiple privately operated medical and dental services available in Hilo, including Kaiser Permanente, Primary Care Clinic of Hawaiʻi, East Hawaii Health Clinic, and Queen's Health Care Center-Hilo (Hawaiʻi Health Systems Corporation, 2022).

Schools and Parks

The Study Area is located within the Department of Education's (DOE) Hilo Complex of the Hilo-Waiākea Complex Area. This complex includes the following schools: deSilva Elementary (K to 6), Haʻaheo Elementary (K to 6), Hilo High (9 to 12), Hilo Intermediate (7 and 8), Hilo Union Elementary (K to 6), Kalanianaʻole Elementary and Intermediate (K to 8), Kapiʻolani Elementary (K to 6), Kaʻūmana Elementary (K to 6), Keaukaha Elementary (K to 6) and the Connections, Ka ʻUmeke Kaʻeo, and Ke Ana Laʻahana Public Charter Schools.

Private schools in the Hilo area include Saint Joseph High School (Pre-K to 12), Haili Christian School (Pre-K to 8), E Makaala School (K to 8), and Mauna Loa School (K to 8).

The UH Hilo is one of ten campuses of the University of Hawaiʻi system. UH Hilo offers 33 undergraduate and three graduate degree programs and has an enrollment of about 4,000 students. The main campus is located within a half mile of the Study Area. The project site is adjacent to the area of the UH Hilo campus referred to as University Park, which includes the Imiloa Astronomy Center, the USDA Pacific Basin Agricultural Research Center, UH Institute for Astronomy, and the Daniel K. Inouye College of Pharmacy.

There are several community and neighborhood parks within the area surrounding the Study Area. The UH Hilo Botanical Garden is located on the UH Hilo campus. The Wailoa River State Recreation Area, also known as Wailoa River State Park, comprises 132 acres around Wailoa River near Hilo Bay. It was developed as a buffer zone following the devastating 1960 tsunami that wiped out the central bayfront district of Hilo. It includes a boat ramp and visitor center with cultural displays, and is popular for walking, picnicking, and fishing.

A.3.9.2 Potential Impacts and Mitigation

Police, Fire, Emergency Medical

The project will not have a significant impact on the need for police, fire, emergency medical, or medical services. There will be no net increase in residential population as employees who will be working at the research facility are already East Hawai‘i residents.

The traffic impact of the new facility will be minimal. During construction, there will not be traffic lane closures or adverse impacts to pedestrians or vehicles on Komohana or Nowelo Streets. Construction vehicles and equipment will be staged on site and moved to and from the property during non-peak traffic hours.

The two structures on the site are designed to meet fire code requirements and fire access roads will be provided within the property. Adequate water supply capable of supplying required fire flow is available and fire flow will be based on County Water System Standards. Detailed design for the fire-fighting system will be developed as design progresses and plans will be reviewed and approved by the Fire Department Prevention Bureau during the building permit process.

Schools, Parks and Recreation Facilities

The project will not increase demand for schools, parks, or recreational facilities. Demand for these public services is determined by the resident population which will not be affected by the project.

A.3.10 Green House Gas, Climate and Modeling Data

A.3.10.1 Introduction

Greenhouse Gas Emissions were estimated by USGS based on the CEQ’s January 9, 2023 *Interim National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change* issued by CEQ and consistent with EO 13990, *Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis*. This section presents methodology and the results of GHG emissions modeling and associated social cost.

Background

CalEEMod is used to estimate emission of ozone precursors, criteria pollutants, and greenhouse gases (GHG) (collectively referred to as “emissions”) from land use development and projects. It provides a simple and integrated platform to quantify construction and operations emissions, assess climate hazards and vulnerabilities, identify environmental burdens, and evaluate benefits of various emission reduction, climate risk reduction, and health and equity measures.

The model uses several default parameters for California. However, it has flexibility to change the parameters and with appropriate changes it can be used for projects located in other states.

The model utilizes widely accepted methodologies for estimating emissions combined with default data that can be used when site-specific information is not available. Sources of these methodologies and default data include the United States Environmental Protection Agency’s (USEPA) AP-42 emission

factors. In addition, local air programs provided customized values are used for projects located in their jurisdictions.

Air pollution, climate change, and equity are not mutually exclusive—they are interrelated and, as such, demand integrated and comprehensive solutions. Specific to emissions, the model calculates construction and operations emissions from land use development projects and construction emissions from linear projects. The model quantifies maximum daily, average daily, average quarterly, and annual emissions, which can be used to support preparation of air quality and GHG analyses in NEPA documents. The emissions inventory modules also used for estimating utility consumption (e.g., water, electricity, natural gas). Based on user inputs, the model provides a method to quantify and score the vulnerability of a project to projected climate change. The model also presents environmental and health burdens relevant to a project area.

Scope of Calculations

The model provides the following primary functions.

- Calculates short-term construction emissions from land use development and linear projects associated with demolition, site preparation, grading, building construction, paving, and architectural coating from the following sources:
  - Exhaust emissions from off-road construction equipment.
  - Exhaust emissions from on-road mobile vehicles (workers, vendors, hauling, and onsite trucks).
  - Fugitive dust emissions from grading, bulldozing, truck loading, demolition, and on-road vehicles traveling along paved and unpaved roads.
  - Evaporative volatile organic compound (VOC) emissions from architectural coating and paving activities.
  - Indirect GHG emissions from electricity consumption.
- Calculates operations emissions for land use development from the following sources:
  - Exhaust emissions from on-road mobile vehicles, hearths (e.g., stoves, fireplaces), offroad (e.g., forklifts, cranes) equipment, landscaping (e.g., mowers) equipment, and stationary sources (e.g., emergency generators, fire pumps, and process boilers).
  - Fugitive dust emissions associated with on-road mobile vehicle travel along roadways.
  - Evaporative VOC emissions from architectural coating activities, consumer products, parking lot degreasers, and fertilizers/pesticides.
  - Indirect GHG emissions from electricity and water consumption and direct GHG emissions from natural gas consumption.
  - Fugitive GHG emissions from decomposition of landfilled solid waste and avoided indirect GHG emissions from combusted biogas used for cogeneration.
  - Fugitive GHG emissions from refrigerants used in air conditioning and refrigeration equipment.

- Calculates changes in carbon and GHG emissions from the following vegetation changes:
  - Soil and aboveground and belowground biomass. Information in soil is obtained from the following web site, https://casoilresource.lawr.ucdavis.edu/gmap/
  - New tree plantings and/or removals. The GHG emission/sequestration and associated social cost is estimated using the tool available at the following web site, https://planting.itreetools.org/#
- Identifies measures to address the environmental and health burdens of the project site based on the project scale and land use type(s). EPA's EJScreen combines demographic factors with a single environmental factor to provide an index in comparison with State and nation.
- Quantifies and scores the vulnerability of a project to projected climate change across eight hazards. In addition, EPA's EJScreen also identifies climate risk.
- Identifies priority climate hazards of most concern to a project and location.
- Identifies climate risk reduction measures applicable to a project based on the project scale, land use type(s), and location.

A.3.10.2 Modeling Results

Emissions Summary

Results of emission during various phases of operation are included in the attachment 1. Emission of various pollutants are below their respective threshold.

GHG (CO2e) Emission and Associated Social Cost

Results of GHG emission from the modeling is included in the Attachment 4. Associated daily social cost is summarized the following Table.

Table A-2: Social Cost of GHG

Year	GHG (CO2e)	Social Cost
	lb/day	$/day
2023	268	$6.24
2024	322	$7.50
2025	219	$5.10
2026	855	$19.92

Social Cost at $0.0233/lb
Social Cost taken from, https://planting.itreetools.org/#

Measures for Health and Equity

Equitable development is driven by priorities and values, as well as clear expectations that the outcomes from development need to be responsive to underserved populations and vulnerable groups, in addition to using innovative design strategies and sustainable policies. Acknowledging and understanding both is necessary for sustaining environmental justice. EJ Indices for diesel particulate matter and air toxics

respiratory are high, considering high air and road traffic from visitors in the area. The model provides the following measures for health and equity.

- Local Labor and Apprenticeships (Construction)
- Local Labor and Apprenticeships (Operations)
- Contract with Diverse Suppliers
- Use of Locally/Regionally Manufactured Products and Materials
- Create a Construction Plan with Community Input
- Increase Urban Tree Canopy and Green Spaces
- Adapt and Re-use Vacant Lots for Green Infrastructure

Measures for Climate Risk

EJScreen provides information on potential impact from climate change. The project is not in 100-yr floodplain. Risk from drought, coastal flood, seal level rise, and wildfire are minimal. The model provides the following measures for climate risk.

- Integrate Climate Change Considerations into Public Safety and Emergency Planning
- Decentralize and Localize Energy Production and Storage
- Strengthen Energy Infrastructure
- Address Energy/Water Efficiency Funding Barriers
- Use Climate-Resilient Design for Infrastructure
- Transition to Climate-Smart Energy
- Develop Climate Hazard Notification System
- Use Green Infrastructure for Stormwater Management
- Incorporate Runoff Projections in Hydrologic Designs

APPENDIX B

Natural Resources Assessment

David, Reginald E., et al.

AECOS, Inc.

May 2022

&

Section 7, ESA Correspondence

AECOS No. 1713

A natural resources assessment for the USGS replacement building Hilo, Island of Hawai‘i

AECOS Inc.
45-939 Kamehameha Highway
Suite 104
Kāne‘ohe, Hawai‘i 96744

May 31, 2022

A natural resources assessment for the USGS replacement building Hilo, Island of Hawai‘i

May 31, 2022 *AECOS* No. 1713

Reginald E. David, David Miranda, and Eric Guinther
AECOS Inc.
45-939 Kamehameha Highway Suite 104
Kāne‘ohe, Hawai‘i 96744
Phone: (808) 234-7770 Fax: (808) 234-7775 Email: guinther@aecos.com

Introduction

The U.S. Geological Survey (USGS) is proposing to build a new facility (the "Project") to support the Hawaii Volcano Observatory (HVO) and the Pacific Island Ecosystem Research Center (PIERC) on land *mauka* of the University of Hawai‘i, Hilo (UH – Hilo) campus. Seismic activity from the 2018 eruption and summit collapse of Kīlauea volcano was primarily centered near the Halema'uma'u crater and significantly damaged buildings in the immediate vicinity on Uēkahuna Bluff including the USGS HVO facility . As a consequence, HVO had to abandon its main building. Since the eruption, staff have been using temporary facilities in Hilo for office, lab, and warehouse functions. The existing PIERC facilities are located in the Hawaii Volcanoes National Park and were not affected by the eruption; however, PIERC has long sought to relocate into Hilo, prompting the USGS to propose a consolidated HVO-PIERC science hub at UH – Hilo. The Project will provide replacement facilities for HVO and PIERC, support approximately 103 staff and volunteers, and include office spaces, conference rooms, laboratories, warehouse/storage, and an operations and monitoring center.

AECOS Inc. was contracted by HHF Planners to conduct terrestrial natural resources surveys of the approximately 13-ac site on TMK-(3) 2-4-001:122 (por) (Figure 1) [1].

[1] This report is intended to become part of the public record and incorporated into an EA for the subject project.

Figure 1. USGS Research Facility Project location (red dot) on land west of the main UH - Hilo campus.

Figure 2. USGS Research Facility natural resources survey area outlined in red.

Site Description

The Project site is bound on the south by Nowelo Street and on the east by Komohana Street (Figure 2, above). Currently the site is covered by secondary open forest typical of this part of the Island of Hawaiʻi. A small cleared area with a number of shipping containers presumably used for storage is present in the southwest corner (cover photo). Trails lead from the clearing in towards the northern boundary of the property. Other trails lead northeast towards the Komohana Street side. The trails are both animal trails and of human construct, used by hunters or by transient persons. Several are flagged, suggesting regular use.

Methods

Botanical Survey

AECOS botanist David Miranda surveyed the Project site on March 23, 2022. Plant species were identified as they were encountered during wandering transects that covered the subject parcel. Species names follow *Manual of the Flowering Plants of Hawaiʻi* (Wagner, Herbst, & Sohmer, 1990; Wagner & Herbst, 1999) for native and naturalized flowering plants, *Hawaiʻi's Ferns and Fern Allies* (Palmer, 2003) for ferns, and *A Tropical Garden Flora* (Staples & Herbst, 2005) for ornamental plants. More recent name changes for naturalized plant species follow Imada (2019).

Terrestrial Vertebrates Survey

Avian Survey

A bird survey was conducted by Reginald David in the morning hours of March 23, 2022. Birds were identified by visual observations aided by Leica 8 X 42 binoculars, and by listening for vocalizations. Avian species abundance was estimated at 4 count-stations distributed more or less evenly across the Project site. A single eight-minute avian point-count was made at each of the count-stations. Weather conditions were ideal, with unlimited visibility, no precipitation, and winds between 1 and 5 kilometers per hour. The avian phylogenetic order and nomenclature used in this report follows the AOU Check-List of North and Middle American Birds 2021 (Chesser et al., 2021).

Results

Vegetation

The site is mostly covered with secondary forest typical of this part of Hilo. Char (2003) recognized three vegetation types in the UH Hilo University Park of Science and Technology area: ʻōhiʻa / uluhe forest, strawberry guava thickets, and ruderal vegetation. All three are represented in the Project survey area. Ruderal vegetation is found in a small, cleared area with a number of shipping containers presumably used for storage (cover photo). In this area, the ground surface is soggy having poor drainage and is predominately covered by grasses (Glenwood Lyons, and broomsedge), sedges, two species of *Crotalaria*, and woody shrubs (*Pluchea carolinensis*, *Hyptis pectinata*, seedlings of *Melochia umbellata* and *Trema orientalis*). The verges of the roads bordering the site on two sides also support a ruderal (weedy wayside) vegetation. The majority of the property is a mixture of guava thickets and more open areas dominated by *uluhe* fern with scattered trees.

Flora

A listing of plants recorded during the March 22 survey is presented as Table 1 and shows 56 species observed by the survey as occurring on the Project site. Of these, 6 (11%) are native species (3 indigenous; 3 endemics). The native plant species are: four ferns: *uluhe* (*Dicranopteris linearis*), *palaʻā* (*Spenomeris chinensis*), *niʻaniʻau* (*Nephrolepis exaltata hawaiiensis*), and *pākahakaha* (*Lepisorus thunbergianus*); and two eudicot trees: *nenelau* (*Rhus sandwicensis*) and *ōhiʻa lehua* (*Metrosideros polymorpha*). All are common species in the Hilo area as well as, for the most part, the Project site.

Table 1. Plant species observed at the USGS Project site in Hilo.

Species listed by family	Common name	Status	Abundance	Notes
FERNS AND FERN ALLIES				
BLECHNACEAE				
Blechnum appendiculatum Wild.	---	Nat	C	
GLEICHENIACEAE				
Dicranopteris linearis (Burm. f.) Underw.	*uluhe*	**Ind**	AA	
LINDSAEACEAE				
Sphenomeris chinensis (L.) Maxon	*palaʻā*	**Ind**	C	

Table 1 (Continued).

Species listed by family	Common name	Status	Abundance	Notes
NEPHROLEPIDACEAE				
Nephrolepis exaltata hawaiiensis W.H. Wagner	*niʻaniʻau*	**End**	C	
Nephrolepis multiflora (Roxb.) F.M. Jarrett ex C.V. Morton	---	Nat	C	
POLYPODIACEAE				
Lepisorius thunbergianus (Kaulf.) Ching	*pākahakaha*	**Ind**	R	
PTERIDACEAE				
Pityrogramma austroamericana Domin	goldback fern	Nat	O	
SCHIZAEACEAE				
Lygodium japonicum (Thunb.) Sw.	Japanese climbing fern	Nat	C	
FLOWERING PLANTS – MAGNOLIIDS				
LAURACEAE				
Persea americana Mill.	alligator pear, avocado	Nat	O	
FLOWERING PLANTS				
MONOCOTS				
ARECACEAE				
Archontophoenix alexandrae H.A. Wndl. & Drude	king palm	Nat	C	
CYPERACEAE				
Rhynchospora caduca Elliot	angelstem beakrush	Nat	C	
ORCHIDACEAE				
Spathoglottis plicata Bkume	Philippine ground orchid	Nat	O	
POACEAE				
Andropogon virginicus L.	broomsedge	Nat	A	
Axonopus fissifolius (Raddi) Kuhlm.	nrw-lvd carpet grass	Nat	O	
Megathyrsus maximus (Jacq.) B.K. Simon & W.L. Jacobs	Guinea grass	Nat	Oc	
Melinus minutiflora P. Beauv.	molasses grass	Nat	Oc	
Melinus repens (Willd.) Zizka	Natal redtop	Nat	Oc	
Paspalum urvillei Steud.	Vasey grass	Nat	O	
Sacciolepis indica (L.) Chase	Glenwood grass	Nat	O	
Themeda villosa (Poir.) A. Camus	Lyon grass	Nat	Oc	

Table 1 (Continued).

Species listed by family	Common name	Status	Abundance	Notes
FLOWERING PLANTS				
EUDICOTS				
AMARANTHACEAE				
Amaranthus sessilis (L.) DC.	sessile joyweed	Nat	Oc	
ANACARDIACEAE				
Mangifera indica L.	mango, *manakō*	Nat	O	
Rhus sandwicensis A. Gray	*neneleau*	**End**	O	
ARALIACEAE				
Schefflera actnophylla (Endl.) Harms	octopus tree	Nat	C	
ASTERACEAE (COMPOSITAE)				
Bidens alba (L.) DC.	---	Nat	R	
Pluchea carolinensis (Jacq.) G. Don	sourbush	Nat	O	
Sphagneticola trilobata (L.) Pruski	wedelia	Nat	C	
Tridax procumbens L.	coat buttons	Nat	O	
BIGNONIACEAE				
Spathodea companulata P. Beauv.	African tulip tree	Nat	C	
CAMPANULACEAE				
Hippobroma longiflora (L.) G. Don	star of Bethlehem	Nat	C	
CECROPIACEAE				
Cecropia obtusifolia Bertol.	guarumo	Nat	O	
CLUSIACEAE				
Clusia rosea Jacq.	autograph tree	Nat	C	
EUPHORBIACEAE				
Euphorbia hirta L.	garden spurge	Nat	U	
Macaranga mappa (L.) Müll. Arg.	bingabing	Nat	O	
FABACEAE				
Chamaecrista nictitans (L.) Moench	partridge pea	Nat	C	
Crotolaria micans		Nat	A	
Crotalaria pallida		Nat	C	
Mimosa pudica L.	sensitive plant	Nat	C	
Paraserianthus falcateria (L.) I. Nielson	albizia	Nat	O	
Trifolium pratense L.	red clover	Nat	C	
LAMIACEAE				
Hyptis pectinata (L.) Poit.	comb hyptis	Nat	C	
MELASTOMATACEAE				
Clidemia hirta (L.) D. Don	Koster's curse	Nat	C	
Melastoma candidum D. Don	---	Nat	A	
MYRSINACEAE				
Ardesia crenata. Sims	Hilo holly	Nat	R	

Table 1 (Continued).

Species listed by family	Common name	Status	Abundance	Notes
MYRSINACEAE (cont.)				
Ardesia elliptica Thunb.	shoebutton ardesia	Nat	O	
MYRTACEAE				
Eucalyptus sp.	---	Nat	R	
Metrosideros polymorpha Gaud.	*ʻōhiʻa lehua*	**End**	O	
Psidium cattleianum Sabine	strawberry guava	Nat	AA	
Rhodomyrtus tomentosa (Aiton) Haask.	rose myrtle	Nat	C	
POLYGALACEAE				
Polygala paniculata L.	bubblegum plant	Nat	C	
ROSACEAE				
Rubus rosifolius Sm.	thimbleberry	Nat	O	
SCROPHULARIACEAE				
Castilleja arvensis Cham. & Sclechtend	Indian paintbrush	Nat	O	
STERCILIACEAE				
Melochia umbellata (Hout.) Stapf.	melochia	Nat	C	
ULMACEAE				
Trema orientalis (L.) Blume	gunpowder tree	Nat	C	
VERBENACEAE				
Citharexylum caudatum L.	fiddlewood	Nat	A	
Stachytarpheta dichotoma (Ruiz & Pav.) Vahl.	*ōwī*	Nat	U	

Legend to Table 1

STATUS = distributional status for the Hawaiian Islands:

End = endemic; uniquely native to the Hawaiian Islands.
Ind = indigenous; native to Hawaiʻi, but a native in other places as well.
Nat = naturalized, exotic, plant introduced to the Hawaiian Islands since the arrival of Cook Expedition in 1778, and well-established outside of cultivation.
Orn = A cultivated plant; a species not thought to be naturalized (spreading on its own) in Hawaiʻi.
Pol = An early Polynesian introduction; introduced before 1778.

ABUNDANCE = occurrence ratings for plant species:

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 - Very abundant abundant and dominant; defining vegetation type.

Lower case letters (o, c, a) following qualitative rating of abundance indicate a localized abundance greater than occurrence rating. For example, Oc would be a plant encountered fairly regularly and common within a local area.

Larger trees species are scattered across the site. Most notable are the ʻō*hiʻa* (*Metrosideros polymorpha*), Alexander palm (*Archontophoenix alexandrae*), Melochia, gunpowder (*Trema orientalis*), autograph (*Clusia rosea*), African tulip (*Spathodea companulata*), mango (*Mangifera indica*), and strawberry guava (*Psidium cattleianum*). The strawberry guava is the only species growing in thickets. The *ʻōhiʻa lehua* are scattered over the site and many are dead or dying. Symptomatically, these ʻō*hiʻa* appear to be afflicted with Rapid Ohia Death (ROD) fungus. *Uluhe* fern (*Dicranopteris linearis*) covers large open areas around the taller vegetation. All of the stand-alone trees are encroached upon by *uluhe* fern growing close up against the trunk of most of the larger trees and in places reaches up over 3 ft in height. In a few instances, the fern has managed to climb high into the trees. Broomsedge grass, *Clidemia hirta* and a few other shrubs grow within the *uluhe* tangle and add to the encroachment on the tree species.

The *uluhe* does not penetrate the strawberry guava thickets. Within these thickets, the understory is diminished or absent or is a prolific bryophyte (mosses and liverworts) assemblage. Several smaller ferns are found as understory in the strawberry guava thickets. These include *Blechnum appendiculatum*, *Sphenomeris chinensis* (*pala'a*), Nephrolepis spp., and *Lygodium japonicum* (Japanese climbing fern). Feral pig activity is evident and the rooting quite thorough so that areas of exposed soil and disturbed rocks are prominant.

Much of the observed plant diversity is associated with disturbed areas, such as the cleared area where shipping containers are placed and along the maintained roadway verges. The ground thus exposed supports both grasses and woody weed species. A vertical wall of tree growth; predominantly strawberry guava appears at the limiting edge of maintenance mowing activity. Present here, mixed into the tall strawberry guava are occasional trees: avocado, melochia, , mango, octopus, African tulip, and Alexander palm.

An old dump site was found comprising mostly bottles and parts of old cars (noted by Char, 2003) and seems to indicate that the Project area saw much human activity in the past.

Avian Fauna

A total of 88 individual birds of 12 species, representing 9 separate families, were recorded during station counts (Table 2). One of the species detected—Pacific Golden-Plover (*Pluvialis fulva*) or *kōlea*—is an indigenous migratory shorebird species. The remaining 11 species recorded are alien to the Hawaiian Islands.

Avian diversity and densities were in keeping with the location and vegetation on the site. Three species—Warbling White-eye (*Zosterops japonicus*), Northern

Table 2. Avian species detected on the USGS site, Hilo
March 2022

Common Name	Species	Status	RA
	PHASIANIDAE - Pheasants & Partridges		
	Phasianinae - Pheasants & Allies		
Feral Chicken	*Gallus gallus*	A	0.75
	COLUMBIFORMES		
	COLUMBIDAE - Pigeons & Doves		
Spotted Dove	*Streptopelia chinensis*	A	1.00
Zebra Dove	*Geopelia striata*	A	1.75
	CHARADRIIFORMES		
	CHARADRIIDAE - Lapwings & Plovers		
	Charadriinae - Plovers		
Pacific Golden-Plover	*Pluvialis fulva*	**IM**	0.50
	PASSERIFORMES		
	ZOSTEROPIDAE - White-eyes		
Warbling White-eye	*Zosterops japonicus*	A	5.50
	LEIOTHRICHIDAE - Babblers		
Chinese Hwamei	*Garrulax canorus*	A	2.00
	STURNIDAE - Starlings		
Common Myna	*Acridotheres tristis*	A	1.00
	ESTRILDIDAE - Estrildid Finches		
Scaly-breasted Munia	*Lonchura punctulata*	A	1.00
Common Waxbill	*Estrilda astrild*	A	1.25
	FRINGILLIDAE - Fringilline and Carduline Finches & Allies		
	Carduelinae - Carduline Finches and Hawaiian Honeycreepers		
House Finch	*Haemorhous mexicanus*	A	2.00
Yellow-fronted Canary	*Ceithagra mozambica*	A	1.25
	CARDINALIDAE - Cardinals & Allies		
Northern Cardinal	*Cardinalis cardinalis*	A	2.75

Key to Table2.

Status:
A = Naturalized, non-native species (introduced).
IM = Indigenous, migratory species.
RA: Relative Abundance ~ Species count / number of point-count stations (n=4).

Cardinal (*Cardinalis cardinalis*) and House Finch (*Haemorhous mexicanus*)—accounted for 47% of all birds recorded during station counts. The most frequently recorded species was Warbling White-eye, accounting for 25% of the total number of individual birds recorded.

Mammals

Three terrestrial mammalian species were detected during this survey. We saw several small Asian mongoose (*Herpestes javanicus*) within the area. Domestic dog (*Canis lupus familiaris*) was heard barking from locations outside of the survey area. Considerable pig (*Sus scrofa*) sign (trails and scat) was encountered across the site.

Discussion and Recommendations

Recommendations are partly based on U.S. Fish and Wildlife Service, Animal Avoidance and Minimization Measures (USFWS-PIFWO, nd). Implementation of the recommendations (provided below as bulleted items) by the Project contractor will minimize impacts to listed species to the maximum extent practicable.

Floral Resources

No plants listed by either state or federal statute as threatened or endangered were found on the Project parcel (HDLNR, 1998; USFWS, nd-a). Native plant species are present, but none is considered especially rare in the Hilo area. Due to human and wild animal activity, the site is unremarkable and dominated by common, naturalized plant species. We agree with recommendation expressed by Char (2003) as follows for development of parcels in the Research Park:

- "Hawaiʻi [s]tate law, Act 71, mandates that any new or renovated landscapes for any building, housing, or other facility developed with [s]tate funds incorporate native Hawaiian plants wherever and whenever feasible. It is recommended that wherever possible the existing ʻōhiʻa trees [and, we might add, *neneleau*] be incorporated into the landscaping plan; some of the smaller trees can be transplanted."

If the *ʻōhiʻa* in this location are found to be infected with the ROD, their disposition might be different from than that recommended above for obvious reasons.

Avian Resources

Only one of the species detected in our survey is a native species: Pacific Golden-Plover. This bird is an indigenous migratory shorebird species that nests in the high Arctic during the late spring and summer months, returning to Hawaiʻi and the tropical Pacific to spend the fall and winter months of each year. The birds usually leave Hawaiʻi and return to the Arctic in late April or the very early part of May. Pacific Golden-Plover is a commonly countered shorebird throughout the Hawaiian Islands during late summer through mid-spring months.

Seabirds

It is possible that the endangered Hawaiian Petrel (*Puffinus sandwichesis*), Band-rumped Storm-Petrel (*Hydrobates castro*), and the threatened Newell's Shearwater (*Puffinus newelli*) over-fly the Project area between April and the middle of December each year in small numbers. The primary cause of mortality in Hawaiian Petrels and Newell's Shearwaters in Hawaiʻi is thought to be predation by alien mammalian species at the nesting colonies (USFWS, 1983; Simons and Hodges, 1998; Ainley et al., 2001). Collision with man-made structures is considered the second most significant cause of mortality of these seabird species in Hawaiʻi. Nocturnally flying seabirds, especially fledglings on their way to sea in the summer and fall, can become disoriented by exterior lighting. Disoriented seabirds may collide with man-made structures and, if not killed outright, become easy targets of opportunity for feral mammals (Hadley, 1961; Telfer, 1979; Sincock, 1981; Reed et al., 1985; Telfer et al., 1987; Cooper and Day, 1998; Podolsky et al., 1998; Ainley et al., 2001; Hue et al., 2001; Day et al., 2003). No suitable nesting habitat exists within or close to the Project area for any of the three seabird species discussed here.

The principal potential impact that the construction of the proposed project poses to protected seabirds is the increased threat that birds will be downed after becoming disoriented by lights associated with the project during the nesting season. The two ways outdoor lighting can pose a threat to nocturnally flying seabirds is if: 1) during construction it is deemed expedient or necessary to conduct night-time construction activities; or, 2) following build-out, security lighting is operated during the seabird nesting season.

- If night-time construction activity or equipment maintenance is proposed during the construction phases of the project, all associated lights should be shielded, and when large flood/work lights are used, they should be placed on poles that are high enough to allow the lights to be pointed directly at the ground (Reed et al., 1985; Teller et al., 1987). Deleterious impacts to transiting seabirds can be avoided if construction

occurs during daylight hours and all outdoor lighting installed is fully "dark sky compliant" (HDLNR-DOFAW, 2016). DLNR recommends avoiding construction-related night-time lighting between September 15 and December 15 (DLNR, 2016).

Hawaiian Hawk

No Hawaiian Hawk (*Buteo solitarius*) was recorded during our survey. This state listed species is regularly seen in the greater Hilo area (David, 2022). Several large trees occur on the property that might be used by nesting Hawaiian Hawk, although these lack the open edge effect preferred by this species for nesting sites.

- Prior to the initiation of clearing and grubbing a qualified biologist should conduct a Hawaiian Hawk nesting survey to ensure that no active nest is disturbed during removal of trees.

Pueo

The Hawaiian endemic sub-species of Short-eared Owl (*pueo* or *Asio flammeus sandwichensis*) inhabits forests and grasslands, but nests on the ground in grasslands. Although *pueo* might forage in the area, the site does not have suitable nesting habitat. No *pueo* were observed in our survey. This bird is stat-listed on Oʻahu only.

Mammalian Resources

The findings of the mammalian survey are consistent with the location of the property and habitats present on that property. Although no rodents were recorded it is likely that some of the four established Muridae found on Hawaiʻi Island—roof rat (*Rattus rattus*), brown rat (*Rattus norvegicus*), Polynesian rat (*Rattus exulans hawaiiensis*), and European house mouse (*Mus musculus domesticus*)—use resources found within the general Project area on a seasonal basis. All these introduced rodents are deleterious to native ecosystems and native faunal species.

No mammalian species currently protected or proposed for protection under either the federal or State of Hawaiʻi endangered species programs were detected during this survey (DLNR, 2015; USFWS, nd-a).

Hawaiian hoary bat

It is probable that the Hawaiian hoary bat overflies the Project area on a seasonal basis as they are regularly recorded in the greater Hilo area (David, 2022). The removal of vegetation within the project area could temporarily displace individual bats using trees for roosting. As bats use multiple roosts within their home territories, the potential disturbance resulting from the removal of the vegetation is likely to be minimal. However, during the pupping season, females carrying their pups may be less able to vacate a roost site as the tree is felled. Further, adult female bats sometimes leave their pups in the roost tree while they forage. Very small pups may be unable to flee a tree that is being felled.

- Potential adverse impacts from such disturbance can be avoided or minimized by not clearing woody vegetation taller than 4.6 m (15 ft) between June 1 and September 15, the period in which bats may have pups.

Other Resources of Potential Concern

Critical Habitat

No federally delineated Critical Habitat for any species occurs within the Project area (USFWS, nd-b). There is no equivalent designation under State of Hawaiʻi endangered species statutes.

References Cited

Ainley, D. G, R. Podolsky, L. Deforest, G. Spencer, and N. Nur. 2001. The Status and Population Trends of the Newell's Shearwater on Kaua'i: Insights from Modeling, in: Scott, J. M, S. Conant, and C. Van Riper III (editors) *Evolution, Ecology, Conservation, and Management of Hawaiian Birds: A Vanishing Avifauna. Studies in Avian Biology No. 22*. Cooper's Ornithological Society, Allen Press, Lawrence, Kansas. Pp. 108-123.

Char, W. 2003. Botanical survey, UH Hilo Mauka Lands Master Plan, South Hilo District, Hawaiʻi. Prep. for PBR Hawaii. 11 pp.

Chesser, R. T., S. M. Billerman, K. J. Burns, C. Cicero, J. L. Dunn, B.E. Hernández-Baños, A. W. Kratter, I. J. Lovette, N. A. Mason, P. C. Rassmusen, J. V. Remsen Jr., D. F. Stotz, and K. Winker. 2021. Check-list of North American Birds. American Ornithological Society. Available online at URL: http://checklist.aou.org/taxa; last retrieved May 20, 2022.

Cooper, B. A., and R. H. Day. 1998. Summer Behavior and Mortality of Dark-rumped Petrels and Newells' Shearwaters at Power Lines on Kauai. Colonial Waterbirds, 21 (1): 11-19.

David, R. E. 2022. Unpublished field notes – Hawaiʻi 1980 - 2022.

Day, R. H., B. Cooper, and T. C. Telfer. 2003. Decline of Townsend's (Newell's Shearwaters (*Puffinus auricularis newelli*) on Kauai, Hawaii. *The Auk,* 120: 669-679.

Hadley, T. H. 1961. Shearwater calamity on Kauai. ʻ*Elepaio*, 21: 60.

Hawaii 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 §13-134-1 through §13-134-10, 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 27, 2015. 16 pp.

Hawaiʻi Department of Land and Natural Resources-Division of Forestry and Wildlife (HDLNR-DOFAW). 2016. Wildlife Lighting. PDF available at URL: http://dlnr.hawaii.gov/wildlife/files/2016/03/DOC439.pdf; last retrieved February 21, 2020.

Hue, D., C. Glidden, J. Lippert, L. Schnell, J. MacIvor, and J. Meisler. 2001. Habitat Use and Limiting Factors in a Population of Hawaiian Dark-rumped Petrels on Mauna Loa, Hawaiʻi. *In:* : Scott, J. M, S. Conant, and C. Van Riper III (eds), Evolution, Ecology, Conservation, and Management of Hawaiian Birds: A Vanishing Avifauna. Studies in Avian Biology No. 22. *Cooper's Ornithological Society*, Allen Press, Lawrence, Kansas (Pg. 234-242).

Imada, C. T. 2019. Hawaiian Naturalized Vascular Plants Checklist (February 2019 update). *Bishop Museum Tech. Rept. 69*. 209 pp.

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

Podolsky, R., D. G. Ainley, G. Spencer, L. de Forest, and N. Nur. 1998. Mortality of Newell's Shearwaters Caused by Collisions with Urban Structures on Kauaʻi. *Colonial Waterbirds*, 21: 20-34.

Reed, J. R., J. L Sincock, and J. P. Hailman 1985. Light Attraction in Endangered Procellariform Birds: Reduction by Shielding Upward Radiation. *The Auk*, 102: 377-383.

Simons, T. R., and C. N. Hodges. 1998. Dark-rumped Petrel (*Pterodroma phaeopygia*). *In:* A. Poole and F. Gill (eds). The Birds of North America, No. 345. The Academy of Natural Sciences, Philadelphia, PA. and the American Ornithologists Union, Washington, D.C.

Sincock, J. L. 1981. Saving the Newellʻs Shearwater. Pp 76-78 in: Proceedings of the Hawaii Forestry and Wildllife Conference, 2-4 October 1980. Department of Land and Natural Resources, State of Hawaii, Honolulu.

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.

Telfer, T. C. 1979. Successful Newell's Shearwater Salvage on Kauai. ʻElepaio 39:71

_____, J. L. Sincock, G. V. Byrd, and J. R. Reed. 1987. Attraction of Hawaiian seabirds to lights: Conservation efforts and effects of moon phase. *Wildlife Society Bulletin*, 15: 406-413.

U.S. Fish & Wildlife Service (USFWS). 1983. Hawaiian Dark-Rumped Petrel & Newell's Manx Shearwater Recovery Plan. USFWS, Portland, Oregon. February 1983.

_____. Undated (nd-a). USFWS Endangered Species. Available online at URL: https://www.fws.gov/endangered/; Last visited on September 4, 2019 and Environmental Conservation Online System (ECOS), online at URL: https://ecos.fws.gov/ecp/species-reports; last retrieved October 30, 2020.

_____. Undated website (nd-b). Critical Habitat Portal. Available online at URL: https://ecos.fws.gov/ecp/report/table/critical-habitat.html; last retrieved April 21, 2021.

U.S. Fish & Wildlife Service-Pacific Islands Fish and Wildlife Office (USFWS-PIFWO). Undated (nd). Avoidance and Minimization Measures. Available online at URL: https://www.fws.gov/pacificislands/articles.cfm?id=149489720; last retrieved July 31, 2020.

Wagner, W. L., D. R. Herbst, and S. H. Sohmer. 1990. *Manual of the Flowering Plants of Hawaiʻi: Volume 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.

Wilson, D. E., and D. M. Reeder (editors), 2005. *Mammal species of the world: a taxonomic and geographic reference.* 3rd edition. 2 vols. John Hopkins University Press. Baltimore, Maryland. 2142 pp.

United States Department of the Interior

U. S. GEOLOGICAL SURVEY
Box 25046 M.S. 205
Denver Federal Center
Denver, Colorado 80225

Date Feb 10, 2023

Dr. Earl Campbell

Field Supervisor

Department of the Interior

U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Box 50088
Honolulu, Hawaii 96850-5000

Dear Dr. Campbell,

Subject: Request for Section 7, Endangered Species Act Technical Assistance for the proposed U.S. Geological Survey (USGS) Hilo Research Facility

The USGS Hilo Research Facility is proposed to support the Hawaiian Volcano Observatory (HVO) and the Pacific Island Ecosystem Research Center (PIERC). Seismic activity from the 2018 eruption and summit collapse of Kīlauea volcano was primarily centered near the Halema'uma'u crater and significantly damaged buildings in the immediate vicinity on Uēkahuna Bluff including the USGS HVO facility . As a consequence, HVO had to abandon its main building. Since the eruption, staff have been using temporary facilities in Hilo for office, lab, and warehouse functions. The existing PIERC facilities are located in the Hawaii Volcanoes National Park and were not affected by the eruption; however, PIERC has long sought to relocate into Hilo, prompting the USGS to propose a consolidated HVO-PIERC science hub near the University of Hawaii - Hilo. The Project will provide replacement facilities for HVO and PIERC, support approximately 103 staff and volunteers, and include office spaces, conference rooms, laboratories, warehouse/storage, and an operations and monitoring center.

The surveyed site is approximately 13-acres and is identified as TMK-(3) 2-4-001:122 (por). The site is located in Hilo, Hawaiʻi (Figure 1). The study site is bound to the south by Nowelo Street and to the east by Komohana Street (Figure 2). The site is immediately north of the existing USDA - U.S. Pacific Basin

Agricultural Research Center. Currently the site is mostly covered with secondary growth typical of this area in Hilo. There is a small, cleared area that has a number of shipping containers on it which are used for storage.

The ground surface is soggy with poor drainage and is predominately weedy grasses (glenwood, Lyons, Andropogon); sedges (Cyperus species), several species of Desmodium, and a variety of woody shrubs (Pluchea, Hyptus, seedling Melochia and Trema).

Various trails proceed from the container yard clearing (shown in the southwestern corner of the site) inward toward the northern boundary of the property. Other trails proceed toward the northeastern or Komohana Street boundary. The trails are primarily animal trails but there are more than a few trails that are of human origin. Several are flagged indicating deliberate passage across the terrain. Other trails might be used by hunters or by transient persons.

USGS Research Facility
Hilo, Hawai'i

USGS Research Facility natural resources survey area outlined in red.

Results of the Biological Surveys

A flora, and fauna survey was conducted by an AECOS biologist on March 23, 2022 (David, R.E., et al). No species currently listed under either federal or State of Hawai‘i endangered species statutes were recorded on the site.

Citations.

David, R.E., D. Miranda, and E. Guinther. 2022. A natural resources assessment for the USGS replacement building, Hilo, Hawaii. Prepared for HHF Planners and the USGS.

Sincerely

Jordan Sizemore

Jordan D. Sizemore
Environmental Protection Specialist
U.S. Geological Survey
jsizemore@usgs.gov

APPENDIX C

Revised Draft

Archaeological Literature Review and Field Inspection

Monahan, Christopher M. Ph.D., et al.

Honua Consulting, September 2022

&

Section 106 consultation correspondence

REVISED DRAFT

Archaeological Literature Review and Field Inspection of 13-Acres in Support of USGS Hilo Facility New Construction, Waiākea Ahupuaʻa, South Hilo District, Hawaiʻi Island TMK: [3] 2-4-001:122 (portion)

A portion of the north side of SIHP #50-10-35-24243 (military building foundation); view south

Prepared for
HHF Planners (Planner)
United States Geological Survey (Lead Agency)

Prepared by
Christopher M. Monahan, Ph.D.,
Frederick LaChance, B.A., and
Trisha K. Watson, Ph.D.

HONUA CONSULTING
Honolulu, Hawaiʻi
September 2022

Management Summary

This report has been completed for HHF Planners and the U.S. Geological Survey (USGS) (lead agency) in support of the construction of a new approximately facility for the USGS Hawai‘i Volcano Observatory (HVO) and Pacific Island Ecosystem Research Center (PIERC) on land owned by the State of Hawai‘i (granted to the University of Hawai‘i by Executive Order No. 3814 dated April 11, 2000) in Waiākea Ahupua‘a, South Hilo District, Island of Hawai‘i, Hawai‘i. The project area is a 13-acre portion of (TMK [3] 2-4-001:122). This project is reviewable under Section 106 of the National Historic Preservation Act (NHPA). The Section 106 process in ongoing at this time. The Area of Potential Effects (APE), or project area, is near the north corner of the intersection of Komohana Street and Nowelo Road next to the University of Hawai‘i at Hilo campus, directly across Nowelo Road from the U.S. Department of Agriculture’s Daniel K. Inouye U.S. Pacific Basin Agricultural Research Center (PBARC). The project area is just southwest of the town of Hilo and about 1.5 miles southwest of Hilo Bay. The proposed undertaking is the construction of a new HVO-PIERC Replacement Facility, which will be approximately 60,000 SF in size, and will include office spaces, conference rooms, laboratories, warehouse and storage, and an operations/monitoring center.

The objectives of this study were: (1) documentation and description of the parcel’s land-use history in the context of both its traditional Hawaiian character as well as its historic-period changes; (2) identification of any historic properties or component features in the project area; and (3) providing information relevant to the likelihood of encountering historically-significant cultural deposits in subsurface context during future construction. This report may be used to support the project proponent’s consultation with the SHPD in compliance with Section 106 of the NHPA, and other environmental requirements (e.g., NEPA [National Environmental Policy Act]).

Archival research and fieldwork demonstrate several relevant findings: (1) the project area has been subject to both an archaeological inventory survey (AIS) and data recovery (DR) in 2004 and 2006, respectively, which completed the historic preservation process for the identified sites; (2) much of the project area has been previously modified by historic-period activities (sugar cane and dairy workers) as well as the military for training purposes during World War II; (3) the eastern half of the project area included five previously documented (by Escott 2004, 2006) historic properties: State Inventory of Historic Places [SIHP] #s 50-10-35-24243, -24244, -24245, -24247 and -2428; all of these sites were inspected, except for SIHP #24245, a set of three iron fence posts attributed by Escott (2004) to ranching or dairy workers; inspected sites showed little to no change in condition since their original documentation, except for some damage from overgrown vegetation; (4) no new or additional historic properties, or potential historic properties, were identified during the pedestrian survey conducted for this report.

Based on all available evidence, our recommendations are as follows: (1) we believe that the historic preservation process for the known historic properties in the project area has been completed (see SHPD letters dated 2004 and 2006 in Appendix A); however, we recommend that SHPD needs to make this final determination; and (2) the SHPD-Archaeology Branch should be consulted on archaeological matters associated with proposed ground disturbance associated with the proposed development project given the potential for encountering subsurface finds.

Table of Contents

Management Summary i

Introduction 1

1.1 Project Background 1
1.2 Regulatory Context 2
1.2.1 SHPD Reviews of Archaeological Work including the Subject Parcel 2
1.2.2 Ongoing Section 106 Consultation 2
1.3 Environmental Setting 3
1.3.1 Natural Environment 3
1.3.2 Built Environment 3

Cultural and Historical Context 9

2.1 Hawaiian Cultural Landscape 9
2.2 Historic Period 11
2.2.1 Māhele and other Historic Land Ownership History 12
2.2.2 Commercial Sugarcane in and near the Project Area 13

Archaeological Context 21

3.1 Overview 21
3.2 Results of Previous Work in the Project Area 21
3.3 Results from Other Studies in the Vicinity of the Project Area 22

Results of Field Inspection 28

4.1 Methodology 28
4.2 Survey Results 28
4.2.1 Overview 28
4.2.2 SIHP # 50-10-35-24243 29
4.2.3 SIHP # 50-10-35-24244 29
4.2.4 SIHP # 50-10-35-24245 29
4.2.5 SIHP # 50-10-35-24247 29
4.2.6 SIHP # 50-10-35-24248 29

Conclusion 41

5.1 Recommendations 42

References Cited 44

Appendix A – SHPD Correspondence re the Subject Parcel A-1

Appendix B – Project Area Photographs B-1

List of Figures

Figure 1. Portion of U.S. Geological Survey (USGS) topographic map showing project area (base map source: USGS online at http://ngmdb.usgs.gov/ topoview) 4
Figure 2. Aerial photograph showing location of project area and main roads....5
Figure 3. Tax Map Key (TMK): [3] 2-4-001 (portion) showing project area (which is a portion of parcel 122) (base map source: Hawai‘i TMK Service n.d.) 6
Figure 4. Construction site plan in southwest quadrant of the image (provided by client) 7
Figure 5. Soil survey data for the project area and environs (soil data from Sato et al. 1973) 8
Figure 6. Portion of 1825 Malden map of Hilo Bay and environs; note, the current project area is located south-southwest of the bay (out of the frame in this view) 14
Figure 7. Portion of 1901 map (Registered Map 2060) showing project area location....15
Figure 8. Portion of 1922 Wall map showing project area location 16
Figure 9. Portion of 1928 Wall map showing project area location 17
Figure 10. Portion of 1945 geological and topographical map showing project area location 18
Figure 11. Portion of 1954 aerial image showing project area location 19
Figure 12. Portion of 1965 aerial image showing project area location 20
Figure 13. Previous historic-preservation studies near the project area....25
Figure 14. Previously identified archaeological sites in and near the project area....26
Figure 15. Aerial image showing pedestrian survey tracks walked in the project area by Honua archaeologists 30
Figure 16. Photo key (numbered photographs taken by Honua archaeologists) at previously-identified historic properties and other views of project area....31
Figure 17. Photo key (numbered photographs taken by Honua archaeologists) at previously-identified historic properties and other views of project area....32
Figure 18. Location of archaeological sites (historic properties) located in the project area....33
Figure 19. View of a portion of SIHP # 50-10-35-24243 34
Figure 20. View of a portion of SIHP # 50-10-35-24243 35
Figure 21. View of a portion of SIHP # 50-10-35-24243 36
Figure 22. View of a portion of SIHP # 50-10-35-24243 37
Figure 23. View of a portion of SIHP # 50-10-35-24244 38
Figure 24. View of a portion of SIHP # 50-10-35-24244 39
Figure 25. View of a portion of SIHP # 50-10-35-24247 40
Figure 26. Overlay of construction plans (southwest quadrant) and archaeological sites in project area (see text above for discussion)....43

List of Tables

Table 1. Previous Historic-Preservation Studies and Results near the Project Area....23
Table 2. Sites Identified in the Subject Parcel and Project Area by Escott (2004) 27

Introduction

1.1 Project Background

This report was completed for HHF Planners and the U.S. Geological Survey (USGS) (lead agency) in support of the construction of a new approximately facility for the USGS Hawaiʻi Volcano Observatory (HVO) and Pacific Island Ecosystem Research Center (PIERC) on land owned by the State of Hawaiʻi (granted to the University of Hawaiʻi by Executive Order No. 3814 dated April 11, 2000) in Waiākea Ahupuaʻa, South Hilo District, Island of Hawaiʻi, Hawaiʻi (Figure 1 and Figure 2). The project area is a 13-acre portion of (TMK [3] 2-4-001:122 (Figure 3).

Because federal funds are being used, and because the USGS is a federal agency, this project is reviewable under Section 106 of the National Historic Preservation Act (NHPA).

The Area of Potential Effects (APE), or project area,[1] is near the north corner of the intersection of Komohana Street and Nowelo Road next to the University of Hawaiʻi at Hilo campus, directly across Nowelo Road from the U.S. Department of Agriculture's Daniel K. Inouye U.S. Pacific Basin Agricultural Research Center (PBARC). The project area is just southwest of the town of Hilo and about 1.5 miles southwest of Hilo Bay.

The client-provided proposed undertaking is described as follows:

> The new HVO-PIERC Replacement Facility is proposed on a 13-acre site near the north corner of the intersection of Komohana Street and Nowelo Road, near the University of Hawaiʻi at Hilo (UH Hilo) campus. It is identified as TMK [3]2-4-001:122 (por). The 13-acre Project Area is part of a roughly 258-acre area which was the subject of the UH Hilo's Mauka Lands Master Plan. The Proposed Action is to construct a permanent research facility in Hilo for HVO and PIERC. These organizations have recently been or are currently located within the Hawaiʻi Volcanoes National Park ("Park") and have different, but compatible, missions. The Proposed Action will provide replacement facilities for both agencies, supporting approximately 50 staff and volunteers from HVO and 53 staff and volunteers from PIERC. The facility will be approximately 60,000 SF in size, and will include office spaces, conference rooms, laboratories, warehouse and storage, and an operations/monitoring center. Conference rooms and storage will be shared to enhance operational efficiencies. HVO researchers and administrative staff formerly housed at Hawaiʻi Volcanoes National Park will move to the proposed facility. Since 2018, these HVO staff have been operating out of temporary facilities in Hilo and working from home. PIERC staff will relocate from their current facilities at Hawaiʻi Volcanoes National Park to the new research facility.

The objectives of this Archaeological Literature Review and Field Inspection (ALRFI) are the following: (1) documentation and description of the parcel's land-use history in the context of both its traditional Hawaiian character as well as its historic-period changes; (2) identification of any historic properties or component features in the project area; and (3) providing information

[1] The term "project area" is used throughout this report; it has the same meaning as the APE.

relevant to the likelihood of encountering historically-significant cultural deposits in subsurface context during future construction.

This ALRFI is not an archaeological inventory survey (AIS), and it is not intended for formal review by the State Historic Preservation Division (SHPD). It may be used, however, to support the project proponent's consultation with the SHPD in compliance with Section 106 of the NHPA, and other environmental requirements (e.g., NEPA [National Environmental Policy Act]).

Figure 4 is a construction site plan provided by the client for the proposed undertaking.

As described in this report, archival research and fieldwork demonstrate several relevant findings: (1) the project area has been subject to both an AIS and data recovery (DR) in 2004 and 2006, respectively, which completed the historic preservation process for the identified sites; (2) much of the project area has been previously modified by historic-period activities (sugar cane and dairy workers) as well as the military for training purposes during World War II; (3) the eastern half of the project area included five previously documented (by Escott 2004, 2006) historic properties: State Inventory of Historic Places [SIHP] #s 50-10-35-24243, -24244, -24245, -24247 and -2428; all of these sites were inspected, except for SIHP #24245, a set of three iron fence posts attributed by Escott (2004) to ranching or dairy workers; inspected sites showed little to no change in condition since their original documentation, except for some damage from overgrown vegetation; (4) no new or additional historic properties, or potential historic properties, were identified during the pedestrian survey conducted for this report.

1.2 Regulatory Context

1.2.1 SHPD Reviews of Archaeological Work including the Subject Parcel

As described in detail below (see Section 3 – Archaeological Context), an AIS including the current project area was completed in 2004 (Escott 2004), and mitigation in the form of DR at two sites was completed in 2006 (Escott 2006). Appendix A includes relevant letters from the SHPD.

In 2012, the SHPD commented on a grading permit for the University of Hawai'i – Hilo's water infrastructure improvements including ground disturbance in the subject TMK parcel (TMK [3] 2-4-001:122). As stated in the letter in Appendix A:

> Our records indicate that an archaeological inventory survey was conducted of Parcel 122 in 2003 and 19 historic properties consisting of over 80 features were documented (Escott 2004). The report was accepted as final by our office in December 2004 (*Log 2004.3367, Doc 0412MM07*). Recommended data recovery field work was completed at two World War II era sites in 2005; no sites were recommended for preservation.

1.2.2 Ongoing Section 106 Consultation

More recently, consultation has taken place between the lead agency (USGS) and the SHPD for the proposed undertaking. Consultation is ongoing at this time.

1.3 Environmental Setting

1.3.1 Natural Environment

The project area is located between about 300 and 340 feet (ft.) above mean sea level. The terrain slopes down moderately from southwest to the northeast. There are no through-flowing drainages or streams in the project area, but one very small dry drainage near the center of the project area was observed. The project area is located on a weathered Mauna Loa pāhoehoe flow dated to approximately 750-1500 years before present (Wolfe and Morris 1996).

Mean annual rainfall in the project area is relatively high at ~180 inches (4,572 millimeters) (Giambelluca et al. 2013). Naturally occurring soils in the project area (Figure 5) consist entirely of Keaukaha highly decomposed plant material (Sato et al. 1973). This soil is described as "not prime farmland," and a typical profile consists of several inches of highly decomposed plant material over shallow bedrock (ibid.).

Vegetation in the project area is extremely dense. Plant species observed in the project area include strawberry guava (*Psidium cattleyanum*), guava (*Psidium guajava*) red ginger (*Alpinia purpurata*), ti (*Cordyline fruticosa*), liliko'i (*Passiflora edulis*), avocado (*Persea americana*), royal palm (*Roystonea* sp.), hala (*Pandanus* sp.), and mango (*Mangifera indica*).

Pedestrian survey was hampered by abundant fire ants (possibly *Wasmannia auropunctata*).

1.3.2 Built Environment

The project area is mostly undeveloped. There is a small cluster of shipping containers in the southwest corner of the project area.

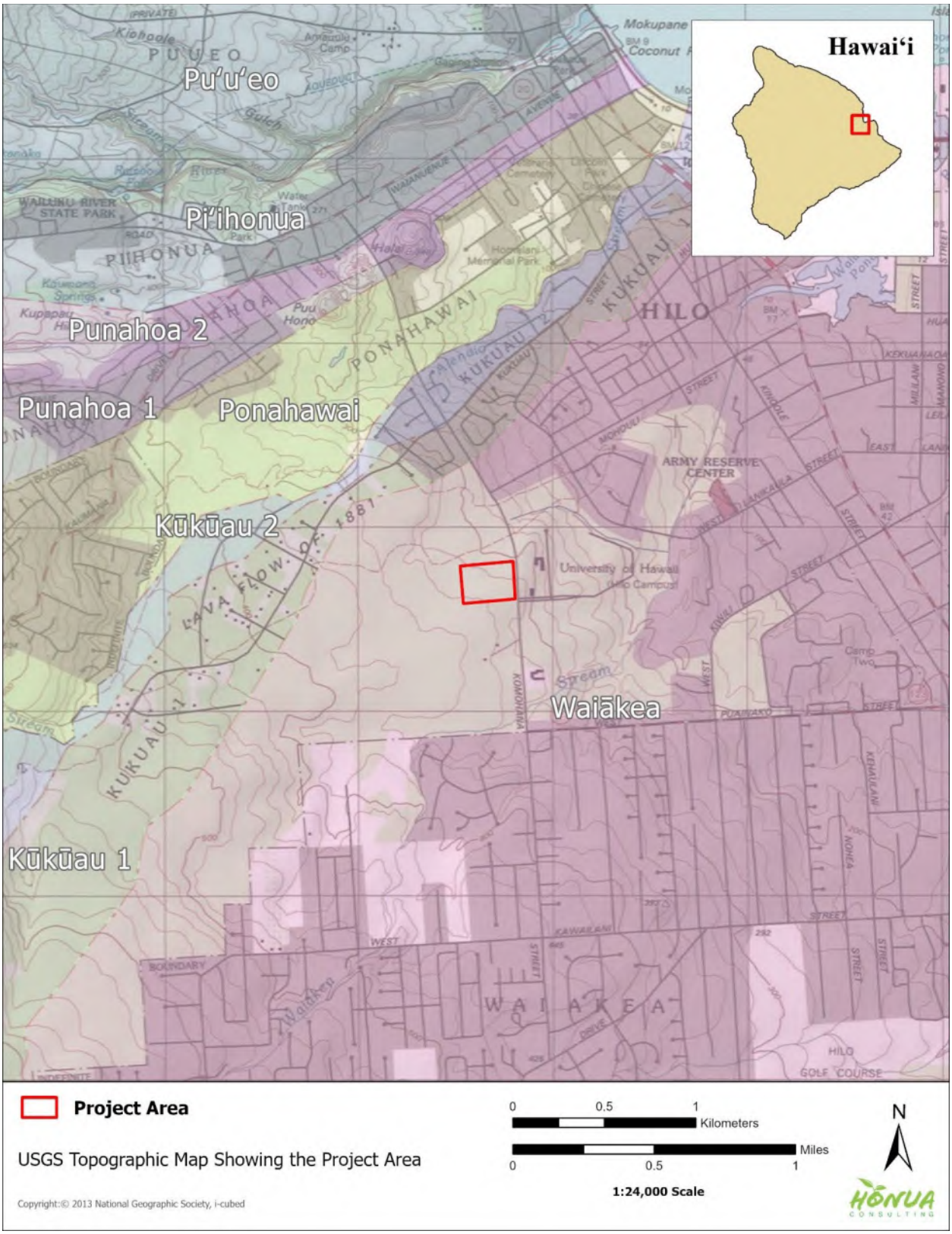


Figure 1. Portion of U.S. Geological Survey (USGS) topographic map showing project area (base map source: USGS online at http://ngmdb.usgs.gov/ topoview)

Figure 2. Aerial photograph showing location of project area and main roads (base image source: ESRI's ArcMap 10.8.1)

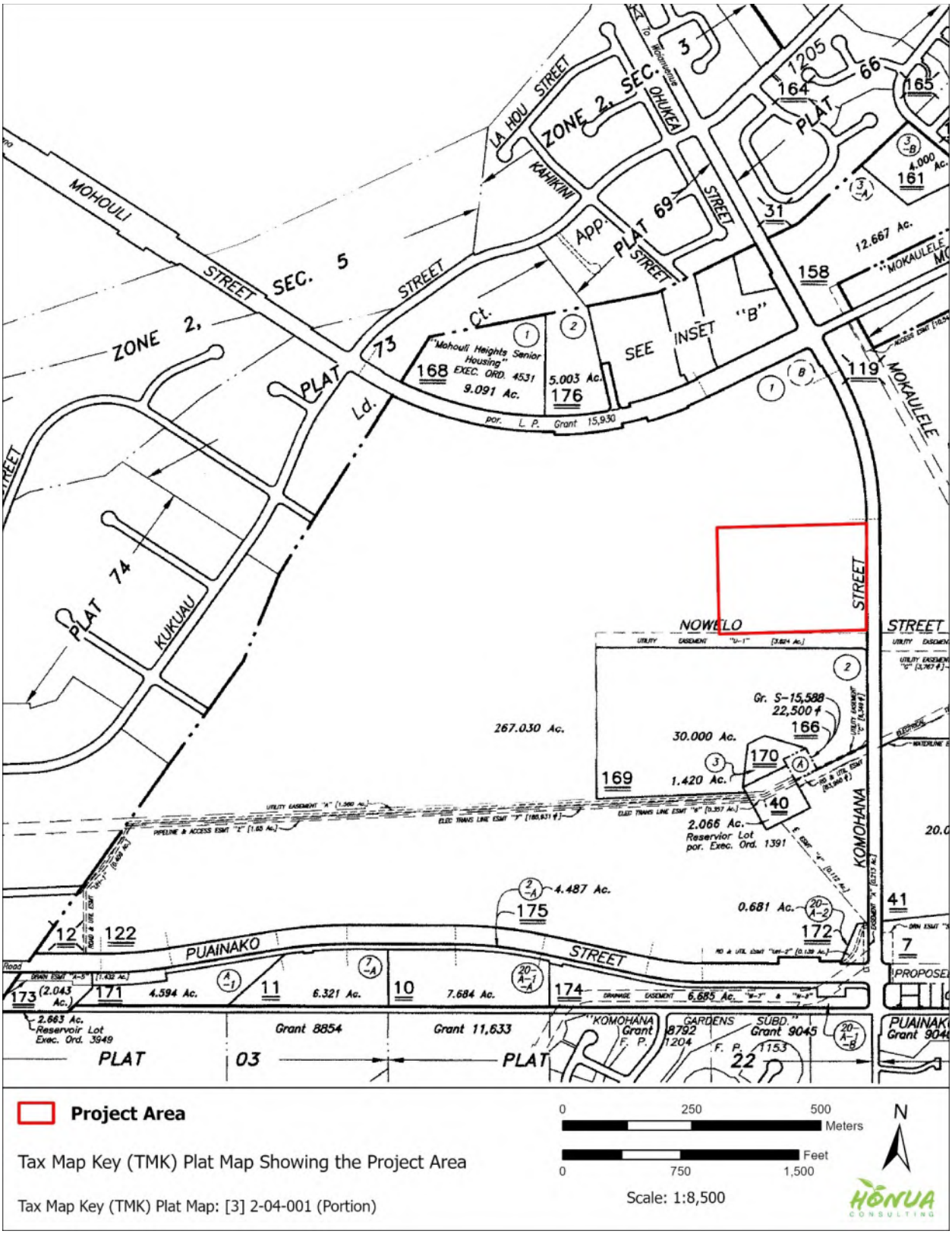


Figure 3. Tax Map Key (TMK): [3] 2-4-001 (portion) showing project area (which is a portion of parcel 122) (base map source: Hawai‘i TMK Service n.d.)

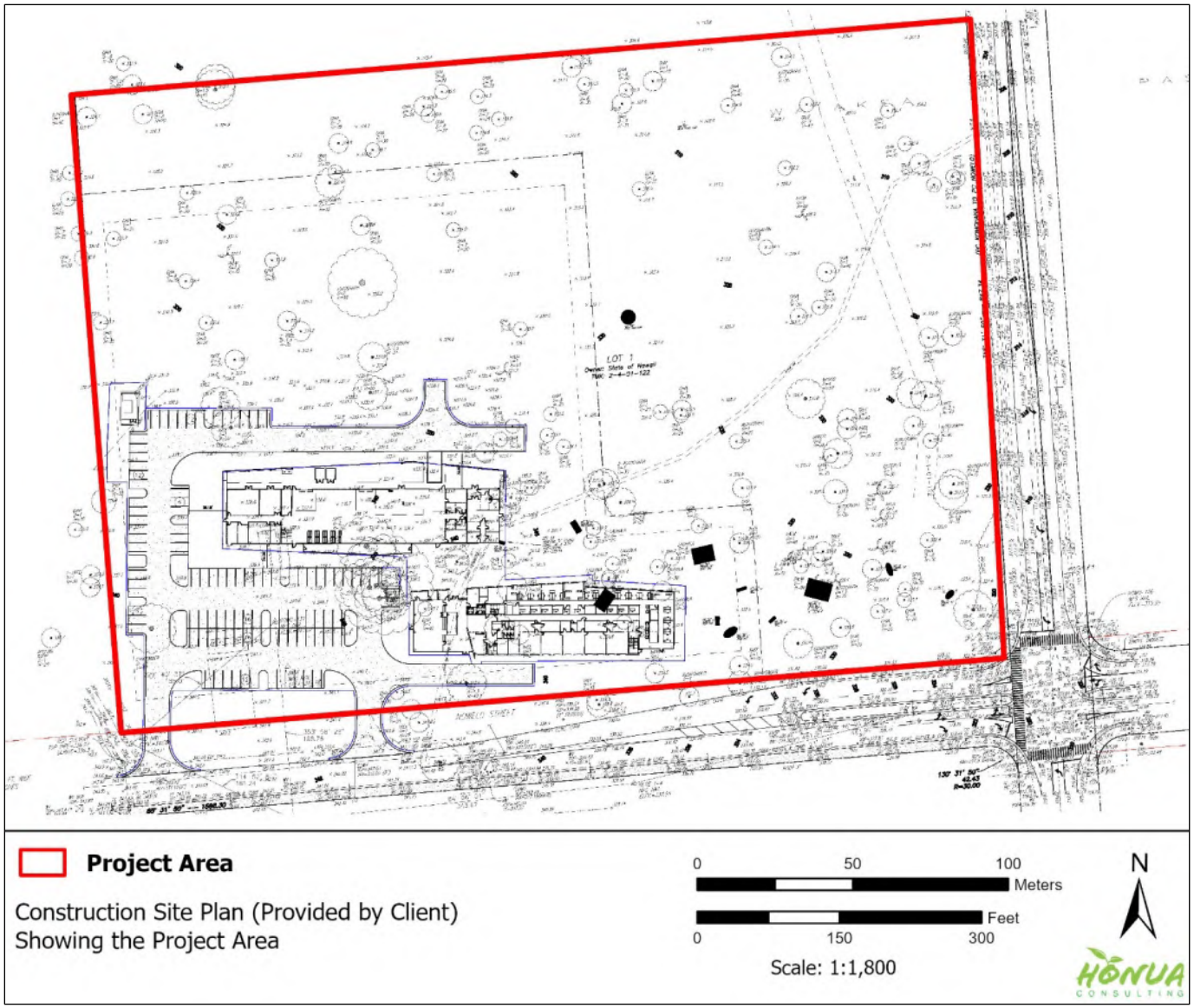


Figure 4. Construction site plan in southwest quadrant of the image (provided by client)

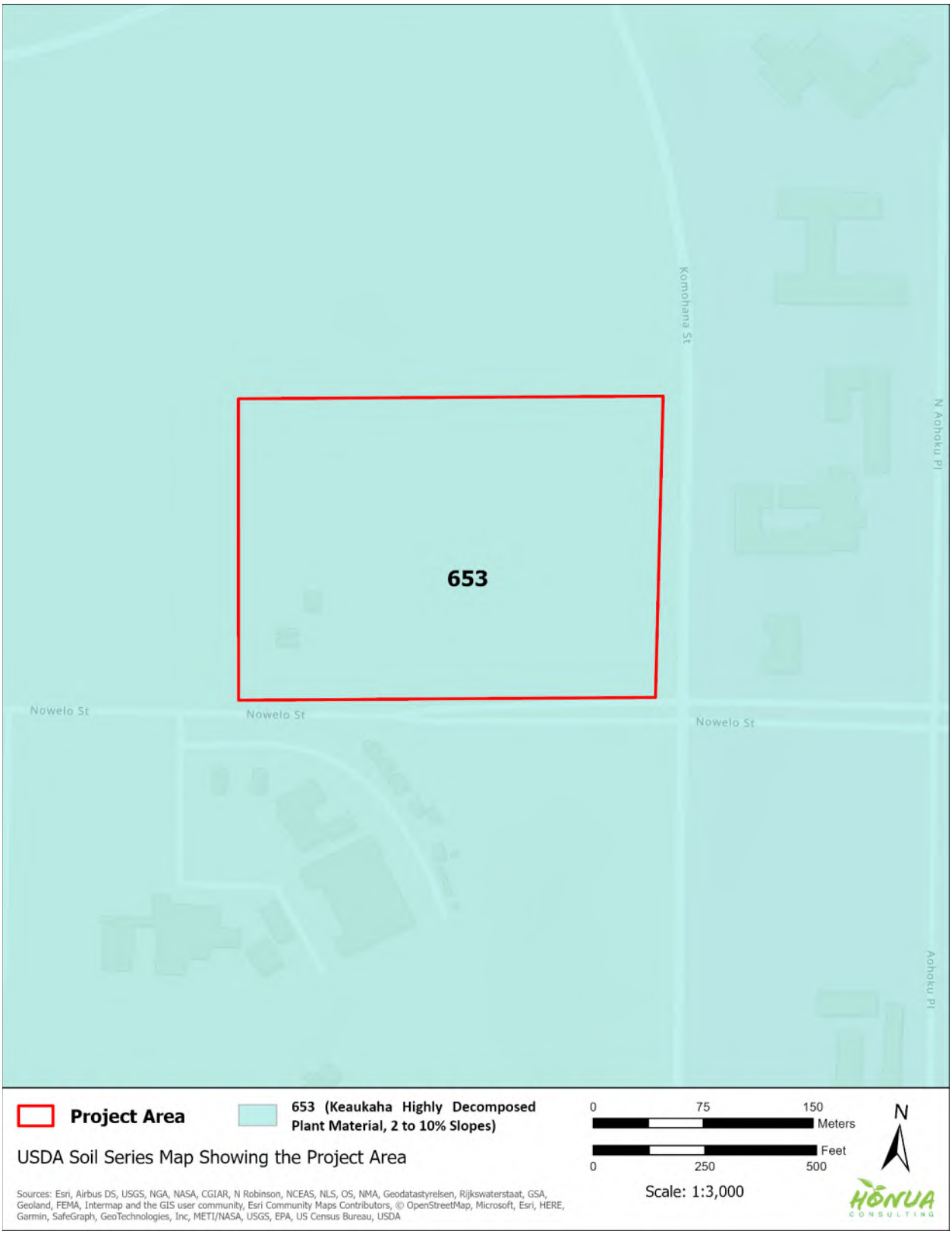


Figure 5. Soil survey data for the project area and environs (soil data from Sato et al. 1973)

Cultural and Historical Context

This section includes a brief synthesis of relevant cultural and historical information related to the types of land uses in and around the project area from pre-Contact, traditional Hawaiian times into the historic period. Note that this section may be expanded if a formal archaeological inventory survey (AIS) is required.

The main objective of this section, primarily through the analysis of historical documents, maps and aerial images, as well as secondary sources (i.e., other cultural resource management reports), is to provide a project area-specific picture of land use and modification over time. Portions of this section are based on Kelly et al.'s (1981) cultural history of Hilo Bay, which provide a chronological framework for major changes in the general area from pre-Contact to late historic-period times. Other cultural and historical summary reports (e.g., Escott 2004; Tam Sing et al. 2017) also provide useful information.

In addition to conducting a records search at the SHPD, as well as the on-line database of the Environmental Review Program (Office of Planning and Sustainable Development), and referencing Honua's proprietary database, we also utilized these on-line sources to obtain cultural, historical and archaeological data:

- OHA's Papakilo database (http://papakilodatabase.com/main/main.php)
- OHA's Kipuka database (http://kipukadatabase.com/kipuka/)
- Bernice P. Bishop Museum archaeological site database (http://has.bishopmuseum.org/index.asp)
- Bishop's Hawaii Ethnological Notes (http://data.bishopmuseum.org/HEN/browse.php?stype=3)
- University of Hawai'i-Mānoa's digital maps (http://magis.manoa.hawaii.edu/maps/index.html)
- DAGS' State Land Survey (http://ags.hawaii.gov/survey/map-search/)
- Waihona 'Aina website (www.waihona.com)
- Digital newspaper archive "Chronicling America, Historic American Newspapers" (http://chroniclingamerica.loc.gov/lccn/sn82014681/)
- Hawai'i State Archives digital collections (http://archives1.dags.hawaii.gov/)
- U.S. Library of Congress digital map collections (https://www.loc.gov/maps/)
- USGS Information Service, including digital map collections (https://nationalmap.gov/historical/index.html)
- AVA Konohiki's website (http://www.avakonohiki.org/)

2.1 Hawaiian Cultural Landscape

The Bishop Museum's *Hilo Bay: A Chronological History, Land and Water Use in the Hilo Bay Area, Island of Hawai'i* (Kelly et al. 1981) and other well-known sources (e.g., Handy 1940; Ellis 1963; Bingham 1969; Handy and Handy 1972; Bird 1974; Pukui et al. 1974; McEldowney 1979; Pukui 1983; Kamakau 1992; Maly 1996) document an unusually rich and diverse cultural landscape around greater Hilo and Waiākea Ahupua'a that is full of wahi pana (legendary places), named locations, natural resources, and other landscape modifications such as archaeological sites that are of interest and value to Hawaiians. Many of these places and resources are associated with mo'olelo, or oral-historical references, related to Hilo's and Waiākea's storied past.

This section begins with general information about Hilo and Wai'ākea Ahupua'a; later, we discuss the project-area environs more specifically.

Wai‘ākea is a relatively large ahupua‘a (~95,000 acres) that includes much of the southern shoreline of Hilo Bay, which is considered to be one of the initial favored places where the first Hawaiians would have settled. Handy and Handy (1972:268) noted “In Hilo there was the bay and the mouth of the Wailuku River” when listing some of the earliest favored locations for the first settlers around the archipelago. At the same time, given the bay’s shape/orientation and exposure to the northeast-facing trade winds, it has likely been susceptible to tsunami and other tidal surges since the earliest Hawaiian settlement. Handy and Handy (ibid.:538) write that “ . . . it is also subject to violent oceanic storms and has many times in its history suffered semidevastation from tidal waves unleashed by earthquake action in the Aleutian area of the Pacific.”

A map depiction from 1825 (Figure 6) provides a general overview of what traditional (pre-Contact) Hawaiian land use once looked like in and around Hilo Bay. The map shows the entire bayfront—between the outlet of the Wailuku River at Pi‘ihonua Ahupua‘a and the outlet of the Wailoa River/Waiākea Pond and Stream at Waiākea Ahupua‘a—was full of garden plots in a wet area among the “Royal Fish Pond” at Waiākea (sometimes labeled the “King’s Fish Pond” on other historic maps) and other inland ponds and waterways. This area of loko pu‘uone (inland fishponds) was apparently spring-fed (Kelly et al. 1981:11). Other famous fishponds of Waiākea include Mohuuli and Loko Waka (and there may have been as many as 10 fishponds in this ahupua‘a at one time). There also appear to have been scattered house sites along portions of the bayfront (note, the symbols at what is today the area of Mokupane Point—at the south side of the mouth of the Wailuku River—appear to signify shallow water [not house sites]). The far end of the bayfront—where it meets the peninsula at Banyon Drive (Waiākea)—is labeled as a “good landing place.”

It is worth noting the relatively high number of named ahupua‘a between the Wailuku River and Waiākea—at least seven (from the north, Pi‘ihonua, Punahoa 2, Punahoa 1, Ponahawai, Kūkūau 2, Kūkūau 1 and Waiākea), over about a mile of shoreline (see, e.g., Kelly et al. 1981:Figure 1, p.2). Such densely-packed ahupua‘a directly reflect the relatively high value of this area’s food resources—including its access to marine resources at Hilo Bay, varieties of limu (seaweed), abundant fresh-water, spring-fed fishponds, waterfowl and other, mauka resources.

Waiākea (literally, “broad [or expansive] water,” Pukui et al. 1974:220 [brackets added]) is associated with mo‘olelo about the famous ‘Umi-a-Liloa (son of Liloa), the sixteenth-century supreme chief of Hawai‘i Island (Kamakau 1992:15–17). This area was known as an early residence of the Hilo chiefs who would gather with their people on the bayfront beaches to amuse and entertain themselves (Kelly et al. 1981:1). When Captain George Vancouver arrived in the early 1790s, Kamehameha I was living at Waiākea (ibid.:8), apparently preparing for (i.e., gathering provisions and materials to) set out to capture Maui, Moloka‘i and O‘ahu in 1795.

At least three named ‘ili (smaller land divisions) of Waiākea are known: Pi‘opi‘o, Makaokū and Honohononui.

An 1841 map depiction of Hilo Bay (not reproduced here) by the famous Wilkes scientific and surveying expedition that included the Hawaiian Islands shows much less detail inland of the depth-charting of the bay (which would have been the primary survey objective); however, it does show that the several structures of the “Town of Hilo”—and others going over to the King’s Pond—are set back some distance from the bayfront. This set up, no doubt, reflects the fact that the bayfront in its natural state, and lacking the hardscape (boulder) reinforcement it currently has, was always susceptible to flooding (tidal surges, tsunami, etc.). A coconut grove is depicted in the current project area with others elsewhere along the bayfront.

Handy and Handy (1972:538–9) discuss variation in Hilo's value to Hawaiians for practicing their cultivation/planting traditions in pre-Contact and early historic times:

> The population of Hilo was anciently as now concentrated mostly around and out from Hilo Bay . . . The Hilo Bay region is one of lush tropical verdure and beauty, owing to the prevalence of nightly showers and moist warmth which prevail under the northeasterly trade winds into which it faces . . .
>
> In lava-strewn South Hilo there were no streams whose valleys or banks were capable of being developed in terraces, but cuttings were stuck into the ground on the shores and inlets for many miles along the course of the Wailuku River far up into the forest zone. In the marshes surrounding Waiakea Bay, east of Hilo [town], taro was planted in a unique way known as *kanu kipi.* Long mounds were built on the marshy bottom with their surface two or three feet above water level. Upon the top and along the sides of these mounds taro was planted. Flood waters which occasionally submerged the entire mound are said to have done no harm, as the flow was imperceptible . . .
>
> On the lava-strewn plain of Waiakea and on the slopes between Waiakea and the Wailuku River, dry taro was formerly planted wherever there was enough soil.

Pukui's (1983) compendium of ʻōlelo noʻeau (poetical sayings) has two entries for Waiākea (which she spells Waiakea). The first, "Ke one ʻanapa o Waiolama," or "The sparkling sand of Waiolama," refers to ". . . a place between Waiakea and the town of Hilo. It was said to have sand that sparkled in the sunlight" (ibid.:190), and that this phrase is used in many chants about Hilo. The second poetical saying about Waiākea refers to people who use their ears for things other than heeding warnings or advice (ibid.:318).

John Papa ʻĪʻī (1959:134) states that the surf at Waiākea was called "Kanukuokamanu."

Referring specifically to the current project area, situated between about 300 and 340 feet (ft.) above mean sea level, Hawaiians practicing a traditional subsistence lifestyle would have used this area for rain-fed cultivation. Scattered house sites, shelter and work areas would have been located in this zone for periodic use when fields were tended. This area corresponds to McEldowney's (1979:18-19) "upland agricultural zone. Forest products such as various wood trees, thatching (e.g., from Hala or *Pandanus*), and birds would have been available in and around the project area as well (Ellis 1963; Maly 1996; Escott 2004).

2.2 Historic Period

This section first presents general information about Hilo and Waiākea and then focuses specifically on the project-area environs.

Starting as early as 1822, missionaries came to the Hilo area to initiate their work, which was supported by Kaʻahumanu, Liholiho (Kamehameha II), and Kaumaliʻi (the former supreme chief of Kauaʻi); and, by 1825, a meeting house and missionary school began operating near Hilo Bay (Kelly et al. 1981:26–29). Kaʻahumanu gifted the land of Punahoa 2 to the missionaries Goodrich and Ruggles, who built missionary homes, meeting houses and churches as well as the Hilo Boarding School and Girls' Seminary (ibid.:36).

The British missionary William Ellis in 1823 estimated the population of the Hilo Bay area was about 2,000 people living in 400 houses, which Kelly et al. (1981:19) believe is "probably close to the permanent population twenty years earlier" [i.e., around the turn of the century].

A major tsunami that struck Hilo in 1837 "caused some loss of life and severe damage to fishponds and taro patches" (ibid.:44). As recounted by the missionary Rev. Titus Coan, "everything not more than fifteen or twenty feet above high-water mark [was swept] into indiscriminate ruin" . . .and, "only thirteen were drowned." Despite this, the population of greater Hilo apparently had grown by the 1840s to about 10,000 people (ibid.).[2]

Kelly et al. (1981:51) refer to the years between 1840 and 1898 as the period of Americanization of Hilo—a time when U.S. businessmen's economic interests came to dominate the windward side of Hawai'i Island—in particular, the advent of commercial sugar cane operations. Quoting Commander Charles Wilkes, whose scientific and mapping expedition visited Hilo in 1840–1841, Hilo by this time was a:

> . . . straggling village, and is rendered almost invisible by the luxuriant growth of the sugarcane, which the natives plant around their houses. . . The whole settlement forms a pretty cluster; the paths and roadsides are planted with pine-apples; the soil is deep and fertile, and through an excess of moisture, yields a rank vegetation. . . Many of the native houses are surrounded with bread-fruit and cocoa-nut trees, and have a fine view of the bay. (ibid.:53)

During the historic period, from as early as the middle 1860s, the project area was part of a vast commercial sugar cane operation known as the "Waiakea Mill company." A state GIS database of the historic extent of commercial sugar cane lands,[3] and other information researched by Escott (2004), shows the project area was located just north of commercial sugar cane fields.

2.2.1 Māhele and other Historic Land Ownership History

Waiākea Ahupua'a was designated Crown Lands in 1848 during the Māhele (Indices of Awards 1929:26), meaning that it was reserved for the king (Kamehameha III at that time). Kelly et al. (1981:89) explain that,

> As early as July 15, 1861, the land was leased by Kamehameha IV to S. Kipi for pasture in the amount of $600 per year . . . for a period of 5 years . . . the *ahupua'a* (95,128 acres) was leased to Rufus A. Lyman [in 1874] for 25 years. By the late 1870s, two businessmen, C.E. Richardson and W.H. Shipman, pioneered commercial sugarcane planting on Waiākea land.

Approximately two dozen Land Commission Awards (LCA) were located in Waiākea Ahupua'a, all but two being located near the coast. Escott (2004:11) describes the nearest LCA to the current project area (about one kilometer to the east) as consisting of five acres to Keaniho (LCA 2402); this award, described as being located at "Ponahawai, Waiakea" in the 'ili of

[2] Numerous other tsunamis and damaging tidal surges have hit Hilo over the years, including one in 1868, 1877 and 1892 (Kelly et al. 1981:71), in addition to the cataclysmic one in 1946.

[3] See https://histategis.maps.arcgis.com/apps/Embed/index.html (accessed March 2022)

"Kanewahineiki," contained a house lot and hala plants, and was bordered by kalo (taro) fields to the west (Waihona 'Aina n.d.).[4]

2.2.2 Commercial Sugarcane in and near the Project Area

Escott (2004:12-15) summarizes historical information on the Waiākea Mill Company, and its relationship to the current project area:

- Waiākea Mill Company was founded by Alexander Young and Theo H. Davies, who acquired the general lease from Rufus A. Lyman in 1879.
- By the early 1900s, the plantation was growing sugar cane on over 6,000 acres.
- In 1911, the company applied for a title to parts of its leased land but was rejected by the Board of Public Lands. The government then made a plan to sell homestead lots and lease sugar cane lots to the public. By 1919, 2003 acres were designated for house lots and 5,300 acres were retained as sugar cane lease lands. None of the publicly leased government land is in the project area.
- Waiākea Mill Company plantation Lot 20-A is the only sugar cane field near the current project area; it was located immediately south of the current project area (area of Pu'ainako Street). This area was classified by the plantation as relatively poor for cultivation due to its shallow, saturated condition.
- In the middle twentieth century, the Fairview Dairy acquired lands near the current project area for pasturing cattle along the Pu'ainako Street area.
- The current project area was once part of a single government parcel known as "Waiakea Pasture Land," consisting of about 500 acres, originally leased to Kazuo Miyasaki in 1939 as pastureland for his dairy cattle. The lease passed to John Matson in 1942, and during World War II, it was used for training by the U.S. Army Corps.

Figure 7, a portion of 1901 map, shows the project area close to the boundary with the ahupua'a of Kūkūau 1 and the lava flow of 1881 (darker-shaded area). No specific features are depicted in the project area.

Figure 8, a portion of 1922 map, again does not show specific features in the project area, which is just north of the newly planned Waiakea Homesteads.

Figure 9, a portion of 1928 map, shows the project area surrounded by plantation camp and mill infrastructure.

Figure 10, a portion of 1945 map, shows the project area just south of a flooded area labeled Waiakea Reservoir. An unlabeled rectangular structure appears to be located right next to (west of) the project area. This might be a depiction of State Inventory of Historic Places (SIHP) #50-10-35-24243, a military building constructed around the time of World War II.

Figure 11, a portion of aerial image from 1954 shows no visible features in the project area, but a 1965 image (Figure 12) clearly shows a road cutting across the project area from northeast to southwest. This road is SIHP # 50-10-35-24247.

[4] https://waihona.com (accessed June, 2022)

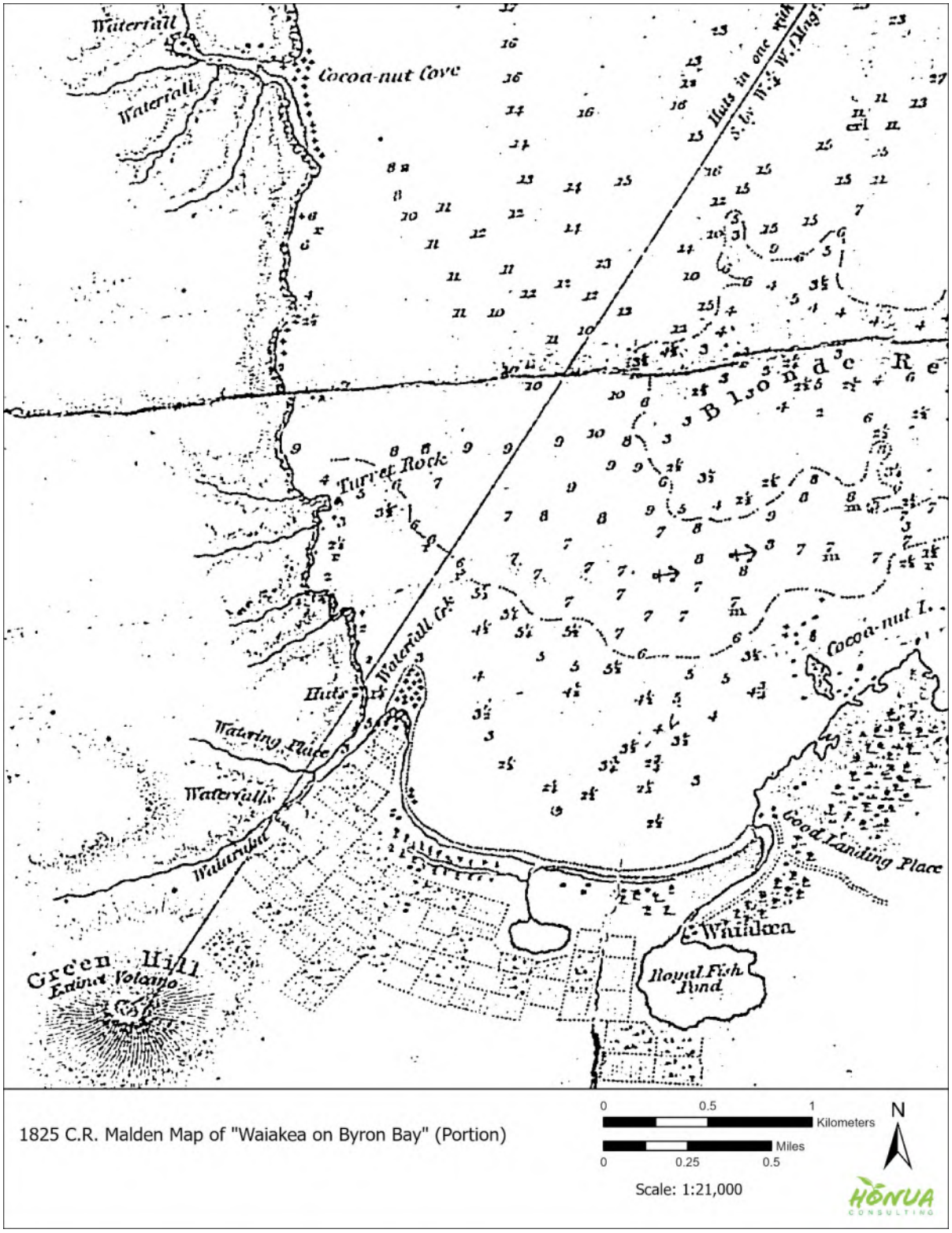


Figure 6. Portion of 1825 Malden map of Hilo Bay and environs; note, the current project area is located south-southwest of the bay (out of the frame in this view)

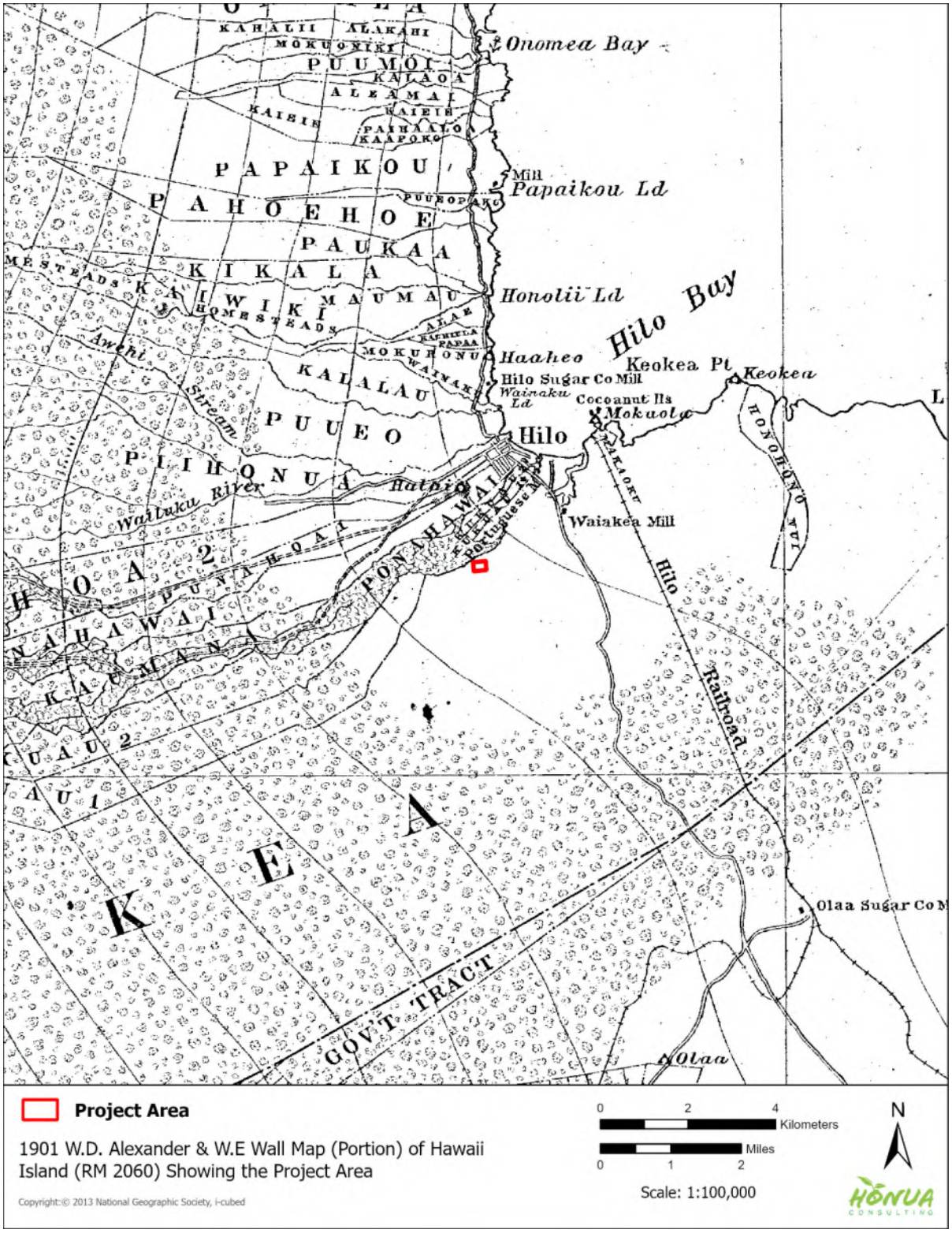


Figure 7. Portion of 1901 map (Registered Map 2060) showing project area location (base map source: DAGS Land Survey Map Search, http://ags.hawaii.gov/survey/map-search/)

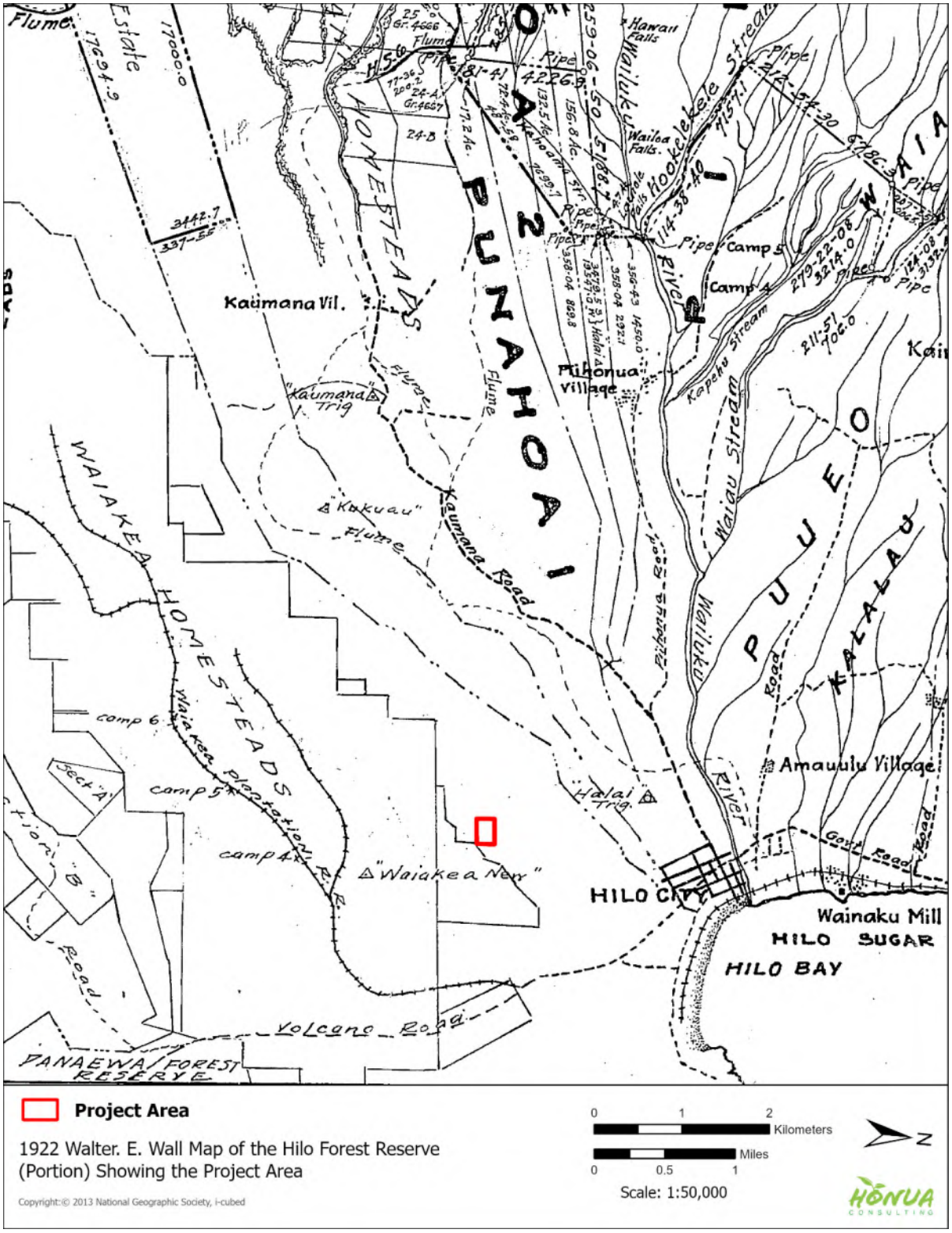


Figure 8. Portion of 1922 Wall map showing project area location (base map source: University of Hawai‘i-Mānoa’s digital maps, http://magis.manoa.hawaii.edu/ maps/index.html)

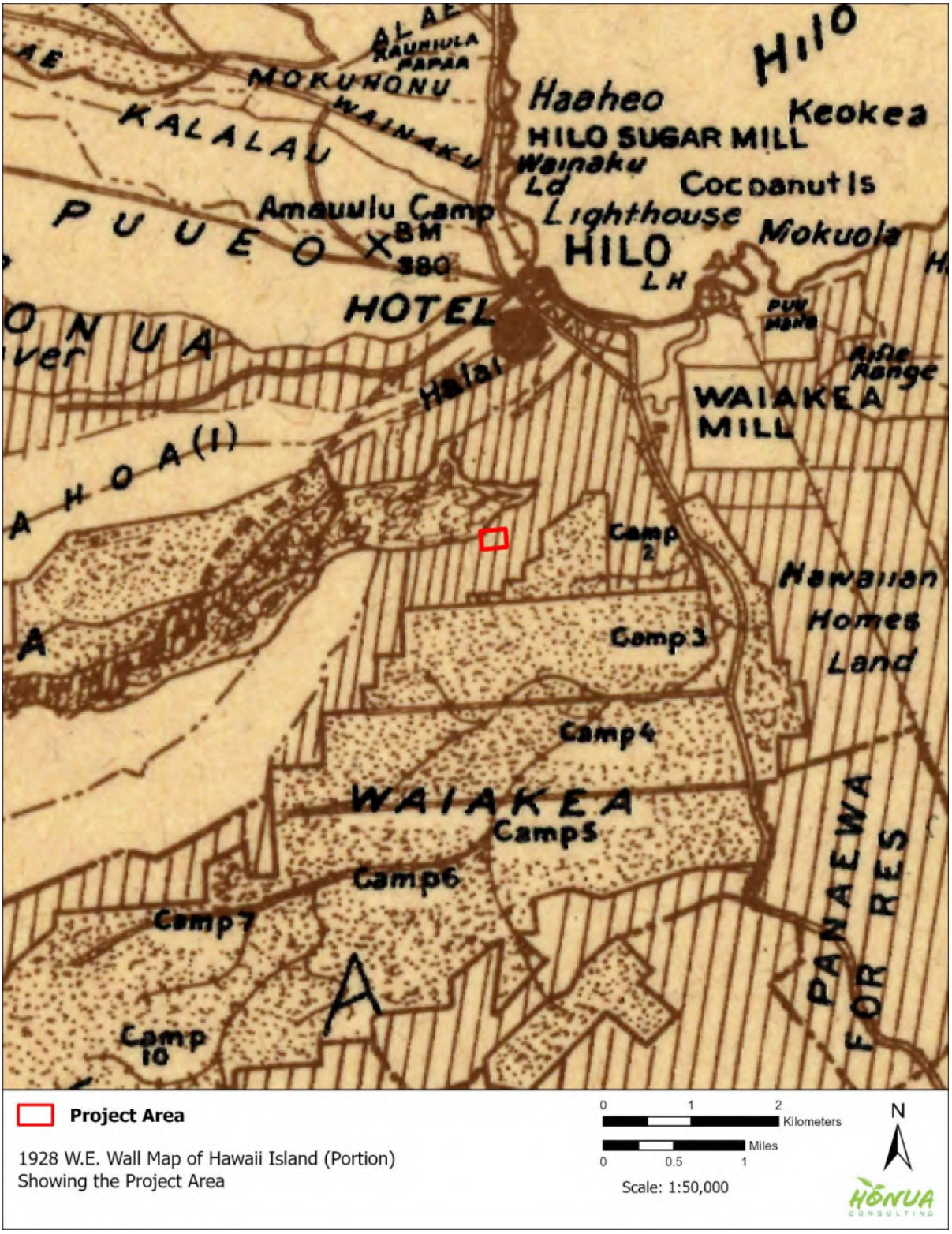


Figure 9. Portion of 1928 Wall map showing project area location (base map source: University of Hawai‘i-Mānoa’s digital maps, http://magis.manoa.hawaii.edu/ maps/index.html)

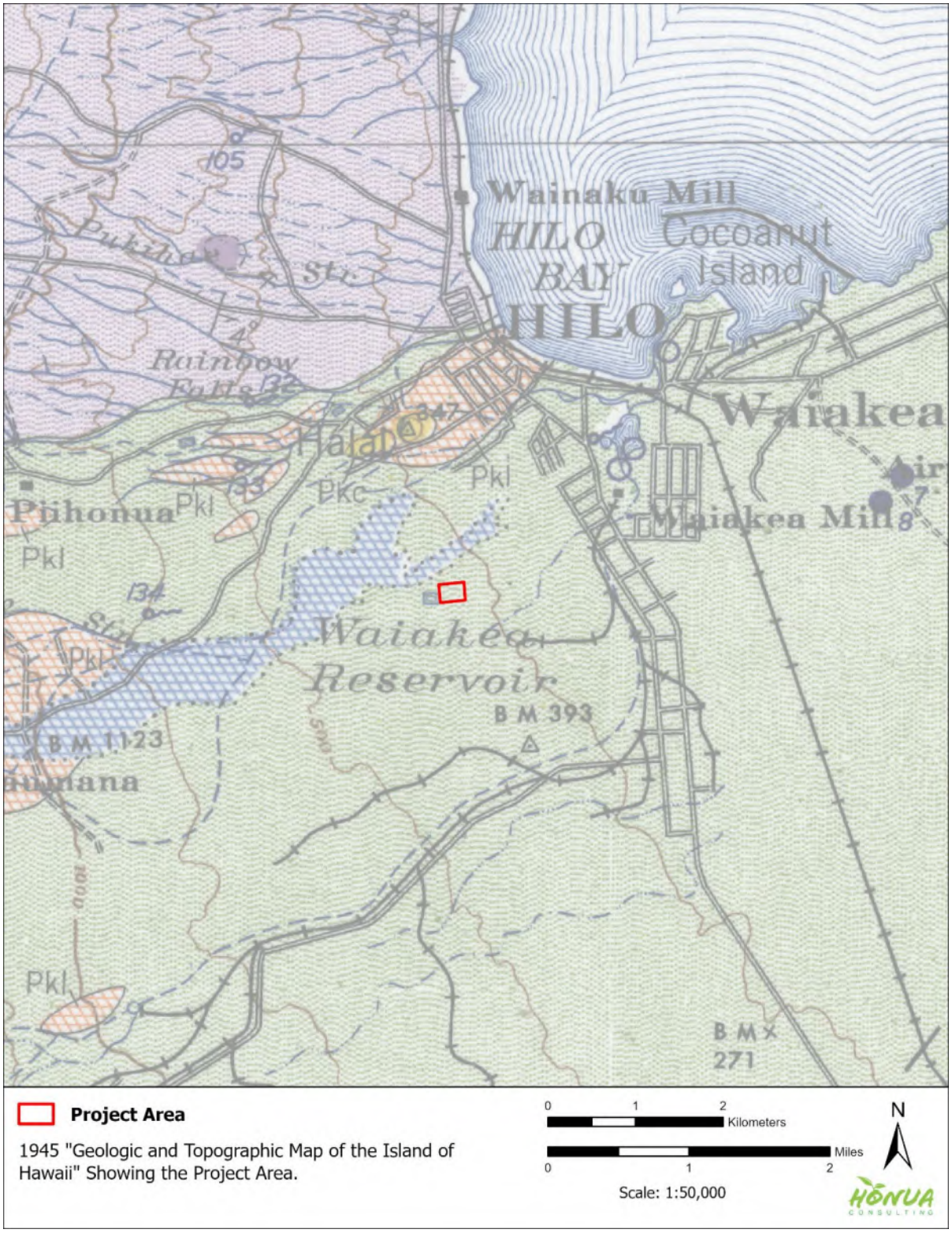


Figure 10. Portion of 1945 geological and topographical map showing project area location (base map source: University of Hawai‘i-Mānoa’s digital maps, http://magis.manoa.hawaii.edu/maps/index.html)

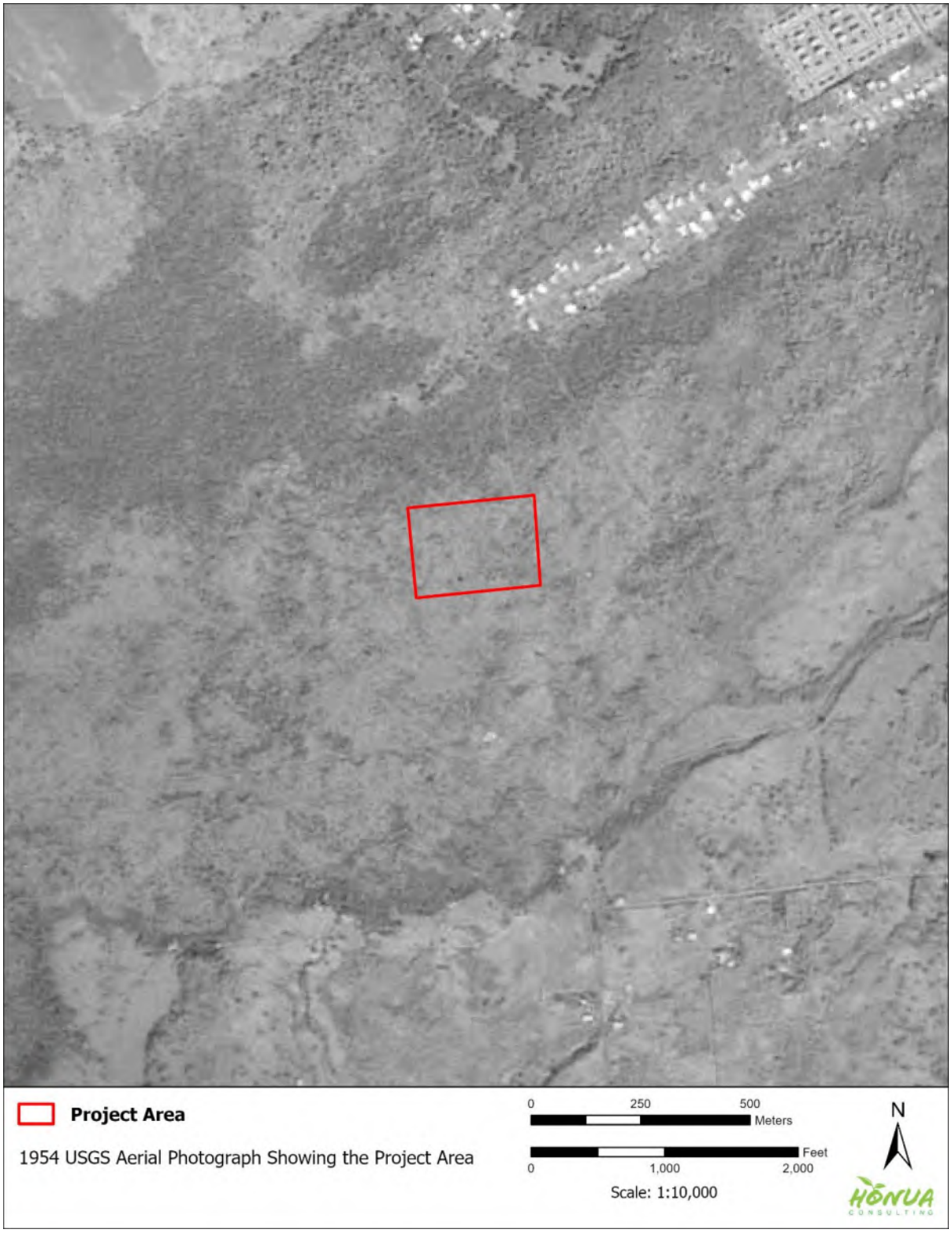


Figure 11. Portion of 1954 aerial image showing project area location (base map source: University of Hawai‘i-Mānoa’s digital maps, http://magis.manoa. hawaii.edu/ maps/index.html)

Figure 12. Portion of 1965 aerial image showing project area location (base map source: University of Hawai‘i-Mānoa’s digital maps, http://magis.manoa. hawaii.edu/ maps/index.html)

Archaeological Context

In this section, we summarize relevant previous archaeological research in order to reconstruct human use and modification of the land in and near the project area. The main purpose of presenting this information is to develop predictive data about the types and distribution of historic properties and their component features we expected to encounter during the field inspection; and to assist in the interpretation of any new findings.

Table 1, Figure 13 and Figure 14 summarize and depict the location and results of previous archaeological studies in and near the project area. For the purposes of this study, this discussion of previous work and results is limited to a radius of approximately one mile around the project area.

3.1 Overview

As summarized in the previous section (Section 2 Cultural and Historical Context), the area in and around the current project area was once part of a vast, commercial sugar cane operation (originally, the Waiākea Mill Company, but also known as other names and entities over the years), starting as early as the middle 1800s and continuing in modern times; thus, archaeological studies in and near the project area have tended to identify large numbers of commercial sugar cane agriculture site-features dating from the historic period. Studies have shown a complete absence of pre-Contact Hawaiian sites in or near the project area. Testing (archaeological excavation) in the vicinity has also demonstrated a lack of subsurface deposits with pre-Contact soil or cultural materials due to the ravages of more than a century of mechanized ground disturbance (plowing) associated with commercial sugar cane operations. Military training sites have also been found in the subject project area.

The most relevant previous archaeological work for the purposes of the subject report is an archaeological inventory survey (AIS) by Escott (2004) of 258 acres that included the current project area (see Figure 13). Escott (2004) also completed mitigation work (data recovery) at two sites in the current project area (see below). As described in the Introduction (see Section 1.2 – Regulatory Context), there is an extensive record of formal decisions by the State Historic Preservation Division (SHPD) regarding the subject parcel (TMK [3] 2-4-001:122) to the effect that its historic preservation process has been completed (and see Appendix A).

3.2 Results of Previous Work in the Project Area

Escott's (2004) AIS identified 16 historic properties (State Inventory of Historic Places [SIHP] #s 50-10-35-24233 to -24248) comprising 80 component features. In addition, three (3) previously-identified sites (SIHP #s 50-10-35-18918, -18919 and -20681) were also recorded in the southeastern portion of Escott's (2004) project area (i.e., not in the subject project area).

Table 2 is a summary of the historic properties, which mostly consist of site complexes of above-ground rock structures built by sugar cane and/or ranching workers in and around old agricultural and/or pastureland fields. Escott's (2004) research shows that the current project area was once known as "Waiakea Pasture Land" with "Waiakea Mill Lot 20-A" located to the south, just above (north of) Pu'ainako Street. Military training site-features dating from around World War II were also documented.

In the current (subject) project area (13 acres), five (5) historic properties were documented:

- SIHP # 50-10-35-24243 – a complex of 12 features interpreted as a World War II-era military training (and possibly used later by dairy workers); features include several "foxholes" constructed of stacked and piled rocks, kerbstone footpaths and the concrete foundation of a small building;
- -24244 – a World War II-era military anti-aircraft gun emplacement;
- -24245 – a set of three isolated iron fence posts interpreted as related to historic-period ranching activities;
- -24247 – dirt road that traverses the project area;
- -24248 – portions of a dirt road that provides access to the eastern portion of -24243.

Escott's (2006) report described the results of data recovery at two sites in the current project area: SIHP #s 50-10-35-24243 and -24244. No other sites in Escott's (2004) project area required any mitigation (e.g., preservation). The SHPD accepted the data recovery report in 2006 (see Appendix A).

3.3 Results from Other Studies in the Vicinity of the Project Area

Previous studies completed within about one mile of the current project area are summarized in Table 1. The studies in the bullet point list below include only those closest to the current project area:

- Two AIS reports from project areas immediately to the south (Bush et al. 2000; McDermott and Hammatt 2001) documented (1) SIHP # 50-10-35-22080, a lava tube containing a single human femur; the site was treated as a human burial, and was eventually preserved in place with a 50-foot buffer; and (2) two historic-period plantation and/or ranching/dairy sites: SIHP # 50-10-35-22734 (rock platform interpreted as probable historic-period planting feature) and -22735 (rock causeway dating to first half of 20th century – related to agriculture, dairy or ranching activities).
- To the east of the current project area, Borthwick et al. (1993) identified four historic properties: SIHP # 50-10-35-18667 (historic-period agricultural field complex with above-ground, stacked & piled rock structures), -18668 (enclosure interpreted as a 20th century camp structure), -18669 (enclosure/wall dating to 20th century) and -18670 (agricultural field dating to 20th century). Calma and Wolforth (2007), working in a portion of Borthwick et al.'s (1993) project area, identified six clearing mounds associated with the Waiakea Mill Company.
- Multiple surveys of a linear road corridor to the south (various phases of the Pu'ainako Street Extension/Realignment project) (Hunt 1992; Hunt and McDermott 1994; Robins and Spear 1996; Eble et al. 1997; Spear 1998; McGerty and Spear 1999) identified several dozen historic-period (sugar cane), above-ground, stacked and piled rock structures designated SIHP #s 50-10-35-18911 to 18923.

Table 1. Previous Historic-Preservation Studies and Results near the Project Area

Author/Date[1]	Type of Study[2]	Location & Notes	Results & Comments[3]
Jensen 1991	AIS	NW of project area; Ponahawai Ahupuaʻa	2 historic properties identified: 14946 (early historic-period house & sugar cane site) & 14947 (Hilo Boarding School & Old Mission Ditch)
Smith 1991	Field inspection	UH-Hilo perimeter road alignment; Waiākea Ahupuaʻa	Described the presence of sites & recommended AIS be conducted
Hunt 1992	Archaeological reconnaissance	Puʻainako Street Realignment/Extension project – S of current project area	31 features identified associated w. historic-period sugar cane (these features were formally assessed by Hunt & McDermott 1994 [see below])
Smith 1992	Field inspection	Waiākea Cane Lots – E of current project area	Identified numerous sugar cane features – walls, clearing mounds, a large rectangular enclosure & C-shaped enclosures
Borthwick et al. 1993	AIS	University of Hawaiʻi land just E of current project area	4 historic properties identified: 18667 (historic-period agricultural field complex), 18668 (enclosure - 20th century camp structure), 18669 (20th century enclosure/wall) & 18670 (20th century agricultural field)
Hunt & McDermott 1994	AIS	Puʻainako Street Realignment/Extension project – S of current project area	13 historic properties (18911 to 18923) associated w. historic-period sugar cane including mounds, stone walls, modified outcrops & alignments
Eble et al. 1997	Supplemental testing of Hunt & McDermott (1994) project area		Archaeological testing of sites 18911, 18912, 18914, 18915, 18916 & 18917 – excavation showed all subsurface evidence of pre-Contact Hawaiian use of the land had been destroyed by commercial agriculture
Robins & Spear 1996	AIS	Puʻainako Street Realignment/Extension project – expanded corridor	Additional historic-period sugar cane agricultural features identified from extension of Hunt & McDermott 1994 project area
Spear 1998	Archaeological reconnaissance	Mauka portion of Puʻainako Street Realignment/Extension	27 features associated w. site 18921 (Hunt & McDermott 1994) were identified
McGerty & Spear 1999	AIS		Identified features of site 18921
Bush et al. 2000	AIS	20-acre parcel – immediately adjacent to (S of) current project area; Waiākea Ahupuaʻa	1 historic property identified: 22080 (lava tube containing 1 human femur); site was eventually preserved in situ w. a 50-foot buffer
Dega & Benson 1999	Archaeological reconnaissance	Puʻainako Street Realignment/Extension project – mauka of current project area	Several historic-period sugar cane features of 18921 identified; 1 possible pre-Contact ʻauwai (traditional irrigation ditch) also identified

Author/Date[1]	Type of Study[2]	Location & Notes	Results & Comments[3]
Dega 2000	Addendum to AIS by McGerty & Spear (1999)	Same as Dega & Benson (1999)	Additional work at 18921: subsurface testing at possible pre-Contact ‘auwai, which was determined to be a historic-period feature
McDermott & Hammatt 2001		Additional 10 acres immediately adjacent to (west of) Bush et al. (2000) project area	2 historic properties identified: 22734 (rock platform - probable historic-period planting feature) & 22735 (rock causeway dating to first half of 20th century – related to agriculture, dairy or ranching activities)
Haun 2002	Field inspection	8 acres NNW of current project area	Historic-period sugar cane features and house site
Escott 2004	AIS	258 acres of University of Hawai‘i-Hilo lands in Waiākea Ahupua‘a; **includes the current project area**	16 historic properties (24233-24248) comprising 80 component features were identified; 3 previously-identified sites (18918, 18919 & 20681) were also recorded; **data recovery was completed at 2 sites in current project area (24243 & 24244); no sites required any preservation**
Calma & Wolforth 2007	AIS	5.2-acre survey SE of current project area within Borthwick et al.’s (1993) survey area	1 historic property identified consisting of 6 sugar cane clearing mounds associated w. Waiakea Mill Company
Tulchin & Hammatt 2009	Monitoring	ESE of current project area	Monitoring of sugar cane features
Clark et al. 2012	AIS	Kapi‘olani Street Extension – linear corridor east of current project area	4 historic properties identified – all dating to historic period (likely early to middle 20th century): 29370 (modified drainage), 29371 (earthen ditch), 29372 (piled cobble mound) & 29373 (remnants of Hilo Dairy buildings)

[1] Arranged chronologically.
[2] AIS = archaeological inventory survey
[3] SIHP = State Inventory of Historic Places; complete numbers in the last column to the right (above) formally preceded by “50-10-35-.”

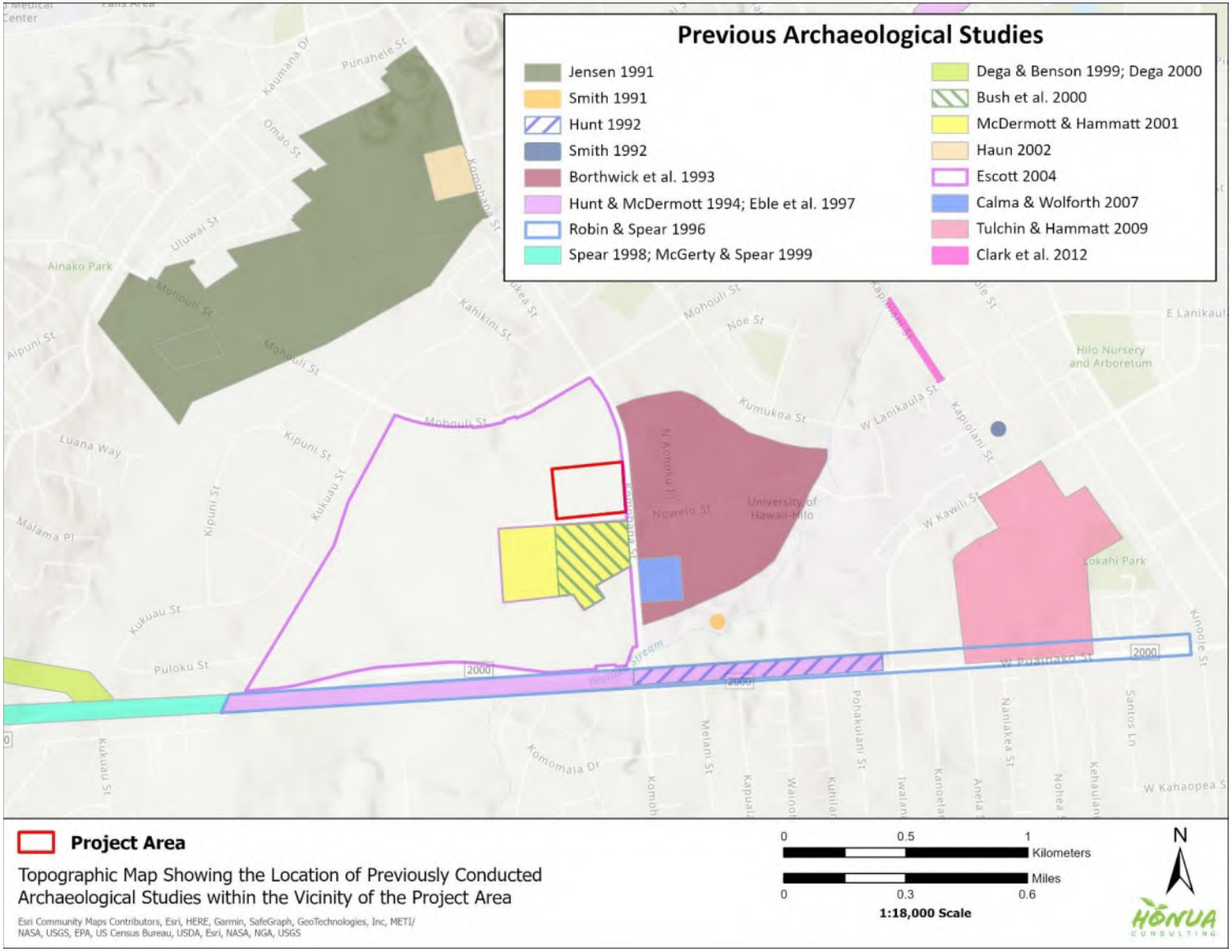


Figure 13. Previous historic-preservation studies near the project area (see table and text above for details)

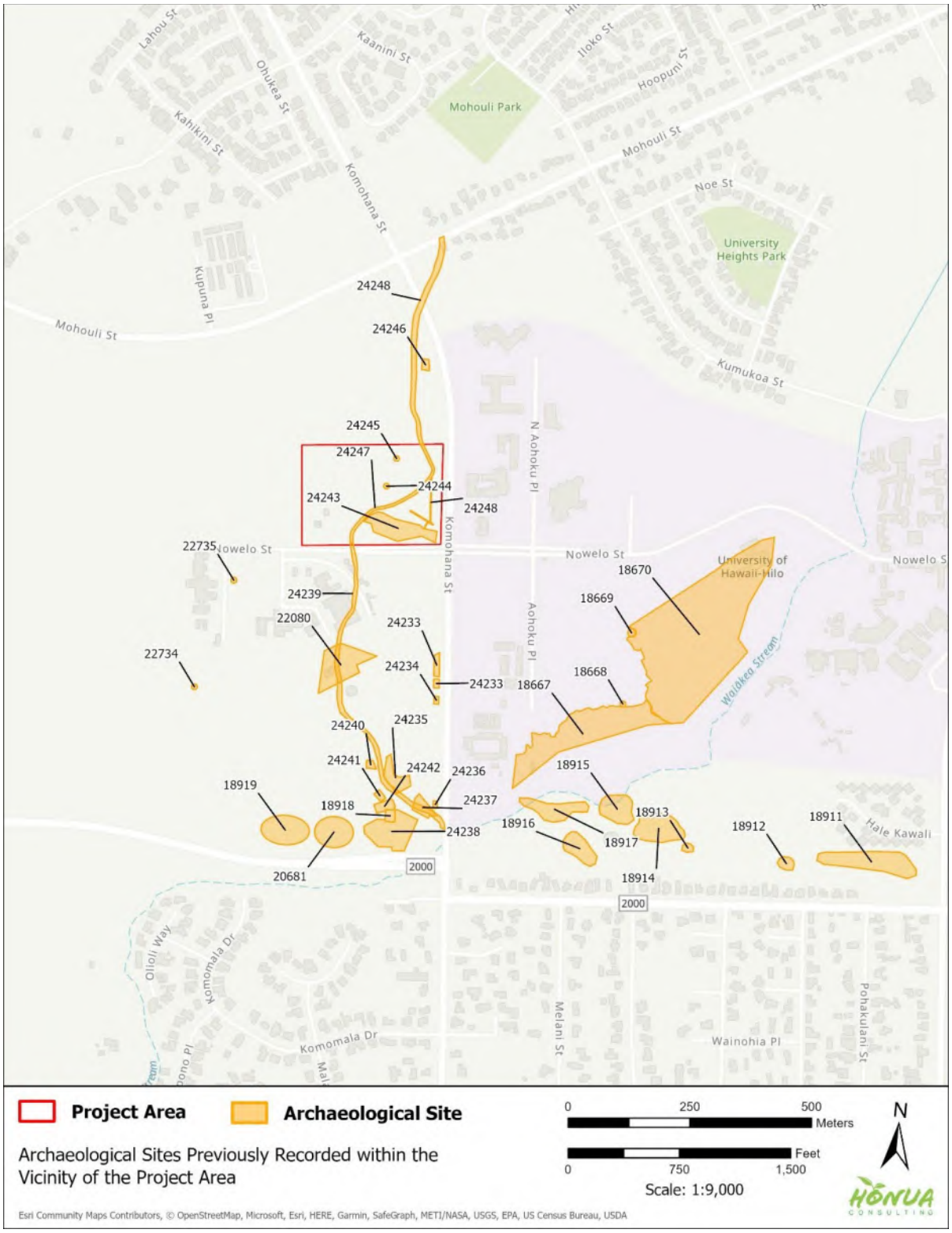


Figure 14. Previously identified archaeological sites in and near the project area

Table 2. Sites Identified in the Subject Parcel and Project Area by Escott (2004)

SIHP #[1]	Description	Mitigation?	Current Disposition
24233	Rock alignment & rock concentration	No further work	Not in current project area
24234	Rock mound	No further work	Not in current project area
24235	11 above-ground, stacked & piled rock structures associated w. a sugar cane field	No further work	Not in current project area
24236	Lava tube opening w. semicircular alignment / enclosure at the opening	No further work	Not in current project area
24237	7 water catchment features related to an old sugar cane field & pastureland associated w. an old dairy farm	No further work	Not in current project area
24238	32 above-ground, stacked & piled rock structures associated w. a sugar cane field	No further work	Not in current project area
24239	Dirt road (appears on 1964 aerial)	No further work	Not in current project area
24240	Military fighting (training) positions ("foxholes") – 2 stacked rock features	No further work	Not in current project area
24241	Enclosure – interpreted as a rest or work location for sugar cane workers	No further work	Not in current project area
24242	5 above-ground, stacked & piled rock structures associated w. a sugar cane field	No further work	Not in current project area
24243	Complex of 12 features interpreted as a military training site (later possibly used by the dairy); includes several fighting (training) positions ("foxholes") & kerbstone footpaths; includes a concrete building foundation for a small building	Data Recovery (completed 2006)	**In current project area**
24244	Military – anti-aircraft gun emplacement overlooking Hilo Bay (likely built during World War II)	Data Recovery (completed 2006)	**In current project area**
24245	3 isolated iron fence posts – likely ranching / pasture feature	No further work	**In current project area**
24246	Rock alignment created by a bulldozer along a dirt road (site 24248)	No further work	Not in current project area
24247	Dirt road (appears on 1965 aerial)	No further work	**In current project area**
24248	Dirt road (partially on 1965 aerial)	No further work	**Partially in project area**
18918	4 above-ground, stacked & piled rock structures associated w. a sugar cane field	No further work	Not in current project area
18919	58 above-ground, stacked & piled rock structures (modified outcrops, mounds, retaining walls, terraces & platforms) associated w. a sugar cane field	No further work	Not in current project area
20681	16 above-ground, stacked & piled rock structures (modified outcrops, mounds & retaining walls) associated w. a sugar cane field	No further work	Not in current project area

[1] SIHP = State Inventory of Historic Places; complete numbers in the last column to the right (above) formally preceded by "50-10-35-."

Results of Field Inspection

Fieldwork for this project was conducted on January 27 and 28, 2022, by Frederick LaChance, B.A., under the supervision of Christopher M. Monahan, Ph.D. (principal investigator). Fieldwork required approximately two (2) person-days to complete. Fieldwork for this project was performed under the archaeological permit number 22-26 issued to Honua Consulting by the SHPD/DLNR in accordance with Hawai‘i Administrative Rules (HAR) §13-282.

The specific objectives of the fieldwork were: (1) relocation and assessment of the condition of five (5) previously recorded sites (State Inventory of Historic Places [SIHP] #s 50-10-35-24243, -24244, -24245, -24247 and -24248); and (2) completion of a pedestrian survey of the entire project area to see if additional sites might be present.

4.1 Methodology

The pedestrian survey started in the southwestern corner of the project area, in an area that was previously leveled and cleared to accommodate several shipping containers. Transects ran north to south; and progressed from west to east, spaced approximately 5 meters apart.

Figure 15 depicts the GPS track log walked by the Honua archaeologist; these data were recorded using Trimble equipment that maintained an accuracy ranging between 1 to 3 meters (3–10 feet). Previously identified sites revisited for this study were marked with Trimble points.

In addition, field notes were recorded, 34 photographs were taken, and a detailed photo log (captions) was created. Figure 16 and Figure 17 depict the location of all project-area photographs recorded—corresponding (numbered) photographs are in Appendix B. All data are stored and backed-up in Honua’s database.

4.2 Survey Results

Figure 18 depicts the location of the five (5) sites in the project area.

4.2.1 Overview

Fieldwork resulted in the following main findings:

1. Except for the shipping container area in the southwestern corner, the western half of the project area is a mix of graded/impacted basalt rock with thin soil deposits and areas of intact, gently undulating pāhoehoe lava flows. A very shallow (dry) ephemeral drainage was noted traversing roughly east to west in the central area of the western half of the project area.
2. The eastern half of the project area included the previously documented historic properties (SIHP #s 24243, 24244, 24245, 24247 and 2428). All of these sites were inspected, except for SIHP #24245, a set of three iron fence posts attributed by Escott (2004) to ranching or dairy workers. Inspected sites showed little to no change in condition since their original documentation, except for some damage from overgrown vegetation. Historic bottles were strewn about the area and a few historic-aged trash deposits are still present. The grounds in the eastern half of the project are a mix of

graded/impacted basalt rock with thin soil deposits and areas of intact, gently undulating pāhoehoe lava flows.

3. No new historic properties were observed in the project area.

4.2.2 SIHP # 50-10-35-24243

This site a complex of 12 features interpreted as a World War II-era military training (and possibly used later by dairy workers). Features at this site include several "foxholes" constructed of stacked and piled rocks, kerbstone footpaths and the concrete foundation of a small building.

Data recovery was completed at this site (Escott 2006), which completed its historic preservation treatment (i.e., no preservation of this site).

Figure 19 to Figure 22 are photographs of this site.

4.2.3 SIHP # 50-10-35-24244

This site is a World War II-era military anti-aircraft gun emplacement.

Data recovery was completed at this site (Escott 2006), which completed its historic preservation treatment (i.e., no preservation of this site).

Figure 23 and Figure 24 are photographs of this site.

4.2.4 SIHP # 50-10-35-24245

This site is a set of three isolated iron fence posts interpreted as related to historic-period ranching activities. It was not found (re-located) during the current fieldwork.

No further archaeological or historic preservation work was required for this site based on the original survey by Escott (2004).

4.2.5 SIHP # 50-10-35-24247

This site is a dirt road that traverses the project area; it appears on a 1965 aerial (see Figure 12) but not on a 1954 aerial (see Figure 11).

No further archaeological or historic preservation work was required for this site based on the original survey by Escott (2004).

Figure 24 is a photograph of this site.

4.2.6 SIHP # 50-10-35-24248

This site is a dirt road, portions of which traverse the project area; portions of it appear on a 1965 aerial (see Figure 12) but not on a 1954 aerial (see Figure 11).

No further archaeological or historic preservation work was required for this site based on the original survey by Escott (2004).

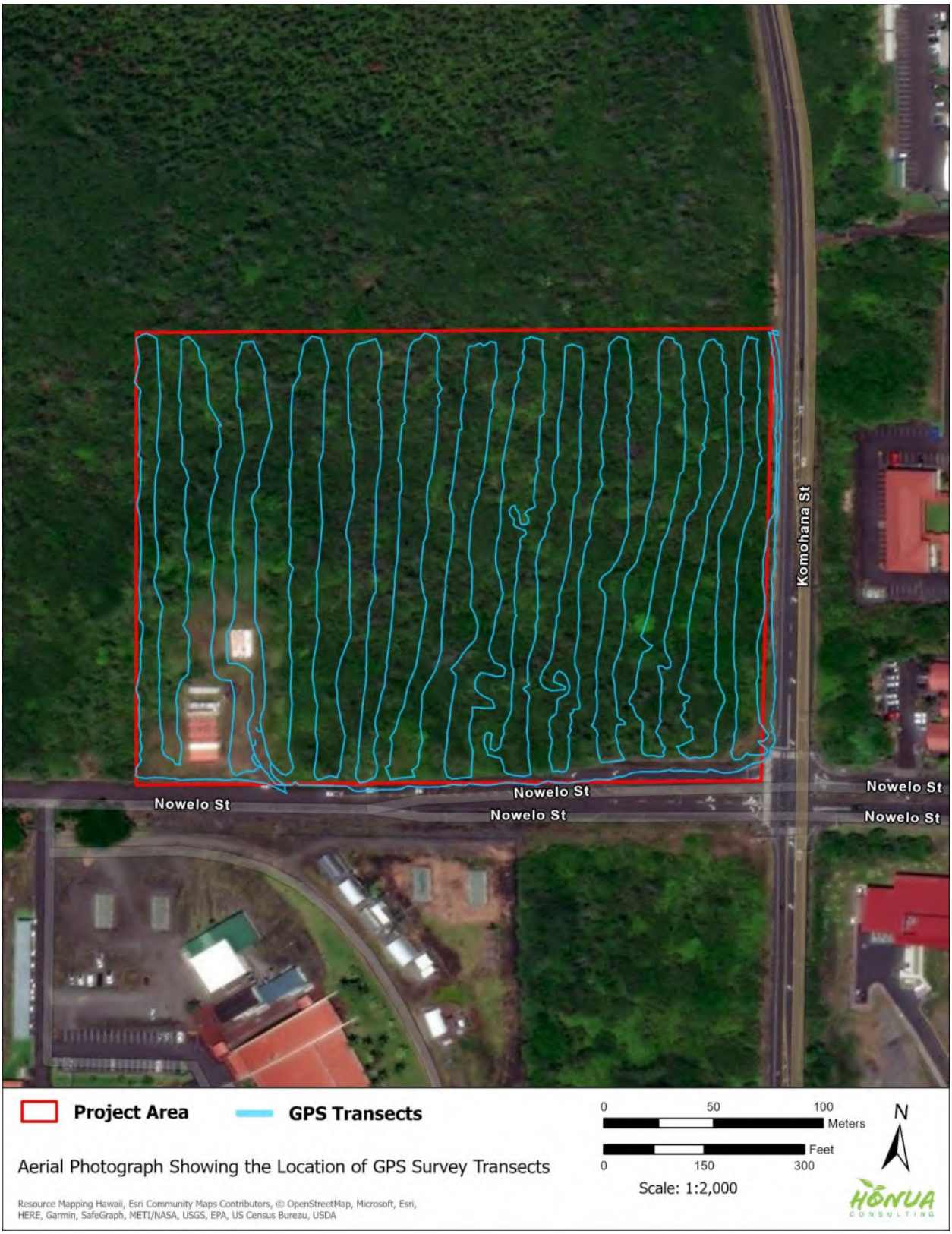


Figure 15. Aerial image showing pedestrian survey tracks walked in the project area by Honua archaeologists

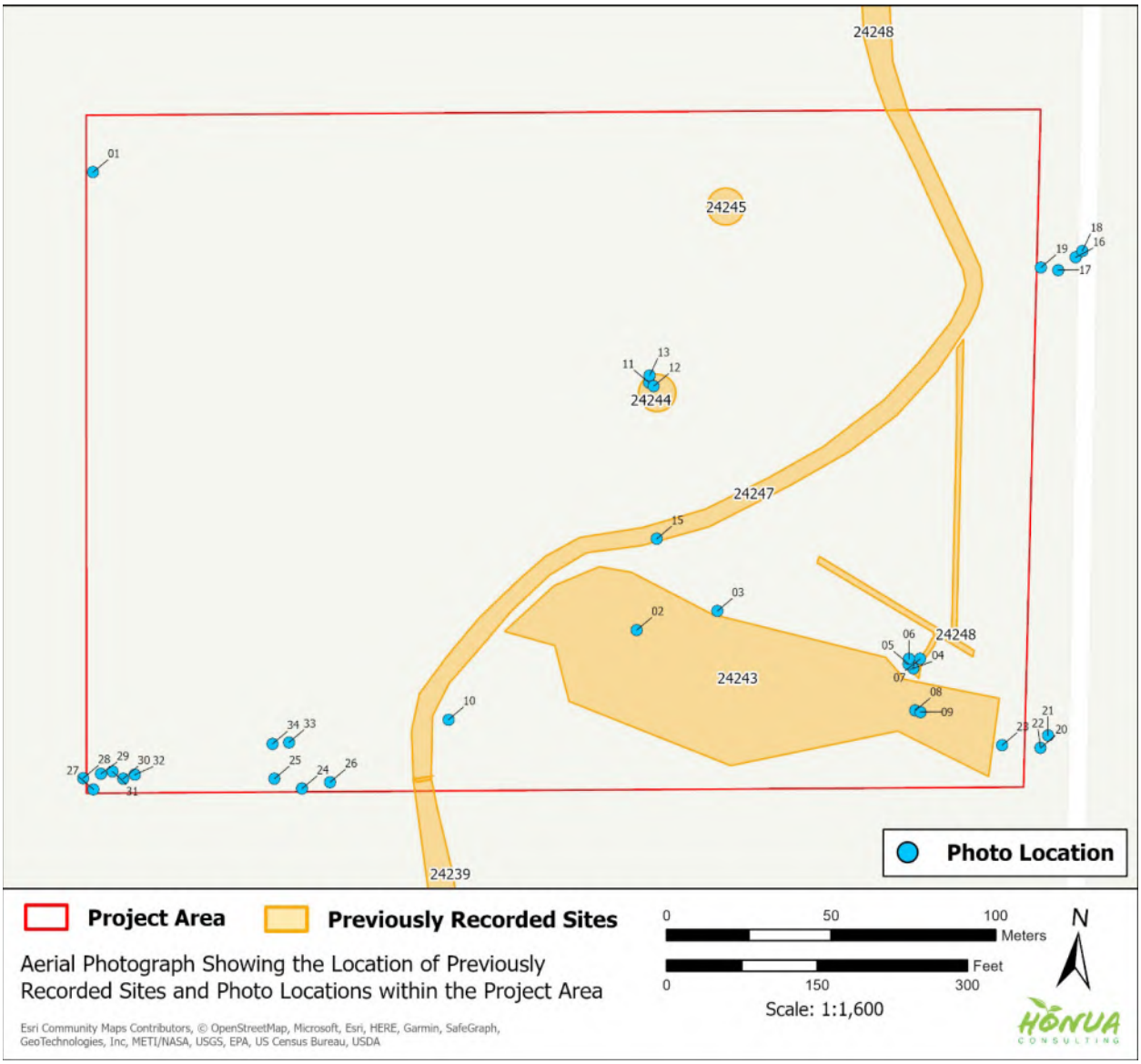


Figure 16. Photo key (numbered photographs taken by Honua archaeologists) at previously-identified historic properties and other views of project area

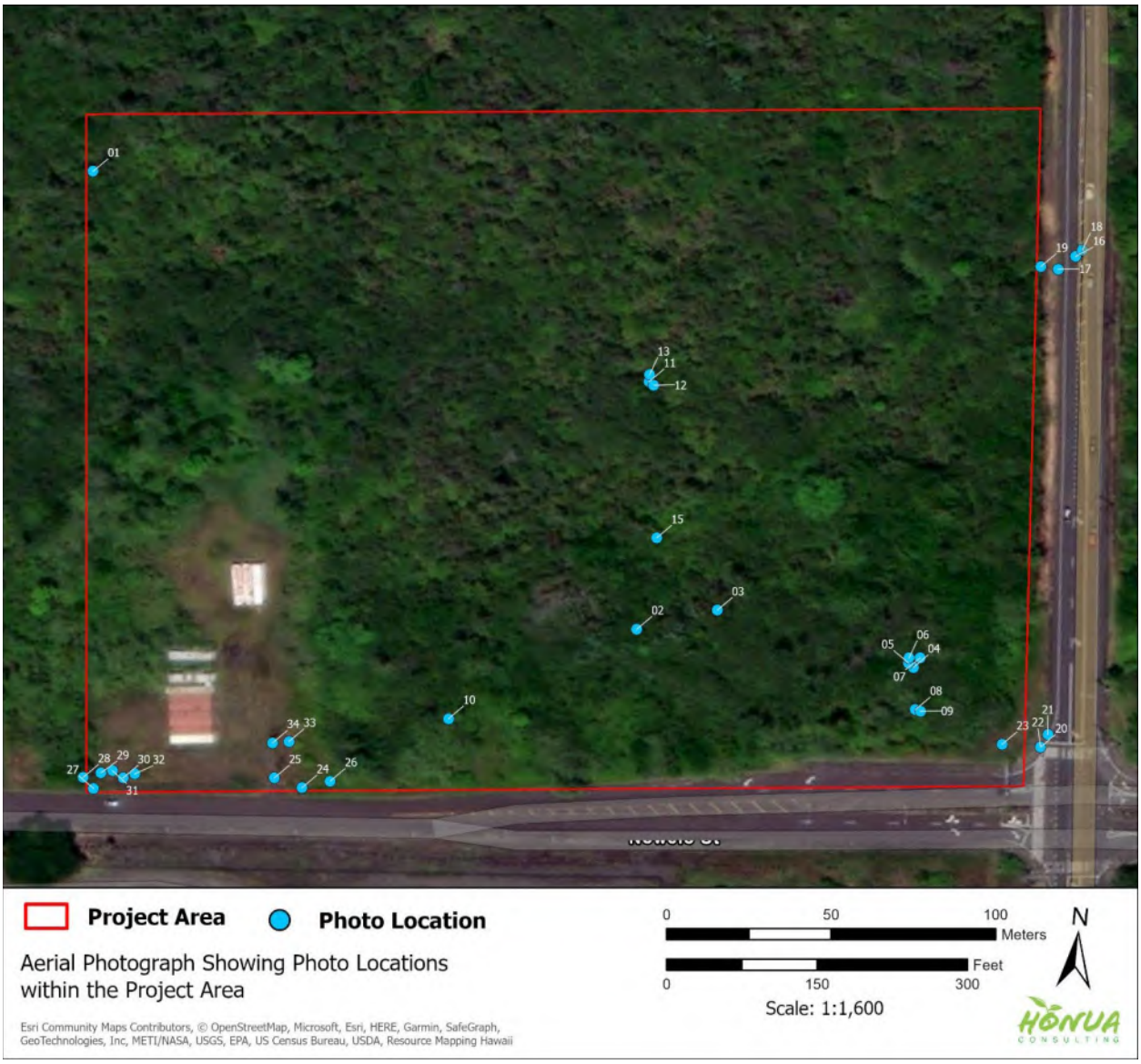


Figure 17. Photo key (numbered photographs taken by Honua archaeologists) at previously-identified historic properties and other views of project area

Figure 18. Location of archaeological sites (historic properties) located in the project area

Figure 19. View of a portion of SIHP # 50-10-35-24243 (Photo 2 on Figure 16 and Figure 17)

Figure 20. View of a portion of SIHP # 50-10-35-24243 (Photo 3 on Figure 16 and Figure 17)

Figure 21. View of a portion of SIHP # 50-10-35-24243 (Photo 7 on Figure 16 and Figure 17)

Figure 22. View of a portion of SIHP # 50-10-35-24243 (Photo 8 on Figure 16 and Figure 17)

Figure 23. View of a portion of SIHP # 50-10-35-24244 (Photo 11 on Figure 16 and Figure 17)

Figure 24. View of a portion of SIHP # 50-10-35-24244 (Photo 13 on Figure 16 and Figure 17)

Figure 25. View of a portion of SIHP # 50-10-35-24247 (Photo 15 on Figure 16 and Figure 17)

Conclusion

This report has been completed for HHF Planners and the U.S. Geological Survey (USGS) (lead agency) in support of the construction of a new approximately facility for the USGS Hawai‘i Volcano Observatory (HVO) and Pacific Island Ecosystem Research Center (PIERC) on land owned by the State of Hawai‘i (granted to the University of Hawai‘i by Executive Order No. 3814 dated April 11, 2000) in Waiākea Ahupua‘a, South Hilo District, Island of Hawai‘i, Hawai‘i. The project area is a 13-acre portion of (TMK [3] 2-4-001:122).

Because federal funds are being used, and because the USGS is a federal agency, this project is reviewable under Section 106 of the National Historic Preservation Act (NHPA). The Section 106 process in ongoing at this time.

The Area of Potential Effects (APE), or project area,[5] is near the north corner of the intersection of Komohana Street and Nowelo Road next to the University of Hawai‘i at Hilo campus, directly across Nowelo Road from the U.S. Department of Agriculture’s Daniel K. Inouye U.S. Pacific Basin Agricultural Research Center (PBARC). The project area is just southwest of the town of Hilo and about 1.5 miles southwest of Hilo Bay.

The client-provided proposed undertaking is described as follows:

> The new HVO-PIERC Replacement Facility is proposed on a 13-acre site near the north corner of the intersection of Komohana Street and Nowelo Road, near the University of Hawai‘i at Hilo (UH Hilo) campus. It is identified as TMK [3]2-4-001:122 (por). The 13-acre Project Area is part of a roughly 258-acre area which was the subject of the UH Hilo’s Mauka Lands Master Plan. The Proposed Action is to construct a permanent research facility in Hilo for HVO and PIERC. These organizations have recently been or are currently located within the Hawai‘i Volcanoes National Park (“Park”) and have different, but compatible, missions. The Proposed Action will provide replacement facilities for both agencies, supporting approximately 50 staff and volunteers from HVO and 53 staff and volunteers from PIERC. The facility will be approximately 60,000 SF in size, and will include office spaces, conference rooms, laboratories, warehouse and storage, and an operations/monitoring center. Conference rooms and storage will be shared to enhance operational efficiencies. HVO researchers and administrative staff formerly housed at Hawai‘i Volcanoes National Park will move to the proposed facility. Since 2018, these HVO staff have been operating out of temporary facilities in Hilo and working from home. PIERC staff will relocate from their current facilities at Hawai‘i Volcanoes National Park to the new research facility.

The objectives of this Archaeological Literature Review and Field Inspection (ALRFI) was the following: (1) documentation and description of the parcel’s land-use history in the context of both its traditional Hawaiian character as well as its historic-period changes; (2) identification of any historic properties or component features in the project area; and (3) providing information relevant to the likelihood of encountering historically-significant cultural deposits in subsurface context during future construction.

[5] The term “project area” is used throughout this report; it has the same meaning as the APE.

This ALRFI is not an archaeological inventory survey (AIS), and it is not intended for formal review by the State Historic Preservation Division (SHPD). It may be used, however, to support the project proponent's consultation with the SHPD in compliance with Section 106 of the NHPA, and other environmental requirements (e.g., NEPA [National Environmental Policy Act]).

Figure 26 is an overlay of the current construction site plan and the existing archaeological sites in the project area. The image shows a small portion (i.e., Features I and possibly L) of State Inventory of Historic Places [SIHP] #s 50-10-35-24243 will be impacted (razed or destroyed) by the proposed undertaking. SIHP # -24243 is a complex of 12 features interpreted as a World War II-era military training (and possibly used later by dairy workers); its component features include several "foxholes" constructed of stacked and piled rocks, kerbstone footpaths and the concrete foundation of a small building. Feature I was described by Escott (2006:12) as:

> . . . a level clearing 9 meters long (east/west) by 7 meters wide. Several pipe joints, glass bottles, and pieces of broken concrete, likely from a water tank . . . Feature I is likely a clearing for a military structure associated with U.S. training in the area.

Escott (ibid.:12-13) described Feature L as " . . . a cement-capped cesspool . . . roughly oval in shape . . . [and] appears to be hand excavated into the bedrock."

SIHP # 50-10-35-24243 has been the subject of a completed program of Data Recovery in 2006 (see SHPD letter from 2006 in Appendix A). The specific scope of work for Escott's (2006) Data Recovery methods at SIHP # -24243 included systematic (100%) collection of all surface artifacts and their subsequent analysis and reporting. The majority of these artifacts were found to date from between 1942 and 1946. These included 78 glass bottles. In our professional opinion, archaeological work at this site has been completed.

Archival research and fieldwork demonstrate: (1) the project area has been subject to both an archaeological inventory survey (AIS) and DR in 2004 and 2006, respectively, which completed the historic preservation process for the identified sites; (2) much of the project area has been previously modified by historic-period activities (sugar cane and dairy workers) as well as by military training during World War II; (3) the eastern half of the project area included five previously documented historic properties: SIHP #s 50-10-35-24243, -24244, -24245, -24247 and -2428; all of these sites were inspected, except for SIHP #24245, a set of three iron fence posts attributed by Escott (2004) to ranching or dairy workers; inspected sites showed little to no change in condition since their original documentation, except for some damage from overgrown vegetation; (4) no new or additional historic properties, or potential historic properties, were identified during the pedestrian survey conducted for this report.

5.1 Recommendations

Based on all available evidence, our recommendations are as follows:

1. We believe that the historic preservation process for the known historic properties in the project area has been completed (see SHPD letters dated 2004 and 2006 in Appendix A); however, we recommend that SHPD needs to make this final determination.
2. Nonetheless, the SHPD-Archaeology Branch should be consulted on archaeological matters associated with proposed ground disturbance associated with the proposed development project, given the potential for encountering subsurface finds.

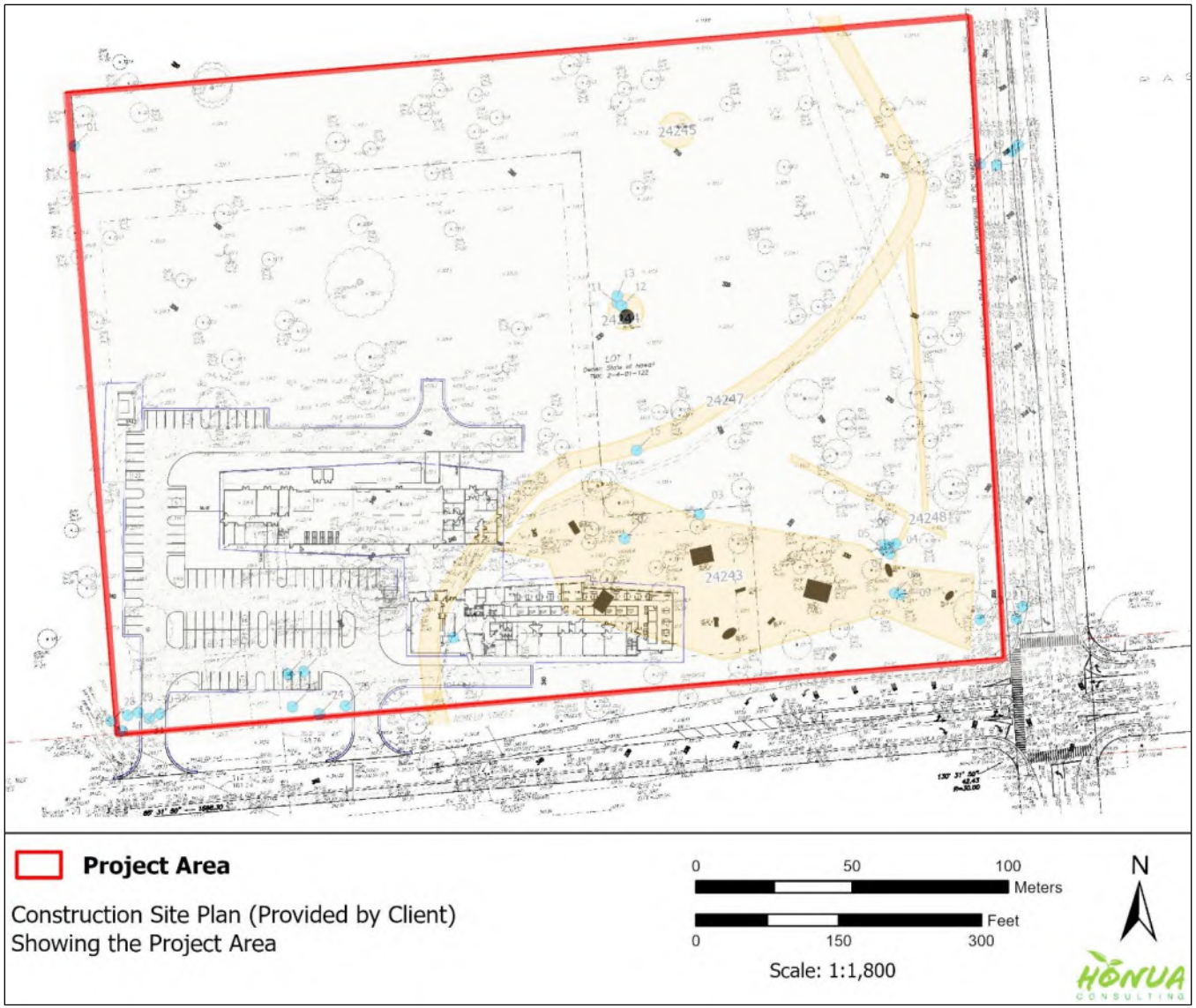


Figure 26. Overlay of construction plans (southwest quadrant) and archaeological sites in project area (see text above for discussion)

References Cited

Giambelluca, T., Q. Chen, A. Frazier, J. Price, Y. Chen, P. Chu, J. Eischeid, & D. Delparte
2013 *Rainfall Atlas of Hawai'i, Interactive Map.* Geography Department, University of Hawai'i-Mānoa. Accessed at <http://rainfall.geography.hawaii.edu/interactivemap.html>.

Handy, E.S.C.
1940 *The Hawaiian Planter,* vol. 1. Bernice P. Bishop Museum Bulletin 161. Bishop Museum Press, Honolulu.

Handy, E.S.C and E.G. Handy
1972 *Native Planters in Old Hawaii: Their Life, Lore, and Environment.* Bernice P. Bishop Museum Bulletin 233. Bishop Museum Press, Honolulu.

Hawai'i TMK Service
n.d. Various TMK maps in this report (cited in captions). On file at Hawai'i TMK Service, 222 Vineyard Street, Suite 401, Honolulu.

Kamakau, S.M.
1992 *Ruling Chiefs of Hawaii* (Multiple translators). Kamehameha Schools Press, Honolulu.

Kelly, M., B. Nakamura, and D. Barrère
1981 *Hilo Bay: A Chronological History.* Department of Anthropology, Bernice P. Bishop Museum, Honolulu. Prepared for U.S. Army Corps of Engineers, Honolulu District.

McEldowney, H.
1979 *Archaeological and Historical Literature Search and Research Design: Lava Flow Control Study, Hilo, Hawaii.* Department of Anthropology, Bishop Museum, Honolulu.

Pukui, M.K.
1983 *'Ōlelo No'eau, Hawaiian Proverbs & Poetical Sayings.* Bernice P. Bishop Museum Special Publication No. 71, Bishop Museum Press, Honolulu.

Pukui, M.K., and S.H. Elbert
1986 *Hawaiian Dictionary.* University of Hawaii Press, Honolulu.

Pukui, M.K., S.H. Elbert, and E.T. Mookini
1974 *Place Names of Hawaii*. The University of Hawaii Press, Honolulu.

Sato, H., W. Ikeda, R. Paeth, R. Smythe, and M. Takehiro
1973 *Soil Survey of the Island of Hawaii, State of Hawaii*. U.S. Department of Agriculture, U.S. Government Printing Office, Washington, D.C.

Thrum, T.
1907a Heiaus and Heiau Sites throughout the Hawaiian Islands. *Hawaiian Almanac and Annual for 1908,* pp. 38-47. Thos. G. Thrum, Honolulu.

1907b Tales from the Temples Part II. *Hawaiian Almanac and Annual for 1908,* pp. 48-78. Thos. G. Thrum, Honolulu.

Thrum, T.G.
1938 *Complete List of Heiaus (Temples) and Sites. Hawaiian Annual for 1938, pp. 121-142. Printshop Co., Ltd.,* Honolulu.

Appendix A – SHPD Correspondence re the Subject Parcel

LINDA LINGLE
GOVERNOR OF HAWAII

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON
DEPUTY DIRECTOR - LAND

YVONNE Y. IZU
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION
KAKUHIHEWA BUILDING, ROOM 555
601 KAMOKILA BOULEVARD
KAPOLEI, HAWAII 96707

November 17, 2004

Mr. Glenn Escott
Scientific Consulting Services, Inc.
711 Kapiolani Blvd., Suite 975
Honolulu, Hawaii 96813

LOG NO: 2004.3367
DOC NO: 0411MM09

Dear Mr. Escott:

SUBJECT: **Chapter 6E-8 Historic Preservation Review, Revised Archaeological Inventory Survey, "An Archaeological Inventory Survey on Approximately 258 Acres of Land for the University of Hawai`i-Hilo *Mauka* Lands Development" Ahupua`a of Waiakea, South Hilo District, Hawaii Island TMK: (3) 2-4-001:122**

Thank you for submitting the revised version of the above mentioned report for our final review. The report, prepared for PBR Hawaii, was received on September 13, 2004. Our review is late and we apologize for any inconvenience this may have caused you or your client.

The report was revised in response to our initial review comments dated December 29, 2003 (Log No. 2003.2584, Doc. No. 0312PM11). The inventory survey of the roughly 258-acre project area was found adequate in terms of field survey and identification of sites, but comments on the significance evaluations and recommended site treatments were deferred until revisions were made.

All the requested revisions have now been adequately addressed. All twenty sites are assessed as significant under Criterion D for yielding information important in prehistory or history. Eighteen of the twenty sites are related to historic agriculture and pasture activities, and we agree that no further documentation or investigation is warranted. The remaining two sites, 50-10-35-24243 and 24244 are associated with military defense and training activities in the upland area of Hilo during World War II, are assessed as significant under Criterion D, and are recommended for data recovery mitigation.

These two sites are arguably eligible under Criterion A as associated specifically with World War II training activities. We believe, however, that data recovery mitigation is warranted and appropriate even if the sites are not preserved. We therefore accept the report as adequate and final, on the condition you revise this evaluation of significance. Please contact our Architecture Branch Chief, Thomas Lim at 692-8030, for recommendations on the form that data recovery work may need to take.

Aloha,

Melanie A. Chinen, Administrator
State Historic Preservation Division

NOV 22 2004

MM:jen

c: Thomas Lim, Architecture Branch Chief
Christopher J. Yuen, Dir, Hawaii Planning, 101 Pauahi St, Suite 3, Hilo, HI 96720-3043

LINDA LINGLE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION
KAKUHIHEWA BUILDING, ROOM 555
601 KAMOKILA BOULEVARD
KAPOLEI, HAWAII 96707

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON
DEPUTY DIRECTOR - LAND

YVONNE Y. IZU
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

December 29, 2004

Mr. Glenn Escott
Scientific Consulting Services, Inc.
711 Kapiolani Blvd., Suite 975
Honolulu, Hawaii 96813

Log No: 2004.3367
Doc No:0412MM07

Doc n/o
0412MM09

Dear Mr. Escott:

SUBJECT: Chapter 6E-8 Historic Preservation Review, Final Submit al Inventory Survey, "An Archaeological Inventory Surve of Land for the University of Hawai`i-Hilo *Mauka* Lands Dev Ahupua`a of Waiakea, South Hilo District, Hawaii Island TMK: (3) 2-4-001:122

Thank you for submitting one replacement page for the above mentioned report, which we received on December 20, 2004. The significance evaluations for two sites, Statewide Inventory of Historic Places (SIHP) Nos. 50-10-35-24243 and 50-10-35-24244, have been changed to include them under Criterion "A" as well as "D." This change was made in response to our November 17, 2004 review letter (Log. No. 2004.3367, Doc. No. 0411MM09), in which we approved this report on the condition you sent us this replacement page.

The report has been accepted as adequate and final. The next step will be the preparation of a mitigation plan for SIHP Nos. -24243 and -24244. If you have any questions, please call MaryAnne Maigret in our Kona office at 327-3690.

Aloha,

Melanie A. Chinen, Administrator
State Historic Preservation Division

MM: slc

c: Thomas Lim, Architecture Branch Chief
Christopher J. Yuen, Director, Hawaii County Planning, 101 Pauahi Street, Suite 3, Hilo, HI 96720-3043

DEC 30 2004

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

GUY H. KAULUKUKUI
FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
601 KAMOKILA BOULEVARD, ROOM 555
KAPOLEI, HAWAII 96707

July 9, 2012

Mr. Gerald Yamada
GW Construction
16-212 Melekahiwa Place
Kea'au, Hawai'i 96749

LOG NO: 2012.1281 ✓
DOC NO: 1207TD01
Archaeology

Dear Mr. Yamada:

Subject: **Chapter 6E-42 Historic Preservation Review –**
County of Hawai'i Grading Permit for UH Hilo Water Infrastructure Improvements
Waiākea Ahupua'a, South Hilo District, Island of Hawai'i
TMK: (3) 2-4-001: 122 (por.) and 173 (por.)

Thank you for requesting comments on this application, which we received May 1, 2012. We apologize for the delay in responding and for any inconvenience it may have caused. The permit is for construction of an exploratory well pad and access road (in Parcel 122) that will connect to an existing water reservoir site (in Parcel 173). Approximately 1.73 acres will be affected; most of the project area is within Parcel 122, a 258-acre parcel that is the proposed site for the expansion of UH-Hilo and Hawaii Community College campuses. The proposed access road will enter Parcel 122 at its southwestern corner and parallel Puainako Street Extension for approximately 1300 feet, then turn north for approximately 280 feet to the exploratory well pad (*c.* 140 by 200 feet).

Our records indicate that an archaeological inventory survey was conducted of Parcel 122 in 2003 and 19 historic properties consisting of over 80 features were documented (Escott 2004). The report was accepted as final by our office in December 2004 (*Log 2004.3367, Doc 0412MM07*). Recommended data recovery field work was completed at two World War II era sites in 2005; no sites were recommended for preservation. All of the historic properties identified during the inventory survey were/are located in the eastern portion of the parcel, well away from the project area as described in your application. We have received no new information to indicate the presence of historic properties within the area of the proposed access road and well pad. Based on the information provided in the inventory survey report for Parcel 122, we believe that **no historic properties will be affected** by the permit.

In the unlikely event that evidence of historic properties, such as rock mounds, trails, walls or lava tubes is discovered during grading, please cease work in the immediate area and contact our office at 933-7653. Please contact me at Theresa.K.Donham@hawaii.gov if you have any questions or wish to discuss this letter.

Aloha,

Theresa K. Donham
Archaeology Branch Chief

Appendix B – Project Area Photographs

The 34 numbered photographs that follow in this appendix correspond to the numbers in the photo key (see Figures 15 and 16).

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

Photo 7

Photo 8

Photo 9

Photo 10

Photo 11

Photo 12

Photo 13

Photo 14

Photo 15

Photo 16

Photo 17

Photo 18

Photo 19

Photo 20

Photo 21

Photo 22

UNIVERSITY OF HAWAII AT HILO
UNIVERSITY PARK OF SCIENCE AND TECHNOLOGY

Photo 23

Photo 24

Photo 25

Photo 26

Photo 27

Photo 28

Photo 29

Photo 30

Photo 31

Photo 32

Photo 33

Photo 34

United States Department of the Interior

U. S. GEOLOGICAL SURVEY
Box 25046 M.S. 205
Denver Federal Center
Denver, Colorado 80225

July 21, 2022

HICRIS Project Review 2021PR01448

Alan Downer, Ph.D.
Deputy State Historic Preservation Office
Administrator, State Historic Preservation Division
Kakuhihewa Building
601 Kamokila Blvd., Suite 555
Kapolei, HI 96707
Ph: (808) 692-8026
Submitted via HICRIS

Subject: **National Historic Preservation Act, Section 106**
Initiation of Consultation
USGS Hilo Facility - New Construction
Waiākea Ahupuaʻa, South Hilo District, Hawaiʻi Island
TMK: (3) 2-4-001:122 (por)

Dear Dr. Downer,

The U.S. Geological Service (USGS) is submitting this letter to initiate consultation under 36 C.F.R. Part 800 of the National Historic Preservation Act (NHPA).

Initiation of Section 106 Process

36 C.F.R. 800.3 outlines the initiation of the section 106 process. We have determined per Section 800.3(a) that the project is an undertaking as defined under Section 800.16(y), because the project is funded in whole or in part under the direct or indirect jurisdiction of USGS and carried out with Federal financial assistance.

Upon determining that the project is indeed an undertaking, we further determined per Section 800.3(a) that due to the nature of the activities, the project involves a type of activity that has the potential to cause effects on historic properties.

Per 800.3(b) we are coordinating our Section 106 review with the overall planning schedule and other reviews required for the project. This correspondence shall constitute our effort to initiation consultation under 800.3(c)(3) of 36 C.F.R. 800.3.

Proposed Area of Potential Effect

USGS' proposed area of potential effect (APE) consists of a 13 acre parcel in Waiākea, South Hilo (Hawai'i Island), situated on a portion of TMK: (3) 2-4-001:122 (Figure 1 and Figure 2). The land is owned by the University of Hawai'i and is to be leased to the USGS. It is located on the northwest corner of Nowelo St. and Komohana St. across from U.S. Pacific Basin Agricultural Research Center and 'Imiloa Astronomy Center.

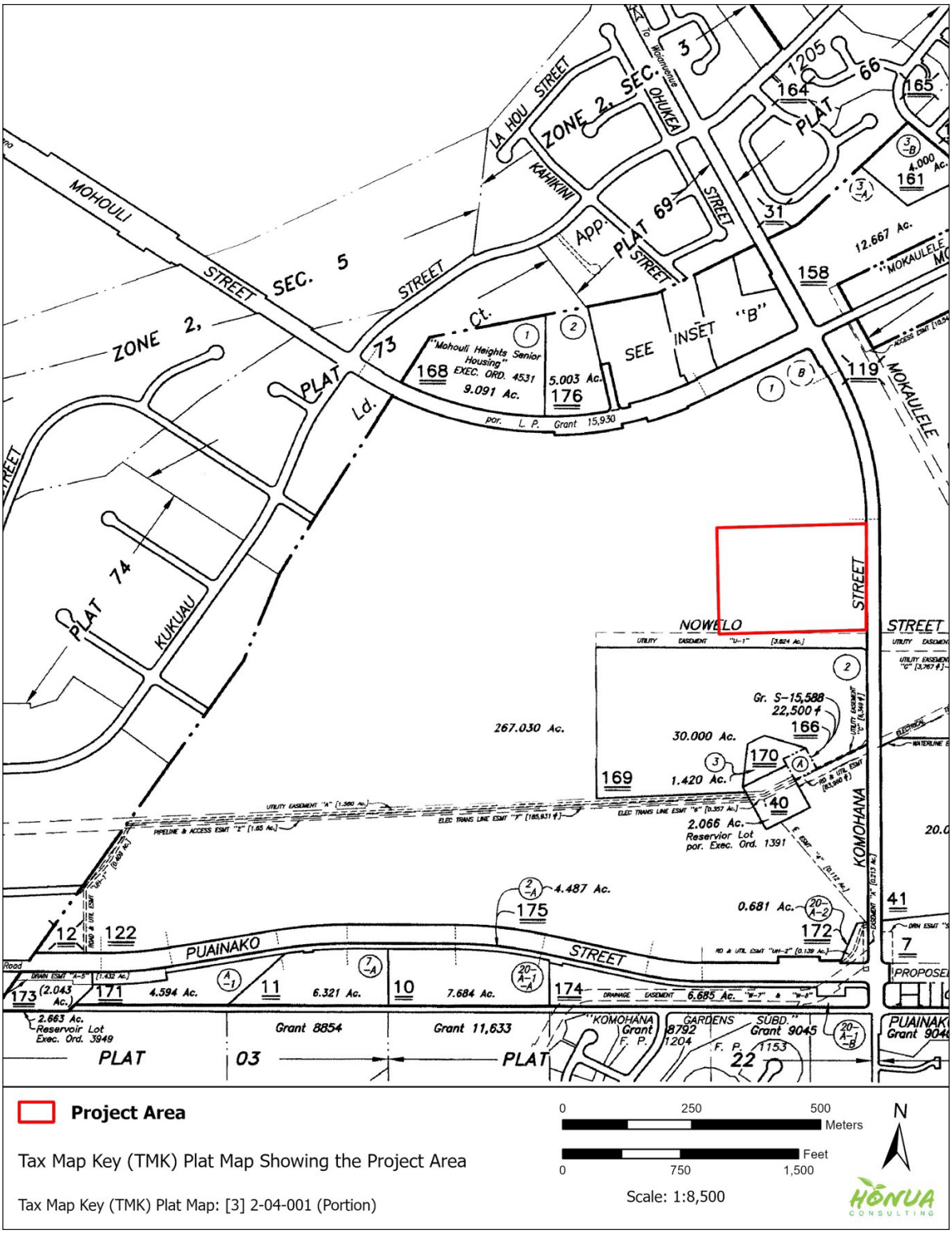


Figure 1. TMK map of the proposed APE

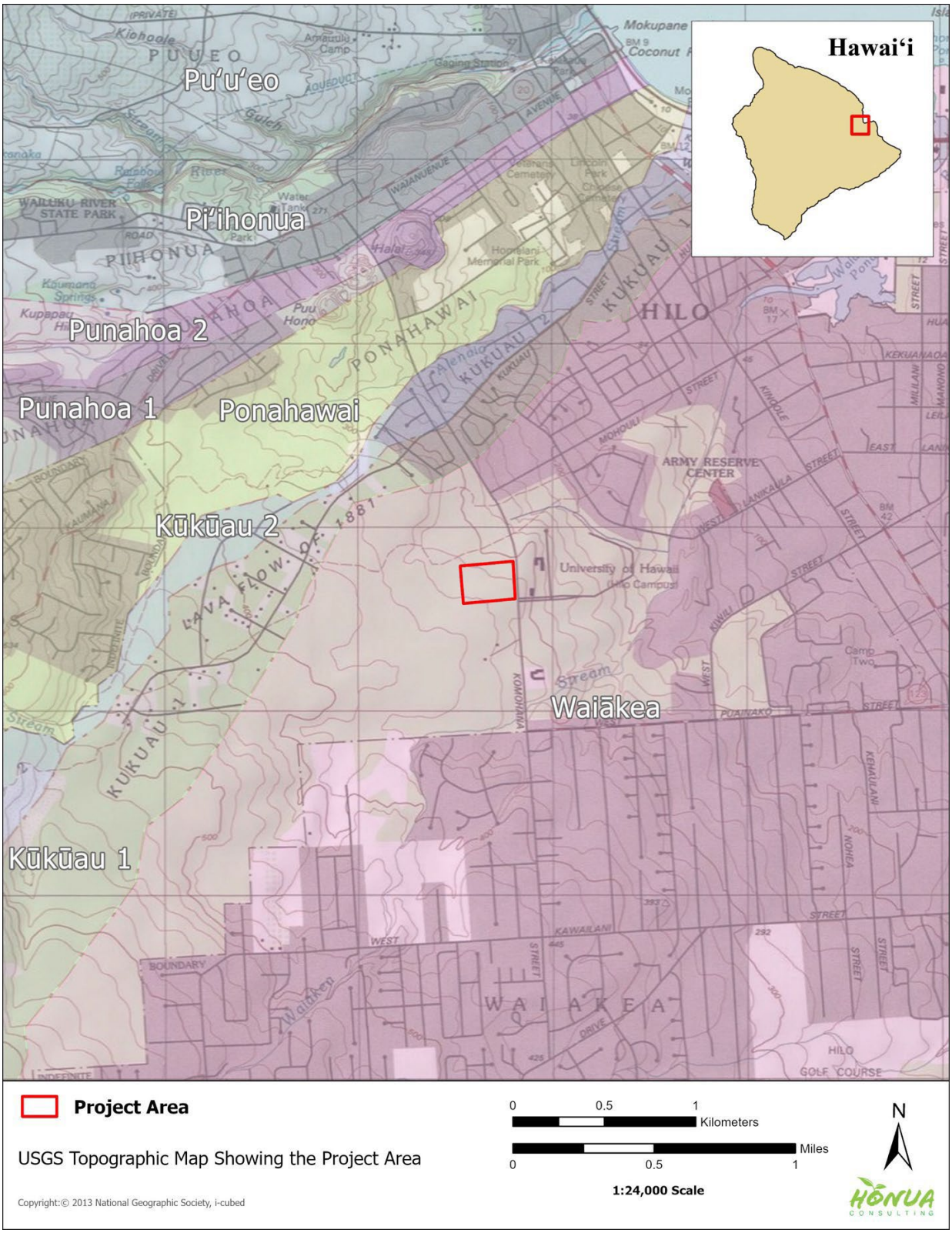


Figure 2. Topography map of the proposed APE

We kindly seek SHPO concurrence with our proposed APE.

Public Input and Consultation

The public will have opportunity to review the proposed action in coordination with the National Environmental Policy Act (NEPA) review. Additionally, invitations to participate in the Section 106 process will be sent to the Native Hawaiian Organization list maintained by the Office of Native Hawaiian Relations, ‘Imiloa Astronomy Center, Ka Haka ‘Ulu o Ke‘elikōlani College of Hawaiian Language, the Hawai‘i Volcanoes National Park (HAVO) Kūpuna Group (sent via HAVO), Historic Hawai‘i Foundation, and National Trust.

We kindly seek SHPO concurrence with our planned public input process and consultation with appropriate parties.

Level of Effort and Identification of Historic Properties

36 CFR Part 800 requires the federal agency to make a reasonable level of effort to identify historic properties. The proposed APE has been previously investigated for separate projects. UH Hilo previously investigated the property for potential development. An environmental impact statement (EIS) was completed in 2005. As part of this, an archaeological inventory survey (AIS) was completed (Escott 2004, submitted into the project file via HICRIS.) The AIS was accepted by SHPD in 2004 (Log No 2004.3367, Doc No. 0411MM09).

Honua Consulting, LLC inquired with SHPD regarding this previous work on February 9, 2022, and SHPD kindly assisted in locating additional documentation regarding this parcel (Table 1).

Table 1. Records identified by SHPD as being within or near the APE. All records will be uploaded into HICRIS.

Document Name, Author, and Date	Document Locator	TMKs	Key Findings / Determination
Final AIS for USDA Pacific Basin Agricultural Research Center (McDermott and Hammatt, 2000)	N/A Cultural Surveys Hawaii (CSH) Report	(3) 2-4-001:122	Identification of SIHP #50-10-35-22080
Final Addendum to AIS for USDA Pacific Basin Agricultural Research Center (McDermott and Hammatt, 2001)	N/A Cultural Surveys Hawaii (CSH) Report	(3) 2-4-001:122 (por.)	Documents results of AIS investigation on an additional 10 acre parcel
Historic Preservation Review (DLNR, 2002)	Log No. 30224 Doc No. 0207PM01	(3) 2-4-001:122 (por.)	Review form notes “This project has already gone through the historic preservation review

			process and mitigation has been complete."
SHPD HRS 6E Review of Draft AIS for UH Hilo Mauka Lands Development (SHPD, 2003)	Log No. 2003.2584 Doc No. 0312PM11	(3) 2-4-001:122	Requesting revisions to draft AIS, including obtaining SIHP for identified historic sites
SHPD HRS 6E Review of Final AIS for UH Hilo Mauka Lands Development (SHPD, 2004)	Log No. 2004.3367 Doc No. 0412MM07	(3) 2-4-001:122	Acceptance of final AIS. Notes next step of preparation of mitigation plan for SIHP Nos. 50-10-35-24243 and 50-10-35-24244
SHPD Review of Revised AIS (SHPD, 2004)	Log No. 2004.3367 Doc No. 0411MM09	(3) 2-4-001:122	Revised report accepted, on the condition that the evaluation of significance is revised
Revised AIS for Approx. 258 Acres for UH Hilo Mauka Lands	N/A SCS Report	(3) 2-4-001:122	Identified multiple historic properties in project area
Data Recovery Plan (DRP) for State Sites 50-10-35-24243 and 50-10-35-24244 (Escott, 2005)	N/A SCS Report	(3) 2-4-001:122	Data Recovery Plan for SIHP Nos. 50-10-35-24243 and 50-10-35-24244
SHPD Review of DRP	Log No. 2005.1054 Doc No. 0505MM11	(3) 2-4-001:122	Finds DRP adequate
Notification of Completion of Data Recovery Fieldwork on State Sites 50-10-35-24243 and 50-10-35-24244 (Escott, 2005)	N/A Scientific Consultant Services (SCS) Report	(3) 2-4-001:122	End of fieldwork letter report in conjunction with data recovery investigations for SIHP Nos. 50-10-35-24243 and 50-10-35-24244
Data Recovery Report (DRR) for State Sites 50-10-35-24243 and 50-10-35-24244 (Escott, 2006)	N/A SCS Report	(3) 2-4-001:122	Data Recovery Report for SIHP Nos. 50-10-35-24243 and 50-10-35-24244
SHPD Review of DRR for State Sites 50-10-35-24243 and 50-10-35-24244 (SHPD, 2006)	Log No. 2006.1822 Doc No. 0606JT11	(3) 2-4-001:122	Requests revisions to DRR
SHPD HRS 6E and Section 106 Review of Grading Permit for USDA Pacific Basic Research Center (SHPD, 2010)	Log No. 2010.3301 Doc No. 1011TD09	(3) 2-4-001:169	No historic properties effected determination. Notes two previous AISs and previous plan for burial parcel completed in area and sufficient identification of historic

			properties and implementation of mitigation.
Draft Burial Treatment Plan (BTP) for SIHP # 50-10-35-22080 (Hammatt and Shideler, 2011)	N/A CSH Report	(3) 2-4-001:170	Draft BTP for SIHP # 50-10-35-22080, burial cave.
SHPD Acceptance of Burial Treatment Plan for SIHP # 50-10-35-22080 (SHPD, 2012)	Log No. 2012.2016 Doc No. 1209.KH04	(3) 2-4-001:170	BTP accepted.
SHPD HRS 6E Review for Grading Permit for UH Hilo Water Infrastructure Improvements (SHPD, 2012)	Log No. 2012.1281 Doc No. 1207TD01	(3) 2-4001:122 (por.) and :173 (por.)	No historic properties affected. Notes: "Our records indicate that an archaeological inventory survey was conducted of Parcel 122 in 2003 and 19 historic properties consisting of over 80 features were documented (Escott 2004). The report was accepted as final by our office in December 2004 (Log 2004.3367, Doc 0412MM07). Recommended data recovery field work was completed at two World War II era sites in 2005; no sites were recommended for preservation."
SHPO Section 106 Review for Hilo Facility New Construction Boring Soil Survey (SHPD, 2022)	HICRIS 2021PR01448 Doc No. 2202SH10	(3) 2-4-001:122 and (3) 2-4-001:999	SHPO concurrence with "no effect" determination (subject project and parcel)

Based on the previous archaeology, five historic properties have previously been identified and recorded in the APE (Figure 3 and Table 2).

Figure 3. Aerial Photograph Showing Locations of Previously Recorded Sites within APE (Honua Consulting, LLC)

Table 2. Previously identified sites within the APE (Escott, 2004)

Site Number	Site Description	Criteria for Significance	Recommendation Mitigation
50-10-35-24245	Fence Posts	D	None
50-10-35-24244	Military	D	Data Recovery
50-10-35-24247	Dirt Road	D	None
50-10-35-24248	Dirt Road	D	None
50-10-35-24243	Dairy / Military	D	Data Recovery

Data recovery on SIHP Nos. 50-10-35-24243 and 50-10-35-24244 was completed in 2005 (Escott, 2005) and a data recovery report (DRR) was completed and submitted to SHPD in 2006 (Escott, 2006). SHPD reviewed the DRR in 2006 (Log No. 2006.1822, Doc No. 0606JT11).

A separate HRS 6E review for another project conducted by SHPD in 2012 indicated that the data recovery for SIHP Nos. 50-10-35-24243 and 50-10-35-24244 was complete (Log No. 2012.1281, Doc No. 1207TD01). It appears from this record that no further work is required for any of the five historic properties in the APE (Table 2).

Honua Consulting, LLC also completed an Archaeological Literature Review and Field Investigation (ALRFI) of the proposed APE. The report findings state:

> ...archival research and fieldwork demonstrate several relevant findings: (1) the project area has been subject to both an archaeological inventory survey (AIS) and DR in 2004 and 2006, respectively, which completed the historic preservation process for the identified sites; (2) much of the project area has been previously modified by historic-period activities (sugar cane and dairy workers) as well as the military for training purposes during World War II; (3) the eastern half of the project area included five previously documented (by Escott 2004, 2006) historic properties: SIHP #s 50-10-35-24243, -24244, -24245, -24247 and -2428; all of these sites were inspected, except for SIHP #24245, a set of three iron fence posts attributed by Escott (2004) to ranching or dairy workers; inspected sites showed little to no change in condition since their original documentation, except for some damage from overgrown vegetation; (4) no new or additional historic properties, or potential historic properties, were identified during the pedestrian survey conducted for this report (Monahan et al. 2022).

A copy of this ALRFI is being provided to the SHPO for review and consideration through HICRIS. The historic preservation process has been completed for the identified sites in the APE, no sites were identificied for preservation, and the contemporaneous field inspection did not identify any new or additional historic properies, or potential historic properties.

In addition to our above referenced efforts, we will also seek input from the public and consulting parties as to any additional properties that may not have been identified through the previous archaeological investigations and surveys. We will provide the results of those consultations to SHPO.

<u>We kindly seek SHPO concurrence with the level of effort undertaken to identify and evaluate historic properties.</u>

Anticipated Determination

Based upon our investigation of the APE, the preliminary site plan (Figure 4) was developed. Some previously identified sites would be removed as part of the development of the USGS facility. These sites have already completed the historic preservation process and none are identified for preservation. Also, based on previous archaeology, we find that these sites fail to embody distinctive charactertistics of a type, period, or method of construction that would make them eligible for the National Register of Historic Places (NRHP). We believe past SHPD findings on these same properties support this finding.

We will send a final determination once the consultation process has been completed and we have taken into consideration any information resulting from consultation. Nonetheless, at this time, we are anticipating making a determination of no adverse effect per 36 CFR §800.5(d)(1).

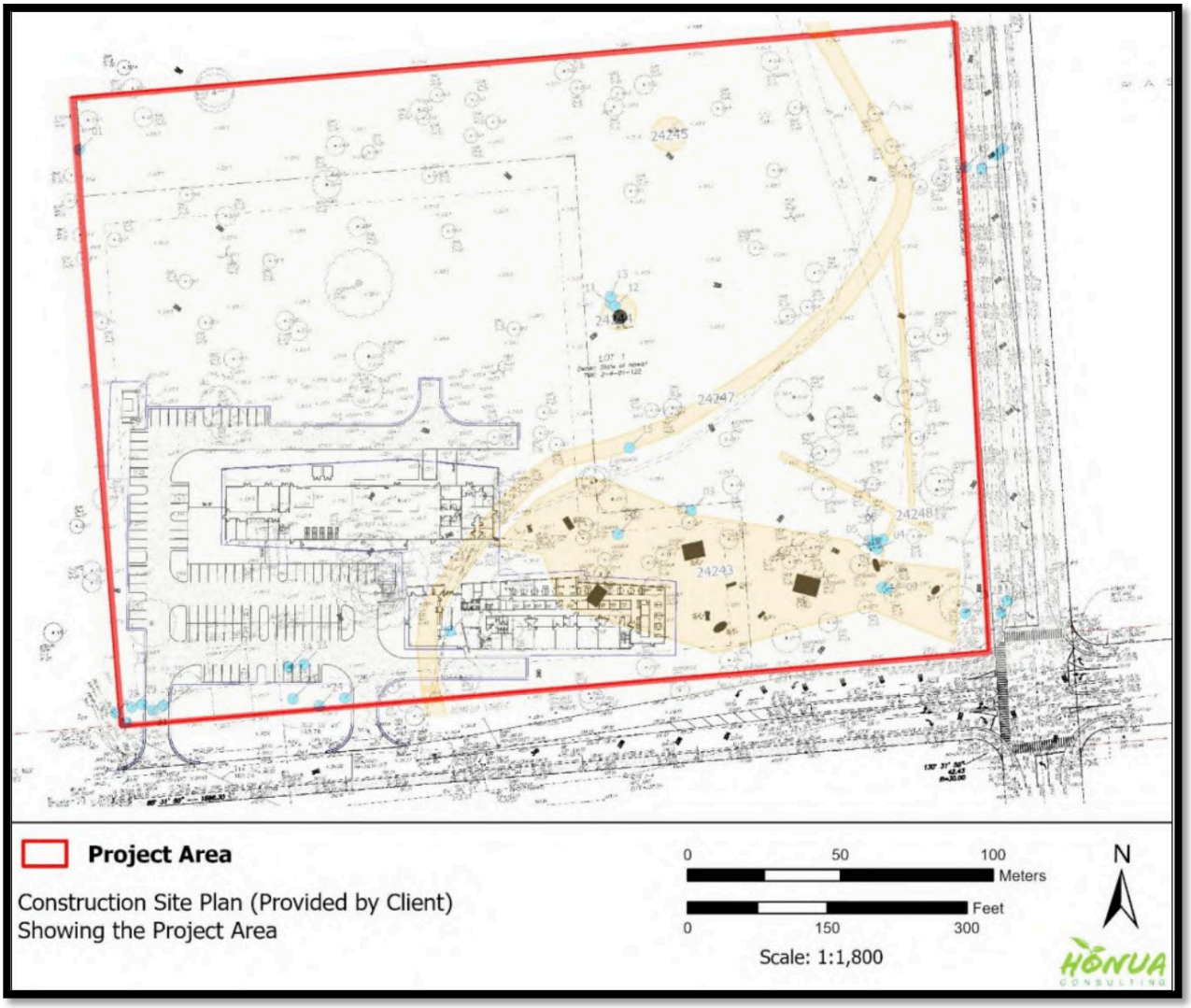


Figure 4. Prelimary Construction Site Plan

Conclusion

USGS seeks SHPO concurrence on the following:

- Proposed APE
- Planning public input process and consultation with appropriate parties
- Level of effort undertaken to identify and evaluate historic properties

Based on the foregoing information, and should no additional historic properties be identified, we anticipate issuing a determination of no historic properties affected after the close of the NEPA draft environmental assessment (DEA) comment period.

Please do not hesitate to contact me at jsizemore@usgs.gov.

Sincerely,

Jordan Sizemore

Jordan D. Sizemore, REM
Environmental Protection Specialist
USGS Environmental Management Branch

United States Department of the Interior

U. S. GEOLOGICAL SURVEY
Box 25046 M.S. 205
Denver Federal Center
Denver, Colorado 80225

July 21, 2022

Subject: **National Historic Preservation Act, Section 106**
Initiation of Consultation
USGS Hilo Facility - New Construction
Waiākea Ahupuaʻa, South Hilo District, Hawaiʻi Island
TMK: (3) 2-4-001:122 (por)

Aloha kākou,

The U.S. Geological Service (USGS) is submitting this letter to initiate consultation under 36 C.F.R. Part 800 of the National Historic Preservation Act (NHPA).

Initiation of Section 106 Process

36 C.F.R. 800.3 outlines the initiation of the section 106 process. We have determined per Section 800.3(a) that the project is an undertaking as defined under Section 800.16(y), because the project is funded in whole or in part under the direct or indirect jurisdiction of USGS and carried out with Federal financial assistance.

Upon determining that the project is indeed an undertaking, we further determined per Section 800.3(a) that due to the nature of the activities, the project involves a type of activity that has the potential to cause effects on historic properties.

Per 800.3(b) we are coordinating our Section 106 review with the overall planning schedule and other reviews required for the project. This correspondence shall constitute our effort to initiation consultation under 800.3(c)(3) of 36 C.F.R. 800.3.

Proposed Area of Potential Effect

USGS' proposed area of potential effect (APE) consists of a 13 acre parcel in Waiākea, South Hilo (Hawai'i Island), situated on a portion of TMK: (3) 2-4-001:122 (Figure 1 and Figure 2). The land is owned by the University of Hawai'i and is to be leased to the USGS. It is located on the northwest corner of Nowelo St. and Komohana St. across from U.S. Pacific Basin Agricultural Research Center and 'Imiloa Astronomy Center.

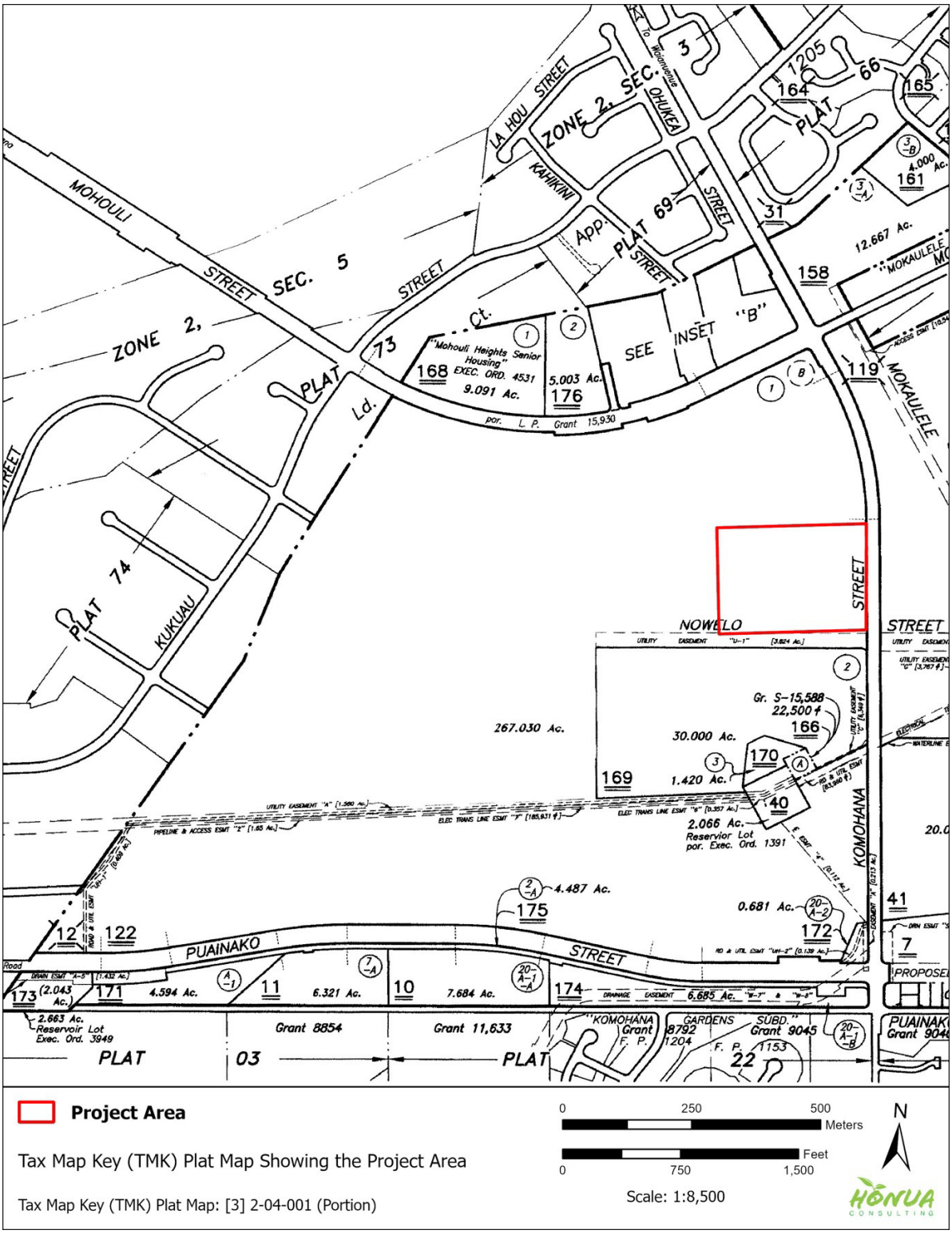


Figure 1. TMK map of the proposed APE

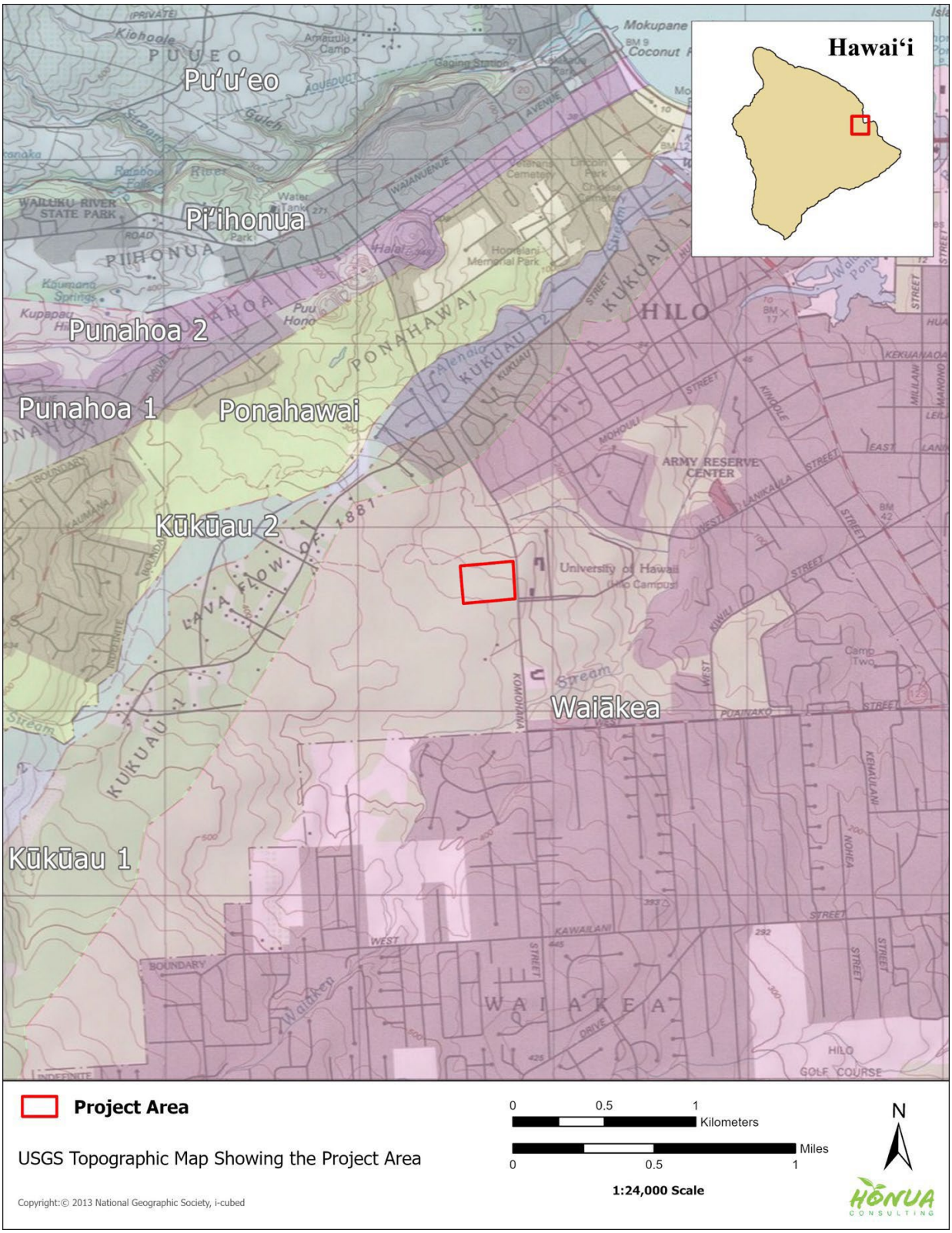


Figure 2. Topography map of the proposed APE

We kindly seek your input with our proposed APE.

Public Input and Consultation

The public will have opportunity to review the proposed action in coordination with the National Environmental Policy Act (NEPA) review. Additionally, invitations to participate in the Section 106 process will be sent to the Native Hawaiian Organization list maintained by the Office of Native Hawaiian Relations, ‘Imiloa Astronomy Center, Ka Haka ‘Ulu o Ke‘elikōlani College of Hawaiian Language, the Hawai‘i Volcanoes National Park (HAVO) Kūpuna Group (sent via HAVO), Historic Hawai‘i Foundation, and National Trust.

We kindly seek your input with our planned public input process and consultation with appropriate parties.

Level of Effort and Identification of Historic Properties

36 CFR Part 800 requires the federal agency to make a reasonable level of effort to identify historic properties. The proposed APE has been previously investigated for separate projects. UH Hilo previously investigated the property for potential development. An environmental impact statement (EIS) was completed in 2005. As part of this, an archaeological inventory survey (AIS) was completed (Escott 2004, submitted into the project file via HICRIS.) The AIS was accepted by SHPD in 2004 (Log No 2004.3367, Doc No. 0411MM09).

Honua Consulting, LLC inquired with SHPD regarding this previous work on February 9, 2022, and SHPD kindly assisted in locating additional documentation regarding this parcel (Table 1).

Table 1. Records identified by SHPD as being within or near the APE. All records will be uploaded into HICRIS.

Document Name, Author, and Date	Document Locator	TMKs	Key Findings / Determination
Final AIS for USDA Pacific Basin Agricultural Research Center (McDermott and Hammatt, 2000)	N/A Cultural Surveys Hawaii (CSH) Report	(3) 2-4-001:122	Identification of SIHP #50-10-35-22080
Final Addendum to AIS for USDA Pacific Basin Agricultural Research Center (McDermott and Hammatt, 2001)	N/A Cultural Surveys Hawaii (CSH) Report	(3) 2-4-001:122 (por.)	Documents results of AIS investigation on an additional 10 acre parcel
Historic Preservation Review (DLNR, 2002)	Log No. 30224 Doc No. 0207PM01	(3) 2-4-001:122 (por.)	Review form notes “This project has already gone through the historic preservation review

			process and mitigation has been complete."
SHPD HRS 6E Review of Draft AIS for UH Hilo Mauka Lands Development (SHPD, 2003)	Log No. 2003.2584 Doc No. 0312PM11	(3) 2-4-001:122	Requesting revisions to draft AIS, including obtaining SIHP for identified historic sites
SHPD HRS 6E Review of Final AIS for UH Hilo Mauka Lands Development (SHPD, 2004)	Log No. 2004.3367 Doc No. 0412MM07	(3) 2-4-001:122	Acceptance of final AIS. Notes next step of preparation of mitigation plan for SIHP Nos. 50-10-35-24243 and 50-10-35-24244
SHPD Review of Revised AIS (SHPD, 2004)	Log No. 2004.3367 Doc No. 0411MM09	(3) 2-4-001:122	Revised report accepted, on the condition that the evaluation of significance is revised
Revised AIS for Approx. 258 Acres for UH Hilo Mauka Lands	N/A SCS Report	(3) 2-4-001:122	Identified multiple historic properties in project area
Data Recovery Plan (DRP) for State Sites 50-10-35-24243 and 50-10-35-24244 (Escott, 2005)	N/A SCS Report	(3) 2-4-001:122	Data Recovery Plan for SIHP Nos. 50-10-35-24243 and 50-10-35-24244
SHPD Review of DRP	Log No. 2005.1054 Doc No. 0505MM11	(3) 2-4-001:122	Finds DRP adequate
Notification of Completion of Data Recovery Fieldwork on State Sites 50-10-35-24243 and 50-10-35-24244 (Escott, 2005)	N/A Scientific Consultant Services (SCS) Report	(3) 2-4-001:122	End of fieldwork letter report in conjunction with data recovery investigations for SIHP Nos. 50-10-35-24243 and 50-10-35-24244
Data Recovery Report (DRR) for State Sites 50-10-35-24243 and 50-10-35-24244 (Escott, 2006)	N/A SCS Report	(3) 2-4-001:122	Data Recovery Report for SIHP Nos. 50-10-35-24243 and 50-10-35-24244
SHPD Review of DRR for State Sites 50-10-35-24243 and 50-10-35-24244 (SHPD, 2006)	Log No. 2006.1822 Doc No. 0606JT11	(3) 2-4-001:122	Requests revisions to DRR
SHPD HRS 6E and Section 106 Review of Grading Permit for USDA Pacific Basic Research Center (SHPD, 2010)	Log No. 2010.3301 Doc No. 1011TD09	(3) 2-4-001:169	No historic properties effected determination. Notes two previous AISs and previous plan for burial parcel completed in area and sufficient identification of historic

			properties and implementation of mitigation.
Draft Burial Treatment Plan (BTP) for SIHP # 50-10-35-22080 (Hammatt and Shideler, 2011)	N/A CSH Report	(3) 2-4-001:170	Draft BTP for SIHP # 50-10-35-22080, burial cave.
SHPD Acceptance of Burial Treatment Plan for SIHP # 50-10-35-22080 (SHPD, 2012)	Log No. 2012.2016 Doc No. 1209.KH04	(3) 2-4-001:170	BTP accepted.
SHPD HRS 6E Review for Grading Permit for UH Hilo Water Infrastructure Improvements (SHPD, 2012)	Log No. 2012.1281 Doc No. 1207TD01	(3) 2-4001:122 (por.) and :173 (por.)	No historic properties affected. Notes: "Our records indicate that an archaeological inventory survey was conducted of Parcel 122 in 2003 and 19 historic properties consisting of over 80 features were documented (Escott 2004). The report was accepted as final by our office in December 2004 (Log 2004.3367, Doc 0412MM07). Recommended data recovery field work was completed at two World War II era sites in 2005; no sites were recommended for preservation."
SHPO Section 106 Review for Hilo Facility New Construction Boring Soil Survey (SHPD, 2022)	HICRIS 2021PR01448 Doc No. 2202SH10	(3) 2-4-001:122 and (3) 2-4-001:999	SHPO concurrence with "no effect" determination (subject project and parcel)

Based on the previous archaeology, five historic properties have previously been identified and recorded in the APE (Figure 3 and Table 2).

Figure 3. Aerial Photograph Showing Locations of Previously Recorded Sites within APE (Honua Consulting, LLC)

Table 2. Previously identified sites within the APE (Escott, 2004)

Site Number	Site Description	Criteria for Significance	Recommendation Mitigation
50-10-35-24245	Fence Posts	D	None
50-10-35-24244	Military	D	Data Recovery
50-10-35-24247	Dirt Road	D	None
50-10-35-24248	Dirt Road	D	None
50-10-35-24243	Dairy / Military	D	Data Recovery

Data recovery on SIHP Nos. 50-10-35-24243 and 50-10-35-24244 was completed in 2005 (Escott, 2005) and a data recovery report (DRR) was completed and submitted to SHPD in 2006 (Escott, 2006). SHPD reviewed the DRR in 2006 (Log No. 2006.1822, Doc No. 0606JT11).

A separate HRS 6E review for another project conducted by SHPD in 2012 indicated that the data recovery for SIHP Nos. 50-10-35-24243 and 50-10-35-24244 was complete (Log No. 2012.1281, Doc No. 1207TD01). It appears from this record that no further work is required for any of the five historic properties in the APE (Table 2).

Honua Consulting, LLC also completed an Archaeological Literature Review and Field Investigation (ALRFI) of the proposed APE. The report findings state:

> ...archival research and fieldwork demonstrate several relevant findings: (1) the project area has been subject to both an archaeological inventory survey (AIS) and DR in 2004 and 2006, respectively, which completed the historic preservation process for the identified sites; (2) much of the project area has been previously modified by historic-period activities (sugar cane and dairy workers) as well as the military for training purposes during World War II; (3) the eastern half of the project area included five previously documented (by Escott 2004, 2006) historic properties: SIHP #s 50-10-35-24243, -24244, -24245, -24247 and -2428; all of these sites were inspected, except for SIHP #24245, a set of three iron fence posts attributed by Escott (2004) to ranching or dairy workers; inspected sites showed little to no change in condition since their original documentation, except for some damage from overgrown vegetation; (4) no new or additional historic properties, or potential historic properties, were identified during the pedestrian survey conducted for this report (Monahan et al. 2022).

The historic preservation process has been completed for the identified sites in the APE, no sites were identificied for preservation, and the contemporaneous field inspection did not identify any new or additional historic properies, or potential historic properties.

In addition to our above referenced efforts, we are also seeking your input as to any additional properties that may not have been identified through the previous archaeological investigations and surveys. We are also seeking your input as to the level of effort undertaken to identify and evaluate historic properties.

Anticipated Determination

Based upon our investigation of the APE, the preliminary site plan (Figure 4) was developed. Some previously identified sites would be removed as part of the development of the USGS facility. These sites have already completed the historic preservation process and none are identified for preservation. Also, based

on previous archaeology, we find that these sites fail to embody distinctive charactertistics of a type, period, or method of construction that would make them eligible for the National Register of Historic Places (NRHP). We believe past SHPD findings on these same properties support this finding.

We will send a final determination once the consultation process has been completed and we have taken into consideration any information resulting from consultation. Nonetheless, at this time, we are anticipating making a determination of no adverse effect per 36 CFR §800.5(d)(1).

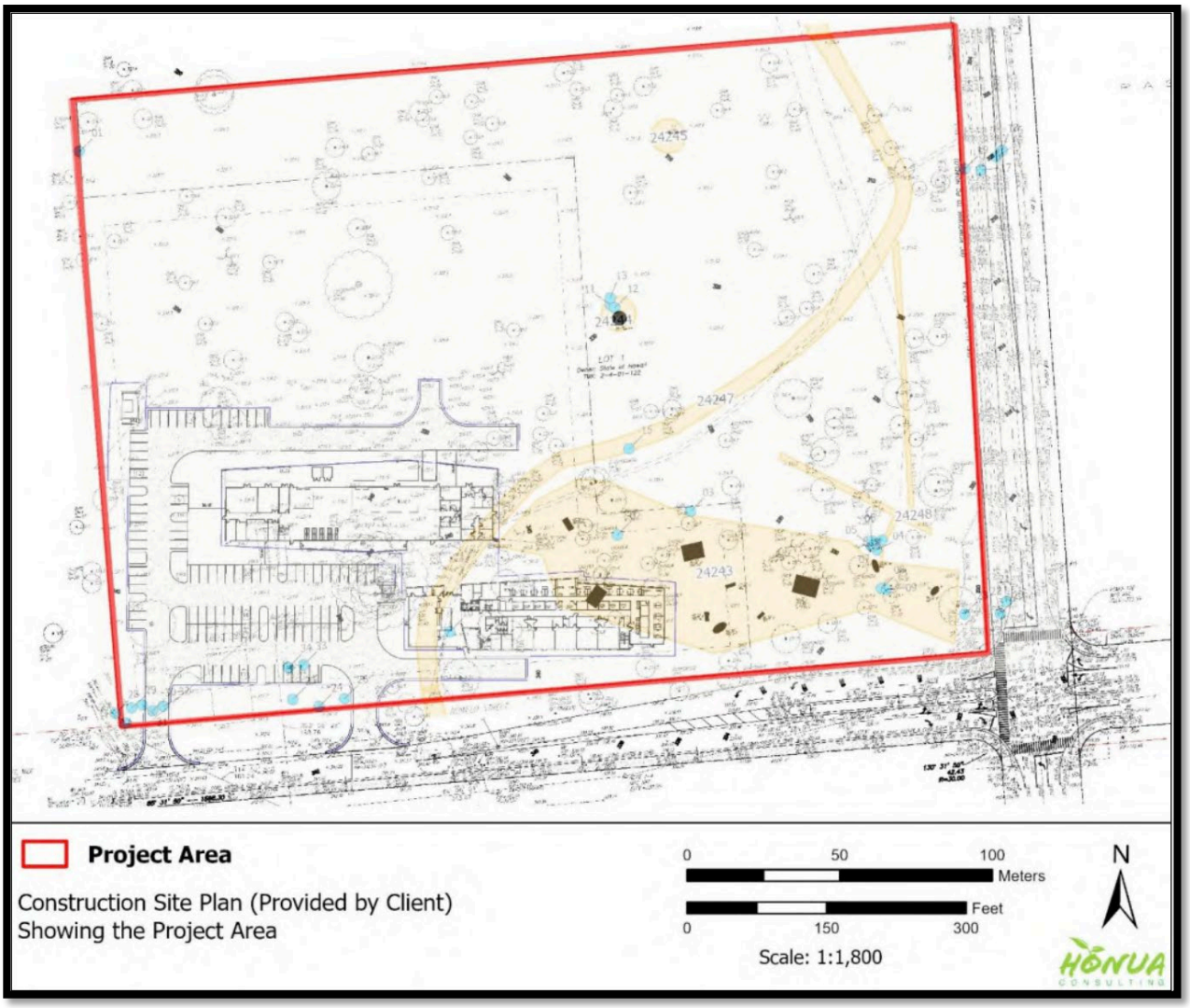


Figure 4. Prelimary Construction Site Plan

Conclusion

USGS seeks your input on the following:

- Proposed APE
- Planning public input process and consultation with appropriate parties
- Level of effort undertaken to identify and evaluate historic properties

Based on the foregoing information, and should no additional historic properties be identified, we anticipate issuing a determination of no historic properties affected after the close of the NEPA draft environmental assessment (DEA) comment period.

Please direct any responses to Dr. Trisha Kehaulani Watson at watson@honuaconsulting.com or (808) 392-1617 by Monday October 3, 2022. We greatly value your time and input. Mahalo for your consideration.

Sincerely,

Jordan Sizemore

Jordan D. Sizemore, REM
Environmental Protection Specialist
USGS Environmental Management Branch

APPENDIX D

Cultural Impact Assessment

Honua Consulting

September 2022

Cultural Impact Assessment for the proposed facility for the USGS Hawai'i Volcano Observatory (HVO) and Pacific Island Ecosystem Research Center (PIERC)
Tax Map Key (TMK) [3] 2-4-001:122 (por.), Waiākea, South Hilo, Island of Hawai'i

Prepared for

40 years HHF PLANNERS places for people since 1980

USGS science for a changing world

University of Hawai'i Hilo

ahl.

Prepared by

HONUA CONSULTING

September 2022

Authors and Lead Researchers

Kepa Maly
Onaona Maly
Trisha Kehaulani Watson, J.D., Ph.D.

Assistant Authors and Researchers

Julie Au, M.A.
Matt Kawaiola Sproat
Chris Monahan, Ph.D.
Fred LaChance, B.A.

Note on Hawaiian Language Use

In keeping with other Hawaiian scholars, we do not italicize Hawaiian words. Hawaiian is both the native language of the paeʻāina of Hawaiʻi and an official language of the State of Hawaiʻi. Some authors will leave Hawaiian words italicized if part of a quote; we do not. In the narrative, we use diacritical markings to assist our readers, except in direct quotes, in which we keep the markings used in the original text. We provide translations contextually when appropriate. Unless otherwise noted, all translations are by Honua Consulting authors.

Front Cover Credit

VIEW OF THE MAUNA LOA ERUPTION ON ITS WAY TO WAIĀKEA IN 1881
SKETCH BY JOSEPH NAWAHI, ESQ., IN THE VOLCANO HOUSE LEDGER (FEBRUARY 21, 1883:356) (SEEN FROM KANUKUOKAMANU AT WAILOA RIVER)

Executive Summary

"...Mau no ka nani, ka maikai.
Ke onaona noho no i Hilo.
I Hilo ka Puulena ma ka moani.
Aohe wahi hoohalahala.
A ka maka ke ike aku..."

"...Many are the attributes, fine qualities
and fragrances which abound at Hilo
At Hilo is the Pu'ulena wind which blows
with its' light fragrance
No place which the eye sees may be criticized..."[1]

At the request of HHF Planners and AHL, on behalf of the U.S. Geological Service (USGS), Honua Consulting, LLC and Kumu Pono Associates (Kepā and Onaona Maly) prepared a Cultural Impact Assessment (CIA) for the proposed New U.S. Geological Survey (USGS) Facility in Hilo, TMK: (3) 2-4-001:122 (por.) Waiākea Ahupua'a, South Hilo District, Hawai'i Island. USGS' proposed area of potential effect (APE) consists of a 13 acre parcel in Waiākea, South Hilo (Hawai'i Island). Situated on a portion of TMK: (3) 2-4-001:122 (Figure 1 and Figure 2). The land is owned by the University of Hawai'i and is to be leased to the USGS. It is located on the northwest corner of Nowelo St. and Komohana St. across from U.S. Pacific Basin Agricultural Research Center and 'Imiloa Astronomy Center.

This ethnohistorical study provides readers with an overview of the rich history of Waiākea Ahupua'a in the district of Hilo, Island of Hawai'i. While preparing this study, the authors reviewed and collected a wide range of archival-historical records that describe the biocultural environment of Waiākea, including the land parcel now identified as TMK: (3) 2-4-001:122 (por.), and the larger district of Hilo. This study is comprised of several primary sections—generally presented in chronological sequence—which cover various periods of history ranging from native traditions to modern land use.

The history of Waiākea is such that it cannot be discussed without also including aspects of the history of neighboring districts, the island of Hawai'i, and at times, all of the islands. A review of this small collection of native traditions and accounts penned by, or in which native witnesses spoke about the history of Waiākea, they demonstrated extensive and intimate knowledge of their living environment (honua ola), from the ocean to mountain. In their words, we find descriptions of land use, features, and resource collection occurring across the landscape.

This study incorporates a wide range of cultural-historical resources, including Hawaiian language resource documents and some of the earliest records from Waiākea. The table of contents is not only meant to identify pages and locations of specific topics or figures, but it is also meant to serve as a guide to specific topics in which readers may be more interested.

---

[1] Excerpts of mele (chant), "Nani Hilo Noweo Ula ka Maka o ka Lehua." A Pele chant from the collection of Kupuna Hoohila Kawelo, (Maly, curator/translator).

The authors' style of report presentation relies heavily on the original accounts written by those who lived the history, or who were among the earliest writers to document it. Thus, we cite large sections of quoted material and link these primary resources together with introductory narratives. In some cases, we provide additional cultural context to help present-day readers understand the period of time or events being discussed.

This review of traditions and land history in the area of the proposed USGS complex, does not appear to have revealed specific traditional-cultural information on the parcel. The significance of Waiākea in the history of the rise and fall of aliʻi (rulers), and its being coveted by aliʻi of Hawaiʻi island, even to being designated as an ʻĀina Lei Aliʻi (Land which Adorns the King), a Crown Land during the "Kālai ʻĀina (Carving out and Settling of Lands) between the Kamehameha aliʻi and other aliʻi, informs us about the importance of this ʻāina (see accounts cited later in this study). In the first 70 years after western contact in 1778, western diseases and the "colonization" of the Hawaiian kingdom, led to a rabid decline in the native population, and radical changes in land use and residency. By 1848, the native Hawaiian population had drastically decreased, and when the Māhele ʻĀina (Land Division) set in place the opportunity for hoaʻāina (native tenants) to acquire fee-simple interest in lands they reside upon and worked for their sustenance, many of the areas formerly used for agriculture and residency had already been abandoned.

It is uncertain whether or not that any hoaʻāina filed claims for kuleana (personal property rights) within the proposed USGS Complex parcel, or for that matter, anywhere within the existing University of Hawaiʻi-Hilo (UH-H) Complex—the area between Kapiʻolani, Kāwili, Pūʻāinakō, Komohana and Mohouli Streets[2]. During our research, we did locate two claims that were awarded along the Waiākea-Kūkūau Boundary, at an elevation in proximity to the lower UH-H complex, and possibly one claim, not awarded that could have included a parcel in the general UH-H vicinity as well (see section on Māhele ʻĀina in this study).

The major land use activities for which records exist in the zone of the UH-H complex are found in two periods of history, those associated the Mauna Loa eruption of 1880-1881, which sent a branch down to within a short distance of the proposed USGS Complex; the other are those records associated with development of the Waiākea Mill field development, and other uses of the land under government land management. For the period of land use associated with the Waiākea Mill, there is no historical evidence that the area of the primary UH-H campus and proposed USGS complex was ever used for the plantation purposes. Earlier traditional land use falls within the parcel elevational zone, with activities such historic grazing and tree cutting, and pasturage uses to 1960. Following that period, roadways, the UH-H campus, and residential activities occurred in section of the land surround the current study area. These periods of history are discussed in later section of the study.

The authors hope that this study will help guide readers, land managers and the USGS in development of resource to promote understanding of the rich history of place and how that history can be honored in the future.

---

2 See Part III of this study for details.

Based on the information gathered and the ethnographic data, the proposed project has the minimal potential to adversely impact cultural resources and traditional or customary practices in the area.

USGS is encouraged to use native plants in their landscaping to restore the native flora that would have traditionally existed in the area. Careful consideration should be given to remove any ʻōhiʻa trees afflicted with ROD and potentially replace them with healthy ʻōhiʻa trees. Additionally, USGS is encouraged to work with Ka Haka ʻUla O Keʻelikōlani, which is located down the street from the Project Area regarding nomenclature and other programming to the extent feasible. Also, USGS is encouraged to work with the ʻImiloa Astronomy Center to develop public programs and educational opportunities that could support the public benefits of the facility.

Table of Contents

EXECUTIVE SUMMARY II
TABLE OF CONTENTS 5
LIST OF FIGURES 7
LIST OF TABLES 8
ABBREVIATIONS AND ACRONYMS 9
1.0 PROJECT DESCRIPTION AND COMPLIANCE 10
1.1 PROJECT DESCRIPTION AND PROPOSED ACTION 13
1.2 BACKGROUND 15
1.3 GEOGRAPHIC EXTENT 16
1.4 GOAL OF CULTURAL IMPACT ASSESSMENT 16
1.5 REGULATORY BACKGROUND 17
1.6 COMPLIANCE 17
2.0 METHODOLOGY 19
2.1 IDENTIFYING TRADITIONAL OR CUSTOMARY PRACTICES 22
2.2 TRADITIONAL KNOWLEDGE, OR ETHNOSCIENCE, AND THE IDENTIFICATION OF CULTURAL RESOURCES 23
2.3 MOʻOLELO ʻĀINA: NATIVE TRADITIONS OF THE LAND 24
2.4 HISTORIC MAPS 24
2.5 ARCHAEOLOGICAL STUDIES 25
2.6 ETHNOGRAPHIC METHODOLOGY 25
3. HISTORIC BACKGROUND 27
3.1 CULTURAL CONTEXT 27
3.2 INOA ʻĀINA – WAHI PANA ʻO WAIĀKEA 30
3.2.1 Selected Place Names of the Waiākea Landscape 31
3.3 TRADITIONAL PERIOD 39
3.3.1 Hiʻiaka-i-ka-poli-o-Pele Travels through Panaʻewa and to Waiākea Bay 40
3.3.2 "He Moolelo Kaao No Kepakailiula," A Tradition about Kepakaʻiliʻula 43
3.3.3 "He Kaao no Pikoiakaalala, ke Keiki Akamai i ka Pana," (The Tradition of Pikoiakaʻalalā–Describing Canoe Making and Bird Hunting in the Uplands of Waiākea and ʻŌlaʻa) 46
3.3.4 "He Moolelo Kaao Hawaii no Laukaieie" 61
3.3.5 "Kaao Hooniua Puuwai no Ka-Miki," The Heart Stirring Story of Ka-Miki 66
3.3.6 Kāwili and Bird Catching Techniques of the Ancient Hawaiians 70
3.3.7 Waiākea and Lands of Hilo Bay: In The Path Of Warring Chiefs 74
3.3.8 Kānāwai Māmalahoe (Māmalahoa) 78
3.3.9 Fishponds of Waiākea Valued by Kamehameha I 80
3.4 HISTORIC PERIOD 80
3.4.1 Māhele ʻĀina – The Land Division in Waiākea 81
3.4.2 Native Tenant and Foreign Claims for Land 83
3.4.2.1 Waiākea Māhele Claimants 84
3.4.3 Proceedings of the Boundary Commission (1873-1875): Documentation of Land Boundaries and Traditional-Customary Practices 97

3.4.4 1823 to 1913: Glimpses into Historical Events – Notes Describing Community, Land Use, and Families *111*
3.4.4.1 1823: A Visit to Waiākea and the Region that Became Hilo Town 111
3.4.5 Waiākea Land Use (1860s – 1960s) *143*
3.4.5.1 Summary of Land Tenure of the Waiākea Mill Company 145
3.4.5.2 Changes in Land Use and Residency in Waiākea 147
3.4.5.3 Pasturage Military Use of the Upper UH-H Complex Parcel 156
3.4.5.4 Fairview Dairy and William Kamau Grazing Leases 159
3.4.5.5 Other Notable Economic Endeavors in Waiākea 159

4.0 CULTURAL RESOURCES 161

4.1 KA NOHONA: CULTURAL AND HISTORIC SITES AS EVIDENCED BY SETTLEMENT 161
4.1.1 Traditional Cultural Properties *162*
4.1.2 The Waiākea Forest Lands *164*
4.1.3 ARCHAEOLOGICAL SITES 166
4.1.3.1 Results of Previous Work in the Project Area 166
4.1.3.2 Results from Other Studies in the Vicinity of the Project Area 167
4.1.3.4 SIHP # 50-10-35-24243 ..... *176*
4.1.3.5 SIHP # 50-10-35-24244 ..... *176*
4.1.3.6 SIHP # 50-10-35-24245 ..... *176*
4.1.3.7 SIHP # 50-10-35-24247 ..... *176*
4.1.3.8 SIHP # 50-10-35-24248 ..... *176*
4.2 NATURAL HISTORIC AND NATURAL RESOURCES WITH CULTURAL SIGNIFICANCE 176
4.3 INTANGIBLE CULTURAL RESOURCES 177
4.3.1 ʻŌlelo a me nā Mele Hoʻohiwahiwa *178*

5.0 TRADITIONAL OR CUSTOMARY PRACTICES HISTORICALLY IN THE STUDY AREA AND SURROUNDING AREA 184

5.1 MOʻOLELO 185
5.2 HABITATION 186
5.3 TRAVEL AND TRAIL USAGE 186
5.4 LOKO IʻA (FISHPONDS) 187
5.5 FARMING AND LAND MANAGEMENT 188
5.6 HAKU MELE, HAKU OLI, AND HULA 188

6.0 ETHNOGRAPHIC DATA 190

6.1 INTERVIEW WITH MICAH ALAMEDA 191
6.2 INTERVIEW WITH LARAE MORTENSEN 193
6.3 INTERVIEW WITH CAMERON MORTENSEN 194
6.4 INTERVIEW WITH CYRUS JOHNASEN 195
6.5 INTERVIEW WITH IKAIKA MAHOE 196

7.0 *KA PAʻAKAI* ANALYSIS 197

8.0 IMPACT ASSESSMENT AND CONCLUSION 200

9.0 REFERENCES 203

APPENDIX I: GLOSSARY OF HAWAIIAN TERMS 206

List of Figures

Figure 1. TMK map of the proposed APE 11
Figure 2. Topography map of the proposed APE 12
Figure 3. Construction Site Plan 14
Figure 4. Diagram of elements that contribute to traditional or customary practices (Honua Consulting) 22
Figure 5. Copy of the public notice placed in the Ka Wai Ola in April 2022 26
Figure 6. At least 77 ancient ahupuaʻa (mauka to makai land management units) were defined in the district of Hilo. Waiākea Ahupuaʻa, easternmost of the lands in the district, is one of the richest in resources, traditions, and history. 29
Figure 7. Register Map No. 10. Plan of Makaoku and Mokuola, Hilo Hawaii. 45
Figure 8. Portion of Hilo Town and Vicinity with Kuleana Parcels and Other Features 85
Figure 9. Helu 2404, Keaniho, Native Register Volume 3:483 91
Figure 10. LCA 2404 (Part 2), Keaniho, Foreign Testimony Volume 5:79 92
Figure 11. LCA 2404, Keaniho, Mahele Award Book Volume 9:398 93
Figure 12. LCA 2402, Keaniho, Native Testimony Volume 4:407 94
Figure 13. Helu 2274, Kapuaakuni, Native Register Volumbe 3:424-425 95
Figure 14. Helu 2274, Kapuaakuni, Native Testimony Volume 4:452-453 96
Figure 15. Helu 2274, Kapuaakuni, Foreign Testimony Volume 5:26 97
Figure 16. Plan of Waiākea Belong to H.M. Kamehameha III, 1851. Register Map No. 524, Survey by S.C. Wiltse, 1851 (Tracing 1901) 100
Figure 17. Portion of "Waiakea or Byron Bay" from original by Lt. C.R. Malden, 1825 Depicting Settlment and Land Use Across Waiākea, Kukuau, Ponahawai, Punahoa and Piʻihonua (Register Map No. 524) 116
Figure 18. Portion of Register Map No. 892; C.J. Lyons, 1882. Sketch showing Lava Flow of 1881. Points fixed by previous survey flow, by information from F.S. Lyman, C. Furneaux, and others. 125
Figure 19. Map of Hawaii. USGS Annual Report 1883, Plate IV (C.E. Dutton, 1883:93) 126
Figure 20. Waiākea Government Tract. Makai Portion, Hawaii Territorial Survey, January 1915. Locations of Planned Homestead and Agricultural Lots, the Waiakea Pasture Land, 1880-1881 Lava Flow, Existing Railroad and Other Features Depicted 151
Figure 21. Portion of Railway and Flume Right of Ways, Through Waiākea Homestead Lots and Government Land; P.E. Arioli and J.N. Smith, February 1930 (Honolulu, Real Property Tax Office) 155
Figure 22. Waiakea Pasture Land (Land Court Application 1205), including an area of 506 acres. Note also the location of LCA 2663 and 2404 (State Survey Branch, C.S.F. No. 9017, June 4, 1940) 158
Figure 23. Previous historic-preservation studies near the project area (see table and text above for details) 172
Figure 24. Previously identified archaeological sites in and near the project area 173

List of Tables

Table 1. Synthesis of Māhele Claims in Waiākea Ahupuaʻa 86
Table 2. Previous Historic Preservation Studies and Results near the Project Area 168
Table 3. Sites Identified in the Subject Parcel and Project Area by Escott (2004) 174
Table 4. OEQC compliance requirements and their corresponding sections in this CIA 200

Abbreviations and Acronyms

AIS: Archaeological Inventory Survey
BMP: Best Management Practice
CIA: Cultural Impact Assessment
EA: Environmental Assessment
ESP: Environmental Review Project, Office of Planning and Sustainable Development
HAR: Hawaii Administrative Rules
HHF: HHF Planners
Honua: Honua Consulting, LLC
HRS: Hawaii Revised Statutes
ILK: Indigenous Local Knowledge
Ka Paʻakai: *Ka Paʻakai O Ka ʻĀina v. Land Use Commission*, 94 Haw. 31 (2000)
LRFI: Literature Review and Field Investigation
NRHP: National Register of Historic Places
OEQC: Office of Environmental Quality and Control
ROI: Range of Influence
SHPD: State Historic Preservation Division
SIHP: State Inventory of Historic Places
SLH: Session Laws of Hawaii
TEK: Traditional Ecological Knowledge
TMK: Tax Map Key
UH: University of Hawaii
USGS: U.S. Geological Survey

1.0 Project Description and Compliance

At the request of HHF Planners and AHL, on behalf of the U.S. Geological Service (USGS), Honua Consulting, LLC prepared a Cultural Impact Assessment (CIA) for the proposed New U.S. Geological Survey (USGS) Facility in Hilo, TMK: (3) 2-4-001:122 (por.) Waiākea Ahupuaʻa, South Hilo District, Hawaiʻi Island. USGS' proposed area of potential effect (APE) consists of a 13 acre parcel in Waiākea, South Hilo (Hawaiʻi Island). Situated on a portion of TMK: (3) 2-4-001:122 (Figure 1 and Figure 2). The land is owned by the University of Hawaiʻi and is to be leased to the USGS. It is located on the northwest corner of Nowelo St. and Komohana St. across from U.S. Pacific Basin Agricultural Research Center and ʻImiloa Astronomy Center.

(This section intentionally left blank.)

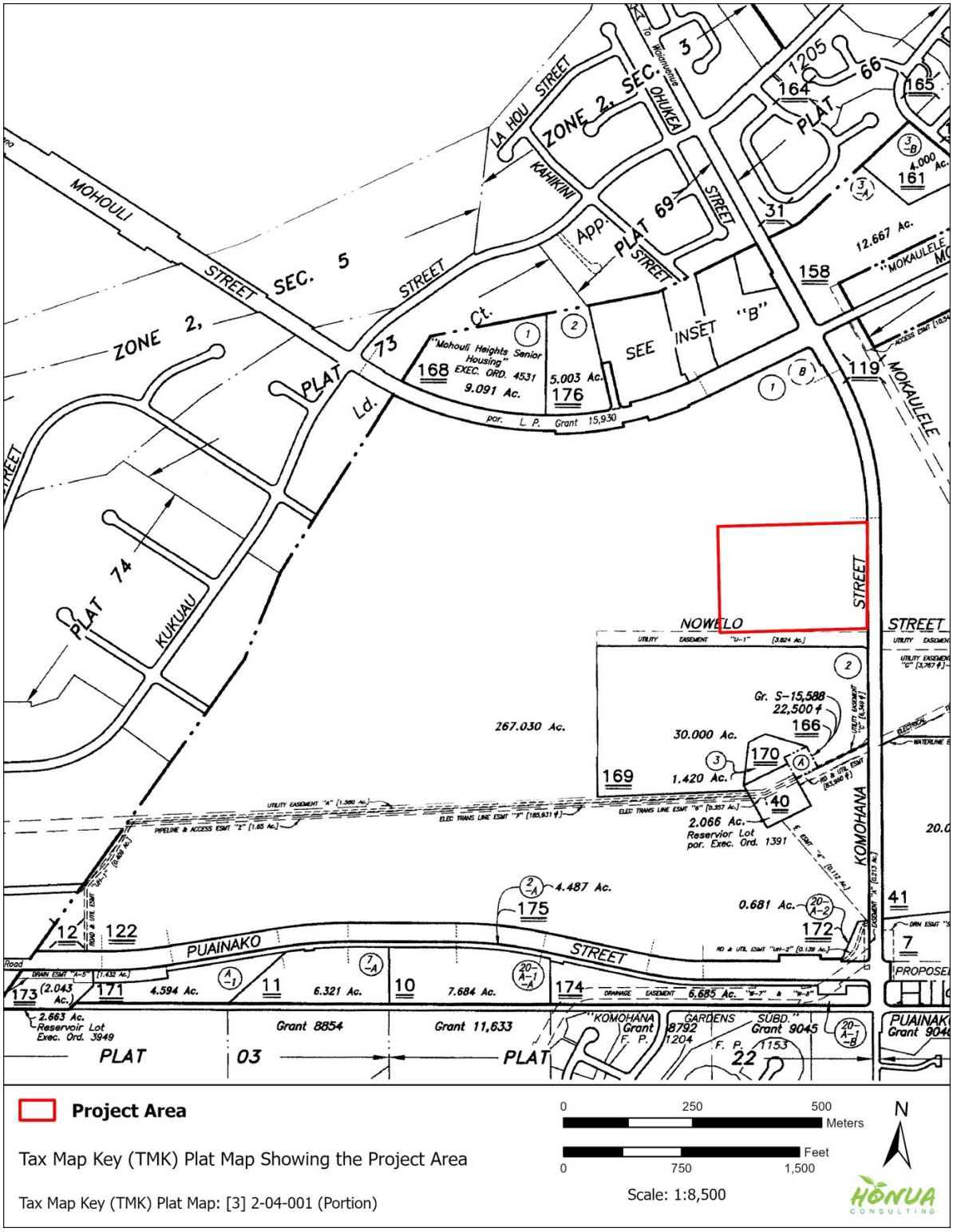


Figure 1. TMK map of the proposed APE

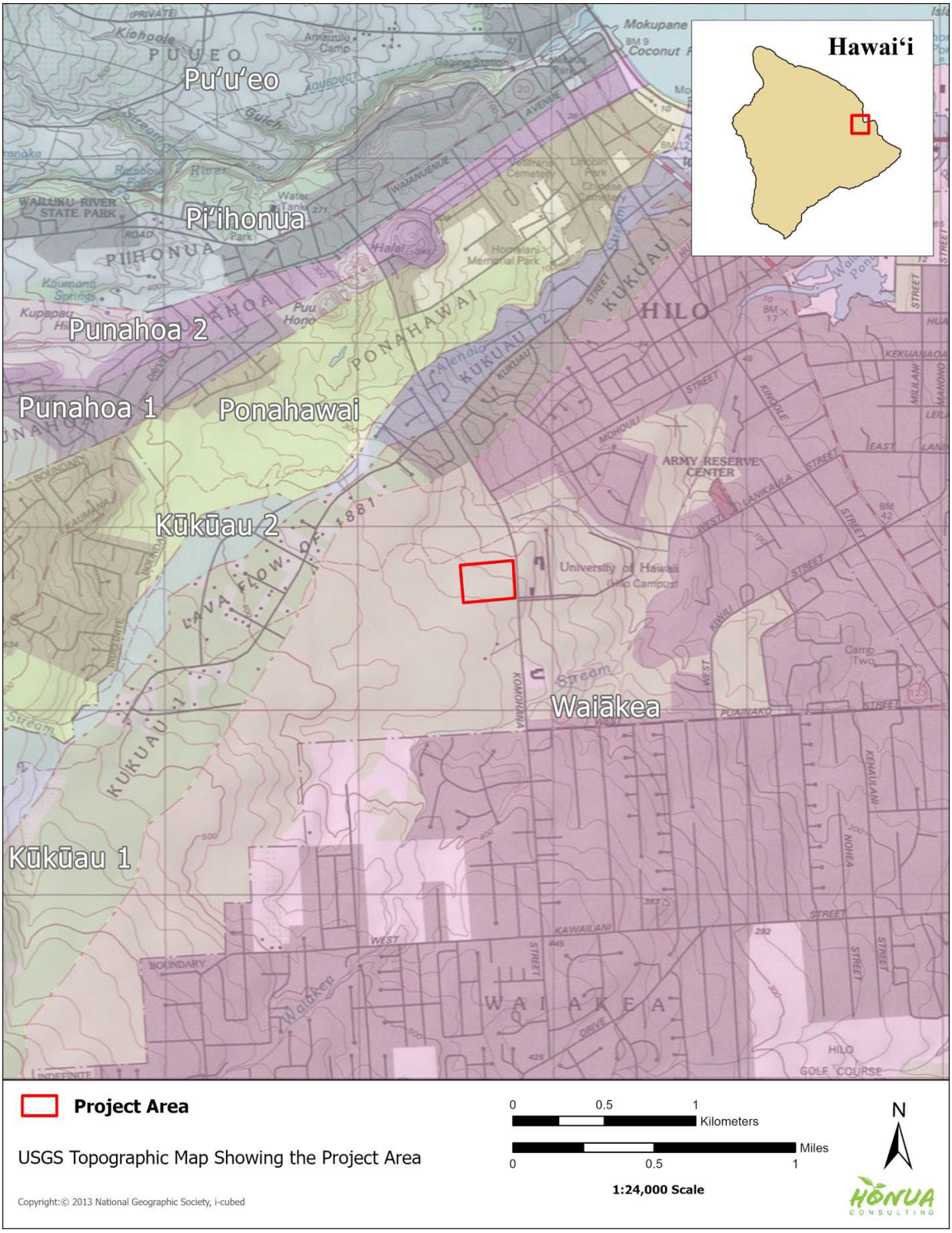


Figure 2. Topography map of the proposed APE

1.1 Project Description and Proposed Action

The USGS proposes to construct a new 60,000 square foot facility to provide offices for its Hawaiian Volcano Observatory (HVO) and the Pacific Island Ecosystems Research Center (PIERC). The new facility will include office spaces, conference rooms, laboratories, warehouse and storage, and an operations/monitoring center. It will provide a consolidated science hub near the University of Hawaiʻi at Hilo campus.

The Proposed Action is to construct a permanent research facility in Hilo for HVO and PIERC. These organizations have recently been or are currently located within the Hawaiʻi Volcanoes National Park ("Park") and have different, but compatible missions.

The Proposed Action (Figure 3) will provide replacement facilities for both agencies, supporting approximately 50 staff and volunteers from HVO and 53 staff and volunteers from PIERC. The facility will be approximately 60,000 SF in size, and will include office spaces, conference rooms, laboratories, warehouse and storage, and an operations/monitoring center. Conference rooms and storage will be shared to enhance operational efficiencies.

HVO researchers and administrative staff formerly housed at Hawaiʻi Volcanoes National Park will move to the proposed facility. Since 2018, these HVO staff have been operating out of temporary facilities in Hilo and working from home.

PIERC staff will relocate from their current facilities at Hawaiʻi Volcanoes National Park to the new research facility. The USGS is concurrently planning a small field station for HVO field staff in Hawaiʻi Volcanoes National Park. The field station is implemented by a separate project and is not part of the Proposed Action, the related Environmental Assessment, or this Cultural Impact Assessment.

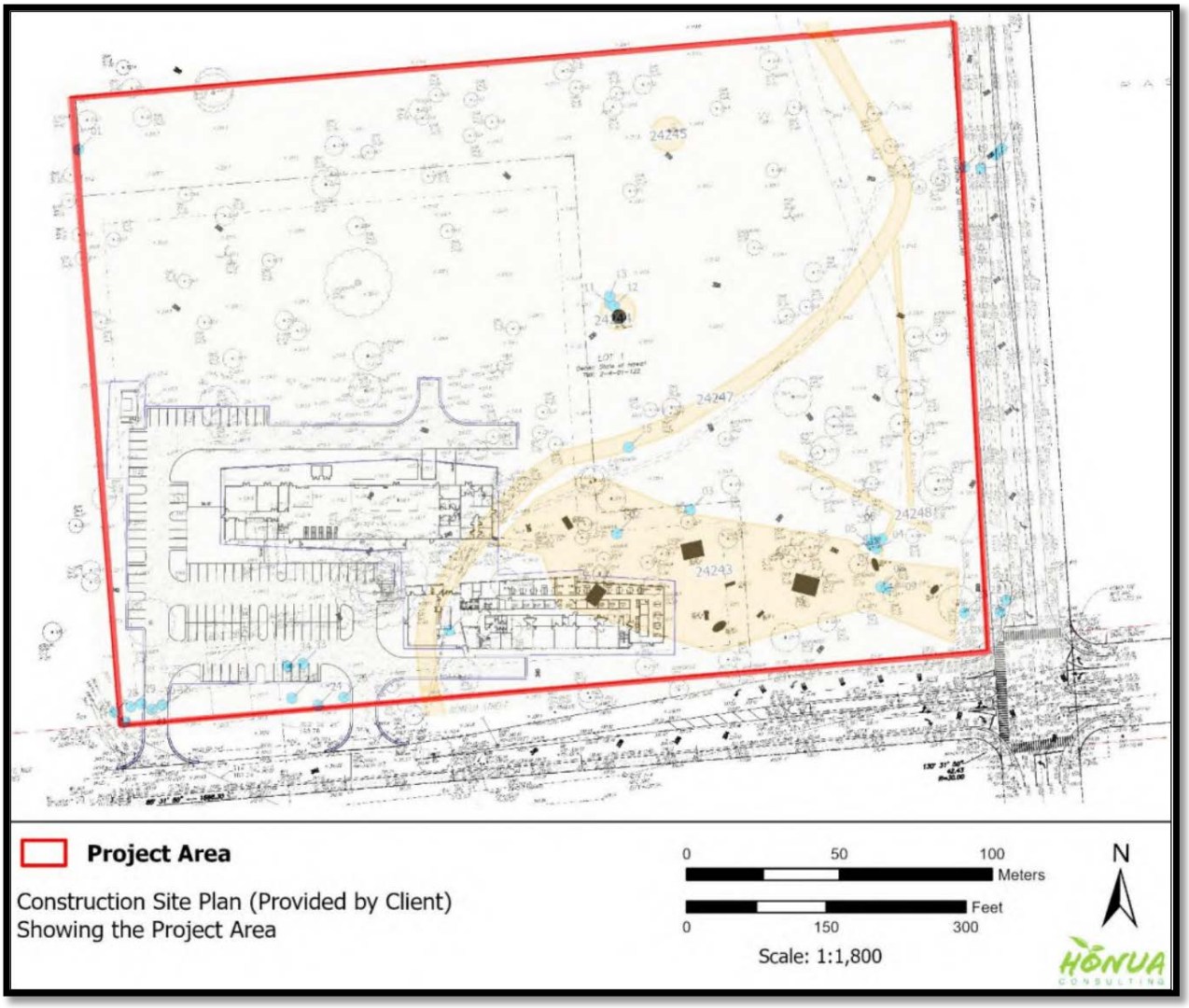


Figure 3. Construction Site Plan

1.2 Background

Articles IX and XII of the State Constitution, other state laws, and the courts of the state require government agencies to protect and preserve cultural beliefs, practices, and resources of Native Hawaiians and other ethnic groups. To assist decision makers in the protection of cultural resources, Chapter 343, HRS and Hawaiʻi Administrative Rules (HAR) § 11-200 rules for the environmental impact assessment process require project proponents to assess proposed actions for their potential impacts to cultural properties, practices, and beliefs.

This process was clarified by the Act 50, Session Laws of Hawaiʻi (SLH) 2000. Act 50 recognized the importance of protecting Native Hawaiian cultural resources and required some environmental review documents include the disclosure of the effects of a proposed action on the cultural practices of the community and state, and the Native Hawaiian community in particular. Specifically, the Environmental Council suggested the CIAs should include information relating to practices and beliefs of a particular cultural or ethnic group or groups. Such information may be obtained through public scoping, community meetings, ethnographic interviews, and oral histories.

It is important to note that while similar in their areas of studies, archaeological surveys and CIAs are concerned with distinct and different foci. Archaeological studies are primarily concerned with historic properties and tangible heritage, whereas CIAs look at cultural practices and beliefs, which can be associated with a specific location, but also often intangible in nature.

The State and its agencies have an affirmative obligation to preserve and protect Native Hawaiians' customarily and traditionally exercised rights to the extent feasible.[3] State law further recognizes that the cultural landscapes provide living and valuable cultural resources where Native Hawaiians have and continue to exercise traditional and customary practices, including hunting, fishing, gathering, and religious practices. In *Ka Paʻakai*, the Hawaiʻi Supreme Court provided government agencies an analytical framework to ensure the protection and preservation of traditional and customary Native Hawaiian rights while reasonably accommodating competing private development interests. This is accomplished through:

1) The identification of valued cultural, historical, or natural resources in the project area, including the extent to which traditional and customary Native Hawaiian rights are exercised in the project area;

[3] Article XII, Section 7 of the Hawaiʻi State Constitution, *Ka Paʻakai O Ka ʻĀina v. Land Use Commission*, 94 Haw. 31 [2000] (Ka Paʻakai), Act 50 SLH 2000.

2) The extent to which those resources—including traditional and customary Native Hawaiian rights—will be affected or impaired by the proposed action; and
3) The feasible action, if any, to be taken to reasonably protect Native Hawaiian rights if they are found to exist.

The appropriate information concerning the ahupuaʻa of Waiākea has been collected, focusing on areas near or adjacent to the project area. A thorough analysis of this project and potential impacts to cultural resources, historical resources, and archaeological sites is included in this assessment.

The CIA provides an overview of cultural and historic resources in the project area using thorough literature review, community and cultural practitioner consultation, and high-level, project-specific surveys. The CIA will focus on identifying areas in which disturbance should be avoided or minimized to reduce impacts to historic properties or culturally important features. The paramount goal is to prevent impacts through avoidance of sensitive areas and mitigating for impacts only if avoidance is not possible.

1.3 Geographic Extent

The geographic extent for impacts to cultural resources and historic properties includes the project area and localized surroundings. This CIA also reviews some of the resources primarily covered by the regulatory review. It primarily researches and reviews the range of biocultural resources identified through historical documents, traditional knowledge, information found in the Hawaiian language historical cache, and oral histories and knowledge collected from cultural practitioners and experts.

There is clear guidance from the Office of Environmental Quality and Control (OEQC), now known as the Environmental Review Program (ERP), within the Office of Planning and Sustainable Development (ESP), that recommends a geographic extent beyond the identified or typical boundaries of the geographic project area. The recommended area is typically the size of the traditional land area (ahupuaʻa) or region (moku), but this can be larger or smaller depending on what best helps to identify the resources appropriately.

The geographic extent of the CIA is based on the position that the “Project Area” is part of a cultural landscape or cultural landscapes that therefore it is most appropriate to set and study the proposed alternatives within that cultural context.

1.4 Goal of Cultural Impact Assessment

This cultural impact assessment looks to partially fulfill the requirement of taking into account the Project’s potential impacts on historic and cultural resources and, at a minimum, describe:

a) any valued cultural, historic, or natural resources in the area in questions, including the extent to which traditional and customary native Hawaiian rights are exercised in the area, b) the extent to which those resources – including traditional and customary native Hawaiians rights – will be affected or impaired by the Project; and c) the feasible action, if any, to be taken to reasonably protect native Hawaiian rights if they are found to exist.

1.5 Regulatory Background

Articles IX and XII of the State Constitution, other state laws, and the courts of the state require government agencies to protect and preserve cultural beliefs, practices, and resources of Kānaka ʻŌiwi (Native Hawaiians) and other ethnic groups. To assist decision makers in the protection of cultural resources, Chapter 343, HRS and Hawaiʻi Administrative Rules (HAR) § 11-200.1 rules for the environmental impact assessment process require project proponents to assess proposed actions for their potential impacts to cultural properties, practices, and beliefs.

This process was clarified by the Act 50, Session Laws of Hawaiʻi (SLH) 2000. Act 50 recognized the importance of protecting Native Hawaiian cultural resources and required that EAs include the disclosure of the effects of a proposed action on the cultural practices of the community and state, and the Native Hawaiian community in particular. Specifically, the Environmental Council suggested the CIAs should include information relating to practices and beliefs of a particular cultural or ethnic group or groups. Such information may be obtained through public scoping, community meetings, ethnographic interviews, and oral histories.

It is important to note that while similar in their areas of studies, archaeological surveys and CIAs are concerned with distinct and different foci. Archaeological studies are primarily concerned with historic properties and tangible heritage, whereas CIAs look at cultural practices and beliefs, which can be associated with a specific location, but also often intangible in nature.

1.6 Compliance

The State and its agencies have an affirmative obligation to preserve and protect Native Hawaiians' customarily and traditionally exercised rights to the extent feasible.[4] State law further recognizes that the cultural landscapes provide living and valuable cultural resources where Native Hawaiians have and continue to exercise traditional and customary practices, including hunting, fishing, gathering, and religious practices. In *Ka Paʻakai*, the Hawaiʻi Supreme Court provided government agencies an analytical framework to ensure the

[4] Article XII, Section 7 of the Hawaiʻi State Constitution, *Ka Paʻakai O Ka ʻĀina v. Land Use Commission*, 94 Haw. 31 [2000] (Ka Paʻakai), Act 50 SLH 2000.

protection and preservation of traditional and customary Native Hawaiian rights while reasonably accommodating competing private development interests. This is accomplished through:

1) The identification of valued cultural, historical, or natural resources in the project area, including the extent to which traditional and customary Native Hawaiian rights are exercised in the project area;
2) The extent to which those resources—including traditional and customary Native Hawaiian rights—will be affected or impaired by the proposed action; and
3) The feasible action, if any, to be taken to reasonably protect Native Hawaiian rights if they are found to exist.

While not attached to a HRS Chapter 343 action, this CIA was prepared under HRS Chapter 343 and Act 50 SLH 2000 as those are the prevailing standards and best practices for CIAs. The appropriate information concerning the ahupuaʻa of Waiākea (South Hilo, Island of Hawaiʻi) has been collected, focusing on areas near or adjacent to the project area. A thorough analysis of this project and potential impacts to cultural resources, historical resources, and archaeological sites is included in this assessment.

The present analyses of archival documents, oral traditions (oli or chants, mele or songs, and/or hula or dance texts), and Hawaiian language sources including books, manuscripts, and newspaper articles, are focused on identifying recorded cultural and archaeological resources present on the landscape, including: Hawaiian and non-Hawaiian place names; landscape features (ridges, gulches, cinder cones); archaeological features (kuleana parcel walls, house platforms, shrines, heiau or places of worship, etc.); culturally significant areas (viewsheds, unmodified areas where gathering practices and/or rituals were performed); and significant biocultural resources. The information gathered through research helped to focus interview questions on specific features and elements within the project area.

Interviews with lineal and cultural descendants are instrumental in procuring information about the project area's transformation through time and changing uses. Interviews were conducted with recognized cultural experts and summaries of those interviews are included herein.

2.0 Methodology

The approach to developing the CIA is as follows:

1) Gather Best Information Available
   a) Gather historic cultural information from stories and other oral histories about the affected area to provide cultural foundation for the report;
   b) Inventory as much information as can be identified about as many known cultural, historic, and natural resources, including previous archaeological inventory surveys, CIAs, etc. that may have been completed for the possible range of areas; and
   c) Update the information with interviews with cultural or lineal descendants or other knowledgeable cultural practitioners.
2) Identify Potential Impacts to Cultural Resources
3) Develop Reasonable Mitigation Measures to Reduce Potential Impacts
   a) Involve the community and cultural experts in developing culturally appropriate mitigation measures; and
   b) Develop specific Best Management Practices (BMPs), if any are required, for conducting the project in a culturally appropriate and/or sensitive manner as to mitigation and/or reduce any impacts to cultural practices and/or resources.

While numerous studies have been conducted on this area, very few have effectively utilized Hawaiian language resources and Hawaiian knowledge. This appears to have impacted modern understanding of this location, as many of the relevant documents are native testimonies given by Kanaka Hawaiʻi (Hawaiians) who lived on this land.

While hundreds of place names and primary source historical accounts (from both Hawaiian and English language narratives) are cited on the following pages, it is impossible to tell the whole story of these lands in any given manuscript. A range of history, spanning the generations, has been covered. Importantly, the resources herein are a means of connecting people with the history of their communities—that they are part of that history. Knowledge of place will, in turn, promote appreciation for place and encourage acts of stewardship for the valued resources that we pass on to the future.

Background research for the literature review was conducted using materials obtained from the State Historic Preservation Division (SHPD) library in Kapolei and the Honua Consulting LLC. report library. On-line materials consulted included the Ulukau Electronic Hawaiian Database (www.ulukau.com), Papakilo Database (www.papakilodatabase.com), the State Library on-line (http://www.librarieshawaii.org/ Serials/databases.html), and Waihona ʻĀina Māhele database (http://www.waihona.com). Hawaiian terms and place names were translated using the on-line Hawaiian dictionaries (Nā Puke Wehewehe ʻŌlelo Hawaiʻi)

(www.wehewehe.com), *Place Names of Hawai'i* (Pukui et al. 1974), and *Hawai'i Place Names* (Clark 2002). Historic maps were obtained from the State Archives, State of Hawai'i Land Survey Division website (http://ags.hawaii.gov/survey/map-search/), UH-Mānoa Maps, Aerial Photographs, and GIS (MAGIS) website (http://guides.library.manoa.hawaii.edu/magis). Maps were geo-referenced for this report using ArcGIS 10.3. GIS is not 100% precise and historic maps were created with inherent flaws; therefore, geo-referenced maps should be understood to have some built-in inaccuracy.

While conducting the research, primary references included, but were not limited to: land use records, including the Hawaiian L.C.A. records from the Māhele 'Āina (Land Division) of 1848; the Boundary Commission Testimonies and Survey records of the Kingdom and Territory of Hawai'i; and historical texts authored or compiled by: David Malo (1987); Samuel M. Kamakau (1964, 1991, 1992); records of the American Board of Commissioners of Foreign Missions (A.B.C.F.M.) (1820–1860); Charles Wilkes (1845); Alexander & Preston (1892–1894); Abraham Fornander (1916–1919); and many other native and foreign writers. The study also includes several native accounts from Hawaiian language newspapers (primarily compiled and translated from Hawaiian to English by K. Maly), and historical records authored by nineteenth century visitors, and residents of the region.

Historical and archival resources were located in the collections of the Hawai'i State Archives, Survey Division, Land Management Division, Survey Division, and Bureau of Conveyances; the Bishop Museum Library and Archives; the Hawaiian Historical Society and the Hawaiian Mission Children's Society Library; University of Hawai'i-Hilo Mo'okini Library; the National Archives and Records Administration (NARA), Maryland; the Library of Congress, Washington D.C.; the National Oceanic and Atmospheric Administration National Library, Maryland; the Smithsonian Institution Natural History and National Anthropological Archives libraries, Washington, D.C.; the Houghton Library at Harvard; the United States Geological Survey (USGS) Library, Denver; the Paniolo Preservation Society and Parker Ranch collections; private family collections; and in the collection of Kumu Pono Associates LLC. This information is generally cited in categories by chronological order of the period depicted in the narratives.

M. P. Nogelmeier (2010) discusses the adverse impacts of methodology that fails to properly research and consider Hawaiian language resources. He strongly cautions against a mono-rhetorical approach that marginalizes important native voices and evidence from consideration, specifically in the field of archaeology. For this reason, Honua Consulting consciously employs a poly-rhetorical approach, whereby all data, regardless of language, is researched and considered. To fail to access these millions of pages of information within the Hawaiian language cache could arguably be a violation of Act 50, as such an approach would fundamentally fail to gather the best information available, especially considering the

voluminous amounts of historical accounts available for native tenants in the Hawaiian language.

Hawaiian culture views natural and cultural resources as largely being one and the same: without the resources provided by nature, cultural resources could and would not be procured. From a Hawaiian perspective, all natural and cultural resources are interrelated, and all natural and cultural resources are culturally significant. Kepā Maly (2001), ethnographer and Hawaiian language scholar, points out, "In any culturally sensitive discussion on land use in Hawai'i, one must understand that Hawaiian culture evolved in close partnership with its natural environment. Thus, Hawaiian culture does not have a clear dividing line of where culture ends and nature begins" (Maly 2001:1). As a leading researcher and scholars on Hawaiian culture, Maly, along with his wife, Onaona, have conducted numerous ground-breaking studies on cultural histories throughout Hawai'i. A substantial part of the archival research utilized in this study was previously compiled and published by Kepā and Onaona Maly, who have granted their permission to use this important work and are identified properly as associated authors and researchers to this study.

This study also specifically looks to identify intangible resources. Tangible and intangible heritage are inextricably linked (Bouchenaki 2003). Intangible cultural resources, also identified as intangible cultural heritage (ICH), are critical to the perpetuation of cultures globally. International and human rights law professor Federico Lenzerini notes that, "At present, we are aware on a daily basis of the definitive loss—throughout the world—of language, knowledge, knowhow, customs, and ideas, leading to the progressive impoverishment of human society" (Lenzerini 2011:12). He goes on to warn that:

> the rich cultural variety of humanity is progressively and dangerously tending towards uniformity. In cultural terms, uniformity means not only loss of cultural heritage—conceived as the totality of perceptible manifestations of the different human groups and communities that are exteriorized and put at the others' disposal—but also standardization of the different peoples of the world and of their social and cultural identity into a few stereotyped ways of life, of thinking, and of perceiving the world. Diversity of cultures reflects diversity of peoples; this is particularly linked to ICH, because such a heritage represents the living expression of the idiosyncratic traits of the different communities. Preservation of cultural diversity, as emphasized by Article 1 of the UNESCO Universal Declaration on Cultural Diversity, 'is embodied in the uniqueness and plurality of the identities of the groups and societies making up humankind'. Being a 'source of exchange, innovation and creativity', cultural diversity is vital to humanity and is inextricably linked to the safeguarding of ICH. Mutual recognition and respect for cultural diversity—and, *a fortiori*, appropriate safeguarding of the ICH of the diverse peoples making up the world—Is essential for promoting

> harmony in intercultural relations, through fostering better appreciation and understanding of the differences between human communities. (Lenzarini 2011:103)

Therefore, tradition and practice, as elements of Hawaiian ICH, are essential to the protection of Hawaiian rights and the perpetuation of the Hawaiian culture.

2.1 Identifying Traditional or Customary Practices

It is within this context that traditional or customary practices are studied. The concept of traditional or customary practices can often be a challenging one for people to grasp. Traditional or customary practices can be defined as follows:

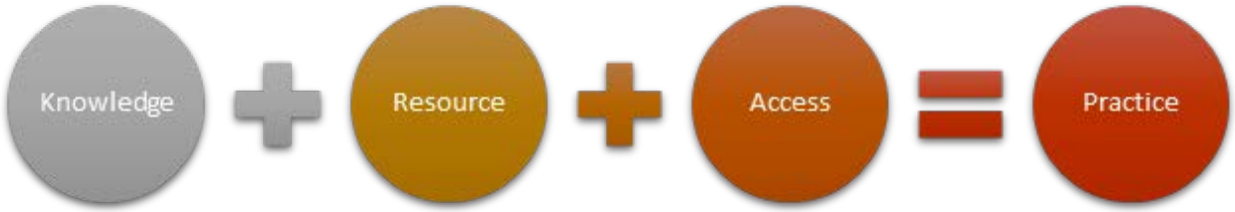


Figure 4. Diagram of elements that contribute to traditional or customary practices (Honua Consulting)

The first element is knowledge. This has been referred to as traditional ecological knowledge (TEK), Indigenous local knowledge (ILK), or ethnoscience. In the context of this study, it is the information, data, knowledge, or expertise Native Hawaiians or local communities possessed or possess about an area's environment. In a traditional context, this would have included information Hawaiians possessed in order to have the skills to utilize the area's resources for a range of purposes, including, but not limited to, travel, food, worship or habitation. This element is largely intangible.

The second element are the resources themselves. These are primarily tangible resources, either archaeological resources (i.e., habitation structures, walls, etc.) or natural resources (i.e., plants, animals, etc.). These can also be places, such as a sacred or culturally important sites or wahi pana. Sometimes these wahi pana are general locations, this does not diminish their importance or value. Nonetheless, it is important to recognize that potential eligibility as a "historic site" on the National Register of Historic Places (NRHP) would require identifiable boundaries of a site.

The third element is access. The first two elements alone are not enough to allow for traditional or customary practices to take place. The practitioners must have access to the resource in order to be able to practice their traditional customs. Access does not just mean the ability to physically access a location, but it also means access to resources. For example,

if a particular plant is used for medicinal purposes, there needs to be a sufficient amount of that plant available to practitioners for use. Therefore, an action that would adversely impact the population of a particular plant with cultural properties would impact practitioners' ability to access that plant. By extension, it would adversely impact the traditional or customary practice.

Traditional or customary practices are, therefore, the combination of knowledge(s), resource(s) and access. Each of these individual elements should be researched and identified in assessing any potential practices or impacts to said practices.

2.2 Traditional Knowledge, or Ethnoscience, and the Identification of Cultural Resources

The concept of ethnoscience was first established in the 1960s and has been defined "the field of inquiry concerned with the identification of the conceptual schemata that indigenous peoples use to organize their experience of the environment" (Roth 2019). Ethnoscience includes a wide range of subfields, includes, but is not limited to, ethnoecology, ethnobotany, ethnozoology, ethnoclimatology, ethnomedicine and ethnopedology. All of these fields are important to properly identify traditional knowledge within a certain area.

Traditional Native Hawaiian practitioners were scientists and expert natural resource managers by necessity. Without modern technological conveniences to rely on, Hawaiians developed and maintained prosperous and symbiotic relationships with their natural environment for thousands of years. Their environments were their families, their homes, and their laboratories. They knew the names of every wind and every rain. The elements taught and inspired. The ability of Indigenous people to combine spirituality and science led to the formation of unique land-based methodologies that spurred unsurpassed innovation. Therefore, identifying significant places requires a baseline understanding of what made places significant for Hawaiians.

Hawaiians were both settlers and explorers. In *Plants in Hawaiian Culture,* B. Krauss explains: "Exploration of the forests revealed trees, the timber of which was valuable for building houses and making canoes. The forests also yielded plants that could be used for making and dying tapa, for medicine, and for a variety of other artifacts" (Krauss 1993). Analysis of native plants and resource management practices reveals the depth to which Hawaiians excelled in their environmental science practices:

> [Hawaiians] demonstrated great ability in systematic differentiation, identification, and naming of the plants they cultivated and gathered for use. Their knowledge of the gross morphology of plants, their habits of growth, and the requirements for greatest yields is not excelled by expert agriculturists of more complicated cultures. They worked out the procedures of cultivation for every locality, for all altitudes, for different

> weather conditions and exposures, and for soils of all types. In their close observations of the plants they grew, they noted and selected mutants (spores) and natural hybrids, and so created varieties of the plants they already had. Thus over the years after their arrival in the Islands, the Hawaiians added hundreds of named varieties of taro, sweet potatoes, sugarcane, and other cultivated plants to those they had brought with them from the central Pacific (Krauss 1993).

Thus, Native Hawaiians reinforced the biodiversity that continues to exist in Hawaiʻi today through their customary traditional natural resource management practices.

The present analyses of archival documents, oral traditions (oli or chants, mele or songs, and/or hula dances and haʻi moʻolelo or storytelling performances), and Hawaiian language sources including books, manuscripts, and newspaper articles, are focused on identifying recorded cultural resources present on the landscape, including: Hawaiian and non-Hawaiian place names; landscape features (ridges, gulches, cinder cones); archaeological features (kuleana parcel walls, house platforms, shrines, heiau [places of worship], etc.); culturally significant areas (viewsheds, unmodified areas where gathering practices and/or rituals were performed); and significant biological, physiological, or natural resources. This research also looks to document the wide range of Hawaiian science that existed within the geographic extent.

2.3 Moʻolelo ʻĀina: Native Traditions of the Land

Among the most significant sources of native moʻolelo are the Hawaiian language newspapers which were printed between 1838 and 1948, and the early writings of foreign visitors and residents. Most of the accounts that were submitted to the papers were penned by native residents of areas being described and noted native historians. Over the last 30 years, Kepā Maly has reviewed and compiled an extensive index of articles published in the Hawaiian language newspapers, with particular emphasis on those narratives pertaining to lands, customs, and traditions. Many traditions naming places around Hawaiʻi are found in these early writings. Many of these accounts describe native practices, the nature of land use at specific locations, and native moʻolelo (history, narrative, story). Thus, we are given a means of understanding how people related to their environment and sustained themselves on the land.

2.4 Historic Maps

There are also numerous, informative historic maps for the region. Surveyors of the eighteenth and nineteenth centuries were skilled in traversing land areas and capturing important features and resources throughout Hawaiʻi's rich islands. Historic maps were carefully studied, and the features detailed therein where aggregated and categorized to help identify

specific places, names, features, and resources throughout the study area. From these, among other documents, new maps were created that more thoroughly capture the range of resources in the area.

2.5 Archaeological Studies

A literature and field inspection has been completed by Honua Consulting. There are numerous previously identified historic sites in the Project Area. None are considered significant.

2.6 Ethnographic Methodology

Information from lineal and cultural descendants is instrumental in procuring information about the project area's transformation over time and its changing uses. The present analyses of archival documents, oral traditions (including oli or chants, mele or songs), and/or hula dance), and Hawaiian language sources including books, manuscripts, and newspaper articles, are focused on identifying recorded cultural and archaeological resources present on the landscape, including: Hawaiian and non-Hawaiian place names; landscape features (ridges, gulches, cinder cones); archaeological features (kuleana parcel walls, house platforms, shrines, heiau or places of worship, etc.); culturally significant areas (viewsheds, unmodified areas where gathering practices and/or rituals were performed); and significant biocultural resources. The information gathered through research helped to focus interview questions on specific features and elements within the project area.

Information from lineal and cultural descendants are instrumental in procuring information about the project area's transformation through time and changing uses. A notice was placed in the *Ka Wai Ola*, published by the Office of Hawaiian Affairs (Figure 5).

Cultural Impact Assessment Notice: Waiākea, South Hilo, Hawai'i Island

Honua Consulting, LLC, is conducting a Cultural Impact Assessment (CIA) for the U.S. Department of the Interior, U.S. Geological Survey (USGS), in Waiākea, South Hilo, Hawai'i Island, TMK [3] 2-4-001:122. USGS is proposing to construct a new facility to support the Pacific Island Ecosystem Research Center (PIERC). The CIA team is seeking consultation with practitioners, Native Hawaiian Organizations, stakeholders, and other individuals. Specifically, consultation is sought on a) identification of an appropriate geographic extent of study, b) historic or existing cultural resources that may be impacted by the proposed project, c) historic or existing traditional practices and/or beliefs that may be impacted by the proposed project, and d) identification of individuals or organizations that should be sought out for consultation on the CIA. Individuals or organizations interested in participating can contact the CIA team at community@honuaconsulting.com or (808) 392-1617.

Figure 5. Copy of the public notice placed in the *Ka Wai Ola* in April 2022

3. Historic Background

Hilo, traditionally divided into three sub-districts, is one of six major moku o loko (districts) of land on the island of Hawaiʻi. The district adjoins Hāmākua on the north and west, Puna, on the east, and Kaʻū to the west. At least 77 ancient ahupuaʻa (mauka to makai land management units) were defined in the district of Hilo. Waiākea Ahupuaʻa, easternmost of the lands in the district, is one of the richest in resources, traditions, and history, and at one time served as a major political, religious and social seat on Hawaiʻi Island (Figure 6). In preparing this study, the authors reviewed and collected a wide range of archival-historical records that describe the biocultural environment of Waiākea, including the land parcel TMK: (3) 2-4-001:122 (por.), on which the United States Geological Survey (USGS) is planning to occupy as its new Hawaiʻi research center.

The documentation cited in this study was collected from both public and private collections and includes Hawaiian language accounts translated from primary sources; records of Kingdom and Government agencies dating from the 1840s to 1960s; journals of historic visitors; and excerpts of oral history interviews with elder kamaʻāina (loosely translated as those being of, or familiar with place). Several native accounts from historic Hawaiian language documents and newspapers were also translated for this study by Maly. Additionally, numerous articles published in newspapers, now available through several online repositories are cited.

Following this introductory overview of the cultural–historical context, we begin with the history of the native Hawaiians from antiquity to the present-day, then integrate the layers of history following western contact. We have organized the information by several categories, cited in chronological order of the period depicted in history. It is the overarching goal of this study to provide users with a foundation for development of interpretative themes and programs such as wayside exhibits and displays, a route app, color brochures, audio guides, place-based/cultural literacy curricula for students[5] and communities who may visit the USGS complex, and to provide opportunities for enrichment of member experience.

3.1 Cultural Context

[5] While we have not suggested specific lesson plans or activities, the collection of archival documentary material in this collection, offers teachers a wide range of historical resources under one cover. Programs ranging from development of early guided reading booklets to self-directed research and writing projects, undertaking family oral history programs, geographical and community mapping initiatives (including development GPS web enable apps and informational websites), and environmental studies (e.g. comparison between current environment and that described in historical records periods), are just some of the possibilities.

It is important to observe that this study, covers the larger cultural-historical context of the regional landscape—setting the foundation for interpreting place, land use, residency, customs and practices, and transitions over time. This approach allows us to piece facets of history together and provides a better understanding of the relationship shared between regional environment and the people of the land. Such an approach also helps us understand how the landscape has changed over time.

[This section intentionally left blank.]

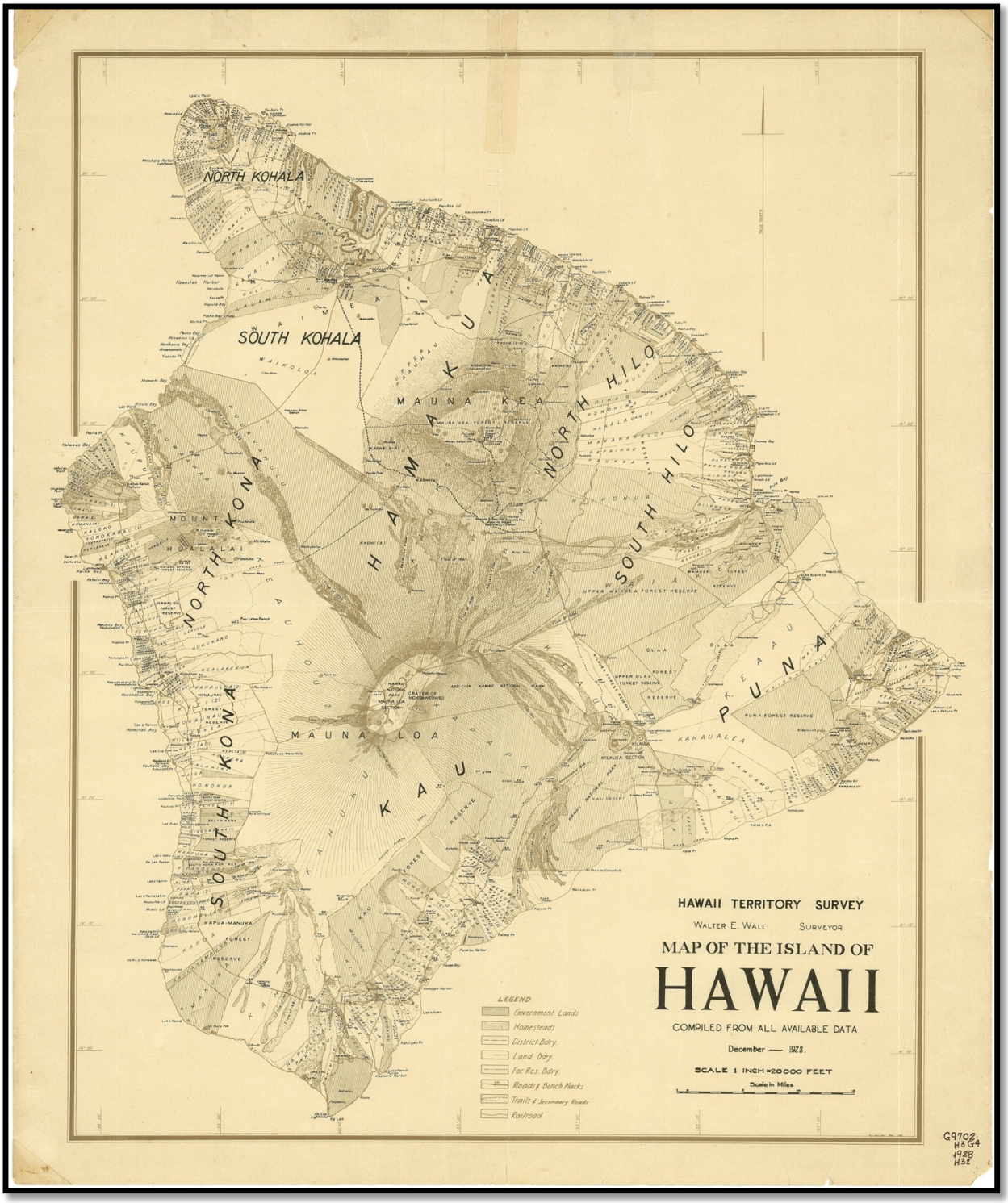


Figure 6. At least 77 ancient ahupuaʻa (mauka to makai land management units) were defined in the district of Hilo. Waiākea Ahupuaʻa, easternmost of the lands in the district, is one of the richest in resources, traditions, and history.

3.2 Inoa ʻĀina – Wahi Pana ʻo Waiākea

Hawaiian place names are an important record of cultural attachment and traditional knowledge of place. The names document the intimate relationship shared between the natural landscape practices, and culture of the Hawaiian people. Moʻolelo (traditions and history) tells us that named locations are significant. It has been observed that "Names would not have been given to—or remembered if they were—mere worthless pieces of topography" (see Handy and Handy with Pukui, 1972:412). In ancient times, named localities served a variety of functions, including:

(1) describing a particular feature on the landscape;
(2) may have been the source of a particular natural resource;
(3) a source of potable water;
(4) trails and trail side resting places (oʻioʻina), such as a rock shelter or tree shaded spot;
(5) been the site of a heiau or other features of ceremonial importance;
(6) triangulation points such as koʻa (ceremonial sites and markers for fishing grounds);
(7) the sites of a single or multiple residences;
(8) areas of planting or raising fish; or
(9) the names may have recorded a particular event that occurred in a given area.

While discussing the meanings of native place names, W.D. Alexander (1902), former Surveyor General of the Kingdom (and later for the Territorial Government) of Hawaiʻi, wrote about "Hawaiian Geographic Names," and under the heading "Meaning of Hawaiian Geographic Names" he wrote:

> It is very difficult, if not impossible, to translate most of these names, on account of their great antiquity and the changes of which many of them have evidently undergone. It often happens that a word may be translated in different ways by dividing it differently. Many names of places in these islands are common to other groups of islands in the South Pacific, and were probably brought here with the earliest colonists. They have been used for centuries without any thought of their original meaning… (Alexander 1902:395)

In the 1970s, esteemed Hawaiian historian Mary Kawena Pukui, spoke to the us about the translations and meanings of place names. She was particularly interested in their meanings and stories, but also expressed a concern about random translations. She shared that when working on the 1974 publication, "Place Names of Hawaiʻi," she expressed concern to her co-authors, and urged care in breaking place names apart to identifiable word and assigning meanings to them. It was her belief that an exact translation could be given when a tradition specifically gave the reason of name, or if the name was made of words which possessed generational knowledge. In other names made up of multiple or perhaps now unknown words, it was more difficult to know the meaning. As a result, when "Place Names of Hawaiʻi" was

published, it was agreed that the nature of the translation would be cited in the notes. We have adapted these to this study, through the use of:

- lit. for literal translation,
- int. for interpretive translation,
- (?) for meaning/pronunciation uncertain.

3.2.1 Selected Place Names of the Waiākea Landscape

The primary sources of information about place names (the origin, meaning, how and why) are found in moʻolelo (traditions) that have been handed down through the generations. While many place names in Waiākea ahupuaʻa have survived the passing of time, countless names have been lost; and for others, their origin or meaning forgotten. The notes that follow below represent a sampling of place names which have been recorded across Waiākea. These names are more than just a dot on a map, they are the record of the relationship shared between people and places and offer both tangible and intangible linkage to traditional knowledge and customs.

In May 1880, G. W. K. Laweliilii Opio, Jr., submitted a short article about storied places of Waiākea, Hilo in the rains that "resonate on the lehua blossoms." The narratives provide physical descriptions and traditions of place as well—

> **Mei 29, 1880 (aoao 4)**
> **Ko Hawaii Pae Aina**
> **Na Wahi Pana o ka Ua Kanilehua**
>
> E Ko Hawaii Pae Aina; Aloha oe: — E oluolu mai ia'u no keia mau wahi hoakaka, a oia keia-malalo iho nei:
>
> Ka Lae o Leleiwi—o keia lae kaulana, aia no ma ka hikina aku o Hilo. Ma kekahi moolelo e pili ana no keia lae, he kanaka maoli no, ua noho i ka uka Waiahulu, a alualuia e Pele, holo keia a lele i ke kai me kaua ilio, a loaa aku la nae i na po-ha-ha a ua wahine hookalakupua la. A o ke kowa mai ka aina aku, he 60 kapuai, aia no ma ka aoao kana ilio, he 12 kapuai kona kiekie i ku ai iloko o ke kai, a ua aneane no e puka i ka ilikai. He pohaku ula keia, aia ma kona poli kahi e loaa ai na ano leho ula maikai no ka lu hee ana.
>
> Mawaho aku o keia lae, ke koʻa ahi kaulana o Ikoa he 5 mile ka mamao, a mai ke kaona mai hoi o Hilo. He 13 mile, a he elua kaau anana a oi aku ka hohonu o keia koʻa. Ma ka hikina aku o keia lae, i pa ai o Kamehameha i ka hoe a ka poe lawaia ma kahi i kapaia o Papai, mawaena o Hilo nei, a malaila i kau ai Kanawai Mamalahoa o Kamehameha, a o Mawae nae ka inoa aina palena o keia mau apana.

No ka Ua Kanilehua—Ua puka mai keia ua mailoko mai o na ua kaulana elua o Hilo nei; o ka ua kualau me ka ua ulumano o Panaewa. Ua pa mai keia ua ma ka hikina aku o Hilo, a hehi mai la i ka aina ma ka lae kaulana o Leleiwi, a nihi ae la i ka uka wehiwehi o Panaewa, a lu helelei iho la iluna o ka lihilihi kuku o Aipo. Aohe nui loa o keia ua, o ka lelehuna wale iho no iluna o ka laau, a e kapaia ma ua inoa elua, oia hoi, ua kanilehua a ua lulehua o Panaewa nui moku lehua, ohia kupu haoeoe i ka uka lehua ula, i ka wili a ka manu—e, ua po Hilo.

No Lokoaka—He loko keia i kaulana i ka nui me ka laula, a o kona anapuni he ¾ mile, a he 1/4 mile ka laula. Ka loa o ka pale pohaku 1.4 mile, he 17 kapuai ka laula a he 19 kapuai ke kiekie. A ua oleloia, aia no iloko o keia loko ka wahine kaulana o Paliuli me Waka kona kupunawahine. He lua hohonu ma ka hikina o keia loko nona na kapuai he 42, a be 90 ke anapuni, a malaila no e loaa ai ke ano i-a i like me ka pipi o Ewa. He Owaka ka inoa a e loaa no maloko na hua liilii aiai i like me ka momi, a he loko makaikai nuiia e ka malihini.

No Honohononui—He aina maikai keia, he nui ka ia, a he oluolu maikai ma ka noho ana. Aole nae he kanaka, aia keia aina ma ke komohana akau o Lokowaka. Aia mawaho aku o keia aina ka pahoehoe limu kohu moe ipo o ka poli, me na lipoa mapu aala onaona o Mokihana. A mawaho koke no ke poina nalu, he 1/4 mile mai ka aina aku.

I ka wa kahiko, he kaulana keia aina i ka nui o ke kanaka he mau mano, a penei ka moolelo kaulana o keia aina i kela wa. I ka wa e paina ai koonei poe a maona, alaila e popoi like na umeke o na hale a pau, a ia wa e loheia ai ka nakeke i uka o Kaumana, he 9 mile a oi aku ka ,mamao; a pela hoi ko Kaumana ke poi like i na umeke, he loheia i kai. I kekahi wa, pii aku la kekahi kanaka o Puhala Kaumana i ke kalai waa, a ua pepehiia make loa ma kela aina mauka, a nolaila kela inoa o Kaumana. Ua like no keia mau aina, a ma ka hoopokole ana, hookah no aina, a o Waiakea Mawaena.

O wau no, G. W. K. Lawelii Opio,
Keaukaha, Hilo, Hawaii.

[Translation]

O Hawaii Pae Aina, Aloha to you:— Please grant me the opportunity to share a little explanation about these things below:

The Point of Leleiwi—This famous point at the far-eastern section of Hilo. One of the traditions of this point it that was once was once a human, who dwelt in the uplands of Waiahulu. He was chased by Pele, and he ran to jump in the ocean with his favorite

dog, where they were turned into stone objects by the supernatural woman [Pele]. There is a channel about 60 feet from the land, there on the side of his dog, that is 12 feet high, standing in the see just about the ocean's surface. It is a red stone, and there in the middle (breast), are found prized red cowry that are used by the lu hee (octopus lure) fishermen. Beyond this point is the famous ahi fishery of Ikoa, about 5 miles distant from the town of Hilo, and 13 miles distant. The koʻa (fishery) is about 80 fathoms or more deep.

It was to the east of this point that Kamehameha was struck on the his brow with the paddle by the fishermen, at the place called Papai, at the boundary with Hilo. It is there that the Mamalahoa Law of Kamehameha was proclaimed. Mawae is the name of the boundary of these two districts.

About the Kanilehua Rains—This name came about because of the two famous rans of Hilo, the Kualau and Ulumano of Panaewa. The falling rain causes the scattering of the bristly blossoms of Aipo [lehua blossoms]. This is not a heavy rain, but instead a light mist upon the forest. It is known by two names, these are the ua kanilehua (rain that resonates/patters on the lehua blossoms), or the ua lulehua (rain that scatters the lehua blossoms) upon the great lehua grove of Panaewa, the jagged growth of the red lehua of the uplands with the turning [glancing about] of the birds, in the dark rains of Hilo.

About Lokoaka—This is a famous fishpond for its size and expanse. Its circumference is 3.4 miles and 1.4 mile wide. The length of the barrier wall is 1.4 mile, 17 feet wide, and 19 feet high. It is said that this pond is the home of the famous woman of Paliuli and Waka, here ancestress. There is a deep hole at the east of this pond, that is 42 feet deep and 90 feet in circumference. There, may be gotten a fish, like the pipi (oysters) of Ewa, known by the name Owaka. There is found within them a very small seed that shines like a pearl. This pond is one that many visitors travel to see.

About Honohononui—This is a good land, there are many fish, and living there is very comfortable. Though there are no people living there. To the northwest of this land is Lokowaka. Outside of these lands there is a stone with limu kohu resting like a lover on its breast, there is also fragrant lipoa as sweet as the Mokihana. Beyond, about ¼ mile from the land, the waves break. In ancient times this land was known for its shark people. There is also a famous tradition of this land from those times, it is this:

When the people of this place ate and were satisfied, all the people in the houses would slam down the covers of their calabashes. At that time, when the people of Kaumana, 9 miles away heard this, they two would slam down the cover their calabashes, and that was heard at the shore.

> Now at one time, there was a man, Puhala Kaumana, a canoe maker who went to the uplands. On his way, he was murdered in the distant uplands, thus, the name Kaumana was given. The lands like this are all short, with Waiakea cutting them off.
>
> I am,
> G. W. K. Laweliilii, Jr.
> Keaukaha, Hilo, Hawaii. [Maly, translator]

Notes compiled by Theodore Kelsey (1891-1987), who in the early 1900s resided in Hilo, and recorded the histories of elder natives provide us with important background on the locations, meaning and history behind Hawaiian place names. On part of the collection of Kelsey's handwritten- and type -set notes are housed in a collection at the Hawai'i State Archives (Series M-445). Among the pages of Kelsey's collection are notes from Reverend H. B. Nalimu, who was born at Pāpa'aloa, Hilo in 1835. The notes include wahi pana of Waiākea—

> **Hawaiian Place Names.**
> **H.B. Nalimu (Theo. Kelsey c. 1921)**
>
> Ku-a-ka-ananuu, he heiau ma ka aina o Maka-o-Ku, kokoke i Mokuola a he awa pae waa.
>
> Wai-a-'iao, he wahi e lawai'a ai ka 'ioa ['iao], mauka mai o Maka-o-Ku'.
>
> Wai-honu, he loko mauka mai o Wao-a-'iao, a maloko o ke-'ia loko e holoholo ai ka honu a me ka i'a. (Lili'u-o-ka-lani Park)...
>
> Honohono-nui, mauka mai o Loko-awa. He aina pahoehoe mai Loko-aka mai a hiki i ka palena, he hapa mile paha. O ka palena mauka oia o Wai-akea, o Honohono-nui ko'u aina i noho ai me ko'u mau makua. Ma Ala-'opae (kokoke ka palena), malaila ua kanu wau he laau kamani. Aia malaila i ke-ia manawa.
>
> Ke-one-kahakaha, mauka mai o ka palena o Honohono-nui. Oia kahi i kahakaha ai na keiki iluna o ke one paha. He one ke'oke'o a he loko kai, o Ke-one-kahakaha ka loko.
>
> Wai-akea, mai Lele-iwi a pii iluna o Mauna Loa, a mai Kalana-kāmaa (ancient stream. H. E. Kelsey property located in bed. Cor[ner] Hualalai and Kilauea Ave.) a hiki i Mawae, oia kona akea.
>
> [Translation]

> Ku-a-ka-ananuu, is a temple in the land of Maka-o-ku, close to Moku-ola and the canoe landing.
>
> Wai-a-iao, is a place where iao were caught. It is mauka of Maka-o-Ku.
>
> Wai-honu, is a pond mauka of Wai-a-iao, and inside this pond, turtles swim along with the fish. (Lili‘u-o-ka-lani Park)…
>
> Honohono-nui, is mauka of Loko-aka. It is pahoehoe land from Loko-aka to about half a mile from the boundary. The mauka boundary is Waiakea. Honohono-nui is the land upon which I resided with my parents.
>
> Ke-one-kahakaha is mauka from the boundary of Honohono-nui. That is perhaps a place where children drew in the sand. It is white sand, and there is an ocean pond. Ke-one-kahakaha is the pond.
>
> Wai-akea, is from Leleiwi and ascends to the top of Mauna Loa, and from Kalana-kāmaa (ancient stream. H. E. Kelsey property located in bed. Cor[ner] Hualalai and Kilauea Ave.) to Mawae, that is its width.

Also among Kelsey’s collection are the following references to Waiākea:

> Kapapala and Waiakea were sub-chiefs who were told by their superior to run around the tracts of land bearing their names (from Tom Cook, surveyor) (BPBM SC Kelsey Box 1.5, July 2, 1921:2).
>
> Kelsey also reported that Mrs. Kamakakuikalani told him that Waiākea was so named “because you could dig anywhere and find water” (ibid. July 18, 1921).

One tradition collected by Kelsey in 1921, references named locations spanning from the uplands to the ocean fisheries of Waiākea. Kelsey’s informant, Reverend Henry B. Nalimu, shared with him his recollections of his ancestor, ‘Ī, for whom ‘Ī-hālau (the long house of the chief ‘Ī) was named —:

I, a relative of Rev. Nalimu’s, constructed the ditch of I-auwai [across the land of the Punahoa]…

I-halau, the great long house of I, was mauka of Waiakea, near Pooholua and mauka of that place. Rev. Nalimu has only heard of the place. He thinks that it is in the forest. When the occupants of I-halau finished a meal they slammed the covers down onto their calabashes in unison so that the report could be heard at I-ko‘a, the fishing-grounds of I where he fished for

ahi. The location of this koʻa was obtained by bringing into line the coconuts of Papaʻi and the Cape of Anapuka (ka lae o Anapuka) on the Puna side, and on the Hilo side, the coconuts of Kau Maui (near Keaukaha), and the cape of Kiha… [Kelsey notes, 1921; in collection of June Gutmanis]

Other place names of the Waiākea vicinity include but are not limited to the following list. The authors have focused on names for which early historical references are available, and offer translations identified as literal, interpretive (at times provided several possibilities), or unknown. Among these names are wahi pana (stories and sacred places).

Hilo Hanakahi (lit. Hilo of Hanakahi) Hanakahi was an ancient chief of the district whose rule was a time of peace.

> The larger region of Hilo Hanakahi extends from the Makaokū vicinity to Leleiwi at the boundary with Puna, From Makaokū-Wailoa, across the sandy shore of the bay, the District was known as Hilo One, and from Wailuku river to the boundary with Hāmākua, the district was known as Hilo Palikū.

Honohononui (an ʻili kūpono or independent land division within Waiākea, and site of the fames fishpond Lokowaka). A specific tradition explaining how the name Honohononui came to be, has not been located. Several possible meanings are possible, these include, but are not limited to:

> Honohono. The endemic and threatened plant species honohono (Haplostachys halostachya), was listed as endangered in November 1979. It is described as "a rare species of flowering plant in the mint family known by the common names honohono or Hawaiian mint. It is endemic to Hawaii, where it is now limited to the island of Hawaii and has been extirpated from Kauai and Maui…" (http://nativeplants.hawaii.edu/plant/view/Haplostachys_haplostachya)
>
> Hono describes bays, coves, inlets, gulches. When a Hawaiian word is repeated — e.g. "honohono" — it adds emphasis to the occurrences of such features or attributes. Honohononui may be translated as describing the "many coves or inlets" of the area.
>
> Hono also described bountifulness, thus repeated and with the word nui, it could describe "great bounty."
>
> Hono is also used to describe a gathering chiefs in a kapu (sacred) ceremony. Thus, "great sacredness abounds."

Honohononui was retained as a land right of Kamehameha I and his descendants.

Kalanakāma‘a (int. To undo one’s kī-leaf or kapa twined sandals) A stream area running from the uplands towards the shore where it mixes with Waiolama; the inland flats between Waiākea and Kūkūau.

Kalepolepo (lit. The dirty one or low born chief (ref. lepolepo a derogatory term used to describe a low born chief); an ‘ili situated on the Kāwili side of the Waiākea pond complex).

Kanukuokamanu (lit. The beak of the bird). The eastern boundary where Hilo One ends and Hilo Hanakahi begins, marked by Wailoa Stream. An ancient surfing area

Kawiakawa / Kawiakawaa – (Int. Press through the narrow channel). Heiau site on shoreward boundary between Waiākea, Hilo District and Kea‘au Ahupua‘a, Puna District (Register Map No. 672 & 705). A small cave where “natives worshipped idols” (Boundary Commission, Volume A No. 1:197).

Ke-au-kaha – lit. The shoreline current.

> Several historical narratives and surveys identify a specific place as “Keaukaha Point” (see Triangulation Station “Keokea 2”). It appears that this name since at least the late 1800s - early 1900s, the entire “kaha” (coastal region) from the area of “Palekai” — the Hilo Harbor-Breakwater complex — crossing over Honohononui, Waiuli (currently known as “Carlsmith Beach Park and the Lehia Residence Lots and Park), and the beyond there to the region of Leleiwi Point[6].
>
> The exception being Honohononui, which was held as an ‘ili kūpono, independent of Waiākea Ahupua‘a.

Kapunakō (int. Water drawn from a spring) A spring in upland Waiākea.

Mohouli. No story describing the origin of the name was located. Mohouli is an ‘ili with a fishpond and strip of land that ascends mauka, it adjoins the land areas of Kalepolepo and Kāwili.

Kāwili (lit. Twist) The name Kāwili is given to an ‘ili of Waiākea that extends from the area of the fishponds to some distance in the uplands where bird catchers of old once gathered feathers from choice birds. The name describes how one would kāwili (twist, i.e. apply) bird lime in among three or four lehua flowers, upon which the choice birds

[6] A wide lava-forest flat land that runs to the Hilo boundary with Puna.

would become stuck while trying sip the nectar of lehua that blossoms. (See also Mokaulele below.)

Mokaulele (Mōkaulele). A wahi pana in the uplands of Hilo, which adjoins Kāwili of Waiākea. The lehua of the region is famous in traditions and chants, like the one below which celebrates wahi pana and famous natural phenomena of Waiākea.

...Ua Kanilehua. He ua kamaaina ia no Hilo nei, e o kana wahi e noho mau ai aia no ma ka lae ohia o Panaewa, a hiki i ka uka o Puliuli o keia wahi ua no. ka ua hoope pua hala o Upeloa. a nana hoi e lu ka lihilihi o na lehua o Mokaulele... J.A.K. Kauakanilehua. Hilo, Hawaii, Aukake 10, 1868 (Nupepa Kuokoa, Augate 22, 1863:4)

> Kanilehua Rain. It is a native/familiar rain of Hilo. It's steady place is there in the lehua forests of Panaewa and on to the uplands of Paliuli (in ʻŌlaʻa). The rain that crushes the blossoms of the pandanus is at Ūpēloa. And from there you may see the rain that scatters the eyelashes (bristles) of the lehua of Mokaulele... [Maly, translator]

Reference to Mokaulele is found on maps, identifying Mokaulele Heights Home Lots crossed by Mohouli Street (see H.S.S. 939)

Panaʻewa (lit. Crooked or unjust place; a land section of Waiākea, on the Puna side of Pūʻāinakō. In some traditions, named for a chiefess, and in the Pele traditions named for a moʻo goddess.

Piʻopiʻo (int. A form of sorcery). Tradition relates that Keoua Ka-lani-kupu-a-pa-i-ka-lani-nui, the father of Kamehameha I fell ill of a lingering sickness at Piʻopiʻo (sorcery) and died at the place in 1752. This set in motion events in history that led to the rise of Kamehameha I to becoming mōʻī of the Hawaiian Island, and the families claim to Waiākea. Piʻopiʻo is an ʻili kūpono in Waiākea and was held independent of the ahupuaʻa (becoming a land title of Victoria Kamamalu). Today, Piʻopiʻo is in the area of the State and county offices in Hilo.

ʻOhele. A wahi pana celebrated in mele, noted for its fine sand, situated on the eastern side of Wailoa, now in the vicinity of Sui San Fish Market.

Ūpēloa (int. Extreme grief, crushed). A hala grove and land area with a stream forming part of the boundary between Waiākea and Kūkūau (extending to an elevation in alignment with Puʻuhonu in Punahoa).

Waiākea (lit. Broad or expansive waters. Wai-Ākea (water of Wākea) for the progenitor of the Hawaiian race. Waiākea is also a native variety of taro, similar to the better-known lehua, but with black streaks along the edges of the stalks (pers. comm. Clarence Mokuʻōhai Medeiros, May 10, 1996).

In another account, we are told that — "Kapāpala and Waiākea were sub-chiefs who were told by their superior to run around the tracts of land bearing their names (from Tom Cook, surveyor) (BPBM SC Kelsey Box 1.5, July 2, 1921:2). Kelsey also reported that Mrs. Kamakakuikalani told him that Waiākea (expansive waters) was so named "because you could dig anywhere and find water" (ibid. July 18, 1921). (see Register Map No. 524)

Wailoa (Lit. Long water). The stream and estuary below Waiākea Fishpond.

3.3 Traditional Period

In this section, "Moʻolelo ʻĀina" we have selected a few of the native traditions of Waiākea and the larger Hilo District (some translated from the original Hawaiian language narratives as a part of this study). Many other better-known moʻolelo may be easily found in various sources, and we leave those to further research on the part of the readers.

It is important to remember that following the arrival of westerners on island shores in 1778, unprecedented change began in the islands. In 1804-1805, an introduced disease, called "maʻi ʻōkuʻu" by the Hawaiians, killed nearly 200,000 natives in one year. Between 1805 to 1893, the native population dropped down to approximately 40,000 from an estimated 400,000-plus in 1778. Losses like this had multiple impacts on the people, landscape, and in the preservation of traditional Hawaiian knowledge. While some traditions, origins of place names, customs and practices survived the passing of time—largely through the efforts of a few native scholars and small isolated pockets of the population who perpetuated their way of life—vast knowledge was lost. We have strived to provide you with selections of the knowledge that have been passed on but acknowledge here that much more has yet to researched and brought forward.

In moʻolelo, we find a rich narrative describing traditions, beliefs and practices, and spiritual and familial relationships that Hawaiians share with one another and their natural environment. Every aspect of nature from the stars in the heavens, to the winds, clouds, rains, growth of the forests and life therein, and everything on the land and in the ocean, was (and is) believed to be alive. Tradition also tells us that the gods and goddesses of old were very protective of the natural environment. In olden times, travel on land and sea, through the forests and beyond was accompanied by prayer and care. Traditions reveal that many a careless traveler, or collector of resources, found themselves lost in a maze of overgrowth, dense mists, and dropped into deep chasms as a result of disrespectful and careless actions.

In the Hawaiian mind, care for each aspect of nature, the kino lau (myriad body-forms) of the elder life forms, was a way of life. This concept is still expressed by Hawaiian kūpuna (elders) through the present day and passed on in many native families. Also, in this cultural context, anything which damages the native nature of the land, ocean and forest (and the kino lau or myriad body-forms of the deity therein) damages the integrity of the whole. Thus, caring for, and protecting the land and ocean resources, is a way of life. In this traditional context we find that the intangible aspects of our living environment are also part of a sacred Hawaiian landscape. Thus, the landscape itself is a highly valued cultural property. It's protection, and the continued exercise of traditional and customary practices, in a traditional and customary manner, are mandated by native custom.

The selections below are generally presented in a chronological order by period in history to which they are associated. They include accounts that are connected with neighboring ahupuaʻa, the larger Hilo district, island or even beyond the shores of Hawaiʻi island. Several native Hawaiian narratives, as originally written in Hawaiian, are included as they may serve as educational resources for those who are learning Hawaiian and for those who will pass the history of place on to future generations.

3.3.1 Hiʻiaka-i-ka-poli-o-Pele Travels through Panaʻewa and to Waiākea Bay

The traditions of Pele and her large family are significant in Hawaiian history, crossing not only all of the Hawaiian Island but also reaching back to Kahiki (the ancestral homeland of the Hawaiian gods and people). Of these traditions, the story of Hiʻiaka-i-ka-poli-o-Pele, the youngest and most beloved of Pele's siblings, is perhaps most famous. The earliest formal retelling of the traditions was published in 1861-1862. In her spirit form Pele traveled to Kauaʻi and engaged in a relationship with a chief by the name of Lohiʻau. After a time, she returned to her home, Halemaʻumaʻu, at Kīlauea, Hawaiʻi. After a while, she felt a longing for Lohiʻau, so she asked her sister, which one of them might go to Kauaʻi to fetch Lohiʻau and bring him to her. Hiʻiaka-i-ka-poli-o-Pele (Hiʻiaka), agreed to make the trip, and traveled with her companions Wahine-ʻōmaʻo and Pāʻū-o-Palaʻe/Palaʻā. On the journey, Hiʻiaka and her party visited numerous locations across the islands. Descending from Kīlauea into Puna, they traveled to Hāʻena, on the sore of Keaʻau, and then entered Waiākea where they encountered Panaʻewa (a moʻo – water-form deity) and her companions who were in the habit of killing travelers along the trail. Hiʻiaka confronted and killed Panaʻewa, then continued on into Waiākea, and beyond. Among the narratives published between 1861 to the 1920s, we find references to Leleiwi, Panaʻewa and other lands within Waiākea. A synthesis of selected narratives and mele (chants), translated by Maly, follows below—

He Mooolelo No Hiiakaikapoliopele
[Ka Hoku o ka Pakipika, Ianuari 2, 1862:1]

...He ua kui lehua ko Panaewa,	At Panaewa are the rains that join the lehua blossoms together,
He ua ma kai kui hala o Puna – e,	In Puna re the rains that join the pandanus leaves together,
Aloha – e...	Beloved...
...A Waiakea i ka Hilo Hanakahi	At Waiakea of Hilo Hanakahi,
Ala i ka po iki,	The path is in darkness,
Ka lehua lei o Hilo – e – o – Hilo,	The lehua garland of Hilo – o Hilo,
He hala i pakuia me ka lehua...	Pandanus is woven together with the lehua...

...Descending through ʻŌlaʻa, Hiʻiaka's presence was made known to Panaʻewa, who determined that she would kill Hiʻiaka and her companions. Discerning Panaʻewa intentions, Hiʻiaka offered a chant that poetically chastised Panaʻewa, whose pettiness was as tiring as cross the many streams of varied landscape Hilo—

[Ka Hoku o ka Pakipika, Ianuari 16, 1862:1]

Pau ke aho i ke kahawai lau o Hilo,	Exhausting are the many steams of Hilo,
He lau ka puu,	The many hills,
He mano kaihona,	The many descents,
He mano na kahawai o Kulaipo...	The many streams of Kulaipo [Kulaimano]...
A ka wai i Panaewa,	The bogs at Panaewa,
O Panaewa nui moku lehua,	O great Panaewa of the lehua grove,
Ohia kupu ha-o-e-o-e,	Ohia of the scraggly sprouts,
I ka ua lehua ula,	In rain of red lehua [the falling bristles],
I ka wi ia e ka manu,	In the trill of the birds,
A ua po – e,	Rain of darkness,
Po Hilo i ka uahi o kuu aina,	Hilo is darkened by the smoke of my land,
Ola ia kini,	The multitudes have life,
Ke – a ma la ke ahi...	By the lighting of the fire...

In 1915, Nathaniel Emerson published an account of Pele and Hiʻiaka, collected from various sources, here we include a synthesis of his account of Hiʻiaka's encounter with Panaʻewa—

Their journey still lay through Puna. They were at Kalalau, not far from Hāʻena (at the place where, centuries afterwards, Kamehameha was struck with that well-nigh fatal blow by an outraged fisherman). Some fishermen were hauling in their nets full of fish. The sight was too much for Pā-pūlehu. "I hunger for fish," she exclaimed. "These fish belong to my father. Oh, if only I were home! How I would eat until I was satisfied!"

> Hiʻiaka thought it best to indulge the appetite of this novice in her service. From a little knoll overlooking the ocean, she saw the canoe of the fisherman named Pahulu out at the fishing ground, already well stocked with fish. Hiʻiaka used her power and drove away the school of fish that would have come to his net. Pahulu was so busy with his fishing that he did not notice the women on the shore, but his assistant called out, "Look at the beautiful woman standing on the shore and watching us!" When the two fishermen came ashore, they willingly shared some of their catch with Hiʻiaka mā… Pā-pūlehu cooked and ate the fish, but because of her poor manners in preparing and cleaning up after herself, she was later consumed by Pele…
>
> Now from Puna, there were two trails which might be taken into Waiākea, one went makai, below the forest, and the other went directly through the forest of Panaʻewa. While the makai trail was longer, it was the one most often traveled by those who went to and from Puna. The trail through Panaʻewa was a treacherous one, for the moʻo-god Panaʻewa lived there and was in the habit of waylaying travelers and eating them… Hiʻiaka entered into battle with Panaʻewa and won, thus the trail through Panaʻewa became safe to travel… [Emerson 1915:30-46].

Later in the 1862 account, the author includes a mele documenting the journey of Pele and her family from Kahiki, making reference to passing the shore of Leleiwi—

> He Mooolelo No Hiiakaikapoliopele. Helu 9.
> [Ka Hoku o ka Pakipika, Helu 9. Maraki 7, 1862:4]

Holo mai Pele mai Kahikina…	Pele traveled from the East,
	[from where the sun arises],
Kai a huakai mai Pele,	Pele's procession moved on,
A ka lae i Leleiwi,	At the point of Leleiwi,
Honi i ke ala o ka hala,	Was borne the fragrance of the pandanus,
O ka lehua o Mokaulele,	The lehua of Mokaulele,
Oia ka Pele a kui la…	That is what Pele made into a lei…

Other early traditions, like that of Kū-a-Pākaʻa and Ka Ipu Makani a Laʻamaomao (The wind gourd of Laʻamaomao), make passing reference to Waiākea and Leleiwi, naming the familiar winds that blow on the land. Published by the native newspaper Ka Hae Hawaii, under the title "He Wahi Moolelo, the May 8, 1861 segment named some of the winds in Hilo—

…He Awa ko Leleiwi,	…The Awa is of Leleiwi,
He Puulena ko Waiakea,	The Puulena is of Waiakea,
He Uluau ko Hilo paliku…	The Uluau is of Hiloplikū,
	(the region beyond Wailuku River)… [Maly, translator]

3.3.2 "He Moolelo Kaao No Kepakailiula," A Tradition about Kepakaʻiliʻula

This moʻolelo is set around the 1500s during the time of Lono-i-ka-makahiki and begins at the land area on the shore of Waiākea known as Makaokū (Figure 6). It was a scared lands and home of heiau luakini (temple state worship, at which human sacrifices were once offered. The earliest published accounts of Kepakaʻiliʻula date back to ca.1863, and this version of the tradition is attributed to David Malo (Ka Hoku o Hawaii, March 13 and 20, 1919). The moʻolelo cited below was published in Ka Hoku o Hawaii (March 20, 1919 - December 9, 1920), and it differs substantially from the versions published in the Fornander Collection of Hawaiian Antiquities and Folklore (1917, IV-III:498-517 and 1919, V-II:384-405). The following narratives translated and paraphrased from the original Hawaiian texts by Maly, focus on the opening of the tradition on the shore of Waiākea at Ka-maka-o-Kū.

> Kepakaʻiliʻula was born at Kamakaokū in an ʻeʻepa (premature or mysterious) form and was given up for dead by his parents. Kepakaʻiliʻula's father was Maka-o-Kū (for whom the land area was named), and his mother was Hina-ai-ka-malama, both of whom were descended from Kū and Hina the akua - aliʻi (god-chiefs) who came from Kahiki and established the highest chiefly bloodlines of Hawaiʻi. At the time of Kepakaʻiliʻula's birth, Makaokū and Hina dwelt near Moku-ola and ruled the district of Hilo.
>
> Kepakaʻiliʻula's birth was accompanied by numerous displays of natural phenomena including fragmented rainbows that rested upon the ocean, rains that poured upon the land, and rivers that overflowed upon the land. His maternal uncles, Kiʻinoho and Kiʻihele, took these signs as omens of Kepakaʻiliʻula's supernatural nature. Without the knowledge of Makaokū or Hina, Kiʻinoho and Kiʻihele rescued Kepakaʻiliʻula and raised him while instructing him in all manner of fighting techniques, and in the use of his supernatural powers. When Kepakaʻiliʻula came of age, his uncle Kiʻihele went in search of a suitably beautiful and highly ranked chiefess to whom Kepakaʻiliʻula could be married.
>
> Kiʻihele departed from Hilo and traveled swiftly on the ala loa (ancient trail that encircled the island) along coastal Waiākea into the forest of Leleiwi, and to the shore of Puna until he reached the place called Keaʻau. At Keaʻau, there lived a beautiful woman named Hōpoe. Arriving at the hale aliʻi (royal compound) of this chiefess, Kiʻihele heard Hōpoe calling him to enter her house and rest, and explain why his journey had him traveling so early in the morning. Kiʻihele told Hōpoe that he could not enter her house, as he was on a journey to seek out a wife for his royal ward. "I have heard of the beauty of Hōpoe, the beautiful woman of Keaʻau, thus I have come to visit you."
>
> Hōpoe then asked, "So what do you think, am I the woman for your ward, and are his features comparable to mine?" Kiʻihele answered, "Listen to me oh beauty of Keaʻau,

> there is perhaps no beauty comparable to yours, but I must continue my journey to find if there is anyone else for my royal ward."
>
> Before Hōpoe could answer, Ki'ihele moved swiftly on along the trail and he arrived at Kula (near Kumukahi, Puna), where dwelt the chiefess Waiwelawela… [May 5, 1919]
>
> After completing his journey, Ki'ihele found that the chiefess Mākole'ā of Kahalu'u, Kona was the most beautiful, and it was to her that Kepaka'ili'ula was wed.

The gods Ku and Hina are recurring figures in traditions of Waiākea as the early rulers of the region. The mo'olelo of "Kapuaokaolehloai"[7] describes Waiākea as their royal residence—

> Ku was the father and Hina[8] was the mother. They had two children, Hookaakaaikapakaakaua[9] a son, and Kapuaokaoheloai[10] a daughter. Waiakea in Hilo is the country where these people lived. The brother was the first born and the sister the last. These people were of high chief rank of Hilo. These two children were brought up without knowing that they were brother and sister. They never saw each other although they lived in the same house. The brother had a male attendant and the sister a female attendant… This manner of living was maintained for twenty years, without their seeing one another. One day the attendants as was their custom went to the uplands of Kaumana, directly above Punahoa to do farm work. After the departure of the attendants in the early morning, Kapuaokaoheloai arose and walked out of doors. Upon looking back at the house she saw a bright light within; so she again entered the house and began a search and found a door, which she opened. As she walked in she saw a red object lying on a bed. She removed the tapa from the face and saw a very handsome young man… [Fornander 1916 IV:540]

---

[7] Fornander Volume IV, 1916

[8] Another Ku and Hina contribution; the favorites of story writers.

[9] Hoo-kaa-kaa-i-ka-paka-ua, literally "to roll, or rolling in the rain drops."

[10] Ka-pua-o-ka-ohelo-ai, literally "the blossom of the eatable ohelo" (berry). (*Vaccinium reticulatum.*)

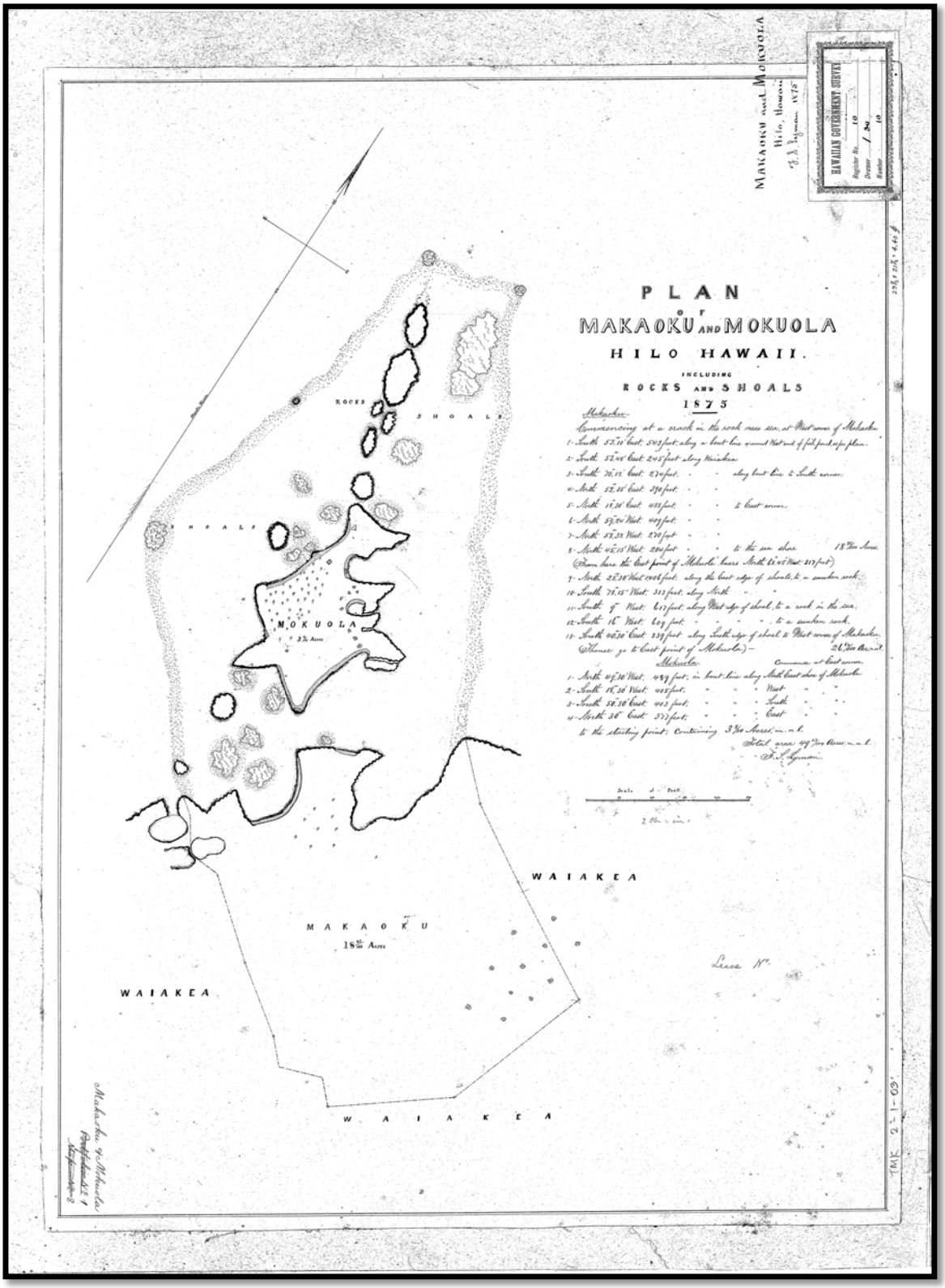


Figure 7. Register Map No. 10. Plan of Makaoku and Mokuola, Hilo Hawaii.

3.3.3 "He Kaao no Pikoiakaalala, ke Keiki Akamai i ka Pana," (The Tradition of Pikoiakaʻalalā–Describing Canoe Making and Bird Hunting in the Uplands of Waiākea and ʻŌlaʻa)

The tradition of Pikoi-a-ka-ʻalalā (Pikoi-son-of-the-crow), printed in the Hawaiian language newspaper, Ku Okoa, in 1865-1866, is one of the earliest written accounts, that provides detailed narratives of the traditional and customary practices associated with the upland forests of Waiākea and neighboring lands. The tradition was submitted to the paper by S.M. Kaui, and ran from December 16th, 1865, to March 10th, 1866.

Pikoi-a-ka-ʻalalā was born to ʻAlalā and Koukou on the island of Kauaʻi, and his family were kūpua (beings with supernatural powers and multiple body-forms). Pikoi-a-ka-ʻalalā possessed exceptional sight and excelled in the Hawaiian art of pana pua (shooting with bow and arrow). Through the tradition of Pikoi-a-ka-ʻalalā, readers learn that many localities throughout the islands are named for places where he competed in matches with archers, shooting ʻiole (rats) and birds from great distances. The tradition is set in the late 1500s when Keawe-nui-a-ʻUmi, the king of Hawaiʻi Island, was in need of an expert to shoot some supernatural ʻelepaio birds that continually interrupted the work of his canoe makers in the uplands of Hilo and ʻŌlaʻa.

Keawe-nui-a-ʻUmi learned of Mainele, a champion in the sport of pana pua, who resided on Oʻahu, and promised him that if he could rid the forest of the enemy ʻelepaio, he could wed his daughter, the beautiful Keakalaulani. As the story unfolds below, we learn that Mainele boasted of his great skills, but he was unable to kill the two birds. In the meantime, Waiākea (for whom the land of Waiākea was named), one of the stewards of Keawe-nui-a-ʻUmi, befriended Pikoi-a-ka-ʻalalā, and learned that he was an expert in the art of pana pua.

Prior to his arrival in Hilo, Pikoi-a-ka-ʻalalā made Waiākea promise that he would not tell anyone who he was, for he had heard of the boastful nature of Mainele, and he wished to teach him a lesson. The narratives below (translated by Maly), focus on events in the uplands of Waiākea and ʻŌlaʻa. In this part of the tradition, we learn about the make-up of the upland forests, named localities, and some of the practices of ancient Hawaiians in the forest region. Arriving in the Hilo District Pikoi-a-ka-ʻalalā asked Waiākea—

HELU 5.

"…Aia i hea kahi o ua mau manu hanaino waa nei?" "Aia no ma waho aku o Panaewa," "e pii hoi ha kaua i ike au," wahi a Pikoiakaalala.

O ka hele aku la no ia o laua a hiki, a ike aku la o Pikoiakaalala i kahi i kau ai na manu

Part 5.

"…Where are those birds who make trouble for the canoes found?" "They are there, outside of Panaʻewa." Pikoi-a-ka-ʻalalā then said, "Let us go up there so that I may see."

The two traveled till they reached the place, and Pikoi-a-ka-ʻalalā saw where the

hanaino waa, a me ke kahua kahi hoi e kalai ai na kahuna a Keawenuiaumi, o ka inoa o ia wahi, o Kalehuapueo, aia no kela wahi ma kai ae o Kaluaopele, mauka ae o Olaa, iwaena konu o ka ululaau, he ahua nae, ina e hiki ilaila, e hiki ia oe ke nana mai ia kai o Hilo, me kou ike maopopo no nae ia kai, he loihi no nae, ua ane hiki paha i ka 27 mile ka loa; a hoi aku la no laua i kai o Hilo, e like no me ka mea mau i ke kaumaha i ka manu i na la a pau a laua e hele ai; a he mea mau no hoi ia laua ka lawe pinepine aku i manu na ke alii Keawenuiaumi, a o ka ke alii mea hoohuoi mau no hoi ia, no ka nui launa ole o ka manu, a he mea mau no hoi ia Keawenuiaumi ka ninaninau mau ia Waiakea kona kahu, i ka mea nana i hoomake ina manu he nui, ike kela ano manu i keia ano manu.

birds who made trouble for the canoes were perched. He also saw the grounds where the canoe making priest of Keawe-nui-a-‘Umi worked. The name of this place was Kalehuapueo, it is there below Kaluaopele (the Volcano), in the uplands of ‘Ōla‘a, in the middle of the forest. There is a small hill there, and if you go there, you will be able to look to the sea of Hilo. By the sight of the sea, you will know that it is a great distance off, perhaps 27 miles away. The two then returned to Hilo, and as was the custom, they were weighted down by birds on all the days they went to the mountains. They frequently went and took birds for the chief Keawe-nui-a-‘Umi, who grew suspicious because so many birds were brought down. Keawe-nui-a-‘Umi regularly asked Waiākea, who was killing these birds, for many different kinds were brought down.

Eia na inoa pakahi o na manu a Pikoiakaalala i pana ai i mea ai no ka wa maka pehu o Hilo. O ka Oo, ka Iiwi, ka Ou, ka Akakane, ka Amakihi, a me ka Mamo, o na manu ai-lehua no a pau o ka uka i Olaa a me ka nahele laau loloa o Panaewa; oia mau manu ka ke keiki Pikoiakaalala i panai, a o ka Waiakea hoi ia e haawi aku ai i ke alii nui me na lii malalo iho, na kaukaualii, na puali, me na koa a me na kanaka hoi o ke alii.

Here are the names of the birds which Pikoi-a-ka-‘alalā shot during his time in Hilo; the ‘Ō‘ō, ‘I‘iwi, ‘Ō‘ū, ‘Akakane, ‘Amakihi, and the Mamo, the birds which eat of the lehua blossoms in the uplands of ‘Ōla‘a, and the long-treed forest of Pana‘ewa. Those were the birds shot by Pikoi-a-ka-‘alalā, and given by Waiākea to the king, the chiefs below him, the attendant chiefs, the warriors and the men of the chief.

A no ka ninau mau o Keawenuiaumi i ka mea nana i pana kela mau manu—i hoike iae la maluna—alaila, hai aku la o Waiakea penei: “He wahi aikane no nau.” “No hea?” wahi a ke alii, “no Oahu mai no,” alaila ninau mai la o Keawenuiaumi, “O wai ka inoa oia aikane au?” “O wai la, aole i hai mai

Because Keawe-nui-a-‘Umi continually asked questions about the one who shot the birds—as described above—Waiākea answered thus: It is a friend of mine.” “Where from?” Asked the chief. “From O‘ahu.” Keawe-nui-a-‘Umi then asked, “What is the name of your friend?” “What

i kona inoa iau," wahi a Waiakea, he oiaio no hoi paha ia, no ka mea hoi, aole no i ike na mea a pau o Pikoiakaalala keia, aole no hoi i hai i kona inoa ia Waiakea; aka nae, o na hana akamai a pau a Pikoiakaalala kana i ike ai, mai ko laua holo ana mai o Oahu aku a hiki i keia wahi i olelo iae nei, a ua hoopaa loa o Waiakea i kana mea i ike ai, no ke akamai lua ole o ua aikane nei ana, (Pikoiakaalala) oia hoi na pana ana i na iole mai Oahu mai a hiki ma Kohala i Hawaii.

indeed? He has not told me his name," responded Waiākea. Now this is perhaps true, because very few people knew of Pikoi-a-ka-ʻalalā, and he had not actually told his name to Waiākea. But because of all the amazing things that Pikoi-a-ka-ʻalalā had done—that is the shooting of rats from Oʻahu to Kohala, Hawaiʻi, Waiākea knew that his friend (Pikoi-a-ka-ʻalalā) was second to none in the skill.

(E waiho iki iho kakou i ka hoonioniolo ana no Pikoiakaalala ke keiki o Kauai o Manokalanipo, a me Waiakea hoi kahi kanaka o Kauakanilehua o Hilo Hanakahi, a e kuehu ae kakou i ka lehu o kapuahi no Mainele a me na hoe waa.)

(Let us now leave the upright nature of Pikoi-a-ka-ʻalalā, the youth of Kauai of Manokalanipō, and Waiākea, the man of the land of Hilo Hanakāhi, where the rains resonate on the leaves of the lehua; and let us stir up the ashes of the fireplace of Mainele and the canoe paddlers.)

Ia Mainele ma i noho ai iuka o Kohala i ke kalai hoe, a hala hookahi malama, a loaa ka hoe, alaila, makaukau na waa e holo aku i Hilo, kahi hoi o ke alii nana i hoouna aku e kii ia Mainele. A hiki o Mainele ma i Hilo, ua makaukau mua hoi ka ai, ka puaa, me na mea no hoi a pau e lawa ai ka malihini; a o ke o no hoi ia i pii ai e pana i ko Keawenuiaumi enemi mau.

While Mainele and folks were residing in the uplands of Kohala, cutting wood for paddles, there passed one cycle of the moon, and they then had the paddles made. Therefore the canoes were made ready to travel to Hilo, the place from which the king had sent for Mainele and his companions. The food was made ready, the pig and all the things to be brought for the visitor; and those things necessary for the journey to the uplands to shoot the enemies of Keawe-nui-a-ʻUmi.

O ka hoomaka iho la no ia o ka pii o Mainele me ke alii, a me na kanaka a pau he nui, a o ka poe makaikai no hoi o kela wahi keia wahi o Hilo a me Puna. A hiki no hoi o Mainele i ke kahua kahi kalai-waa, a ike iho la nae i ke kumu koa kahi e kau mau ai ua mau manu nei, aole nae he ikeiaku o na

Mainele and the King, and many of the people, those who had traveled from one place or another in Hilo and Puna, began their journey to the uplands. When Mainele arrived at the canoe making grounds, he saw the koa trees where birds had perched, though the (bird) enemies of

enemi o ke alii, no ka mea hoi, aia no a koele ke koi i ka waa, alaila, o ka manawa iho la no ia e lele mai ai o ua mau manu nei a kau i ke kumu o kekahi koa nui. Hookoele no hoi na kahuna a ke alii i kekahi kaele waa kahiko no a lakou mamua i haalele ai, i mea hoi e lohe ai ua mau manu la, alaila lele mai, oiai o ka laua hana mau ia ke lohe i kekahi koi e koele ana.

the king were not to be seen. But when the striking of the adzes was heard on the hulls of the canoes, the birds flew and perched atop a large koa tree. When the priest of the king, began to dig out one of the old canoe hulls, left by from an earlier time when they had fled; it was then, when the birds heard the chipping, that they began to fly about.

O ka manawa no ia e hiki ai, me ko laua manao paha he kalai-waa, no ka mea, o ko laua enemi nui hoi ia o ke kalaiwaa. A he oi no hoi o na manu pololei nui wale i ke koho e mai no mamua i na olelo hooiloilo, e olelo mai ai penei: “E Keawenuiaumi e! haalele ia he waa ino, he waa puha, ua loli kaele.” Aole no hoi ma ko Keawenuiaumi waa wale no ka laua hana e hooiloilo ai, o ka waa o kela kanaka keia kanaka ka laua e hanai.

That was what they did, when they heard the digging, because their great enemy were the canoe makers. Now normally, these types of birds were foremost in stating whether worms were in the wood, but here, they called out always: “Say Keawe-nui-a-‘Umi! Leave it behind, it is a bad canoe, a canoe that will shatter, a rotted hull.” It was not only the canoes of Keawe-nui-a-‘Umi, but the canoes of other men as well, that the two birds did this to.

O ka lele mai la no ia o ua mau manu la a kau mai la iluna, ma ko laua wahi mau e kau ai. I ua mau manu la no a kau mai, ike aku la no hoi o Mainele, ke akamai kaulana; o kona manawa iho la no ia i haalele koke ae ai i kana mea make, me ka olelo kaena e anae mamua o kona hookuu ana i kana pua, penei no hoi: “Heaha la ke kumu o ke ku ole ana o keia mau manu i ka poe i hele mai ai e pana i keia mau manu, ma ke kua paha ka pana ana i ku ole
ai? No ka mea, he nui na kino, a he kokoke loa no hoi laua e kau mai nei...”

These birds flew and perched at their usual place above. When the birds perched there, Mainele saw them, he then began boasting about his fame and skill with the bow, and that he could kill them for which he released his arrow: “There is no tree that these birds can land on that the people cannot shoot them. They will be shot in the back perhaps, for their bodies are large, and they land nearby...”

A lohe ae la ke alii, a me ka aha kanaka e ku pu ana me ia, (Mainele) oliloli nui ae la lakou. O ke kuu aku la no ia o Mainele i kana pua, me kona manao hoi e ku aku na manu ia ia, he ole ka hoi ua mea he ku aku, mai

Hearing this, the king and the people gathered there with him (Mainele), and were exceedingly happy. Then Mainele released his arrow, thinking that he would strike the birds, but he did not hit them.

ku no nae, o ka pololi ana o ka pua a ku no i ka mino kahiko o na manu, oia no ka mea i halai, o ka hoomau aku la no ia o Mainele i kana hana i kaulana ai o ka pana, oi pana wale a la aohe wahi mea ku aku o na manu, a po ia la, moe iho la no o Keawenuiaumi me Mainele, a me na kanaka a pau ilaila.

He tried again and again, his arrows hungered for the birds, but all the shots of this famous person, missed. When darkness fell, Keawe-nui-a-'Umi, Mainele, and all the people with them went to sleep.

A i ke ao anae no, oia ka lua o ka la, i lawa no i ka maamaa anae, o ko Mainele manawa iho la no ia e panai, me ke ake nui e ku na enemi mau o ke alii, aole no hoi he komo wahi ai iki i kona opu, a no ke ku ole o na manu, olelo ae la ia i ke alii e hana i laau alanui nona e pii aku ai iluna o ke kumu koa, i kokoke i kahi o ua mau manu nei e kau ana, me kona manao a kokoke iki ae, alaila, ku ke panae. A paa ke alanui, pii ae la o Mainele alaila, pana ae la no ia i na manu, oi pana wale no ia la a ahiahi, aohe no he mea a ku iki, a moe hou no ilaila.

With the light of day—this was the second day—Mainele practiced and when it was enough, he began again to shoot, with great desire for these enemies of the king. Because the birds did not land nearby, he told the king to have a wooden ladder made so that he could climb atop one of the koa trees, close to where the birds regularly perched. He thought that if he could get closer, he would be able to shoot them. The ladder was made secure, and Mainele climbed upon it. But again, his arrows missed, and with the coming of night, the people again slept there.

A ao ae la, o ke kolu ia o ka la, alua no hoi alapii, i mea hoi e kokoke ae ai o ka pana no hoi ka Mainele, o ka nana no hoi ka ke alii, a me na kanaka iluna, me ke ake nui e ku aku ana no ia Mainele na manu, hele no hoi a uakaha ka a-i o ke alii, a nalulu ka lae, me na kanaka a pau i ka ua mea o ke kali ana no ke ku o na manu i ke akamai kaulana o Mainele a po wale no ke kolu o ka la, aohe no he ku o na manu.

At day light, the third day, a second ladder was made so as to enable Mainele to shoot from a closer location. The king and all of the people looked on and saw the great desire of Mainele to get the birds. Looking up, the neck of the king was stiff, and his brow ached, it was so with all of the people who were awaiting the striking of the birds through the ingenuity of Mainele. But as the third night approached, the birds had not been struck.

Moe no a ao ae, o ka ha ia o ka la, a akolu hoi alapii o ka hana ana, e like no me ka Mainele e olelo ai, pela no ke alii e olelo ai i kona poe kanaka e hana, a ane kokoke loa

They slept again, and arose at daylight, and had a third ladder made. Thus Mainele drew near to the place where the birds perched. He shot his best arrow, and

o Mainele ma kahi a na manu e kau ai, o kana no ka pana, oi pana wale no a aohe no he ku o ua mau manu la, he akamai no hoi o Mainele i ka pana, he akamai no hoi na manu i ka alo ana i ka Mainele mea make e lele aku ana he pua.

it did not strike the birds. While Mainele was smart with the bow, the birds too were smart at dodging the deadly arrows of Mainele.

A po iho la ka ha o ka la, moe no ke alii, me na kanaka a pau, a ao ae la, o ka lima ia o ka la, aha no hoi alapii o ka hana ana, a ia hana ana o ke alapii, ua kokoke loa i kahi a na

enemi e kau mau ai, a e lalau ae no o Mainele i na manu me kona mau lima, e loaa no, aole no hoi i ike na manu i ke kokoke loa o ke alapii, kahi hoi a Mainele e noho ana, a haalele la hoi i ko laua wahi e kau mua ai, i loa no i ka po a ao ae no, o ka na kahuna hana mau no hoi ka hookoele me ke koi i na kaele-waa e waiho ana... Oiai ua hiki ae o Mainele iluna o kahi i hana ia nona, i na manu no a kau mai, o ko Mainele lalau ae la no ia me kona mau lima, alo ae la no na manu, oi lalau wale o Mainele me kona mau lima huluhulu a aole he loaa iki o na manu. Hele no hoi a uluhua o Mainele i na manu, me he hoa hakaka kanaka la. A o ke alii hoi o Keawenuiaumi, ua hele a uiha, a luhi, a uakaha ka a-i, a me kona poe kanaka pu kekahi, oi noke wale o Mainele i ka lalau lima a aohe he loaa iki o na manu, a po wale ka lima o ka la, moe no ilaila a ao ae o ke ono ia o ka la, ike ae la o Mainele ua ao, hoomaka ae la ia e pii iluna o kahi ana e hopu ai i na manu, alaila pane mai la o Keawenuiaumi, "Aole au i upu i kau kaikamahine maikai a na ke kanaka akamai i ka hopu lima i kuu mau enemi, i upu au i kau mea maikai a na ke kanaka akamai i ka pana, e like hoi me oe e Mainele, wahi a ka poe i ike ia oe; a no kou

The fourth night settled in, and the king and all his people slept. At daylight on the fifth day, a fourth ladder was built, and Mainele was even

closer to the place where his enemy perched. Mainele then grasped for the birds with his hands, trying to catch them, but he could not , as the birds wouldn't come near the ladder, where Mainele was sitting. They left where they had originally perched through the days and nights that they had bothered the priest and the canoe carvers... Mainele was situated atop the place made for him, and the birds landed. Mainele then reached out to try and grab the birds, but he could in no way grab them. Mainele went after the birds, fighting as if they were a human enemy. The king, Keawe-nui-a-'Umi became wearied, and the necks of all gathered there became stiff and sore. Again, Mainele was unable to secure the birds, and the fifth night fell. They all slept and at daylight the sixth day, Mainele again climbed the ladder and tried to grab the birds. Keawe-nui-a-'Umi called out to him, "I did not think that I was going to give my pleasing daughter to a man who was smart at grabbing my enemies with his hands. I thought that my daughter was going to go to a man who was skilled with the bow, like I thought you were, Mainele. Everyone who told me of you said that you

lohe ana hoi ia oe he akamai lua ole i ka pana, hoouna aku ai au i kou mau hoe waa ponoi, me kou mau waa kapu, nou wale iho no, aole no hai; a ka inoa he akamai io oe, aole ka, hoi iho ilalo."

O ka hoi iho la no ia o Mainele me ka hilahila nui. [Ianuari 13, 1866]

were second to none in your skill with the bow, thus I sent my paddlers and sacred canoes, reserved only for me, after you. But now I see that it is not so. Return down here."

Thus, Mainele returned down with great shame. [January 13, 1866]

HELU 6.

E ka poe e heluhelu ana, ua ike ae la hoi kakou i ko Mainele akamai ole, a me kana mau olelo kaena e ana mamua, a me kona ku ana i ka leo a ke alii (Keawenuiaumi). A e olelo ae hoi kakou no ke keiki Pikoiakaalala, a me Waiakea hoi kona kuleana o ka ua Kanilehua a me ke one o Ohele i Kanukuokamanu.

Ia Keawenuiaumi ma i pii ai iuka me Mainele, e like me ka mea i kii iai nona, a o Waiakea pu no hoi kekahi i na la a Mainele e pana ana, ma ke ao wale no nae, a ahiahi no hoi no o Waiakea i kai, oiai o kana aikane (Pikoiakaalala) wale no ko ka hale, no ka mea, aohe he lana nui o kona manao i ka pii iuka e ike i ko Mainele pana ana, no ka mea hoi, ua maopopo no iaia, aohe e ku ana na manu ia Mainele, nolaila no ke kumu o ko Pikoiakaalala noho ana i kai, a no ka hoonanea ia hoi kekahi e ke aheahe makani he Malanai, a me ka hooholu maikai ia e ka lau o ka niu o Mokuola, a o kana mea loa ia e lealea loa ana; mai kona wa i hiki mai ai a hiki i ka manawa a kakou e lohe nei. A he mea mau no hoi i ke Kama Aliiwahine a ke Alii Kalani Keawenuiaumi i ka hele mau ana ma ko Waiakea hale, no ka mea hoi, ua kaomi mau ia kona kania-i e na lawalu manu ai-lehua i ka uka i Olaa, a me ka

Part 6.

So my readers, we have seen that Mainele was not so smart, as was declared by his boastful words spoken earlier, and in his rising up to the voice of the king (Keawe-nui-a-'Umi). Now let us speak again of our youth, Pikoi-a-ka-'alalā and of Waiākea, and his place in the Kanilehua rains, and the sands of 'Ohele at Kanukuokamanu.

When Keawe-nui-a-'Umi and his companions traveled to the uplands with Mainele, Waiākea, who had gone to fetch him was there as well. He stayed during certain days when Mainele was shooting at the birds, but in the evening, Waiākea returned to the shore where his friend (Pikoi-a-ka-'alalā) remained at the house. This was because he had no great desire to travel to the uplands to see Mainele's efforts at shooting. He knew that Mainele would have no luck in striking the birds, thus Pikoi-a-ka-'alalā remained at the shore, relaxing in the soothing Malanai breeze which causes the fronds of the coconut trees of Mokuola to sway. This was his great pleasure, from the time of his arrival through that of which we have heard. The royal daughter of King Keawe-nui-a-'Umi (named Keakalaulani), also regularly went to the house of Waiākea,

nahele o Panaewa. A na ia mea i kau-o holookoa mai i kona nui kino e hele mai i kahi o Waiakea, a no ka halawai ana o ke kiionohi o ke kaikamahine alii me ke akawailiula o Mana (Pikoiakaalala) a no laila, ua loaa i ke kaikamahine alii ka haawina kaumaha o kona puuwai palupalu no Pikoiakaalala...

where she frequently ate the broiled birds that eat the lehua blossoms in the uplands of ʻŌlaʻa and the forests of Panaʻewa. Thus this fair chiefess met with the youth of the red glistening waters of Mānā (Pikoi-a-ka-ʻalalā). The chiefess had grown heavy, with a softness in her heart for Pikoi-a-ka-ʻalalā...

A eono la o Keawenuiaumi iuka, a elima hoi po, a i ke ono hoi o ka la i olelo iae la, oia hoi ka la a Keawenuiaumi i pane aku ai ia Mainele a kakou i kuehu aku nei i kela Helu.

Now, for six days and five nights, Keawe-nui-a-ʻUmi was in the uplands. It was on the sixth day the Keawe-nui-a-ʻUmi told Mainele, that which we read above.

Pii hou aku la no o Waiakea e ike no i ka Mainele hana, a o kana hana mau iho la no ia o ka pii, a o ka Pikoiakaalala mea mau no hoi ka ninau, "Pehea mai la na manu?" O ka hoole no hoi ka Waiakea hana, "Aohe he ku o na manu." A ia Waiakea i hiki aku ai iuka, ike aku la oia e kulou mai ana o Mainele, aohe he ekemu iki, aohe hoi he kau mai ma kona wahi mau, oiai ua hala iho la na enemi o ke alii ia Mainele.

Waiākea went again to the uplands to see what Mainele was doing, and when he returned, Pikoi-a-ka-ʻalalā would ask him, "How are the birds?" Waiākea would tell him, "The birds have not been struck." When Waiākea had gone to the uplands last, he saw Mainele standing with his head bent down, he had no answer, and no place to go at all, thus the enemies of the king had passed on to Mainele.

Nolaila, ninau ae la o Waiakea i ke alii, "No keaha hoi ka mea e kulou nei o Mainele, aohe hoi he ekumu iki, aohe hoi he pana mai i na manu?" "No ke akamai ole," wahi a Keawenuiaumi.

Waiākea then asked the King, "Why is Mainele standing there with his head bent down, with the least bit to say, did he not shoot the birds?" "No, because he did not have the skill," said Keawe-nui-a-ʻUmi.

Alaila, pane aku la o Waiakea penei, oiai he wahi kahu iwikuamoo ponoiia no ke alii; "E kuu Haku e; e aho paha e hoao hoi i kau wahi pana." "Aia i hea kau pana?" wahi a Keawenuiaumi. "Aia no hoi i kai o Hilo, i kou hale no ia e noho la." Ninau mai la o Keawenuiaumi, "Nohea ia kanaka?" "No Oahu mai no hoi," wahi a Waiakea. "Oia no hoi ka mea nana e pana na haawe manu au i amo aku ai i na la maka pehu ai o kakou

Waiākea then spoke as a true retainer of the king, "My lord; perhaps you will try my friend with the bow." "Where is your bow-man?" Asked Keawe-nui-a-ʻUmi. "There at the shore of Hilo, at my house where I live." Keawe-nui-a-ʻUmi then asked, "Where is this man from?" "From Oʻahu," said Waiākea. "He is the one who has shot the abundance of birds, which we ate until our eyes bulged. I will ask him," said

la, au no hoi i ninau mai ai iau la," wahi a Waiakea.

Waiākea.

...Penei hoi o Waiakea i olelo ai, "He oi wale no kela keiki akamai nui wale, ia lakou nei i holo e mai ai (Mainele ma) ma na waa kaulua mai Oahu mai, hoi mai hoi au mai ka makaikai ana mai, a hiki mai au i kahi i kau ai na waa o makou, o kou wahi waa wale no ke kau ana, a e ku ana ua keiki la malaila, a iau e hoomakaukau ana i kuu wahi waa, ninau mai la ua keiki la, E holo ana kou waa a i hea? hai aku la au, "E hoi ana au i Hawaii, o makou hoi me ka waa kaulua, i kii mai nei ia Mainele, a eia ka hoi ua hala e aku nei." Alaila, olelo mai la kela iau, "O kaua hoi ha ke holo i ike au i kou aina o Hawaii." ae aku la au, ae, o ko ia la ee mai la no ia, a o ka holo mai la no ia o maua.

Waiākea then said, "The knowledge and skill of this youth is above everyone else's. When we went on our journey to O'ahu (for Mainele and companions), and the double-hulled canoes, landed on O'ahu, when we came back from our journey on land, I saw this youth standing next to my canoe. And as I prepared my canoe, the youth asked me, "Where is your canoe off to?" And I answered, "I am returning to Hawai'i, all of us and the double-hulled canoes. We have fetched Mainele, and he has gone." He then said to me, "Let the two of us travel, so that I may see your land, Hawai'i." I agreed and he boarded the canoe, and we two traveled together.

...Alaila, kena koke mai la o Keawenuiaumi, "O kii hoi ha," o ke kii mai la no ia o Waiakea a hiki ana, ia hiki anaku o Waiakea...olelo aku la o Waiakea, "I kii mai nei au ia oe e pii kaua iuka e panai oe i na enemi o kuu alii Keawenuiaumi, no kou ike ana ia oe no kou akamai lua ole i ka pana, nolaila, ua hai aku nei au i ke alii i na mea a pau au i ike ai nou, a oia ka mea i hoouna mai nei o Keawenuiaumi iau e kii mai ia oe, no ka mea, ua huhu loa ia o Mainele, a ua uluhua loa no hoi ke alii no ke ku ole o kona mau enemi."

Keawe-nui-a-'Umi then ordered, "Bring him here." So Waiākea fetched him. When Waiākea came to stand before his friend (Pikoi-a-ka-'alalā)... Waiākea said, "I have come to bring you to the uplands, that you may shoot the enemies of my king, Keawe-nui-a-'Umi, for I have seen your unsurpassed skill with the bow. Thus I told the king all that I had seen you do, and so he is the one who sent me to get you. He is very angry with Mainele, the king is very troubled that he did not strike down his enemies."

Alaila, olelo mai la o Pikoiakaalala, "He punahele no nae paha oe ia Keawenuiaumi?" "Ae," wahi a Waiakea. Alaila, i aku la o Pikoiakaalala, "A i na he punahele io oe ea, E pii oe a olelo aku i poi nui, e hoopiha a piha pono i ka wai, a e lawe

Pikoi-a-ka-'alalā then spoke, "Perhaps you are a favorite of Keawe-nui-a-'Umi?" "Yes," answered Waiākea. Pikoi-a-ka-'alalā then said, "If you are a true favorite, you must go up there and take a large container and fill it with water. Take it

ae a malalo pono o ke kumu o ke koa, kahi a na manu e kau ai," he ae wale no ka Waiakea. "A eia hou, ina e ike oe ua hiki aku au, alaila, e paae oe me ka pauku laau i ko lima, a iau e ku ana ma kahi o ke poi wai a nanae iluna i kahi a na manu e kau mai ana."

below the koa tree where the birds perch." Waiākea agreed to do so. "Here also, when you see that I have arrived, strike your hand with a piece of wood until I am standing at the place where the water container is set, and I am looking up to where the birds perch." [January 20, 1866]

HELU 7.

"A pau auanei kuu nana ana iluna i na manu la ea, alaila, e hahau iho oe i kekahi kanaka o Mainele ma, oiai elima ko lakou nui mai Oahu mai. A iau auanei e kilo ana ilalo i ke poi wai la ea, alaila, hahau no oe i kekahi kanaka; pela no oe e hahau ai a pau i ka make eha kanaka, a o Mainele hoi, e waiho oe ia ia, aia a ike mai oe iau e lena ana au i kuu kikoo, a heluhelu au i ke mele, a pau ia, hookuu au i kuu pua, a make na manu, alaila, hahau iho no oe ia Mainele, i hookahi kona make ana me na enemi mau o ke Alii; pela auanei oe e hanai, e like me kau olelo ia oe, ke punahele io hoi oe na ke alii."

Part 7.

"When I am finished looking above at the birds, you must strike down one of the men with Mainele folks, for there are five of them who have come from O'ahu. And then when I gaze into the water container, you must again strike down one of the men; and so it must be that you strike and kill four men, you must only leave Mainele. You will then see me string my bow, and I shall recite a chant. When I release my arrow, the birds shall be killed. Then you will kill Mainele, thus his death shall come at the time of the death of the enemies of the King. These are the things that you must do, as I have instructed, then you will become the true favorite one of the king."

O keia mau olelo a pau a Pikoiakaalala i aoao ai ia Waiakea, he ae wale no ka Waiakea. A pau ko laua kamailio ana no keia mau mea i olelo ia; hoomaka koke iho la o Waiakea e kukini mama, e hai aku i kona Haku Alii i na mea a pau a kana pana akamai, ana i kaena e ai imua o ke alii nona ka enemi mau o na manu.

All of the instructions given by Pikoi-a-ka-'alalā to Waiākea, Waiākea agreed to. When they finished their conversation, Waiākea swiftly ran back to tell the King all about the skilled one with the bow, and what had been said about the one who had boasted before the king and the despised birds.

Ia Waiakea i pii ai, oia aku no mamua o ka pii ana, mahope wali aku no o Pikoiakaalala, o kona kumu hoi i emi hope ai, no ka walea i ke kui lei lehua mamo ai a

While Waiākea was going to the uplands, Pikoi-a-ka-'alalā was slowly following behind. The reason being that he was enjoying himself, making garlands of the

ka manu, a me kona hoonaue pu ana aku kekahi me ka ua i Hilo one, (Keakalaulani) ia Waiakea e ahai ana i na huaolelo i haiia iaia, aole no hoi oia i ike mai i ka Pikoiakaalala ma hoonaue ana mai mahope. A hiki e o Waiakea i kahi a ke alii Keawenuiaumi e noho ana, ma Kalehuapueo, a o Pikoiakaalala ma aku no hoi a Makaulele, ike aku la o Pikoiakaalala i ka popohe maikai mai a ka lehua ula me ka lehua kea, olelo ae la ia i ke Kama Alii Wahine, "Ina paha e ike au i ke kui ana o ka lei lehua, ina la wau ua hele e kui i lei no kaua," pane mai la ke Kama Alii Wahine opio, "Owau no kai ike, nau no e kui aku i lei nou, a paa ko lei, pii hoi oe, a hoi no hoi au a Alenoho, kakali o ka huikau o na manu i ka pua o ka lehua."

lehua mamo blossoms, food of the mamo birds, and traveling with Keakalaulani, who was like the rains of Hilo One. Waiākea followed the instructions given him, but he did not know that Pikoi-a-ka-'alalā them, were following behind. When Waiākea arrived before the King, Keawe-nui-a-'Umi, who was then dwelling at Kalehuapueo, Pikoi-a-ka-'alalā them were at Makaulele [Mokaulele], where they saw the perfect fullness of the lehua blossoms—red lehua and white lehua. He said to the Chiefess, "If only I knew how to string a lei of these lehua blossoms, I would make a lei for us two." The Chiefess answered, "I am one who knows how, let me make a lei for you. And when you go to the uplands, I will return and wait at 'Alenoho, waiting with tumult of the birds on the lehua blossoms.

akamai i ka pana, au i olelo iho nei iau, a o ka makou ia e kali aku nei?" Olelo aku la no hoi o Waiakea, "E i ae no mahope mai, i pii e mai nei au mamua nei e olelo aku ia oe, a ina oe e ae mai alaila, e olelo aku au?" "Pehea ia olelo au e ae aku ai au?" Alaila, hoopuka mai la o Keawenuiaumi i kona manao penei: "Ua ike no oukou a pau i kau mau mea i hooko ai no ka poe a pau i na mai e pio kou mau enemi manu; a ma ka lakou mau olelo wale no au e hooko aku ai; o kau mau olelo no hoi a pau au e olelo mai nei no kau akamai, pela no au e hooko aku ai." A pau ka olelo ana a ke alii, hoomakaukau ia iho la na mea a pau i oleloia. Hoopiha ia iho la kekahi poi nui a piha i ka wai, hapaiia aku la a ke kumu o ke koa. A ike iho la o Waiakea ua hooko ia kona mau olelo a pau e kona Haku.

nui-a-'Umi asked, "Where is the youth that is skilled with the bow of whom you told me, and for whom we wait?" Waiākea answered, "He is following behind, I came to the uplands first to speak with you." "What are the words that you wish to speak?" "What do you think of these words that I have spoken to you?" Keawe-nui-a-'Umi the spoke his thoughts, "All of you know the things that I have done for the one who would extinguish my enemies. And it was only by their saying it, that I fulfilled the needs. Now, all that you have said, from your skilled one, so I shall fulfill his instructions." When the king finished speaking, all things that were instructed were prepared. A large container was filled with water and carried to the koa tree. Waiākea saw that all that he had spoken to his Lord had been accomplished.

Alaila, ua kii aku la o Waiakea ia Pikoiakaalala, a loaa no iaia e pukukui ana no i ke anu a ka ua lililehua o Makaulele. “O oe mai la ia?” wahi a Pikoiakaalala. “Owau keia o Waiakea o kau aikane aloha, i kii hou mai nei au ia oe, ua ae mai nei kuu Haku i na mea a pau au i kena mai ai iau e pii e mamua, a o ia hoi au i holo hou mai nei ia oe.” “Ina kaua,” wahi a Pikoiakaalala o ka pii aku la no ia o laua (Pikoiakaalala ma), a hoi no hoi o Keakalaulani ma me kona wahi kahu wahine i kai o Hilo.

Then Waiākea went to fetch Pikoi-a-ka-‘alalā , and found him there in the cold misty rains of Makaulele. “So it is you?” said Pikoi-a-ka-‘alalā. “It is I, your friend,” said Waiākea, “Come to fetch you, for my Lord had agreed to all that you said, before I went up. And now I have come for you.” Pikoi-a-ka-‘alalā said “It is for us.” So they two made preparations to go to the uplands. Keakalaulani and her female attendant returned to the shore of Hilo.

Ia Pikoiakaalala ma i hiki aku ai ma kekahi oioina, o Mahinaakaaka ka inoa, aia no kela wahi ma ke alanui e pii ana i Olaa. Ilaila, ike aku la o Pikoiakaalala i kekahi iole nui, pane aku la ia ia Waiakea, “Ka iole nui hoi!,” “Aia i hea?” wahi a Waiakea, “Ei aku mamua o kaua, ua hele ka nuku a paa i ka pulu hapuu.” O ka pana aku la no ia o Pikoiakaalala, ku no ua iole nei, o Akiakaiole, a ua pana ia no ia wahi o Akiakaiole, aia no ma Olaa. Mahope aku no hoi laua nei, a ike iho la o Waiakea i keia iole nui io e waiho ana. A pii aku la no laua nei a hiki i Kapueuhi, malaila no ko laua komo anaku, no ka mea, o ke alanui no ia e pii ai a hiki i kahua kalaiwaa o ke alii Keawenuiaumi, oia hoi o Kalehuapueo.

Pikoi-a-ka-‘alalā and his companion arrived at a trailside resting place known by the name of Mahina‘akaaka; that place is along the trail that ascends to ‘Ōla‘a. There, Pikoi-a-ka-‘alalā saw a very large ‘iole, he told Waiākea, “What a large ‘iole!” “Where?” “There in front of us. The snout is held fast in the pulu of the hāpu‘u.” Pikoi-a-ka-‘alalā then shot, and struck the iole named ‘Aki‘akia‘iole. ‘Aki‘akia‘iole is now one of the storied places in ‘Ōla‘a. Afterwards, Waiākea saw the great iole left there. They then continued upland till they reached Kapu‘euhi; they entered there because the trail rises up to the clearing of the canoe makers of the king, Keawe-nui-a-‘Umi, that is Kalehuapueo.

A hiki aku la laua nei i kahi i oleloia ae nei, pihoihoi nui mai la ka ahakanaka me na huaolelo ma ko lakou waha, “Eia ua pana akamai loa la! A pela mau ka ka aha olelo, a no ka hooho nui ana o na kanaka, oiai e noho ana no o Mainele ia Kepookulou, a i kee anae iluna, ike aku la ia ia Pikoiakaalala ma e pii mai ana, a i kona ike ana o ke keiki

They then arrived at the place spoken of above, and the people were greatly excited, and the words from their mouths were “So here is the expert with the pana!” Such were the words and murmuring of the people. Meanwhile, Mainele was sitting with his head hung down, as Pikoi-a-ka-‘alalā and his

no a laua i pana ai i Kulaokahua, a i mua hoi o Kakuihewa, manao maopopo loa iho la ia, me ka olelo ae i kona mau hoa eha, "E make ana paha kakou," "I ke aha hoi?" wahi a kona mau hoa. O ke keiki no hoi keia a maua i pana ai iloko o ka hale o Kakuihewa i Oahu." Kai no paha he keiki e keia i olelo iae nei...

companion drew near. Then he knew that this was the youth with whom he had competed in the sport of pana at Kulaokahu'a (O'ahu), before the king, Kakuihewa. He then knew, and told his four companions, "We are going to die." Why?" they asked. "This is the youth that we competed with in the sport of pana at the house of Kakuihewa, at O'ahu." "Perhaps this is a different youth," they said.

A ma ia wa i hooili ia iho ai ko Mainele naau e ka ukana kaumaha he hilahila, me ka manao no nae hoi, o ka hilahila wale no ke loaa iaia, aole la hoi o ka make pu kekahi e hana ia nona. A ku o Pikoiakaalala ma ke kumu o ke koa, kahi hoi a ke poi wai e ku ana, ka laau hoi a na manu e kau mau ai, nanae la ia iluna, a ike ae la i na manu e kau ana i ka wekiu, oiai ua hookoele e iaku mamua, i mea e lohe ole ai ka mea kaulana i ka pana; a ike lea ae la o Pikoiakaalala i na manu, hoi iho la kona mau maka ilalo i ke poiwai hoomanao ae la o Waiakea i kona kauoha, hapai ae la i kana laau, a hahau iho la i kekahi kanaka o Mainele, a make loa, ka Pikoiakaalala no ke kilo i ke poi wai, o ka Waiakea hana no hoi ka pepehi i kanaka o Mainele, a pau eha kanaka i ka make, a o Mainele aku no hoi ka hope, aia a heluhelu ae o Pikoiakaalala i kana mele mau, alaila, o ko Mainele wa ia e make ai ia Waiakea. A ma ia wa no, hoomaka iho la o Pikoiakaalala e lena i kana kikoo, me ka nana no nae o na maka ilalo i ke poiwai.

Then Mainele's very core trembled with sadness and the burden of shame, knowing that only shame would be had by him; he did not know that death would be the result of his deeds. Pikoi-a-ka-'alalā stood at the koa tree, where the water container had been set, and below the branch where the birds regularly perched. He looked up and saw the birds perched at the very top of the tree. He then caused the tapping of the wood to begin, so that the sound of the bow of this famous one would not be heard. Pikoi-a-ka-'alalā rejoiced at seeing the birds, and then looked down into the water container. Waiākea then remembered what he had been instructed, and took up his club and struck and killed the first of the men who had accompanied Mainele; and so he killed all four of the men. Only Mainele remained. Then Pikoi-a-ka-'alalā began his chant, and that was the time that Mainele was to die. At the same time, Pikoi-a-ka-'alalā began to string his bow, while his eyes were looking down into the water container.

Heluhelu ae la ia i kana wahi mele mau. Penei no ia:

"Aia la, aia la o Pikoiakaalala,

He recounted his mele, thus:

"Behold, there is Pikoi-a-ka-'alalā,

O Alala no ka makuakane,
O Koukou no ka makuahine,
Hanau o Kikoookalani,
O Kikoookahonua,
O Kikoookamauna,
O Kikoookamoana,
O Kikoookapo,
O Kikoookeao,
O Kapunanui,
O Kapunaiki,
O Ke-i,
O Ke-hamau,
Hamau - Aia ka hoi ua manu iluna,
Eia hoi au ilalo nei,
E lele ae oe e kuu pua,
O ka a-i o kela manu,
O ka a-i o keia manu,
Huihui a kahi hookahi."

'Alalā is the father,
Koukou is the mother,
Born was Kīko'okalani
(Expanse of the heavens),
Expanse of the earth,
Expanse of the mountain,
Expanse of the sea,
Expanse of the night,
Expanse of the light,
Of the large spring,
Of the little spring,
That which is spoken,
That which is silent,
Silence, there are the birds above,
And here I am below,
Let you fly my arrow,
The target is that bird,
The target is that bird,
Joined together as one."

O ka hookuu aku la no ia o Pikoiakaalala i kana pua, oia kolili no a ku ana na a-i o a na manu a elua; i ka pua no ana a lele, o ka manawa koke iho la no ia o Pikoiakaalala i holo ai i kai, me kona ike ole aku i ke ku ana o na manu. Uwa nui ae la ka pihe kanaka, me ka hooho ana; "a make ka manu e!" A pela mau aku no ka ikuwa hauwalaau ana o nalii me na kanaka.

Pikoi-a-ka-'alalā then released his arrow, it twirled and struck the two birds; the moment the arrow flew, Pikoi-a-ka-'alalā immediately departed for the lowlands, not knowing whether or not he had hit the birds. There was a great roar from the people there, calling out, "The birds are dead!" And such was the din of the voices of the chiefs and people.

A o Pikoiakaalala hoi, aia kela ke holo kiki la i kai, me kona manao no, aole e ku ana iaia na manu, no ka mea, he mau manu akamai loa i ka alo ana i ka pua. Eia ka auanei ua ku aku la no, a no ke ku ana ka ka mea e uwa nui ia mai nei mahope. A iaia i akakuu iki iho ai kona holo ana, ua komo aku la nae keia i ka nahele loloa o Panaewa; halulu ana hoi o Waiakea ma-hope ona, a alawa ae la ia, o Waiakea no; ninau ae la o Pikoiakaalala, "Pehea na manu, ua ku nae

Now Pikoi-a-ka-'alalā had arrived at the shore, not knowing if he had killed the birds or not; for the two birds were extremely clever at dodging the arrows. But he had hit them, and that was the reason for the great cry rising behind him. So he slowed down his pace, and entered into the dense forest of Pana'ewa. Waiākea was noisily following him and saw him. Pikoi-a-ka-'alalā asked Waiākea, "How are the birds, were they hit?"

paha?" "Ae, ua ku," wahi a Waiakea. "A heaha hoi kou mea i holo mai nei?" "No kou manao no aole i ku na manu..." "E hoi hou kaua," wahi a Waiakea, o ka hoi hou aku la no o laua nei a hiki i kahi o ka luahi a kana pua, o na enemi mau hoi o Keawenuiaumi."

Waiākea said, "Yes." "And why have you followed me?" Because at first I thought that perhaps the birds had not been hit..." Waiākea then said, "Let us two return to the place where the arrow struck the enemies of Keawe-nui-a-'Umi."

Ku kohana iho la o Pikoiakaalala imua o ke alii, nona na enemi e waiho ana i ka make. Ia wa, hoike ae la oia i kona inoa, a me kona akamai nui, penei no ia:

Pikoi-a-ka-'alalā stood alone before the king, and the dead enemies were there on the side. At the time he revealed his name to the king, his great skill was known, the king spoke thus:

"O kuu mea i upu ai, o ka mea e make ai o kou mau enemi, alaila, e lilo kau kaikamahine i wahine hoao nana, a e hooili aku no hoi au i kou Noho Alii maluna ona, oiai hoi, o oe ae nei ke akamai lua ole, nana i pale ae nei i ka mea uluhua a kou naau, e enemi mau ai i ke Kau me ka Hooilo, o ka noho ana o nei aina, me ka lana nui o kou manao, e lilo i keiki oe nau, a owau hoi kou makua, a o Hawaii nei ka Moku noho ia, o luna, o lalo, o uka, o kai, o ke kanaka nui, o ke kanaka iki, a hale nui, a hale iki, ua pau a me oe. A o kuu Kama Lei aloha he kaikamahine, o ka mea ia nana e hoopumehana kou poli o na po ua lanipili o ua wahi nei" (Hilohanakahi).

"My desire was that my enemies be killed, and to the one who succeeded, would be wed to my daughter, and also inherit my kingdom. Therefore, because you have unsurpassed knowledge, and have protected me from my enemies—those who caused me grief summer and winter, in the dwelling upon this land—it is with great hope that you will become a son to me, and I will be your father. Hawai'i will be the Island upon which you dwell—above, below, from the uplands to the sea; the great men, the little men; the great houses, the little houses, all are for you. And my cherished daughter, a beloved lei, is the one who will warm your breast on the rainy nights of this place here" (Hilo Hanakāhi).

A pau na olelo a ke alii, o ka hoi iho la no ia o ke alii me na makaainana a pau, a halihali pu ia o Mainele me na manu i kai o Hilo, a kau ia i ka Heiau i Poo, aia no kela wahi ma Hilo one, a malaila pu o Kanukuokamanu, o ka nuku no ia o ua mau manu la... [Ianuari 27, 1866]

When the king finished speaking, he, all the chiefs and people, and those carrying Mainele and the birds, returned to the shore of Hilo. Mainele was placed on the Temple at Po'o; that place is there on Hilo One, at Kanukuokamanu; and it is named for the nuku (beaks) of those birds... [January 27, 1866]

3.3.4 "He Moolelo Kaao Hawaii no Laukaieie"

"He Moolelo Kaao Hawaii no Laukaieie…" (A Hawaiian Tradition of Laukaieie) was published in the native language newspaper, Nupepa Ka Oiaio, between January 5th 1894 to September 13th 1895, submitted to the paper by Moses Manu. The story is a rich and complex account with island-wide references to—places; descriptions of place name origins; history and mele; it is also interspersed with accounts from other traditions and references to nineteenth century events.

The following narratives (translated by Maly) have been excerpted from the moʻolelo and include an overview of the tradition and those narratives which recount the travels of Makanikeoe (one of the main figures in the moʻolelo. During his travels, Makanikeoe sought out caves, and tunnels that served as underground trails, and through the description of his travels, we learn about wahi pana in Waiākea and neighboring lands. Interestingly this is one of two substantial traditions that reference a shark god by the name of Kāneialehia (the second "He Moolelo Kaao Hawaii No Keliikau[a] O Kau," published in Home Rula Republika). Kāne-ia-lehia was the guardian of the Waiākea ocean-front, from Makaokū, Keaukaha, and Leleiwi, and to the boundary of Puna, though his primary residence was at Waiuli.

> Kaholokuaīwa [w] and Koaʻekea [k] lived at Ulu, in Waipiʻo Valley on the island of Hawaiʻi. They were descended from the chiefly and godly lines of Kahiki and Hawaiʻi. Their first child was Laukaʻieʻie. But because she was born in an ʻeʻepa (mysterious) form, looking more like a plant than a child, she was wrapped in līpoa seaweed and set in the stream. Without her parents knowledge, Laukaʻieʻie was retrieved by Hinauluʻōhiʻa, a mountain goddess and nurtured. Later, two other children, boys, were born to Kaholokuaīwa and Koaʻekea. One was named Hiʻilawe, and the other was Makanikeoe (who was also a wind deity).
>
> Koaʻekea's sister was Pōkāhi, and her husband was Kaukini. Though they had been married for a long time, they were childless, and because of their prayers and offerings, the forest goddess, Hinauluʻōhiʻa, approached Pōkāhi while she was gathering seaweed, and told her that she would have a girl child to raise as her own. The condition was, that no one, not even her brother and sister-in-law were to know about this child. Because Pōkāhi and Kaukini lived on the mountain ridges between Waipiʻo and Waimanu, it was easy for her to keep the secret. It was in this way, that Laukaʻieʻie came to be raised by her own aunt and uncle.
>
> As a youth, Laukaʻieʻie's companions were the spirits of the plants and animals of the forest. When she matured, she was exceptionally beautiful, and thoughts of finding an acceptable mate for her began to grow. One night, when Laukaʻieʻie was sleeping, she dreamed of flying past the valley lands of Hawaiʻi, and across, Maui,

Moloka‘i, O‘ahu, Kaua‘i, Ni‘ihau, Ka‘ula, and on to Lehua[11], where she saw a handsome young chief, named Kawelonaakalāilehua. It was this chief that was destined to become her husband… [January 5-19, 1894]

He Moolelo Kaao Hawaii No Laukaieie
[Nupepa Ka Oiaio, Maraki 16, 1894:4]

…Ua hoi lakou ma Hamakua Hikina a me Hilo-paliku a hoea ma Hilo one. Ia lakou i hiki aku ai malaila, ua hookipa ia lakou e ko laila kamaaina o Kaneialehia, nona hoi ke kai maluhia mai ke kai o Makaoku ma Mokuola, a hiki i ka lae o Leleiwi ma Keaukaha, o ka lae uluhua keia a ka poe hula —

“Hookahi a‘u lae uluhua ea
O ka lae o Leleiwi ea
He ukali o Makahanaloa ea
Me ka ulili holo kahakai ea.”

A ua waiho aku lakou i kona lokomaikai, aole no hoi lakou iho malaila, a ua huli hoi aku lākou no Punapaiaala, a ua ukali pu aku hoi ke kamaaina a hiki ma kai o Papai me Paukupahu. Ua kuhikuhi ae la o Kaneialehia i ka lua o ko laila wahi mano Kaulana i ka olelo ia, “Aia a Mano nana i kumu pali.”

Ina ua hele oe e ka mea heluhelu ma ke alanui mai Hilo aku no Puna, alaila, e ike no ‘oe i kahi i kapaia o “Ai a Mano, nana i kumupali[12],” mawaena o Kumu me Haena ma Keaau. I ka hiki ana aku a ua huakai mano nei ma ke lae o Kalohi ma Hopoe i ka wai koo lihilihi…

He Moolelo Kaao Hawaii No Laukaieie
[Nupepa Ka Oiaio, Maraki 16, 1894:4]

…[Makanikeoe and his traveling partners] Returned to Hamakua, and then Hilo-paliku, and reached Hilo one. When they arrived there, they were welcomed by Kaneialehia, a native of the area, it was he who maintained the peace (safety) of the

[11] The lengthy narratives include site descriptions and traditional accounts for various locations on each of the named islands.

[12] ‘Ōlelo No‘eau (M.K. Pukui, 1983:10 No. 64) provides another version of the saying “‘Ai a manō, ‘a‘ohe nānā i kumu pali” (When the shark eats, he never bothers to look toward the foot of the cliff), explaining “Said of person who eats voraciously with no thought of those who provided the food, shows no appreciation for what has been done for hm, nor has care for the morrow.

ocean waters from Makaoku at Mokuola to the point of Leleiwi at Keaukaha. It is this point that is remembered by the hula people —

"There is one point that perplexes me,
The point of Leleiwi,
Makahanaloa is the attendant,
Also the ulili [wandering tattler] which
runs across the shore."

They soon departed from his kind hospitality, not staying there long, turning towards Puna of the fragrant bowers, attended by their kamaʻāina, reaching the sea of Pāpaʻi and Paukūpahu. Kaneialehia then pointed out Kaulana, the shark of that place, stating, "There is the Shark of the cliff base."

If you, my readers, travel along the this path between Hilo and Puna, you shall see the place named "Ai a Mano, nana i kumupali" [also spoken as a warning people to be wary along the shore line.] between Kumu and Kaena at Keaau. The shark travelers then went as far as the point of Kalohi at Hopoe where the water props up the eyelashes [a poetic description of birds sipping the nectar of lehua blossoms]...

Later on in their journey, in the forests of ʻŌlaʻa, Makanikeoe called upon the goddess, Hinahelelani (one of the body-forms of Hinauluʻōhiʻa). Describing the ʻieʻie, he called upon her in mele, and she revealed herself in her forest cover of ʻōhiʻa. It was Hinahelelani, who first grew as an ʻōhiʻa tree at ʻŌlaʻa and then as the ʻieʻie plant which first grew near Puaʻaloa at the place known as Pāʻieʻie in Waiākea.

The party then traveled from ʻŌlaʻa into Waiākea, reaching Panaʻewa—

[Nupepa Ka Oiaio, Okatoba 5, 1894:1]
...Ua nalowale koke aku la ka mea nona keia moolelo me kona ohana a pau a hiki ma loko o kanahele o Panaewa ma kahi i kapa ia Kahiolo; aia hoi he mau puka elua keia e hamana ala a hiki i keia wa.

Aole nae he hohonu o keia lua i ka honua, e like me kekahi mau lua e ae, aka, o kona mau puka nae e hili pono ana iluna, aole he wahi e hiki ai i ke kanaka ke iho a ilalo, no ka mea, he pali kona mau aoao a pau, aia ma ke kolu o ka puka e huli pano ana i kai o Keaukaha, aia malaila e hiki ai ke kono mai ke kanaka.

He ekolu mau mana o loko o keia lua, ua moe pololei aku ka mua a hoea maloko o ke kai ma Puhi e pili pu ala me ke Poi Kohola o ka nalu o Milo. He mana keia e hele aku ai a loaa ka wai e huai la ma na kahakai ma ia mau aina, o ka lua, ua moe aku ia a puka ma ka

loko o Waiakea... o ke kolu o ka mana o keia lua, ua moe aku ia iuka pono o ke kuahiwi i ke komohana akau, a hoea ka puka mauka o kanahele laau ma Olaa. O Kepuhi ka inoa. He lua nui hohonu keia. He hookuukuu kaula ka mea e hiki ai ke kanaka ke iho ilalo o keia lua nei. Poepoe a hamama pono ana iluna o na laau me na lau nahelehele a pau e ulu ana maloko o ua lua nei...

Ia Makanikeoe i konoai maloko o kela lua, aia o Hinauluohia ke hooulu ia i ka ieie ma ua mau nahele kaulana ala o Hilo, a liko i mea nui ma na wahi a pau

[Nupepa Ka Oiaio, Okatoba 5, 1894:1]
Makanikeoe and family then disappeared, coming into the forest of Panaewa, at the place Kahiolo, where are found to large opening to this day.

The two openings are not deep in the earth like other pits, but the openings are joined together, and a person cannot enter to descend because they are cliffs on all sides. It one turns towards the makai side there is a third opening; and that is where a person may enter.

There are three branches in this pit. The first runs straight down to Puhi adjoining the place of waves at Milo. This is the branch that one travels to get the fresh water for these lands. The second branch comes out a the fishpond of Waiakea.... The third of the branches in this pit runs to the uplands of Olaa. Its name is Kepuhi. This is a deep pit. Its opening at the top is round, covered with forest, and the plants that grow within the pit...

Manu stops the traditional narrative here and calls the reader's attention to the nature of ʻŌlaʻa. It is a land that separated Puna from Hilo, and it has no shoreline, though there are three "Mākāhā" as described by the people of old. "These are not like the true mākāhā of the Loko Kuapā (walled fishponds), but in the way that the people live on the land and exchanged things from inland with those people who lived in Hilo, Puna and Kaʻū."

Continuing his narrative, Manu adds further details about meeting Kānekoa in the upland forests and describing several places on the way to the shore of Waiākea.

[Nupepa Ka Oiaio, Okatoba 12, 1894:1]
...Aia keia lua ke hamama ʻla kona mau puka a hiki i keia wa, na ko Olaa poe kamaaina e hooia mai i keia lua a me ka poe o kai o Keaukaha. A o keia hoi ka lua mua loa i ike ia ma ka aina o Hilo, Hawaii... Ia Makanikeoe i haalele aku ai la ia Kanekoa maloko o kanahele laau Olaa, ua huli hoi ma la oia a hiki ma kahi o kona kaikuahine Haku Lani e noho ana me na ohana a pau ma Lanipo.

Aia keia wahi ma kai ae o ke alanui aupuni e hele ana mai Hilo Taona aku no Puna ma kanahele o Panaewa, ua pili pu me kahi e pahoehoe o Kahiwakaa [Kawiakawa] pu a me Mawae, ka mokuna o Hilo a me Puna. Aia mawaena o keia wahi o Lanipo a ua kupono hoi keia wahi i kai o Papai, kahi i paa ai ka wawae o ka naʻi aupuni kaulana a me kona lae i hauaia ai i ka hoe Kamehameha I.

Ia Makanikeoe i hiki aku ai ma kela wahi a ka mea nona keia nanea e noho mai ana a ua nee ko lakou no kahi o kela lokowai o Lokowaka, a ua au ia wahi wai iho la lakou nei a pau malaila me ka hana poi [illegible] o ana i na mea a pau maloko o kela loko.

Ma keia makaikai mau o na poe malihini, aole he poe kamaaina nana lākou iki mai ma kela wahi, a mahope io o ko lākou hana ana, a ua hele aku ka huakai ma kai o Waiuli.

> [Nupepa Ka Oiaio, Okatoba 12, 1894:1]
> The opening of the pit [lava tube skylights] may be seen there to this day. Kamaaina of Olaa will attest to it, as will the people who live shoreward at Keaukaha. This was indeed the very first of the holes seen on the lands of Hilo. Makanikeoe left Kanekoa behind in the forest of Olaa and turned to join his elder lord sister and was with the family down at Lanipo.
>
> This place shoreward of the government trail that goes between Puna and Hilo Town, through the forest of Panaewa. It is near a place of pahoehoe lava, between Kahikawaa [Kawiakawa] and Mawae, which is the boundary of Hilo and Puna. There in between these places is Lanipo. It is very close to shoreward place of Papai, where the foot the famous conqueror of the nation was stuck, and his brow struck by the paddle, Kamehameha I.
>
> When Makanikeoe arrived at this place with the one for whom the story is told, was staying, they then went on to the ponds of Lokowaka. They all bathed in the water of this place, splashing with one another in the pond.
>
> This is a regular practice of visitors who travel to that place. Afterwards, Makanikeoe and companions traveled to the shore of Waiuli.

[Nupepa Ka Oiaio, Okatoba 19, 1894:1]
O kahi keia a Kaneialehia i olelo ai i kanaka oia wahi e hoala ana i kuapa, aole e paa i ke kai ke hoea mai, he mea oiaio ia, aole i paa ia wahi i manao iaʻi i loko a hiki i keia wa.

A no ia wahi hoi o Waiuli ke kai halakika i haku iaʻi i ke mele e kelii ka Moi Kalakaua i make, a mai keia wahi aku i hele aku ai ka ui nohea kaulana oia mau la o Waipio a hiki ma Leleiwi, ka lua o na Lae kaulana loa ma Hilo.

O ka lae o Leleiwi ma Waiakea kai o Hilo, ua kapaia kona inoa ma o Waiolama (k) me Punahoa kana wahine, a na laua mai o Leleiwi kane, me kona kaikuahine o Makahanaloa. E loaa no ma ka moolelo o Keaomelemele.

A o Leleiwi nei keia i haina mai ai e Pele a make maloko o ke kai, aia kona Kino pohaku me he le Palaoa ʻia ke ano e waiho la maloko o ke kai o ka lae mai ka aina aku nei. He pohaku ula keia, a o ka leho maikai—ula a me ke ahi la ke nana aku iloko o ke kai. He lele ke ike mai i ke kanaka, e loaa no i ke kanaka lulu leho o Hilo ma keia pohaku o Leleiwi…

[Nupepa Ka Oiaio, Okatoba 19, 1894:1]
[Waiuli] This is the place of Kaneialehia who was previously mentioned. At one time a kuapa (pond wall) was being made, but it does not keep the ocean out. Truly it is not set firmly at this pond to this day.

It is for this place, Waiuli, with the ocean that slips and slides, that the mele was composed for the deceased chief, King Kalakaua. From this place the famous beauty of Waipiʻo [Laukaʻieʻie] went to Leleiwi the very famous point for Hilo.

About the point of Leleiwi at shore of Waiakea, Hilo. It name was given by Waiolama (k) and Punahoa his wife, he named their son Leleiwi, and his older sister was name Makahanaloa. This account is found in the tradition of Keaomelemele.

It is said that Leleiwi was killed by Pele in the sea. His stone body, which looks like a palaoa [whale tooth hook pendant], may be seen in the ocean fronting the point. One may still see this, and those who of Hilo dive for leho [cowrie shells for lures] know where the stone of Leleiwi is… [Maly, translator]

3.3.5 "Kaao Hooniua Puuwai no Ka-Miki," The Heart Stirring Story of Ka-Miki

"Kaao Hooniua Puuwai no Ka-Miki" is a tradition about two supernatural brothers, Ka-Miki (The quick, or adept, one) and Maka-ʻiole (Rat [squinting] eyes), who traveled around the island of Hawaiʻi along the ancient ala loa and ala hele (trails and paths) that encircled the island. During their journey, the brothers Ka-Miki and Maka-ʻiole competed against ʻōlohe (experts skilled in fighting or in other competitions, such as running, fishing, debating, or solving riddles, that were practiced by the ancient Hawaiians) in famed kahua (contest arenas) and royal courts. They also challenged kahuna (priests) and ʻōlohe whose dishonorable conduct offended the gods of ancient Hawaiʻi. Ka-Miki and Maka-ʻiole were empowered by their ancestress Ka-uluhe-nui-hihi-kolo-i-uka (The great entangled growth of uluhe fern which spreads across the uplands), a body-form of the goddess Haumea (the creative force of nature—also called Papa and Hina—who was a goddess of priests and competitors).

The tradition was presented to the native newspaper, Ka Hoku o Hawaii, by noted Hawaiian historians, John Wise and J.W.H.I. Kihe, between 1914 to 1917. It is set in about the 1300s, at the time when Pili-a-Kaʻaiea (Pili) was sovereign chief of all Kona. Along their journey, the brothers visited the royal court of the chief Waiākea-nui-kumu-honua, who was the brother of the chiefess Panaʻewa-nui-moku-lehua, and the chief Piʻihonua-a-ka-lani. The traditions associate place names with people and events in history and describe a broad range of sites and travel across the Hilo landscape. The narratives also share with us the poetry and attachment that Hawaiians share with the forests, rains and streams which were such an integral part of the Hilo landscape.

> ...Ka-Miki, Maka-ʻiole, and their companion, Keahiʻālaka, departed from the compound of Kapuʻeuhi and continued their journey, descending on the ala loa to Hilo. Reaching the Hilo Boundary, the travelers approached a large compound, where they saw a man coming towards them with a club. This man was Kūkulu-a-hāneʻe-a-hina-pū [Kūkulu]. Kūkulu was a guardian of the chiefess and lands called Panaʻewa-nui-moku-lehua [Panaʻewa of the great lehua forest]. Panaʻewa was a sacred chiefess of Hilo and sister of the chiefs Waiākea-nui-kumu-honua and Piʻihonua-a-ka-lani. The compound of the chiefess and surrounding community were forbidden to strangers, and Kūkulu regularly killed unaware travelers [thus the name Panaʻewa — "Unjust place"]. Kūkulu challenged Ka-Miki mā but he was quickly defeated...
>
> The lands of Waiākea were named for the high chief Waiākea-nui-kumuhonua, the brother of the chief, Piʻihonua-a-ka-lani, and chiefess Panaʻewa-nui-moku-lehua... [February 17, 1916]. When Ka-Miki arrived at the court of Waiākea, arrangements were made for him to compete with the ʻōlohe–experts of the land, at the kahua (contest site) of Kalepolepo (situated between Mohouli and Kāwili). ʻŪpēloa the champion, land administrator and war counselor of Waiākea, and an expert fighter with ʻōkaʻa lāʻau [war clubs] was called to Kalepolepo... After much boasting, ʻŪpēloa and Ka-Miki met on the contest field, and in no time, ʻŪpēloa was defeated and completely bound up...
>
> ...Chief Waiākea heard that ʻŪpēloa had been defeated and was greatly surprised that his war counselor and war club fighting expert had fallen. Waiākea then called to his messenger Kapunakō to get Kaūmana, the foremost teacher of lua, haʻihaʻi, kākā lāʻau [bone breaking fighting, and spear fighting], and all manner of fighting and bring him to the kahua. Upon arriving before his chief, Kaūmana asked Waiākea to send his messenger Kapunakō, to bring Kalanakāmaʻa, Kaūmana's foremost student, to join him at the kahua of Kalepolepo.
>
> The place called Kalanakāmaʻa, situated in Kukuau, was named for Kalana-kāmaʻa-o-uli, the foremost ʻōlohe student of Kaūmana, and champion of Waiākea. Kalanakāmaʻa was

the ward of Kīpuka ʻāhina [k], Hale-aloha [w] and Hale-loulu [k], who dwelt above Hilo on the mountain lands.

When Kapunakō arrived before Kīpuka ʻāhina, he spoke about the great rains and rivers of Hilo, a poetic reference to the many skilled ʻōlohe for which Hilo was famed. It was in this way that Kapunakō described the overwhelming skills of Ka-Miki and his victory over ʻŪpēloa. Kīpuka ʻāhina then asked:

Māmā Hilo i ka wai?
Is Hilo lightened of the waters?

Kapunakō responded:

> ʻAe māmā Hilo i ka wai ʻole, ua kau i ka lani ka holo [waʻa] ua o Hilo, na ka Mālualua e kiʻi ala i pulu ka liko o ka lehua a me ka māmane! (Indeed, one can move swiftly through Hilo, for the streams are without water, the water trough [i.e., the clouds] of Hilo are set in the heavens. It is the Mālualua that fetches moisture for the budding lehua and māmane.)

Kīpuka ʻāhina then asked in amazement:

Nawai e nele o Hilo i ka wai?
He lau ka puʻu, mano ka ihona, he kini nā kahawai o Hilo,
e ʻau i ka wai o Hilo a pau ke aho!

Who could possibly make Hilo destitute of water?
There are lau (400, poetically many) hills, mano (4,000, many)
places to descend, and kini (40,000, many) streams to cross,
indeed, one is worn out swimming through the waters of Hilo!

It was in this way that Kīpuka ʻāhina learned that a master ʻōlohe had come to Hilo challenging its many ʻōlohe. Using his ipu hōkiokio [gourd nose flute], Kīpuka ʻāhina awakened Kalanakāmaʻa, for this was the only way in which Kalanakāmaʻa could be safely awakened, or he would kill whoever dared to wake him. [February 24–March 2, 1916]

Kalanakāmaʻa joined his teacher Kaūmana and met with the assembly at Kalepolepo. Carrying his club Pūpū-kani-oe-i-ka-ua-o-Hilo [Land-snail singing in the rain of Hilo], Kalanakāmaʻa entered the kahua with Kaūmana and a great cry arose praising the abilities of these Hilo champions. Ka-Miki and Kalanakāmaʻa exchanged taunts, Ka-Miki stated that Kalanakāmaʻa would become the kāmaʻa lau-ʻī i hili kuanaka ʻia [twined ti leaf sandals] that Ka-Miki wore upon his feet. Outraged, Kalanakāmaʻa leapt to attack Ka-Miki

with his club Pūpū-kani-oe-i-ka-ua-o-Hilo, Ka-Miki leapt out of the way, and took ʻŪpēloa's club from Maka-ʻiole. Seeing his student miss, Kaūmana called out to Kalanakāmaʻa telling him how to strike Ka-Miki— ʻōlelo noʻeau:

Kau i ka lani ka holoua o Hilo, hilo ʻia i ke aho a ka ua he ʻlo ka hauna lāʻau e kiʻi ai, aʻohe wahi pā ʻole, pā ma ke poʻo a hōʻea i nā wāwae, pā no pau ka ʻoni, ʻoni no he aīwaiwa ia, he hialōloa no ka naele, alaila hoʻi hou ka hauna lāʻau a ke koa kua makani.

Placed in the heavens is the water trough of Hilo, entwined in the cordage of the rains, ʻIo [Hawk] is the war club strike to use, for there is no place that canʻt be hit. Strike at the head and reach to the feet, for once struck, there will be no movement. If there is any movement, he is indeed a skilled expert of the depths [deepest knowledge], then return and strike again in the manner of the windswept koa tree [March 9, 1916].

Ka-Miki then attacked Kalanakāmaʻa and quickly overcame him. Kaūmana then leapt to the kahua and was beaten as well. After Ka-Miki defeated Kaūmana, word spread throughout the region, and Piʻihonua called his council together, wondering how they might help regain the honor of Hilo from this stranger.

Hanakahi told Piʻihonua that it would be best not to fight. Pi'ihonua then said that perhaps it had been a mistake to honor Hanakahi with his title as champion, and marriage to ʻOhele [March 16, 1916]. Hanakahi told Piʻihonua all of the things that Nā-Mauʻu-a-Pāʻao had told Piʻikea about Ka-Miki, and said it would be unwise to compete and thus leave all of the champions of Hilo in disgrace.

Hanakahi himself was a master ʻōlohe trained by Maulua, of Hilo-Palikū. He was skilled in kākālāʻau [spear fencing], pololū [long spear fighting], ihe laumeki [barbed spear fighting], and all manner of knowledge. Hanakahi told his chief, "It is my desire to go before Ka-Miki, not in the manner of a competitor, but in the spirit of friendship, and to learn from them the things that they have been taught by their teachers. If I succeed, I will be the foremost ʻōlohe of all Hilo, and I will serve as their guide as they journey from one border of Hilo to the next border of Hilo." Hanakahi then asked his chief, "Do you agree?" Piʻihonua told Hanakahi to go and compete first, and then if he was securely bound, to surrender and ask for friendship.

Hanakahi approached Kalepolepo, and the contest between Ka-Miki and himself was announced. ʻŌkaʻa lāʻau [club-spear fighting] was selected as the method of fighting, and when Hanakahi asked Ka-Miki, "How shall the victory be determined?" Ka-Miki said, "By the breaking of one's spear."

> Ka-Miki greatly admired the nature of Hilo-Hanakahi, and as they competed, Ka-Miki dodged each of the thrusts. To those gathered at the kahua, it was as if Ka-Miki was the teacher and Hilo-Hanakahi was the student. Hilo-Hanakahi tried each technique he had learned from his teacher, but was unable to score against Ka-Miki. Worn out, Hilo-Hanakahi collapsed and was taken off of the kahua borne in a net. Hilo-Hanakahi acknowledged the nature and skills of Ka-Miki and surrendered to him, thus ke ʻahi kananā [the fierce tuna] of Hilo befriended Ka-Miki mā upon the kahua.
>
> Hilo-Hanakahi returned to the chief Piʻihonua, and they spoke of the events which had taken place at Kalepolepo. Piʻihonua then sent his messenger to invite Ka-Miki and companions to his compound, in the manner of aikāne [companions] [March 23, 1916]. Ka-Miki mā were well hosted by Piʻihonua, and Ka-Miki asked Hilo-Hanakahi to accompany them to the border of Hilo and Hāmākua, at Kaʻula. Piʻihonua agreed, and the group then departed for Wailuku… [March 30, 1916].

3.3.6 Kāwili and Bird Catching Techniques of the Ancient Hawaiians

There are a number of traditional accounts describing the arts of the class of people who caught native birds in order to collect their feathers. Several methods of bird catching were widely practiced by native Hawaiians. As described below, the place name Kāwili, in Waiākea commemorates one of the practices employed by the poʻe ʻāhele manu (bird catchers).

Nearly all of the accounts recorded in the 1800s about bird catching customs tell us that traditionally, the rarer birds, whose feathers were sought for ornamental purposes were not killed by the bird catchers. One account from the later period in the life of Kamehameha I, reported that as a result of growing commercial activities in the islands, traditional methods of harvesting resources and catching birds, were changing. Regarding these changes, and the response of Kamehameha I to careless collection of bird feathers, Kamakau (1961) wrote in the 1860s:

> Troubles that arose were not of his making, and those that had to do with disputes about religion came after his time. He ordered the sandalwood cutters to spare the young trees and, not to let the felled trees fall on the saplings. “Who are to have the young trees now that you are getting old?” he was asked and he answered, “When I die my chief and my children will inherit them.” He gave similar orders to bird catchers, canoe makers, weavers of feather capes, wood carvers, and fishermen. These are the acts of a wise and Christian king who has regard for the future of his children, but the old rulers of Hawaii did the same. [Kamakau, 1961:209-210]

While researching various ethnographic records of the Bernice Pauahi Bishop Museum

(BPBM), the author reviewed Hawaiian language papers (handwritten and typed) collected by island historian, Theodore Kelsey. Kelsey was born in Hilo in the late 1800s and spent his entire life speaking with elderly Hawaiian people, collecting their stories, and translating their writings. Among his papers curated at the Bishop Museum (BPBM Archives–SC Kelsey; Box 1.5), are notes on various aspects of Hawaiian culture including bird catching. Kelsey's informant was the elder Reverend Nālimu (born in 1835), who shared his account of note places—including Kāwili and Mokaulele which cross the UH-H complex—and through the uplands of the Hilo District and ʻŌlaʻa. Bird catching, both as a means of providing feathers used for making Hawaiian emblems of royalty, and other birds as a food source was practiced across the mountain region.

The following Hawaiian texts are presented verbatim as recorded by Kelsey in c. 1921 (including his use of diacritical marks). The English translation of the Hawaiian narratives was prepared by the author of this study and reflects the basic tenor of the Hawaiian narratives. It should be noted here, that in the Hawaiian language, occurrences of certain words naturally imply a specific action or statement, which is reflected in the translation below:

"AHELE MANU"
by H.B. Nalimu
Poʻe kia manu o Laa, oia ka poʻe ahele manu, kekahi me ka laau a kekahi me ka lehua. O ka mea ahele manu ma ka lehua malaila ka puka e hanai kokoke i ka lehua, he puka paa ke-ia. Kekahi piko o ke kaula ma ka la-la o ka ʻohiʻa e paa ai. Elima, eono paha anana ka lo-ihi o ke aho mai ka puka mai a hiki i ka lima o ke kanaka e paa nei i ka piko o ke aho. A o ka puka aia ma kahi kokoke i ka lehua e kiko aku ai ka manu i ka lehua. I ka wa e lele mai ai ka manu lele no a ku maluna o ke-ia puka e kiko aku i ka lehua. A ia manawa e huki ai ke kanaka i ka piko o ke kaula a paa ka wawae o ka manu. Pii ke kanaka iluna a lawe i ka manu a hana hou aku i kela puka malaila. O ka akakane a me ka ʻiiwi, a me ka ʻo-oʻ iluna o ka pua lehua. Ahele me ke aho olonaʻ makalii. Maluna o ka maiʻa pala e ahele iʻ ai ka manu o-u'.

"KĀWILI KĒPAU."
O ke kepau oia ke kohu o ka ʻulu. E ʻoki-oki ai i ka ʻulu a kahe mai ke kohu keʻokeʻo, a i ka wa e maloo ai ua kohu ʻla i ke ahiahi alaila ua paa aʻe ua kohu la.

Hele oe e ho-ulu-ulu ke-ia kohu a pau. Ho-ulu-ulu a nui, alaila lilo aʻeʻla uaʻ kohu nei i kepau. Alaila hele oe e ʻohi i hookahi kukui maka a hemo kona iwi ʻa ʻo kona ʻiʻo malama 'oe kelaʻ. Hele hou oe i ka' pa-ihi ku-kepau (kind of clover) he pa-ihi ʻele-ele ia, a hoohui me ke kukui maka, alaila nau a wali ke kukui maka me ka pa-ihi. Hookomo iloko o ke kapa wauke (he mea uaua ia), alaila ʻuwiʻ i ka wai o ke kukui a me ka pa-ihi iloko o ka ʻopihi, oia ka "ipuhao" e kupa ʻai iluna o ke kapuahi. I ka wa e hoomaka ai e paila alaila

‘oki-oki i ke kepau a liilii a hookomo iloko o ke-ia wai kukui me ka pa-ihi i paila ia. Kii elua ni-au ai ‘ole ia, mau laau liilii paha e koali ai iloko o ke-ia wai paila.

Pela e hanai a pau kela‘ wai a mo‘a kela‘ kepau. Hookomo iloko o ke poho ‘opihi a i ‘ole he la-i‘ a wahi i ka la-i‘. Kāwili ‘iuka a'e nei o Mokau-lele. Neenee ke pulu ‘ohi‘a o ia wahi ilalo o ka pahoehoe.

Ilalo no oe e ku ai o ka pahoehoe a hana oe i ke kepau iluna o ka pua lehua. Ina ekolu, eha‘ pua lehua au i kāwili ai i ke kēpau alaila i ka wa e pili ai kekahi pua lehua i ka manu alaila alualu a loaa. Pee hou oe iloko o ka pulu ‘ohi‘a (kāhi o ka lau ‘ohi‘a e luhe ana ilalo, oia ka pulu ‘ohi‘a) a pili hou kekahi manu. Opa‘ ke poo o ka manu a make. Hookomo iloko o kekahi eke. Hola ekolu paha alaila ho‘i, nui ka manu, i hookahi kaau, iwakalua, kanakolu paha. A kela manu makalii; ua momona—–kuhikuhi kona i‘o, momona. Oia ke kāwili kēpau.

“LAAU KIA MANU.”
Ekolu, eha‘ paha anana ka lo-ihi o ka laau. Kau ia ka pua lehua iluna o ia laau nei mai kekahi ‘ao-ao o ka laau a hiki i kekahi poo o ka laau. Hana elua kanaka, kekahi ma kekahi laau a kekahi ma kekahi. Kepau maluna o ka laau a he mau pua lehua mawaena o ke-ia mau kēpau—–he laau kia manu ia |_____|. Olaa ka aina kia manu a me Piihonua. Nui ka manu o-o‘ ma Puu O-o‘. Malaila ka po‘e kia manu e hele ai a loaa na lei hulu no na lii. O Pana-‘ewa kekahi wahi kia manu.

Huki ka laau kia manu iluna mawaena o na ‘ohi‘a elua. Hana me ka ‘upena kekahi. Huki ia iluna ka ‘upena, hookahi laau maluna, hookahi laau malalo. He ‘upena ‘olona‘ maka hakahaka, a he kaula ‘olona‘ ma na poo. ‘Elima, eha‘, ekolu paha anana kela' ‘upena palupalu. Lele no ka manu, paa ka wawae, paa ka pekekeu. Ina‘ hookahi, elua manu, waiho no pela', oia na manu e kahea ana i na manu e a‘e. Nui ka manu, hookuu ilalo ka ‘upena a huki hou iluna. He ulu ‘ohi‘a ma kekahi ‘ao-ao a me kekahi ‘ao-ao. Oia ka hana ana o ka po‘e lawai‘a manu. Ho‘i i ka hale e wehe ai ka hulu o ka manu ‘o-o‘. Piha ke po‘i i ka hulu a haku lei. Malalo o ka po-ae-ae o ka o-o‘ oia ka hulu a-a‘, a maluna o ka piapia oia me pue.

[Translation]

Bird Snaring (or Trapping)
Bird catchers (kia manu) of ‘Ōla‘a were people who snared (‘āhele) birds. Some with branches and others with lehua blossoms. The individual who snared birds among the lehua made a snare (lasso) close to the lehua flower, the snare was secured there.

One end of the line was securely fastened on the branch of the ʻōhiʻa. The cord of perhaps five or six fathoms long, extended from the lasso (on the branch) to the man's hand where the end of the line was held tightly. The snare was placed close to a lehua blossom, where the bird would step (kīkoʻo) to the lehua. At that time, the man would then pull the end of the cordage and secure the feet of the bird. The man then climbed the tree, took the bird, and he would make the snare there again. The ʻakakane (ʻapapane), the ʻiʻiwi, and the ʻōʻō were caught up in the lehua, snared with fine olonā cordage. The ʻōʻū bird was snared while it was on the ripe banana fruit.

Preparing Bird Lime to Kāwili, or Ensnare Birds.

The bird lime (kēpau) is made from the sap of the breadfruit. Cut the breadfruit bark and the white sap flows, and when the sap is dry, say in the evening, the sap is hardened. You go and gather the sap. When enough has been gathered, the sap can be made into bird lime. Then you go and gather some raw kukui, removing the shell, you keep its meat. You then get the "clover" for making bird lime (ʻihi-ku-kapu, the Nasturtium sarmentosum), it is a black pāʻihi, and you mix it with the raw kukui. Then you chew it, and the kukui and pāʻihi become slimy. This is put into a wauke bark cloth (it is a tough piece), then the juice of the kukui and pāʻihi are squeezed into the ʻōpihi (shell), it is the "pot" for cooking the broth over the fire. When it starts to boil, the (ʻulu) gum is cut into small pieces and put in the juice of the kukui and pāʻihi so it can boil. Then get two coconut mid-ribs or perhaps little sticks to stir this boiling juice. This is how it is done until the juice is cooked and becomes the birdlime. It is then placed into the empty ʻōpihi or a ti leaf, wrapped up in ti leaves. Kāwili is in the uplands adjoining Mokaulele. Then go to where there is low branching ʻōhiʻa (pulu ʻōhiʻa), where the pāhoehoe is below.

You are below on the pāhoehoe, and you apply the bird lime above around the lehua flowers. Now you kāwili (twist, i.e. apply) this bird lime in among three or four lehua flowers, then when a bird is stuck by one of the lehua that blossoms, you free it and it is caught. You then hide again among the low ʻōhiʻa branches (a place where the ʻōhiʻa tops droop down, that is the pulu ʻōhiʻa), and catch another bird. You squeeze the birds head and it is killed. It is placed into a bag. Returning (home) perhaps around three ʻo clock, there are many birds, perhaps forty, twenty, or thirty. Those small birds; when fat––the meat is tasty and sweet. That's how one prepares kāwili kēpau, or bird lime to ensnare birds.

Snaring Birds on Branches.

The (decoy) branch is perhaps three or four fathoms long. Lehua blossoms are placed on this branch, from one side of the branch up to the tip of the branch. Two

men do this job, one at one (end of the) branch and one at the other. Bird lime is placed on top of the branch along with many lehua blossoms in between this bird lime––this is a bird catchers (kia manu) branch [drawn] |_____|. ʻŌlaʻa and Piʻihonua are lands of bird catchers. The are many ʻōʻō birds at Puʻu ʻŌʻō. It is there that the bird catchers go to get the feathers for adornments (lei) of the chiefs. Panaʻewa is also a place of the bird catchers.

The bird catchers (decoy) branch is pulled in between the ʻōhiʻa lehua trees. One (person) uses the net. The net is pulled up, one branch is above, one branch is below. It is an open (wide) meshed olonā net (ʻupena olonā maka hakahaka), and olonā cordage at the tip. It is a soft (pliable) net perhaps five, four, or three fathoms long. As the birds fly their feet are caught, or their wings caught. Now if there are one or two birds, they are left, these are the birds that call out to the other birds. When there are many birds the net is let down (the birds taken), then the net is pulled up again. ʻŌhiʻa growth is all around. So this is the work of the "bird-fishers," or lawaiʻa manu. They return to the house and then remove the feathers of the manu ʻōʻō. When the container is filled with feathers, a lei is made. Below the wing-pit is where the male ʻōʻō bird feathers are, and above on the back by the tail, are the pale yellow feathers. [Nalimu in Kelsey; Bishop Museum, Archives–SC Kelsey; Box 1.5; Maly, translator]

3.3.7 Waiākea and Lands of Hilo Bay: In The Path Of Warring Chiefs

In the early to mid-1800s, several Hawaiian historians began collecting and writing about Hawaiʻi's history. Among the prominent native writers cited in this study are John Papa Ii (1959), and Samuel Mānaiakalani Kamakau (1961). Additionally, several foreigners, either visiting or having taken up residency (e.g., Ellis 1963 and Fornander 1917-1919 and 1969), added to the efforts of recording history. Ii (1959) and Kamakau (1961) record events that occurred in the Hilo region early in the life of Kamehameha, and places in the ahupuaʻa of Waiākea are included, though not specifically the current study area.

...Alapai, ruler of Hawaii [from c. 1730-1754] and great uncle of Kamehameha, and his wife Keaka took charge of him [Kamehameha]. Some years later, Alapai and his chiefs went to Waiolama in Hilo, where Keoua Kupuapaikalani, the father of Kamehameha, was taken sick and died. Before Keoua died he sent for Kalaniopuu, his older half-brother and the chief of Kau, to come and see him. Keoua told Kalaniopuu that he would prosper through Kamehameha's great strength and asked him to take care of the youth, who would have no father to care for him. Keoua warned Kalaniopuu, saying, "Take heed, for Alapai has no regard for you or me, whom he has reared." After this conversation, Keoua allowed his brother to go, and Kalaniopuu left that night for Puaaloa [situated in the ahupuaʻa of Waiākea, in the area called Panaʻewa].

> As Kalaniopuu neared Kalanakamaa [in Waiākea], he heard the death wails for Keoua and hastened on toward Kalepolepo [between Mohouli and Kāwili] where he had left his warriors. There they were attacked by Alapai's men, who had followed Kalaniopuu from Hilo. First the warriors from the lowland gained, then those from the upland… Kalaniopuu continued his journey, and at midnight reached Puaaloa, where he arranged for the coming battle. The next day all went as he had planned, his forward armies led the enemy into the forest of Paieie, where there was only a narrow trail, branchy on either side and full of undergrowth. There his men in ambush arose up against the enemy warriors, and his rear armies closed in behind them… When news reached Alapai that his warriors had been destroyed, he sent another company of warriors to meet Kalaniopuu at Mokaulele on the outer road, which was an ancient road, known from the time of remote antiquity… (Ii 1959:3-4).

Kamakau further elaborated on the events and stating:

> …Keoua (called Ka-lani-kupu-a-pa-i-ka-lani-nui), fell ill of a lingering sickness at Piʻopiʻo adjoining Wailoa in Waiakea and died there in 1752… His older brother Ka-lani-opuu was with his kahu, [guardian-attendant] Puna, above Kalepolepo at the time (Kamakau 1961:75).

Kamakau's narratives follow a similar line as Ii's regarding the death of Kamehameha I's father, and the subsequent battles between Alapaʻi and Kalaniʻōpuʻu (Kamakau 1961:75-76, 125). During this time of turmoil between the aliʻi of Hawaiʻi, Kamakau (1961) wrote about the chief Kahekili of Maui, saying that he came to Hawaiʻi, in search of feather adornments. The feathers were collected in the lands above Hilo, and speak of a chief by the name of Keawehano, and the customs associated with catching birds—

> …Ka-pohu and Ka-ʻakakai went to Hawaii after feather capes and bird feathers in order to gain admission to ʻUmi-hale. They landed in Kohala and Ka-ʻakakai went by way of Hamakua to Hilo and became friendly with Keawe-hano, the chief of Hilo. As for Ka-pohu, he went around by Kona, Ka-ʻu, Puna, and finally reached Hilo and there heard in some native villages that a man from Maui had become a friend of Keawe-hano and had obtained a feather cape from him. Keawe-hano's houses were situated on the beach at Punahoa, close to Piʻihonua and facing the waves of Huia and Hikanui. Ka-pohu went along outside the fence of Keawe-hano's place and saw Ka-ʻakakai sitting with Keawe-hano at the threshold of the house, both wearing feather capes on their shoulders, feather necklaces about their necks, and helmets on their heads. Now when Ka-ʻakakai saw Ka-pohu standing outside the fence, he scowled, took up as much room as possible, and left no room in the doorway. Ka-pohu, observing their splendid apparel, chanted these words:
>
> Po Kaʻula i ka hulu o ka manu, Kaʻula is darkened by the feathers

	of the birds,
Ke nonoi a‘e la ka hulu o ka manu	The feathered birds are appealing
I komo iloko ua i Poli - e.	to the rain to fall at Poli.

As soon as Keawe-hano heard these words chanted, he brushed Ka-‘akakai aside and looked out. Then Ka-pohu went on boldly chanting:

Ku pololei ka ‘opua ua malie	The hanging clouds stand erect;
	it is calm
A ka luna aku i Maunalahilahi,	On the upland of Maunalahilahi,
Eia la!	Lo, here it is!
O ka i‘a a ke akua la	The fish of the god
Ua lahilahi wale.	Is thin.

Keawe-hano heard the words and called out to Ka-pohu, “Come into the house! There is food and fish in here.” As Ka-pohu entered he chanted:

A Kahuku i Ola‘a,	From Kahuku to Ola‘a [I have traveled],
Ka uka i Pana‘ewa,	To the uplands of Pana‘ewa,
Ka uka o Haili,	To the uplands of Haili,
Kapili manu e,	To catch birds with lime,
Kawili manu e,	To catch birds with snares,
Kololio manu e,	To catch birds with lines,
Wiliwili manu e,	To twist the necks of birds,
O ka hulu o ka manu.	For their feathers.
‘Ahu‘ula mai no,	[Give me] a feather cape,
Mahiole mai no.	[Give me] a feather helmet,
Hulikua mai no.	[Give me] a feather necklace.

To these words Keawe-hano responded, “Here is your feather necklace, here is your feather helmet, but the cape you two shall share!” No sooner had he uttered the word share (mahele) than Ka-pohu reached for a corner of the feather cape that Ka-‘akakai was wearing and drew it over his own shoulders, leaving Ka-‘akakai without any. In that short space of time Ka-pohu had gained the friendship of Keawe-hano. He turned to Keawe-hano and said, “I have two masters, Ka-hekili and Ka-hahana. If your lord goes to war against my two lords, should my lords be victorious over yours I will preserve your life that day” (o ‘oe ka‘u ola nui ia la). Keawe-hano made the same promise to Ka-pohu, and both agreed to abide by their vow… [Kamakau 1961:130-131]

Following the death of Kalani‘ōpu‘u, in 1782, the island of Hawai‘i was to have been ruled by Kîwala‘ō, Kalani‘ōpu‘u’s son, while the gods and heiau were to be cared for by Kamehameha

I. Disagreements arose over the division and redistribution of lands. In the Hilo district, Waiākea and Pōnahawai were among the contested lands (Kamakau 1961:120). Shortly after this division (Kālai ʻĀina), Kīwalaʻō was killed at Mokuʻōhai, South Kona. Ii records that while the division of land was being discussed, Waiākea was likened to a food container (Ii 1959:14); a symbolic reference to the agricultural and fishpond resources of the land. Ii provided details of the division to be made by Kīwalaʻō was being discussed, his half-brother, Keōua, was told by one of his advisers:

… "Perhaps you should go to the chief and ask that these lands be given to us. Let Waiakea and Keaau be the container from whence our food is to come and Olaa the lid[13]." Keoua did so, but the other Kau chiefs objected to this and spoke disparagingly to him. When Keoua returned, his advisor asked, "How was your venture?" When Keoua told him all that had been said, the man remarked seriously, "A break in a gourd container can be mended by patching, but a break in the land cannot be mended that way." (Ii 1959:14)

Kīwalaʻō died in a subsequent battle, and Hawaiʻi Island came under the control of three individuals, two cousins and their uncle. Keawemauhili the sacred half-brother of Kalaniʻōpuʻu, resided in Hilo and controlled Hilo and Hāmākua. Keōua-kūʻahuʻula (son of Kalaniʻōpuʻu) resided in Kaʻū, while Kamehameha I, also a nephew of Keawemauhili's and cousin of Keōua's, controlled Kohala and Kona.

Around 1790, a dispute arose between Keawemauhili and his nephew Keōua, and Keōua attacked and killed Keawemauhili. Kamakau reports that Keōua divided the lands of Hilo District between his chiefs and warriors, and "the fat Mullet of Waiakea and Piʻopiʻo became theirs" (Kamakau 1969:152). In 1791, Keōua was killed, and Kamehameha I retained Piʻihonua, Punahoa, and Waiākea as his personal land holdings in Hilo. Liholiho, or Kamehameha II, was born in Hilo in 1797 (Kamakau 1961:260), and because of the value of Waiākea, Liholiho retained Waiākea until his death in 1824. For a time, a granddaughter of Keawemauhili's, Kaunuohua, held Waiākea, but in the Māhele, or Land Division of 1848, Kauikeaouli (Kamehameha III), assumed the rights to Waiākea (Board of Commissioners 1929:26). Kauikeaouli retained Waiākea until his death in 1854. The ahupuaʻa was among the Crown Lands, which under the monarchy, came to be held in perpetuity by the rulers of Hawaiʻi.

[13] The reference to ʻŌlaʻa as the "lid," may be taken to imply that the fine resources of bird feathers, olonā fiber for cordage, and the famous kapa (bark cloth) called ʻōʻū-holo-wai-o-Laʻa were the wealth which covered the needs of the chiefs.

3.3.8 Kānāwai Māmalahoe (Māmalahoa)

Perhaps one of the best remembered events in the history of Kamehameha I as it related to the Waiākea-Hilo and Kea‘au lands took place in ca. 1784. Keawemauhili of Hilo and Keoua of Ka‘ū, joined forces in Hilo, and there was no place for Kamehameha I to encamp along Hilo Bay. Writing in the Hawaiian newspaper Kuokoa, Kamakau told readers how the famous Kānāwai Māmalahoa (Law of the Splintered Paddle) came to be proclaimed (see. also “Ka Moolelo o Mamalahoe Kanawai” Nupepa Ka Makaainana, Dec 6- 30, 1895) While spying on events around Hilo, Kamehameha and his companion Kahakui secretly paddled from Laupāhoehoe to Kea‘au:

> **Maraki 16, 1867**
> **Nupepa Kuokoa**
>
> ...Holo akula o ia ma Papai, ma Keaau i Puna, e lawaia ana kekahi poe kanaka a me kekahi mau wahine, a he wahi keiki uuku i ke kua o kekahi kanaka. A ike o Kamehameha i ua poe lawaia nei e makaukau ana e hoi, o kona lele akula no ia mai luna aku o kona waa, me ka manao e kii i kela poe kanaka e pepehi, aka, ua holo kekahi poe me na wahine, a koe iho elua kanaka i hakaka me Kamehameha, aka, ua luuluu kekahi kanaka i ke keiki ma ke kua. O ka hakaka ihola no ia, e poholo iho ana ka wawae o Kamehameha i ka mawae pohaku, a paa loa ihola, no laila, hahau ia ihola kona poo i ka hoe a ka poe lawaia. A no ka luuluu o ua kanaka lawaia nei i ke keiki, a no ka ike ole ia no hoi kekahi o Kamehameha keia e hakaka pu nei, ina ua make loa o Kamehameha i ia la. Ua kapa ia ka inoa o ia hakaka ana o Kaleleiki. O ka pa ana hoi o ke poo o Kamehameha i ka hoe, ua lilo ia i Kanawai Mamalahoa no Kamehameha... [Ku Okoa March 16, 1867]
>
> ...Ua kau o Kamehameha i ke kanawai, “E hele ka elemakule a me ka luahine a me ke keiki a moe i ke alanui...” [Ku Okoa November 23, 1867]
>
>> He [Kamehameha] went to Papa‘i, at Kea‘au, Puna, and he came upon some men and women who were fishing, and a little child rested on the back of one of the men. Seeing the fishermen preparing to go away, he leaped from his canoe intending to catch and kill them, but, some of the men and the women fled, two of the men stayed to fight with Kamehameha, but one man was burdened with the child on his back. During the fight, Kamehameha slipped and caught his foot in a crevice of the rock and was securely held, the fishermen then struck him over the head with a paddle. It is only because one of the men was hampered with the child, and that they did not know that it was Kamehameha that they were fighting with, that Kamehameha was not killed that day. This fight was named Ka-lele-iki. And from the striking of Kamehameha’s head with a paddle, the law of Māmala-hoe (Broken Paddle)

> was made for Kamehameha… [Ku Okoa March 16, 1867; see Kamakau 1961:126]
>
> …Kamehameha issued the law, "Let the old men and women and children go in peace and sleep [in safety] on the trails…" [Ku Okoa November 23, 1867]

In regard to this law that governed travel along the ala hele of Hawai'i, Kamakau (1968) also observed:

> This became the law over the whole Hawaiian group in the time when Kamehameha ruled over the kingdom. He gave the name of Mamalahoa to the law for his escape from death when he was beaten by the fishermen at Papa'i in Kea'au… And because he escaped from death, he named the kanawai Mamalahoa; it was the great lifesaving law… [Kamakau 1968:15]

This significant native Hawaiian law and practice—directly tied to travel along the ala loa between Puna and Hilo—was documented in other accounts as well. Two additional variations of the narratives are included here. One account was recorded by a native Hawaiian who lived in the time of Kamehameha I, the other was recorded by Eben Low, as told to him by an elderly Hilo native in 1932:

> Eia ka'u ike ana i ko Kamehameha au. Eia ka noho ana o ko Kamehameha au, a'u i ike ai me ke kanawai o kona aupuni… Eia keia, ua hookapu ia, eia ka luahine a me ka elemakule e hele no ka luahine a moe i ke alanui a me ka elemakule…
>
> > Here is what I saw in the time of Kamehameha. Here is how the people lived in the time of Kamehameha as I know it, and the laws of his kingdom… Here is this, he placed a restriction on the old women and old men, that the elderly women and elderly men were able to go and sleep along the trail sides and not be molested… (Interior Department Document No. 139, Box 401-1-12 — "Customs and Practices;" narrator unknown, ca. 1848).

Kanawai Mamalahoa

E na kanaka e malama oukou i ke Akua a e malama hoi i kanaka nui, a me kanaka iki, e hele ka elemakule, ka luahine, a me ke kama, a moe i ke ala, aohe mea nana e hoopilikia. Hewa no, make!

O people, respect the Gods, respect also the important man and the little man, and the aged men and aged women, and the children sleep along the trailside, and not be bothered by

anyone. Failure to do so is death! (As told to Eben P. Low by an aged Hawaiian from Hilo – recorded June 9, 1932.)

3.3.9 Fishponds of Waiākea Valued by Kamehameha I

> Iune 8, 1922 (aoao 2)
> Nupepa Kuokoa
> He Kupanaha Keia Mea o ka Ono a ka Puu
>
> Aole e ono ana ka puu i na mea ai kokoke mai, aia ka ono i na mea mamao i kahi e.
>
> E nana ae kākou i ka moolelo o Kamehameha I... Ma ka mokuna aina o Hilo na loko iʻa ono a kaulana, oia o Waiakea, Mohouli, Kalepolepo a me Waiahole; a ku kaawale mai o Hoakimau. Aia no keia mau loko apau ma Waiakea...
>
> Eia aku ka iʻa o na aina o Panaewa me Keaukaha. Ku ae ka ono i ka anae, e loa ana ke kii ana mai i na iʻa o Waiakea...
>
> > The throat does not desire the to eat that which is close, but instead desires that which is far away at another place.
> >
> > When we look to the tradition of Kamehameha I... In the district of Hilo there are fishponds famed for their delicious fish. They are Waiakea, Mohouli, Kalepolepo, and Waiahole; there is also Hoakimau some distance off. All of these fishponds are at Waiākea.
> >
> > Here is the fish of the lands of Panaewa and Keaukaha. The desire is for the anae, that is what is fetched from Waiakea... [Maly, translator]

3.4 Historic Period

In pre-western contact Hawaiʻi, all land and natural resources were held in trust by the high chiefs (aliʻi ʻai ahupuaʻa or aliʻi ʻai moku). W.D. Alexander, Surveyor General of the Hawaiian Kingdom wrote:

> "...It is admitted that under the ancient feudal system, the allodium of all land belonged to the King, not, however, as an individual, but "as the head of the nation or in his corporate right..." (Alexander; Survey Letter Book No. 9, September 30, 1891:107. Hawaii State Archives)

The use of lands and resources were given to the hoaʻāina (native tenants), at the prerogative of the aliʻi and their representatives or land agents (konohiki), who were generally lesser chiefs

as well. In 1848, the Hawaiian system of land tenure was radically altered by the Māhele ʻĀina (Land Division) which is some ways was an expanded practice of the ancient Kālai ʻĀina. This change in land tenure was aggressively called for by the growing Western population and business interests in the island kingdom—generally individuals were hesitant to enter business deals on lease-hold land.

3.4.1 Māhele ʻĀina – The Land Division in Waiākea

In the present-day, all land tenure in Hawaiʻi is based on events that were promulgated in 1848, as a part of the Māhele ʻĀina. As a result of the Māhele ʻĀina, all land in the Kingdom of Hawaiʻi came to be placed in one of three categories: (1) Crown Lands (for the occupant of the throne), (2) Government Lands, and (3) Konohiki Lands (see Penal Code, 1850).

Hawaiians view the natural and cultural resources are one integrated system. Settlement and residency on the ʻāina (land, that which feeds you) was determined by the nature of the landscape and the availability of resources necessary to sustain the population. While there was a sophisticated system of land and resource management in place, the system was place-based. The environment was not only physical, but also spiritual. The significance of Waiākea Ahupuaʻa becomes apparent when one realizes that the ʻāina was held by the descendants of Kamehameha I as am ʻĀina Lei Aliʻi (Crown Land) om the Māhele ʻĀina (see Buke Mahele, 1848).

Laws from the period of the Māhele record that ownership rights to all lands in the kingdom were "subject to the rights of the native tenants," those individuals who lived on the land and worked it for their subsistence and the welfare of the chiefs (Kanawai Hoopai Karaima… {Penal Code} 1850:22). The 1850 resolutions in "Kanawai Hoopai Karaima no ko Hawaii Pae Aina," authorized the newly formed Land Commission to award fee-simple title to all native tenants who occupied and improved any portion of Crown, Government, or Konohiki lands. These awards were to be free of commutation except for house lots located in the districts of Honolulu, Lahainā, and Hilo (see Penal Code, 1850:123-124). After native Hawaiian commoners were granted the opportunity to acquire their own parcels of land through the Māhele, foreigners were also granted the right to own land, provided they had sworn an oath of loyalty to the Hawaiian Monarch (Kameʻeleihiwa 1992:300).

In order to receive their awards from the Land Commission, the hoaʻāina were required to prove that they cultivated the land for a living. They were not permitted to acquire "wastelands" (e.g., fishponds) or lands which they cultivated "with the seeming intention of enlarging their lots." Once a claim was confirmed, a survey was required before the Land Commission was authorized to issue any award. The lands awarded to the hoaʻāina became known as "Kuleana Lands." All of the claims and awards (the Land Commission Awards or L.C.A.) were numbered, and the L.C.A. numbers remain in use today to identify the original

owners of lands in Hawai‘i.

By the time of its closure on March 31, 1855, the Land Commission issued only 8,421 kuleana claims, equaling only 28,658 acres of land of nearly 4-million acres, to the native tenants (Kame‘eleihiwa 1992:295). In addition to the chiefly claims for lands in Waiākea and Honohononui made by ali‘i claimants, at least thirty-three (33) native and two (2) foreign claimants applied for personal properties (kuleana) in Waiākea. The royal applicants, and settlement of their claims (e.g., awarded or given up), was recorded in the 1848 “Buke Mahele.” The Waiākea records are cited below:

Buke Mahele 1848 – Division with the King

Ianuari 1848
Buke Kakau Paa no ka Mahele Aina
i hooholo ia iwaena o Kamehameha 3 a me Na Lii a me na Konohiki ana.
Hale Alii Honolulu

Page 5
Ko Kamehameha 3

Na Aina	Ahupuaa	Kalana	Mokupuni
Popoki	Ahupuaa	Puna	Hawaii
Humuula	Ahupuaa	Hilo	Hawaii
Kulaimano	Ahupuaa	Hilo	Hawaii

Ianuari 27, 1848

Page 6
Ko Victoria Kamamalu

Na Aina	Ahupuaa	Kalana	Mokupuni
Piopio	Ili i Waiakea	Hilo	Hawaii
Kalalau	Ahupuaa	Hilo	Hawaii
Honohononui		Ili i Waiakea	

Page 27
Ko Kamehameha 3

Na Aina	Ahupuaa	Kalana	Mokupuni
Makaoku	Ili no Waiakea	Hilo	Hawaii

Ianuari 28, 1848

Page 28
Ko Mikahela Kekauonohi

Na Aina	Ahupuaa	Kalana	Mokupuni
Honokohau	Ahupuaa	Kona	Hawaii

Page 91
Ko Kamehameha 3

Na Aina	Ahupuaa	Kalana	Mokupuni
Waiakea	Ahupuaa	Hilo	Hawaii

...Feberuari 4, 1848

Page 92
Ko Kaunuohua

Na Aina	Ahupuaa	Kalana	Mokupuni
—			

Feberuari 4, 1848

Page 186
Ko Kamehameha 3

Page 187
No Ke Aupuni

Inoa o na Aina	Ahupuaa	Kalana	Mokupuni	Inoa o na Aina	Ahupuaa	KalanaMokupuni
Waiakea Ahupuaa	Hilo	Hawaii	Kulaimano	Ahupuaa	Hilo	Hawaii
	Makaoku	Ili no Waiakea		Hilo	Hawaii	

Maraki 8, 1848

‘Ili Within the Ahupua‘a Waiākea

The ahupua‘a of Waiākea is one of the largest ahupua‘a in all the islands, as such there are many smaller land units like ‘ili known in Waiākea. These ‘ili—which were often associated with ‘ohana groups over the generations, and some of them identified as ‘ili kūpono, independent lands within an ahupua‘a—include, but are not limited to:

- Hanahana
- Honokawailani
- Kalanakāma‘a
- Kalepolepo
- Kāwili
- Keaukaha
- Kōlea
- Milo
- Mohouli
- Pā‘ie‘ie
- Pana‘ewa
- Pi‘opi‘o
- Pua‘aloa
- Pū‘āinakō
- Puhi

Countless and unknown place names were found within ahupuaa and ‘ili—sadly, many have been lost with the passing of time and changing patterns of residence and land use. The occurrence of place names of smaller areas, sites, features, points on land, and on the sea provide important insight into the depth of cultural attachment shared between Hawaiians and their Honua ola (living environment).

3.4.2 Native Tenant and Foreign Claims for Land

Some 250,000 pages were recorded as a part of the process of settling claims made by tenants of the lands across the Hawaiian Kingdom. In 2000-2002, Kumu Pono Associates LLC digitized the entire collection of the Mahele (six distinct record categories), from the original microfilm collection in the Hawaii State Archives. We subsequently reviewed every

record and created an updated index, allowing us to identify better the "who," "where," "what" and "when" of claims (awarded or not) across the islands. The documents were primarily recorded in Hawaiian. Translations that accompany the Hawaiian language accounts below were translated by Kepā Maly. It will be noted that both the original Hawaiian and English language texts include a number of transposed spellings, and in some cases, personal- or place- names were changed. Because the use of the older names has not survived the passing of time, it is impossible to state with certainty which names were correct, or if both may have had localized use at one time.

3.4.2.1 Waiākea Māhele Claimants

The entire ahupuaʻa of Waiākea was retained by the Kauikeaouli Kamehameha III, becoming ʻĀina Lei Aliʻi (Land which Adorns the Chief -- Crown Land). Most of the kuleana parcels awarded to native tenants were situated in the area now incorporated into Hilo Town – around the ponds and lower flat lands of Waiākea (Figure 8), though a few claims reached out as far as Pūʻāinakō, Puaʻaloa and Panaʻewa. The ʻili kū pono of Honohononui was retained by Chiefess Victoria Kamāmalu. <u>It does not appear that any claims were made for the area around the proposed USGS complex, through at least one claim that was awarded – Helu 2402, belonging to Keaniho and Kahue is not far from the project site on the boundary with Kūkūau. And possibly one claim made by Kapuaakuni (Helu 2274), not awarded, was made in the ʻili of Pūʻāinakō on the east side of the larger U.H. complex parcel.</u>

(This section intentionally left blank.)

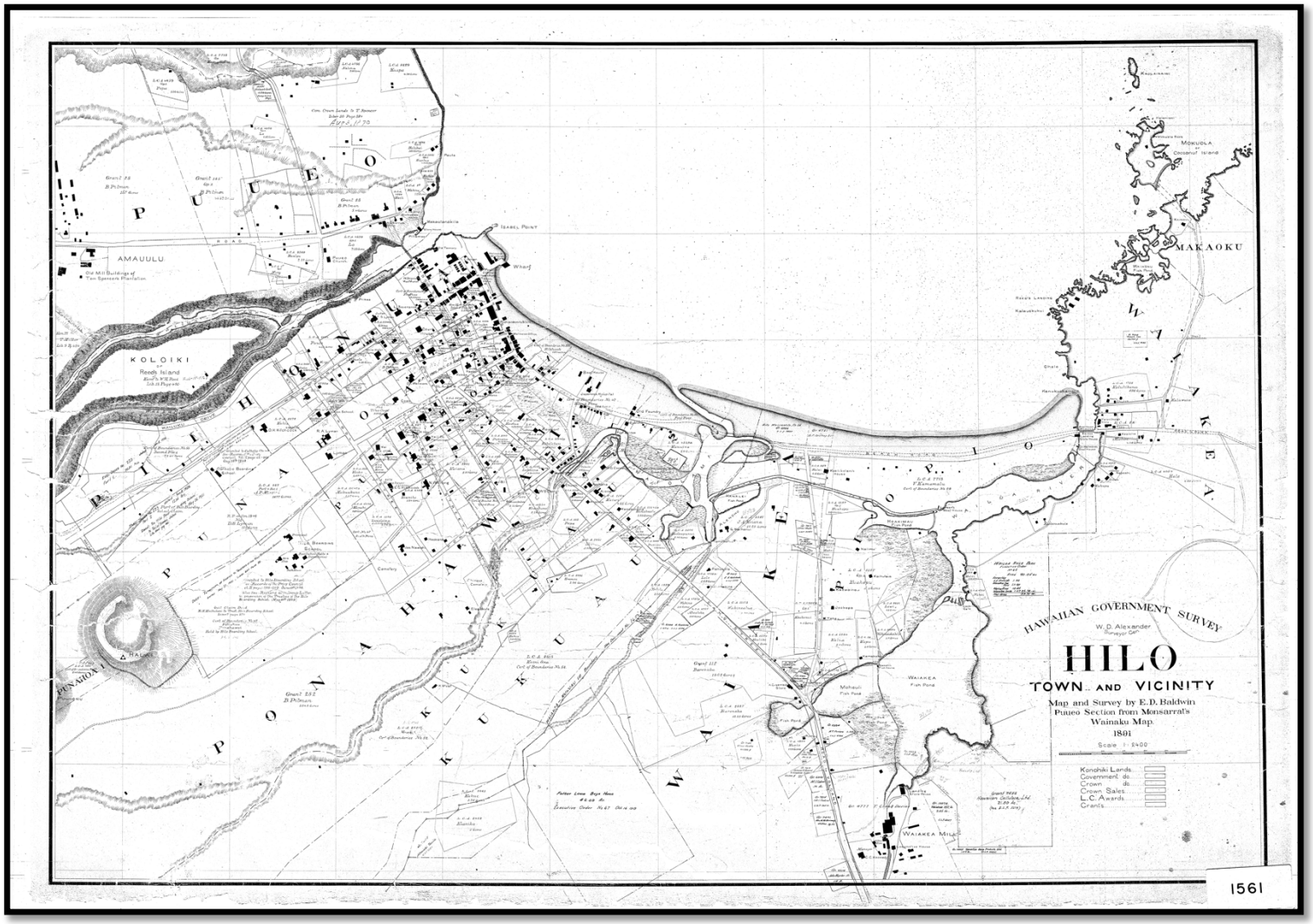


Figure 8. Portion of Hilo Town and Vicinity with Kuleana Parcels and Other Features

Table 1. presents readers with a synthesis of claims (whether awarded or not) for kuleana, clearly identifiable as being for ʻāina in the ahupuaʻa of Waiākea. The claims of Keaniho-Kahue and Kapuaakuni are emphasized in bold print. Such claims provide us with important documentation of traditional residency, land use, the occurrence of other place names, and suggest types of sites that have occurred, and may still be extant in overgrown areas on the land which may not have been impacted by historic land use practices.

Features carried over from the period prior to and leading up to the Māhele ʻĀina would include, but not be limited to — include house sites, burials, rock walls and alignments, enclosures, trails, and terraces, and rock clearing mounds.

Table 1. Synthesis of Māhele Claims in Waiākea Ahupuaʻa

Book	Vol:page	Helu	Claimant	Claim Synthesis
FT MA RP	5:48 4:313-314 1147	1E	Mahoe	In the Ili of Keawe Kapu, a cultivated field received from his Pea the Konohiki.
FT MA RP	5:48 10:129 2768	1F	Kapu	At Piopio, a cultivated field received from his ancestors.
FR	1:131	190	Ragsdale, Alex.	A house to given to him by the government at Byron's Bay (Waiakea). Not awarded.
NR NT	2:631 4:668	1106	Taylor, J. (Haae)	A Kihapai in the ili of Kolea, Waiakea Ahupuaa. Being 1050 feet in length and 1056 wide. Not awarded.
NR NT FT MA RP	3:52 4:415 5:7-8 10:282 8191	1279	Halai Kalona	May parcel of land is in the ili of Kolea at Waiakea. It is an enclosed planting lot.
NR NT FT MA RP	3:76 4:465 5:30 9:448 5625	1333	Kalolo	In the ili of Koloniho, a kihapai, 45 fathoms on two sides by 40 fathoms on two sides.
NR NT FT MA	3:77 4:465-466 5:30 10:128	1335	Kaheananui (Kaehunui)	In the ili of Alenoho, Waiakea Ahupuaa, a kihapai, two side, 46 fathoms long, and two sides 34 fathoms long, enclosed with a fence. Not awarded.

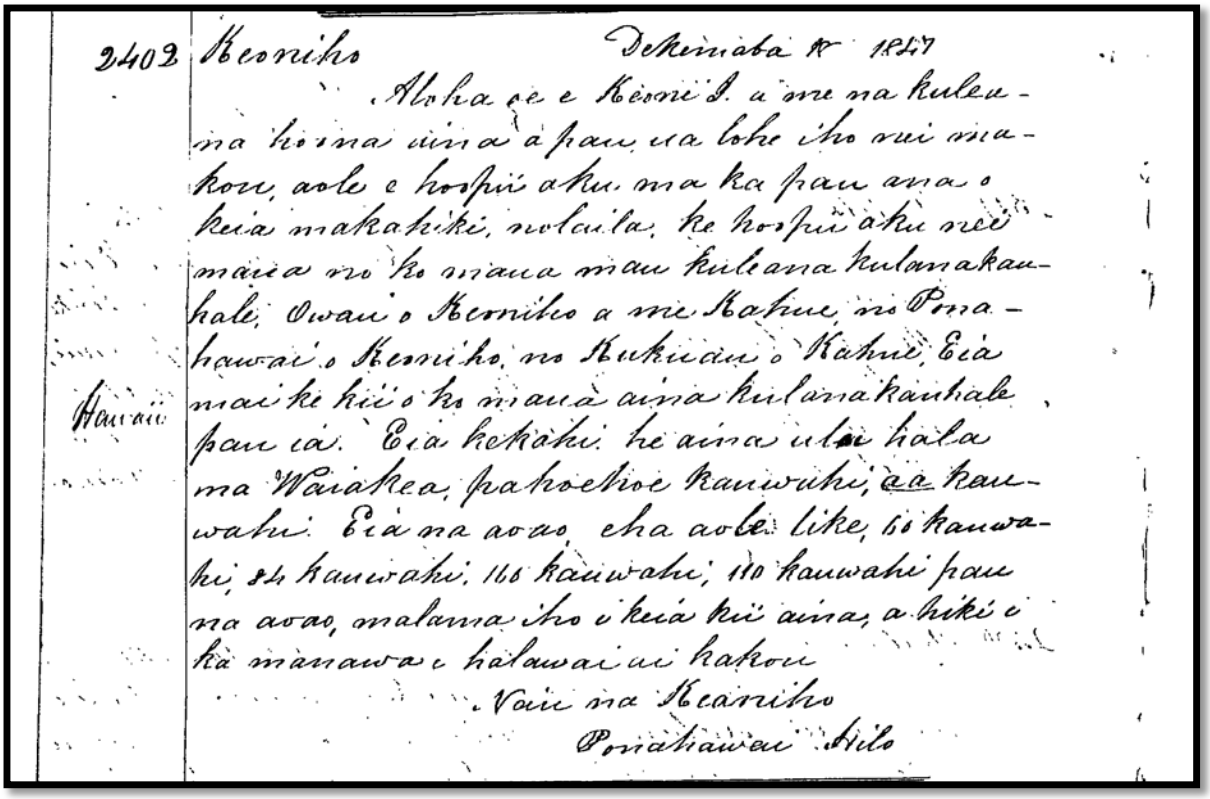
NR NT FT MA RP	3:234 8:85-86 5:50 6:306 1146.	1738	Kaluhikaua	In the ili of Kamokoloa, Waiakea Ahupuaa, a house lot that is 72 fathoms long by 39 fathoms wide. Bounded on the north by the ili of Ohele, on the west by the trail running along the river. It is fenced and partly cultivated.
NR NT FT	3:424 4:452-453 5:26	**2274**	**Kapuaakuni**	**In the ili of Puainako, a lot that is partially enclosed, with two houses, along the road to Kaluapele. Puaakuni died (ca. 1848) and was buried in the enclosure.**
NR NT FT MA RP RP	3:428 4:406 5:7 10:125 5713 6577	2281	Kaiana	In the ili of Alenoho, a parcel 10 acres of size.
NR NT FT MA RP	3:452 4:451 5:23, 26, 28 10:124 7601	2327 & 8696	Barenaba (Kahu kula)	In the ili of Kalihi, a lot enclosed with a stone wall, and several houses. A lot adjoining the <u>pond of Kalepolepo</u>. Bounded on one side by the Alanui pii i ka lua o Pele (Main trail that ascends to the Volcano).
NR NT FT	3:458 4:452 5:26	2338	Samuela (Kumu ao)	Here is the nature of my land, some of it is suitable for planting when the aa is broken up and separated. It is good for growing uala (sweet potatoes) and kope (coffee). But the land is not rich. There are also some ulu trees. It is in the ili of Koleaiki, Alenoho is above, below it is the ili of Koleanui, and on the Puna side is the ili of Kalihi. Not awarded.
NR NR FT MA RP RP	3:483 8:675, 5:79 (pt. 2) 9:937 6790 8063	**2402**	**Keoniho & Kahue**	**Aina uluhala ma Waiakea, pahoehoe kauwahi, aa, kauwahi (land with a grove of pandanus, some areas are pahoehoe, and some areas are aa. Also 2 kihapai for Keoniho and 3 for Kahue.**
NR NT FT	8:675 4:440 5:21	2603	Napeahi & Pikaka	Our claim is for a house lot. It is 8 chains long and 8 chains wide. Pikaka subsequently release his claim to

MA RP	2:1542 1148			Napeahi. There are also properties in the ili of Kialoa (1), and in Kialoa (2). There is a kukui tree and an ulu tree. There are also 4 houses. One each for Napeahi, Paakai, Kamokualiiole, and Kalua. The right is from the ancestors in the time of Kamehameha I.
NR NT FT	8:679 4:473 5:34	3872	Peke	In the ili of Alenoho, house lot and two kihapai. 100 long, by 20 wide. Not awarded.
NR NT FT	8:680 4:471 5:24	3996 (B) & 8081	Hewahewa	At Kalunui, my aina mahiai. Also aina at Hapaiolaa, Keaau. Waiakea not awarded.
NR NT FT MA RP	8:681 4:440 5:25 10:131 2756	4004	Hale	In the ili of Hinaauauwai, with 4 kihapai and two houses, from the time of Kamehameha I.
NR NT FT MA RP	8:681 4:457 5:27 4:312 603	4344	Kuaio (w.)	In the ili of Kolea, the lot is partially enclosed and there are three houses. There is also a kihapai, bounded by Waiuli on the Puna side. These are old claims from the time of Kamehameha I. Waiuli section not awarded.
NR NT FT MA	8:689 4:447 5:23 4:311	4737, 4737B 4738B	Moealoha Wahine Lolo	There are three land claims, one each for Moealoha, Wahine and Lolo. They are in Waiakea, all of varying sizes. Nakai helped to write it out.
NR NT FT MA RP	8:691 4:441 5:23 4:314 1121	4785	Nakai	My little claim is in Waiakea. The majority of my land is pahoehoe, with only a little place suitable for kipohopoho (planting in mulched pits and holes). Where I may cultivate crops. On the pahoehoe I do hoopuepue (mound planting) with mulched debris and dirt, to get some crops to grow. One side is 100 fathoms long, another side is 80 fathoms, another is 57 fathoms, and the other is 76 fathoms. The ili is Hanahana. <u>On one side is Waiakea loko (fishpond), and on</u>

				the Puna side is vacant land. There are 3 kipi kalo, a kihapai, and a house.
NR NT FT RP	4:354 4:666 5:54 5546	4918A	Kapapa	Coconut trees alongside the trail where one exits from Panaewa. Other claims for lands in larger Hilo area and Keaau. Waiakea not awarded.
NR NT MA RP	8:698 4:448 6:287 1913	5018	Keawe	In the ili of Kuahua, my kuleana is bounded on one side by Wailoa Stream. Some areas are cultivated and other areas are pahoehoe. The ili of Hanahana is mauka.
NR NT FT MA RP	8:702 4:445 5:22 10:132 1873	5157	Kuahopu	In the ili of Piopio, there are several kihapai at various places. There are also six kipi planting sites in the fishpond. My right is from the time of Kamehameha I.
NR	5:443	7713	Kamamalu, Victoria	Honohononui Ili i Waiakea (see also Buke Mahele citations above).
FT MA	3:408 10:428	7713	Kamamalu, Victoria	Piopio Ili i Waiakea. See also MA 10:428-439 (see also Buke Mahele citations above).
NR NT FT	8:705 4:442 5:25	8802	Kane	In the ili of Ohualolo. My land is close to Kawaimake, some of it is “aina kula hanai holoholona” (open land to graze livestock), other sections are cultivated with crops, there is also a house build there. It is most aa and unsuitable to grow crops on. Not awarded.
NR NT MA RP	8:706 4:443 4:310 1927	8803	Kamanohaka	A three partially cultivated kihapai at Piopio. On the Puns side, it is bounded by the loko, it is not enclosed.
NR NT	8:706 4:453	8811	Kilioe	My claim is in the ili of Puaaloa. It is 18,000 long on two sides and 16,000 wide on two sides. It is cultivated and there are three houses. Not Awarded.
NR NT FT MA	8:706 4:448 5:25 10:130	8854	Kalua	At Piopio, a house lot that is 44 fathoms long, 25 fathoms on one side and 20 fathoms on the other side. Gotten from

RP	1908			my ancestors to my parents, and now to me.
NR FT	6:488 5:75	8868	Kapaakiha (w.)	An ili of land here in Hilo, Hawaii, in the Ahupuaa called Waiakea. Here are its boundaries, situated from The uplands to the sea. The lagoon of Keokea is seaward. Milo is the ili, inland. It is there between, here is its name, Puhi. Not awarded.
NR NT FT MA RP	8:707 4:443 5:21 4:310 1874	9982	Levi	My claim is in the ili of Paeaahu, there are 4 separate kihapai parcels and houses. The fourth parcel is bounded on the Puna side by a loko (fishpond).
NR NT FT MA RP	8:707 4:441 5:25 4:313 2768	10004	Lonohoihilo/ Wahinenohoihilo	In the ili of Laeaahu/Paeaahu, held since before the time of Kalaiopuu/Kalaniopuu, five generations back. There are three kihapai, also a house is on the lot. On the Puna side of lot is the loko (fishpond) of Waiakea.
NT FT RP	4:466-467 5:44 4365	11050B	Kaihenui	In the ili of Kolea, two parcels, and two houses.
FT MA RP	3:492 10:262 7235	11173	Wahinealua	A piece of land in the ili of Alenoho, adjoining the Alanui Aupuni.
FT MA RP	3:493-494 10:261 8216	11174	Kealiko (w.)	A piece of land at Alenoho, makai of the Alanui Aupuni.

As noted above, at least one claim (Helu 2402) was made further inland for a kuleana at Waiākea. Initially filed under the names of Keaniho and Kahue, the claim was subsequently separated into two claims, one for Keaniho in Waiākea, the other claim for Kahue was settled in Kūkūau adjoining the Keaniho claim. The Māhele records provide the following information:



2402 Keoniho Dekemaba 18 1847

Aloha oe e Keoni I. a me na kuleana hoina aina a pau, na loke iho nui makou, aole e hoopii aku ma ka pau ana o keia makahiki, nolaila, ke hoopii aku nei maua no ko maua mau kuleana kulanakauhale, Owau o Keoniho a me Kahue, no Ponahawai o Keoniho, no Kukuau o Kahue, Eia mai ke kii o ko maua aina kulanakauhale pau ia. Eia hekahi he aina ulu hala ma Waiakea, pahoehoe kauwahi, a kauwahi. Eia na aoao, eha aole like, 60 kauwahi, 84 kauwahi, 160 kauwahi, 110 kauwahi pau na aoao, malama iho i keia kii aina, a hiki i ka manawa e halawai ai kakou

Voir na Keaniho

Ponahawai Hilo

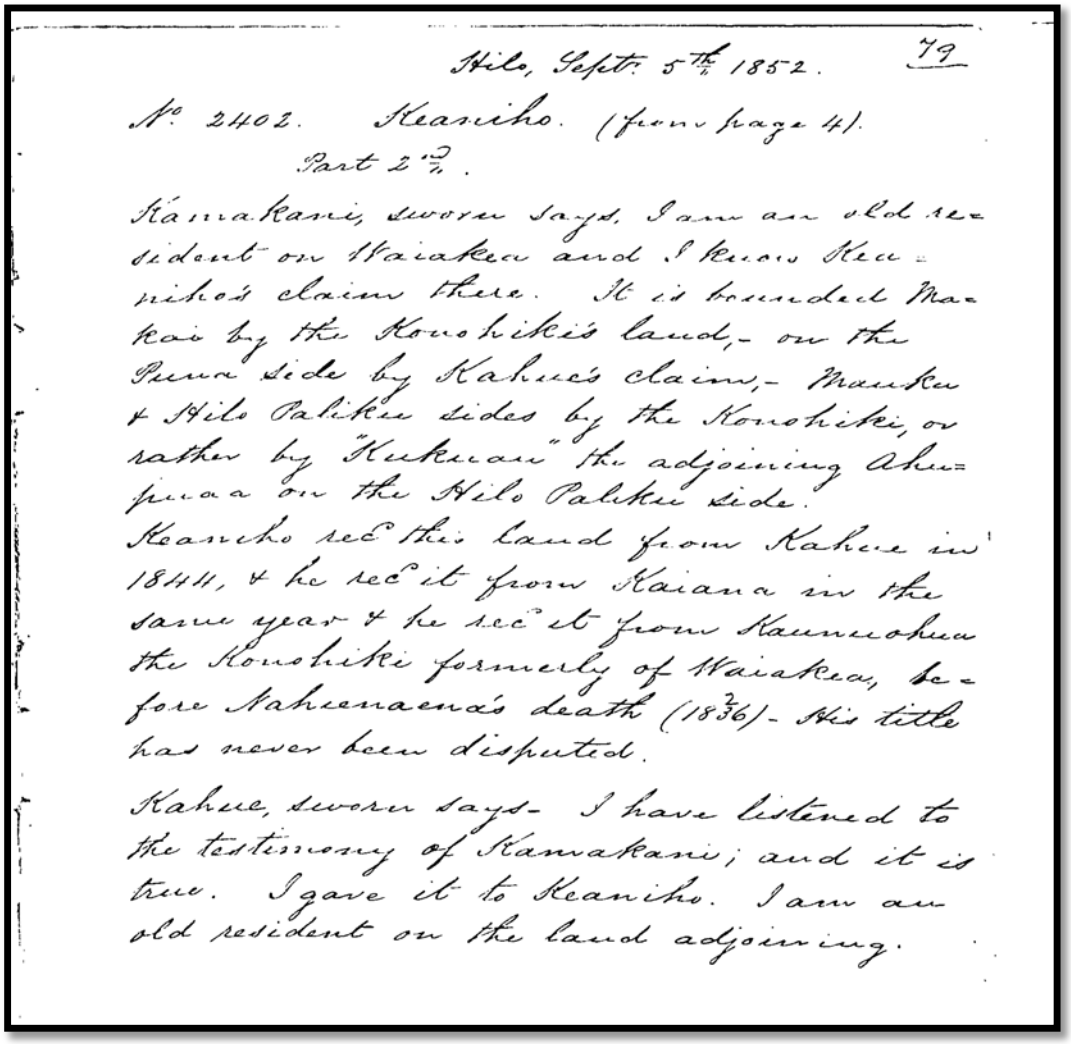
Hawaii

Figure 9. Helu 2404, Keaniho, Native Register Volume 3:483

December 18, 1847.
Aloha to you John Ii, and all who settle land claims. We have heard we should petition by the end of the year, therefore we hereby petition for our house lot(s).

I, Keaniho and Kahue. Keaniho of Ponahawai, and of Kahue of Kukuau. Here is a diagram of our house lot. It is finished. Also, there is a hala grove at Waiakea, a portion is pahoehoe lava and a portion is a‘a lava. Here are the four sides which are unequal, 60 at one place, 84 at one place, 160 at one place and 110 one place. That is all the sides. Care for this diagram until the time when we meet.

Done by me, Keaniho
Ponahawai, Hilo



Hilo, Septr. 5th 1852. 79

No. 2404. Keaniho. (from page 4).
Part 2nd.

Kamakani, sworn says, I am an old resident on Waiakea and I know Keaniho's claim there. It is bounded Makai by the Konohiki's land, - on the Puna side by Kahue's claim, - Mauka & Hilo Paliku sides by the Konohiki, or rather by "Kukuau" the adjoining Ahupuaa on the Hilo Paliku side.
Keaniho recd this land from Kahue in 1844, & he recd it from Kaiana in the same year & he recd it from Kaunuohua the Konohiki formerly of Waiakea, before Nahienaena's death (1836) - His title has never been disputed.

Kahue, sworn says - I have listened to the testimony of Kamakani; and it is true. I gave it to Keaniho. I am an old resident on the land adjoining.

Figure 10. LCA 2404 (Part 2[14]), Keaniho, Foreign Testimony Volume 5:79

Sept. 5th, 1852
Kamakani, sworn says, I an old resident on Waiakea and I know Keaniho's claim there. It is bounded: Makai by the konohiki's land On the Puna side by Kahue's claim Mauka & Hilo Paliku sides by the konohiki or rather by "Kukuau" the adjoining Ahupuaa on the Hilo Paliku side.

Keaniho received this land from Kahue in 1844 & he received it from Kaiana in the same year & he received it from Kaunuohua, the konohiki formerly of Waiakea, before Nahienaena's death (1836). His title has never been disputed.

14 Note: The first part of the claim, referenced from page 4, cover land in Pohanawai Ahupuaʻa.

Kahue, sworn says, I have listened to the testimony of Kamakani, and it is true. I gave it to Keaniho. I am an old resident on the land adjoining.

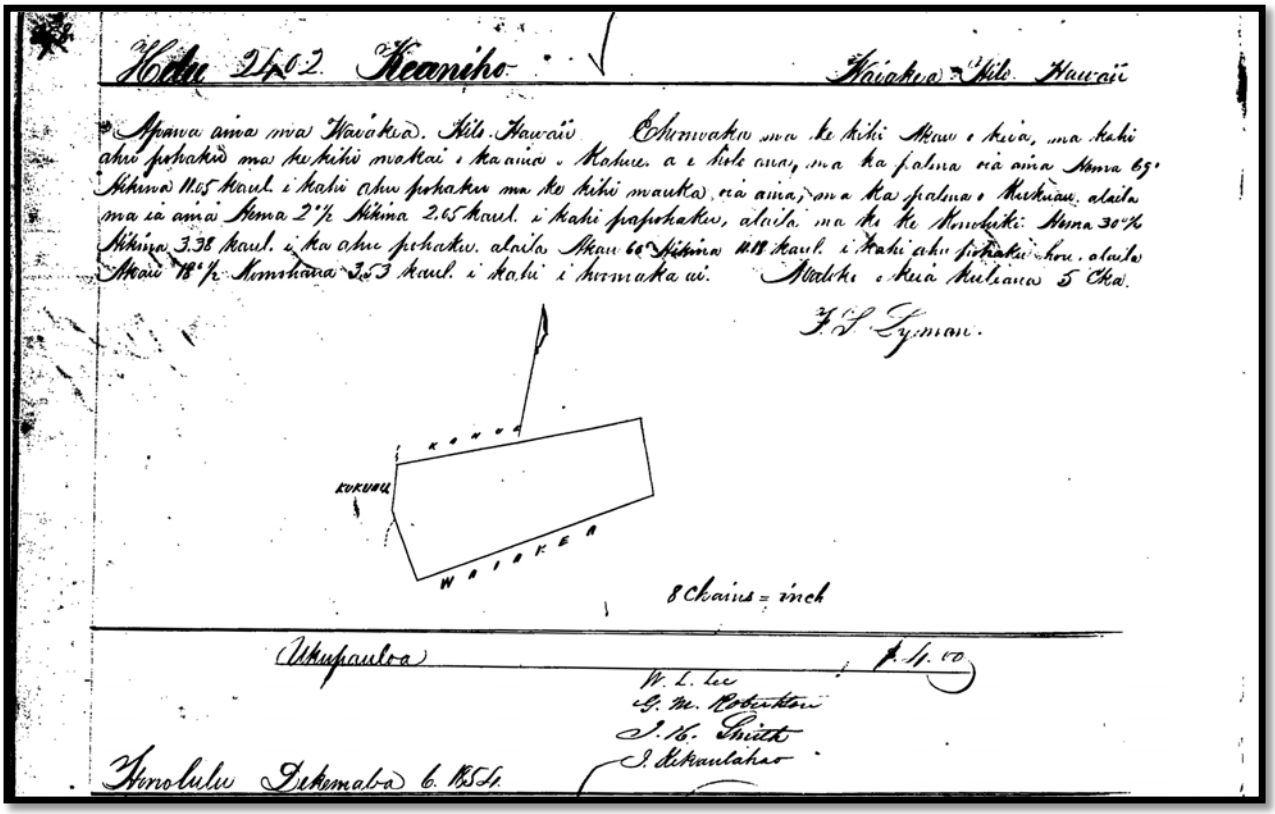


Figure 11. LCA 2404, Keaniho, Mahele Award Book Volume 9:398

Apana aina ma Waiakea, Hilo, Hawaii. E hoomaka ma ke kihi Akua o keia, ma kahi ahu pohaku ma ke kihi makai o ka aina o Kahue a e holo ana ma ka palena oia aina Hema 69° Hikina 11.05 kaul. i kahi ahu pohaku ma ke kihi mauka oia aina, ma ka palena o Kukuau, alaila ma ia aina Hema 2° ½ Hikina 2.05 kaul. i kahi papohaku, alaila ma ko ke Konohiki Hema 30° ¼ Hikina 3.38 kaul. i ka ahu pohaku, alaila Akau 60° Hikina 11.18. kaul. i kahi ahu pohaku hou, a Laila Akau 18° ½ Komohana 3.53 kaul. i kahi i hoomaka ai.

Maloko o keia kuleana 5 Eka...

F.S. Lyman
December 6, 1854...[15]

[15] In addition to coordinates as a part of the metes and bounds, the reference point include old and new ahu pōhaku (stone cairns). a pā pōhaku (stone wall), and the

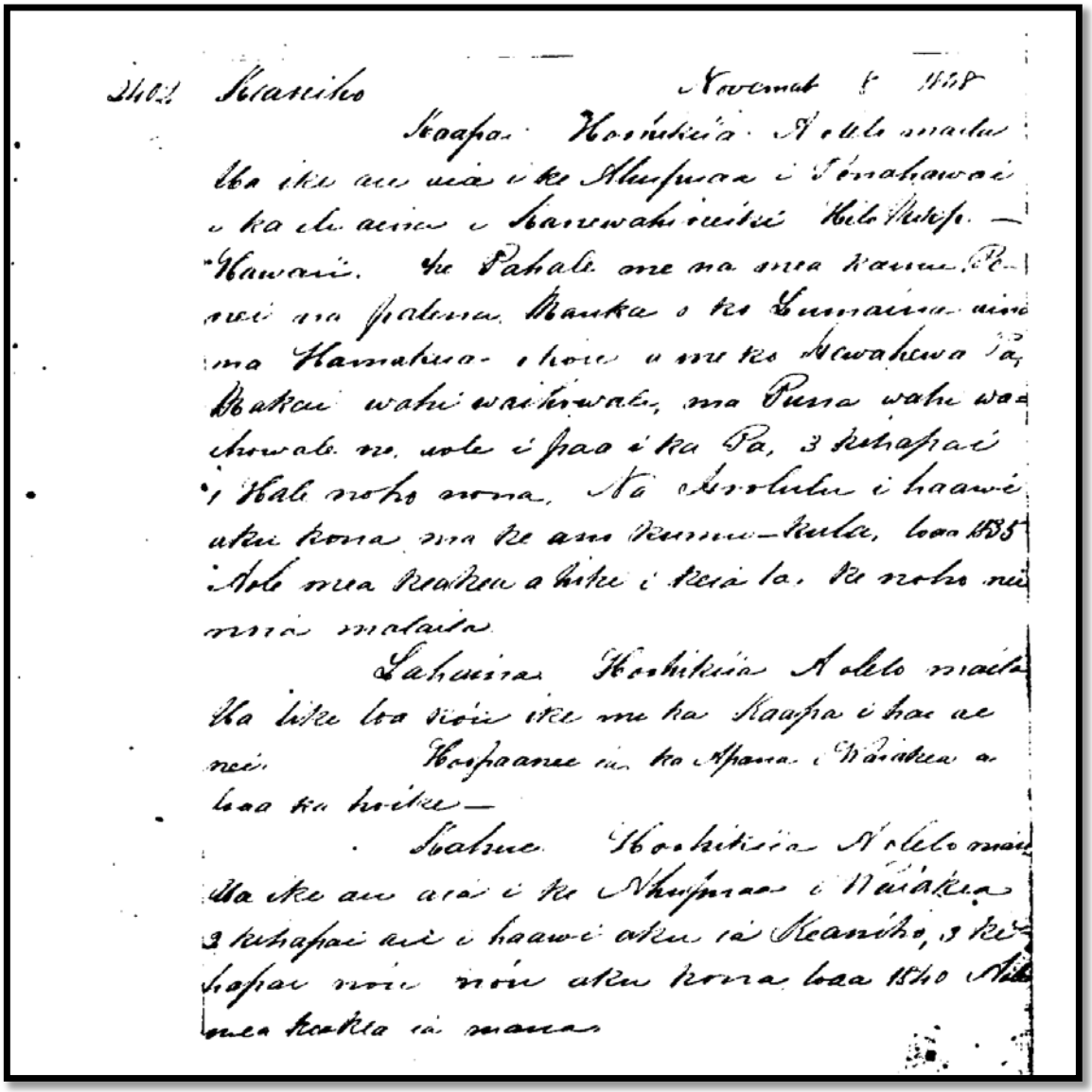


Figure 12. LCA 2402, Keaniho, Native Testimony Volume 4:407

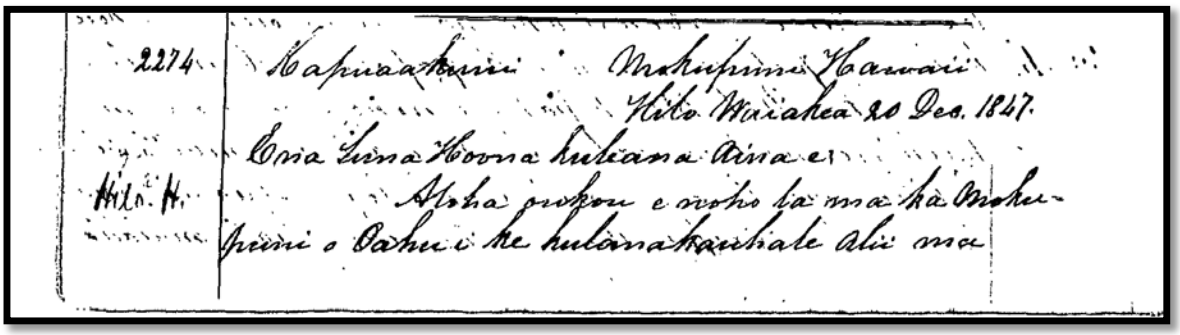
November 8, 1848
Kaapa sworn and states [describes the Ponahawai claim]…

Kahue sworn and states; I know that there in the Ahupuaa of Waiakea are 2 kihapai (cultivated fields) that I gave to Keaniho; 3 kihapai are for me. He received his section from me in 1840.

No one has opposed us.

boundary of Kūkūau. These types of features are among those which might be anticipated elsewhere on the landscape.

While the above documentation of for the kuleana claims of Kahue and Keaniho, do not specify the type of crops being cultivated on their land in Waiākea, they do confirm that cultivation was occurring. Additionally, one claim (Helu 2274), made by Kapuaakuni, was situated above the road to Puna and the Volcano (generally Kīlauea Street), in the ‘ili of “Puainako/Puuainako,” which is the source of the present-day street name.


2274 Kapuaakuni Mahupuni Hawaii
Hilo Waiakea 20 Dec. 1847.
Ona Luna Hoona kuleana aina e
Hilo H. Aloha pukou e noho ka ma ka Mahupuni o Oahu i ke kulanakauhale alii ma

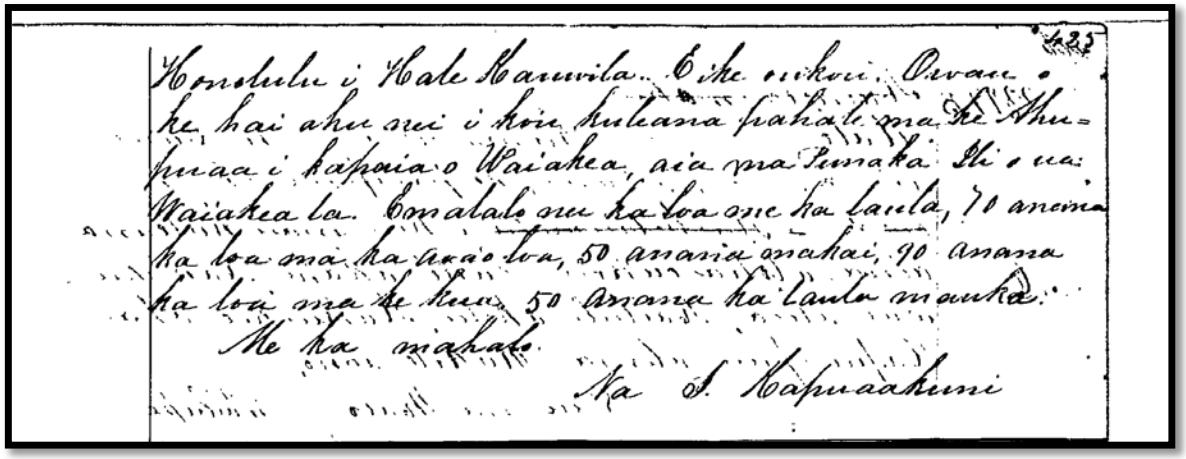

Honolulu i Hale Kauwila. E ike oukou. Owau o
ke hai ahu nei i koi kuleana pahale ma ke Ahu-
puaa i kapaia o Waiakea, aia ma Punaka Ili o na
Waiakea la. Emalalo nei ka loa one ka laula, 70 anana
ka loa ma ka aoao loa, 50 anana mahai, 90 anana
ka loa ma ke kua 50 anana ka laula mauka.
Ke ka mahale.
Na I. Kapuaakuni

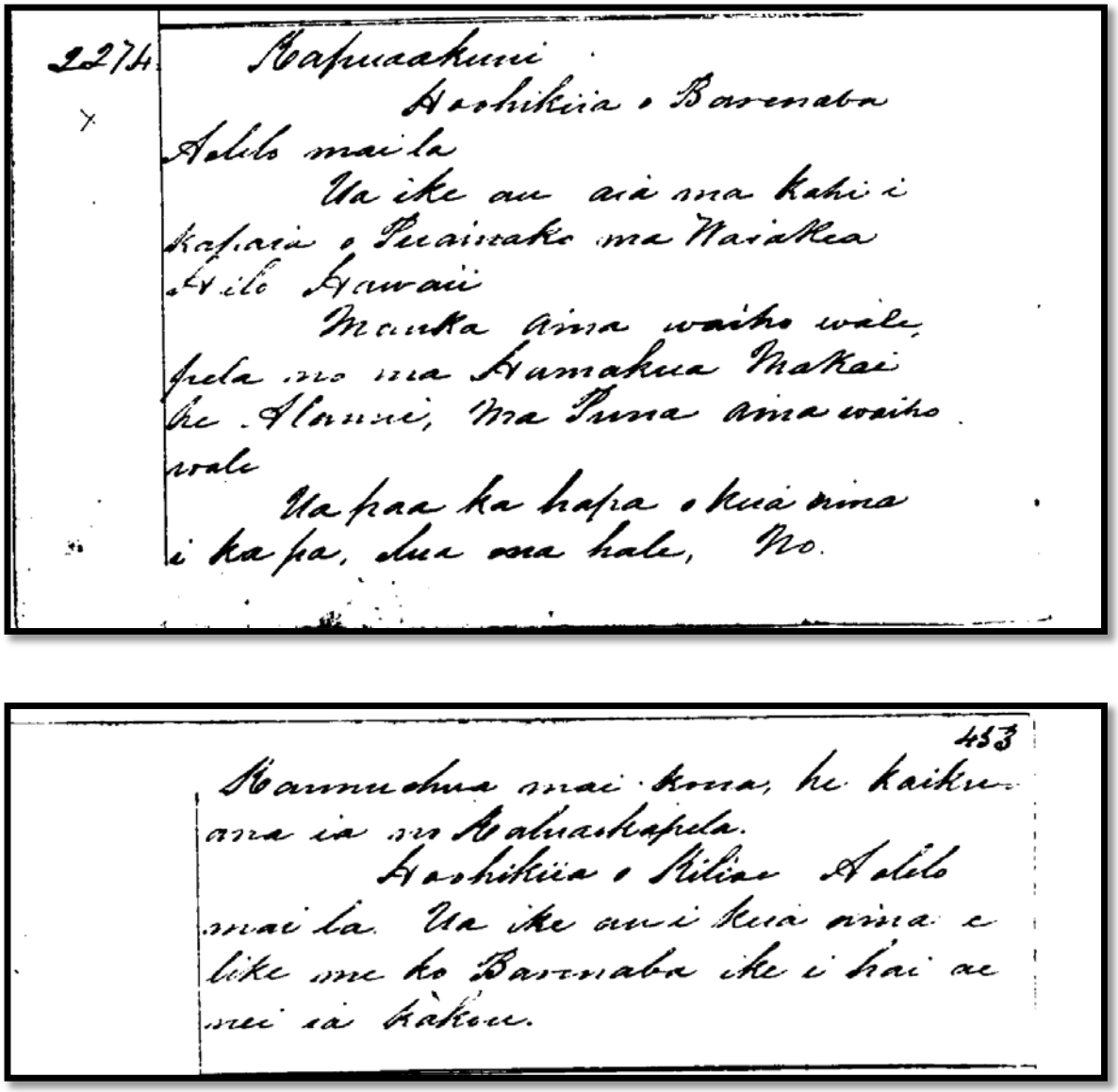
Figure 13. Helu 2274, Kapuaakuni, Native Register Volumbe 3:424-425

Island of Hawaii
Hilo, Waiakea 20 Dec. 1847

O Commissioners who Settle Land Claims.

Aloha to you who reside on the island of Oahu in the royal city at Honolulu, Hale Kauwila. So you may know, I hereby tell you of my house lot claim in the Ahupuaa named Waiakea, it is there in Punaka [Puainako], which is an ili of Waiakea. Here below is the length and width, 70 fathoms along the long side, 9- fathoms at the back, and 50 fathoms wide towards the uplands.

With appreciation,
By I. Kapuaakuni



2274 Kapuaakuni

Hoohikiia o Barenaba

A olelo mai la

Ua ike au aia ma kahi i kapaia o Puaininako ma Waiakea Hilo Hawaii

Mauka aina waiho wale, pela no ma Hamakua Makai he Alanui, Ma Puna aina waiho wale

Ua paa ka hapa o keia aina i ka pa, elua ona hale, No.

453

Kaunuohua mai kona, he kaikuana ia no Kaluaokapela.

Hoohikiia o Kilioe A olelo mai la. Ua ike au i keia aina e like me ko Barenaba ike i hai ae nei ia kakou.

Figure 14. Helu 2274, Kapuaakuni, Native Testimony Volume 4:452-453

Hoohikiia o Barenaba, A olelo mai la: Ua ike au aia ma kahi i kapaia o Puaninako ma Waiakea, Hilo, Hawaii.

Mauka aina waiho wale, pela no ma Hamakua. Makai he Alanui, ma Puna aina waiho wale.

Ua paa ka hapa o keia aina i ka pa, elua ona hale. No Kaunuohua mai kona, he kaikuana ia no Kaluaokapela.

Hoohikiia o Kilioe, A olelo mai la: Ua ike au i keia aina e like me ko Barenaba ike i hai ae nei ia kakou.

[Translation]
Barenaba Sworn and Testified: I have seen, there at the place called Puainako at Waiakea, Hilo, Hawaii.

Towards the uplands is vacant land, also on the Hamakua side, is untended land, also on the Hamakua side. Towards the sea is the Alanui, and on the Puna side is vacant land.

Half of this land is enclosed with a wall; he has two houses there. His interest was from Kaunuohua, and he is the elder brother of Kaluaopela.

Kilioe Sworn and Testified: I know his land to be as Barenaba knows and stated before us.

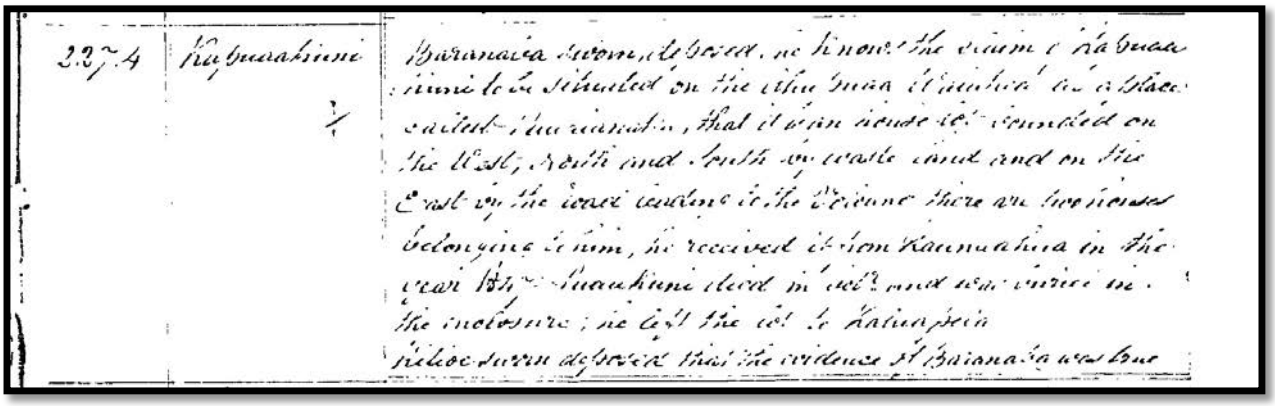


Figure 15. Helu 2274, Kapuaakuni, Foreign Testimony Volume 5:26

Barenaba sworn, deposed: he knows the claim of Kapuaakuni to be situated on the Ahupuaa of Waiakea at a place called Puuainako; that it is a house lot bounded on the West, North and South by waste land and on the East by the road leading to the Volcano. There are two houses belonging to him, he received it from Kaunuohua in the year 1847. Puaakuni died and was buried in the enclosure, he left the lot to Kaluapela. [ca. November 1848]

Kilioe sworn, deposed that the evidence of Barenaba was true.

Other than the references to the place called “Puuainako” (Pū-‘āina-kō), and the road to the Volcano, the location of land of Kapuaakuni and Kaluapela is not presently known.

3.4.3 Proceedings of the Boundary Commission (1873-1875): Documentation of Land Boundaries and Traditional-Customary Practices

In 1862, a Commission of Boundaries (the Boundary Commission) was established in the Kingdom of Hawaiʻi to legally set the boundaries of ahupuaʻa that had been awarded to Aliʻi, Konohiki, and foreigners during the Māhele. In 1874, the Commissioners of Boundaries were authorized to certify the boundaries for lands brought before them (W.D. Alexander in Thrum 1891:117-118). The primary informants for the boundary descriptions were old native residents of the areas being discussed (generally born between the 1780s to 1820s). The native witnesses usually spoke in Hawaiian, and their testimony was translated into English and transcribed as the proceedings occurred. Also, in the days leading up to the recordation of testimonies regarding the boundaries of Waiākea and Humuʻula, Hilo; and Keauhou, Kaʻū, we find that a difference of opinion had arisen among the witnesses. The commission proceedings standardized the boundaries of these lands, sometimes without following the former traditional boundaries.

Readers will note that there are significant inconsistencies in spelling of various words, including place names, people names, and features on the landscape. This is problematic, but with the help of maps produced as a part of the surveys to establish boundaries, and other period maps a number of the locations described can be identified. Because of its status as ʻĀina Lei Aliʻi (Crown Land), minimal action by the Boundary Commission was recorded for Waiākea Ahupuaʻa (Figure 5). As a result, Waiākea's boundaries were settled through the records of neighboring ahupuaʻa.

The narratives cited below, are verbatim transcripts from the testimonies given by native residents or landowners, and those given by surveyors who recorded the boundaries based on the testimony of native guides and their own field work. The testimonies include descriptions of Waiākea by association with various lands like ʻŌlaʻa, Keaʻau and Kukuau[16].

The testimonies are important as they document detailed knowledge of the landscape from the ocean front to the kula lands and the mountain zone. They document various traditional and customary practices across various elevational zones. The witnesses generally described the boundaries as they rose from the ocean or lowlands, running through the forest lands, to a point where they reached the slopes of Mauna Loa. ʻŌlaʻa and Waiākea are both cut off by larger lands of the Hilo (Humuʻula) and Kaʻū (Kapāpala-Keauhou) Districts. The primary boundary points given are Pōhakuloa, Kūlani, Kīpū, Māwae and Waiolama-Kalanakāmaʻa. They also describe a wide range of traditional practices including travel on native trails, land use in various elevational zones, collection of resources; the collection of, or "hunting" of birds, canoe making, and the subsequent historic practices associated with hunting

[16] ʻIili kupono of Waiākea, like the large land of Honohononui, given to Chiefess Victoria Kamamalu was handled through separate proceedings which may be located in Honohononui Ili, Waiakea Ahupuaa District of Hilo, Island of Hawaii Boundary Commission Volume A No. 1 pages 245-246

introduced ungulates—all under the control of Konohiki [17]. The testimonies also record those changes had occurred on the landscape during the lifetime of the witnesses. It is of importance to note that the boundaries were known by the native tenants, and the rights to take or hunt resources in traditional times were fiercely protected—individuals without chiefly, genealogical claims, or residency ties to given lands were not allowed to trespass and take resources from the ahupuaʻa. We have used underlining, square bracketing, bold and italic print to highlight place names and particular points of historical interest recorded in the testimonies.

[This section intentionally left blank.]

[17] In regards to hunting, it will be noted that descriptions of traditional hunting practices are limited to native species of birds, including the *uaʻu, nēnē, mamo* and *ʻōʻō*; while descriptions of historical hunting practices are limited to goats, which were hunted under contract of *Konohiki*, the Crown, or the Government.

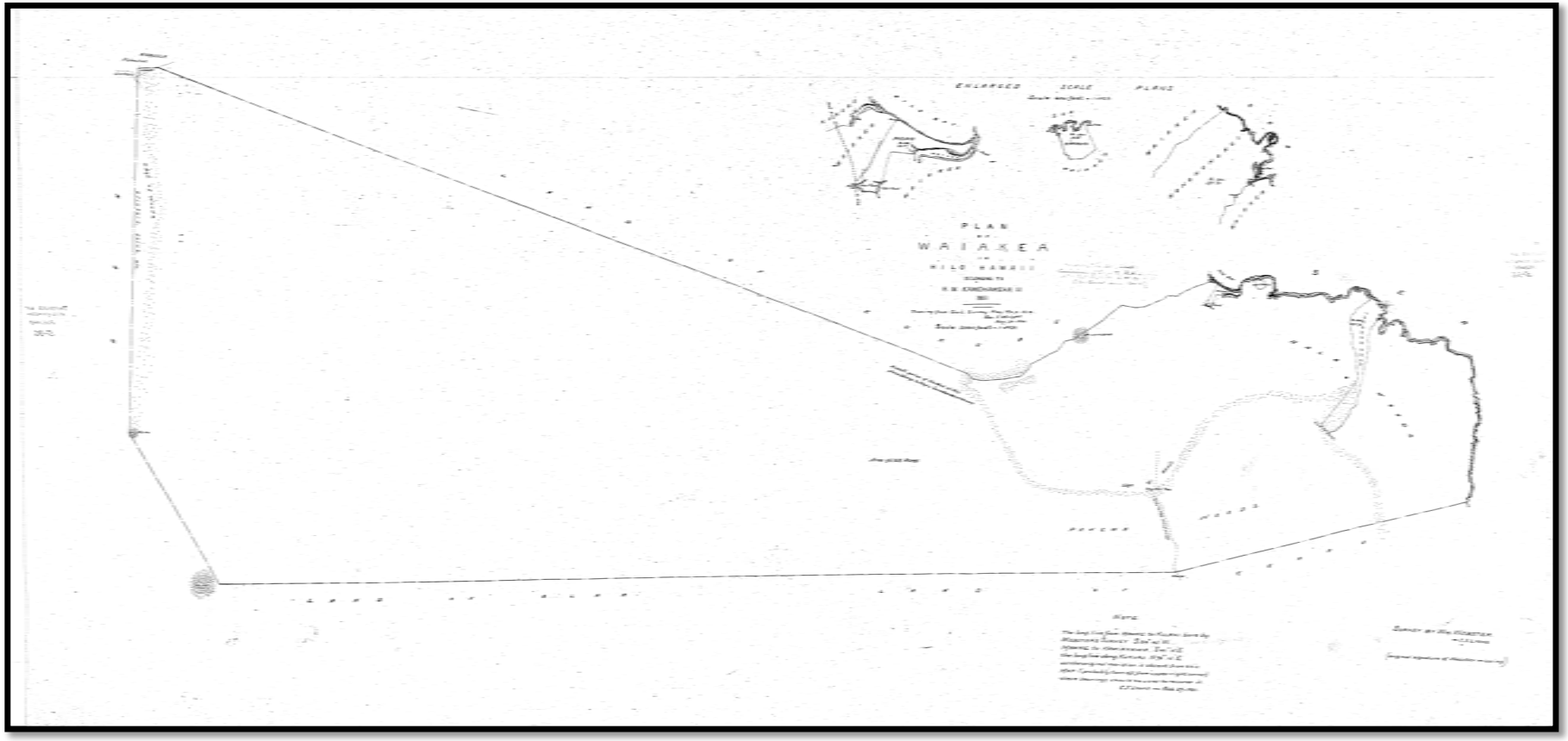


Figure 16. Plan of Waiākea Belong to H.M. Kamehameha III, 1851. Register Map No. 524, Survey by S.C. Wiltse, 1851 (Tracing 1901)

Waiakea, District of Hilo, Island of Hawaii
Boundary Commission Volume A No. 1 pages 238-240

Honolulu, July 7, 1873
R.A. Lyman, Esquire, Hilo

Honolulu, July 7, 1873

R.A. Lyman, Esq.
Hilo

Dear Sir
Mr. F.H. Harris is authorized by the Commissioners of Crown lands to make application to you as Commissioner of Boundaries to have the boundaries of all Crown lands on the Island of Hawaii defined. He has a list of the lands with him.

I have also authorized Mr. F.H. Harris to make application to you for the settlement of boundaries of all lands belonging to Est. of His late Majesty and Her Excellency, R. Keelikolani.

I expect to be in Kona by the trip of the "Kilauea" which leaves here on the 28th inst. Can't you make it convenient to come round as the steamer goes to Hilo on that trip.

I wish also to apply for the settlement of the boundaries of Honohina.

I remain,
Yours Respy.
Jno. O. Dominis

Honorable R.A. Lyman
Boundary Commissioner
for Island of Hawaii, Haw. Is.

The undersigned would herewith make application for the settlement of the boundaries of the following named Ahupuaas or Lands belonging to the Crown, viz.:

Waiakea in the District of Hilo bounded by Keaau, Olaa, Kapapala, Humuula, Piihonua... [page 238] ...Humuula in the District of Hilo bounded by Kapapala, various lands in Kona and Kohala and Hamakua, and Hakalau, Makahanaloa, Papaikou, Paukaa, Piihonua and Waiakea in the District of Hilo... [page 239]

...Olaa in the District of Puna, bounded by Keaau, Wm. C. Lunalilo, H. M. Waiakea & Kapapala...

Your Honor will therefore please appoint a day for hearing the evidence in the foregoing named lands and having decided upon the same to grant a certificate to that effect to the undersigned.

Hilo Hawaii, August 16th A.D. 1873

(Signed) Jno. O. Dominis
Crown Land Agent.
by F.H. Harris
Atty. at law. [page 240]

The metes and bounds of Waiakea were decided by testimonies and surveys of adjoining lands—ʻŌlaʻa and Keaʻau, Puna; Keauhou and Kapāpala, Kaʻū; and Humuʻula on the mountain lands of Hilo; thus, no further commission proceedings were conducted under the heading of Waiākea.

Keaau Ahupuaa
District of Puna, Island of Hawaii, 3d J.C.
Boundary Commission Testimony – Volume A. No. 1:191-198
June 4, 1873

Nailima K. Sworn: (same witness as for Olaa)
I was born at Olaa and know the boundaries between Olaa and Keaau. My kupuna, now dead, showed them to me. Keaau ends at Halemaomao at the junction of the Hilo and Puna Road. Olaa on the Hilo side of the road and Keaau on the Puna side. Thence makai to Pohakuloa, thence makai to Puuenaena (big ohia trees) thence to Kalaninauli, so called by Nahienaena... Have heard Waiakea joins Olaa and Keaau at Waiaele, Mawae is near there and have always heard that it is the boundary between Keaau and Waiakea. From the Government Road to Olaa, seashore Kawiakawaa is at sea shore... [page 196-197]

Naipo K. Sworn:
...Keliinohopuu, my father, Ku, his brother and Kapuli (all dead) showed me boundaries. They told me Kapohakau, a large rock on the point at shore is the boundary between Waiakea and Keaau; thence mauka along Waiakea to Kawiakawa a small cave where natives worshipped idols, the boundary runs up mauka in awaawa; Keaau on the Puna side and Waiakea on Hilo side to Mawae... The sea bounds Keaau on the makai side and the land had ancient fishing rights extending out to sea... [Volume A No. 1:197-198]

Testimony (December 16, 1873)

Kaikamahine K. Sworn.
I was born at Kau at the time of Niaukani [Kamehameha's return to Hawai'i from O'ahu in c. 1812]; moved to Hilo when a child and have resided here ever since; the boundaries of Kukuau [on the Waiākea side] were told me by old kamaaina... All these kamaaina are now dead. I have been a canoe builder.

Commencing at the Waiolama river which belongs to both lands [Waiākea and Kukuau 1st] the boundary runs to the head of the river at a place called Palaoa, on Kukuau 1st. Thence to Pohakunui at Kipi's place, the boundary between Kukuau 1st and Waiakea is in a swail (what I call kahawai) just outside of this place thence to Waipio, a water hole on Kukuau 1st. The land is very narrow there... [pages 160-161]

Kapu K. Sworn.
I know the boundaries between Waiakea and Kukuau 1st. I heard them from my parents Koi K. and Palau W. (both now dead), who were born on Waiakea...

Commencing at a pile of stones on the Puna side of the Waiolama river, thence to Hanalei fishpond on Waiakea, there is a stone wall between the fishpond and the river which is the boundary between the two lands. Thence to Kumu [a spring] on the bank of Waiolama river. Thence to Kalanakamaa where the government road to the volcano runs through the land. Thence to Huia on Kukuau, there is a small kahawai there belonging to Waiakea and the level land on the Hilo side belongs to Kukuau. Thence to Upeeloa ['Ūpēloa] where lauhala trees are growing. At this place there is a kahawai between the two lands that runs into Huia kahawai [Hū'ia stream], thence to an old planting ground called Lokoiki. All the men that I have seen planting at this place belong to Kukuau, therefore I say the land belongs to Kukuau... [pages 161-163]

D. Kaihenui, sworn: ...Maalo was Konohiki of Waiakea. <u>If Kukuau people went for fish makai of Kuauna, Waiakea people took them away</u>. Stones were put along the old Kuauna and it has been cut through for canal, and below the canal, stones are still there... [Volume D:342]

The Ahupuaa of Kukuau 1st (bounding Waiakea)
District of Hilo, Island of Hawaii
Boundary Commission, Hawaii Volume B:160-165

Kaikamahine K. Sworn.

I was born at Kau at the time of Niaukani [Kamehameha's return to Hawai'i from O'ahu in c. 1811]; moved to Hilo when a child and have resided here ever since; the boundaries of Kukuau were told me by old kamaaina. Kaainapau was one of them, he lived on the land, and was the cause of my coming here. All these kamaaina are now dead. I have been a canoe builder.

Commencing at the Waiolama river which belongs to both lands [Waiākea and Kukuau 1st] the boundary runs to the head of the river at a place called Palaoa, on Kukuau 1st, thence to Pohakunui at Kipi's place the boundary between Kukuau 1st and Waiakea is in a swail (what I call kahawai) just outside of this place thence to Waipio, a water hole on Kukuau 1st. The
land is very narrow there. Thence to Wainaku a pool of standing water where rushes are growing. The boundary line runs alongside of Waipio, thence to Kahawai, belonging to Kukuau, thence to Kalokoiki an old planting place, mostly belonging to Waiakea. Kukuau taking only a small part of it, thence to Kukuinui, a Kahawai with kukui [page 160] trees in and around it, the boundary running in the old road to Kaunuunumoa, thence to Kilohana an old resting place and hill on the road; thence still following the road to Kumuniu an old cocoanut tree; thence up the road to Naiheakealahou, where there is a well of water and a grave yard; thence to Huawai a bathing place belonging to Waiakea.

From this place all the pahoehoe belongs to Waiakea, thence to Kuaiaina the junction of two roads, one from Waiakea and one from Kukuau. Pahoehoe and the trees growing on it belong to Waiakea, and the ohia on the Hilo side belongs to Kukuau 1st. Thence to Kaaipopolo where the bush begins and where they used to catch birds, the forest all being on Kukuau 1st; thence the boundary runs to Kanekaulukaau an old planting place in the woods, belonging to Waiakea. Palaoa is the name of the adjoining planting place on Kukuau.

Thence to the Hilo side of Ohuliipe, a heiau belonging to Waiakea. This heiau is on a hill and from it you can see the sea. The boundary line is some distance from this hill, it follows up a ridge that runs mauka and makai and is the dividing line; it is where painiu [Astelia] grows. Thence from the ridge to Nehuiki where we used to get canoes eight fathoms long; very large koa grows there; thence to Kailio where koa and ohia grow together; thence to Kalaiholona; thence to Kailihololei, where the bird catchers used to catch oo; thence to Muanui, another bird catchers place. This is as far as I know the boundaries of
Kukuau 1st.

C.X.d.

Kapu K. Sworn.

I know the boundaries between Waiakea and Kukuau 1st. I heard them from my parents Koi K. and Palau W. (both now dead), who were born on Waiakea. I was also with Webster when he surveyed Waiakea. He surveyed the line between Kukuau and Waiakea, his kamaaina were Kukelekai [page 161] and Kahaoleopuni, both from Kukuau 1st. There was no Waiakea kamaaina present to show boundaries. I do not know as any one was hunted up from Waiakea.

Kukelekai is dead, Kahaoleopunui is at Hamakua and is blind. That was the first time that I ever saw the boundaries.

Commencing at a pile of stones on the Puna side of the Waiolama river, thence to Hanalei fishpond on Waiakea, there is a stone wall between the fishpond and the river which is the boundary between the two lands; thence to Kumu [a spring]; on the bank of Waiolama river, thence to Kalanakamaa where the Government Road to the volcano runs through the land.
Thence to Huia on Kukuau, there is a small kahawai there belonging to Waiakea and the level land on the Hilo side belongs to Kukuau. Thence to Upeeloa [‘Ūpēloa] where lauhala trees are growing. At this place there is a kahawai between the two lands that runs into Huia kahawai; thence to an old planting ground called Lokoiki. All the men that I have seen planting at this place belong to Kukuau, therefore I say the land belongs to Kukuau.

Thence to Kukuinui at the kahawai of Upeeloa (This last kahawai runs down and enters into the other kahawai of Upeeloa). The gulch is the dividing line; thence to Kapuahiakaahumanu, belonging to Waiakea, thence follow the ancient road to Kaunuunumoa, up to Kilohana, an old resting place; thence till up the old road, to Kumuniu, thence up the old road, to Kaunuunumoa, belonging to Waiakea; thence along old road to a place called Naiheakealahau, belonging to Waiakea; thence along to Kahueawai still following the old road. Thence to Kaaipopolo, thence to a large ohia marked W, at the edge of the forest. This is as far as I went with Webster, and this is all that I saw at that time. I have been told the following from the edge of the forest to the boundary runs to the Hilo side of Ohuliipe a heiau, the woods are not very thick there, and the [page 162] painiu grows on a ridge close to the boundary.

The boundary runs along the Hilo base of the ridge. I have always heard that from Ohuliipe the land of Kukuau only runs to the aa, opposite to Nahuina which is the junction of Kamana [Kaumana] and Piihonua roads. I have been to Nahuina and know the place it is in the old lava flow called Poohina; the flow of 1852 has flowed over it there.

Kukuau is cut off by Kaumana and Waiakea. The ohia at this place is scrubby, being on the aa, below it is tall.

C.X.d.

Boundary Commission adjourned. Case
continued to December the 17 instant.

R.A. Lyman
Commissioner of Boundaries, 3d J.C.

Boundary Commission opened and case
continued on the 17 of December A.D. 1873
according to adjournment from the 16 inst.

Kaaua K. Sworn
I was born at Waiakea uka at the time of Akakai Mokuakai [The battle of Mokuohai, 1782]. I know a part of the boundaries between Kukuau 1st and Waiakea. Kuakaahalawa and Keike, who were bird catchers and canoe makers and old settlers on the land, and who knew all the boundaries, told them to me.

Commencing at the seaside on the Puna bank of the Waiolama river, the boundary between Kukuau and Waiakea runs mauka to Kumu, a noted jumping off place [lele kawa] and boiling springs at the head of the Waiolama river; thence in a swail to Kalanakamaa, a place on the Government road to the Volcano. The swail is on Waiakea; thence in the swail mauka to the Puna side of Kipi's yard; thence to the water hole of Waipio, belonging to Kukuau 1st; thence to Wainaku, a water hole where rushes are growing, belonging to Kukuau 1st; thence to Kahana, on Kukuau 1st, where there is a lauhala grove, aa and pahoehoe [page 163].

The boundary runs near to a swail, but the swail is on Waiakea. The old road to Kaumuumumoa is near the boundary and on Kukuau 1st the boundary running between the road and the awaawa. Thence along this old road to Kalokoiki (I do not know as this place belongs to either land); thence along the old road to Kukuinui, where the kahawai runs on to Kukuau 1st and belongs entirely to that land, taking the name of Waiola gulch.

Kukuinui is a grove of Kukui trees in the gulch; thence along the old road to Kapuahiakaahumanu (called so from its being an old bird ground); thence to Kilohana; thence to Pilenui; thence to Kumuniu, there leaving the old road to Kaumuumumoa, the boundary runs up a branch road, that leads to Kahakauwila, and runs along said road to Mananui; one side of the road belonging to Waiakea and the other to Kukuau 1st.

Thence to Niaheakealahau where Waiakea takes all the road and Kukuau 1st is confined to the tall ohia; thence the boundary runs to the Hilo side of a bathing place called Kuawai;

this place is on Kukuau 1st; thence to Kahuakamoa (In olden times a noted place for cock fighting); thence the boundary runs along the line of the old road (now used for drawing down wood) to Kuaiaina, where the roads from Kukuau and Waiakea join. The pahoehoe and trees on it belong to Waiakea, and the forest on the Hilo side to Kukuau 1st. Thence to Kaaipopolo, a place where popolo now grows.

Note.
Witness states that Mr. Webster marked a tree, on the opposite side from Kaaipopolo, as the true boundary between the two lands, but as he objected to that boundary Mr. Webster changed the survey to Kaaipopolo.

There is a large tree with a blaze on it at this place; thence to Kahamouli; thence to Ohuliipii [Ohuliipee], a hill on Waiakea. I do not know of there being a heiau [page 164] there in olden times; thence to a place called Kanoa; thence to Nehuiki, an old canoe building place; thence to Kaileo, another canoe building spot where koa trees are growing. I have lived there; thence to Kalaiholona, a canoe building place; thence to Kailihelelei, a grove of koa trees; thence to Muanui, a great bird catching place; thence to Hoaa, the boundary is on a line with Hoaa, but the place itself is way inside of Waiakea. I have always been told that Kukuau ends at Piliiki. I do not know what other lands join above it.

Opuloa K. and Nahua (now dead) and Kaawa from Olaa were the kamaaina with Webster. Kahaoleopunui now living in Hamakua was a kamaaina of Kukuau 1st.

C.X.d... [page 165]

The Ahupuaa of Olaa
District of Puna, Island of Hawaii
Boundary Commission, Hawaii Volume B:305-306

The Ahupuaa of Olaa, District of Puna Island of Hawaii.

On this, the 8th day of October A.D. 1874, the Commission of Boundaries for the Island of Hawaii, 3d J.C. met at the Court house in Hilo, on the application of F.H. Harris, Attorney at Law for J.O. Dominis, Agent of Crown Lands for the settlement of the boundaries of Olaa, situated in the District of Puna, Island of Hawaii. Due notice of hearing personally served on all owners or agents of adjoining lands, as far as known. Present: L. Kaina for all parties concerned.

For Petition see Folios 238 and 240, Book A.

Testimony

Nailima K. Sworn.
I was born at Olaa at the time of the death of Kekuakalani [1819] and lived there until about a year ago when I moved to Hilo. I am a kamaaina of Olaa and know the boundaries of the land.

Kapuna, an old kamaaina of Olaa told them to me. Commencing at Pohakuloa the junction of the Hilo and Puna roads to Kilauea at the mauka corner of Olaa and Keaau on the boundary of Keauhou; thence the boundary of Olaa runs makai along the old road through the edge of the koa grove; thence makai still along the road through the woods to Keekee to Palauhulu, junction of the Panau and Hilo Road.

Thence along the road to Kanekoa following the road through houses; thence along the road to makai of where the old road to Puna used to run. This point is outside of Naia's houses, where you look makai. Thence makai to the junction of Keaau Road at the grove of ohia trees called Pahee. Thence following along the Hilo Road to makai of Makaulele to another junction of Keaau Road; thence mauka to Puhala trees on an ahua on the Puna side of an old kauhale called Kilohana, near some orange trees. Thence mauka to Puaaehu, a kauhale on the Hilo side. Thence mauka to Kanamanu, an old kauhale on the boundary covered with ohia trees. Thence to [page 305] Kaaipuaa; thence to Waiaele, a swamp in the woods; thence to Mawae junction of Olaa and Waiakea; thence along Waiakea to the upper end of land.

C.X.d.

Note.
L. Kaina declines to question the witness on the boundaries between Olaa and Waiakea as the Agent of Crown Lands accepts the boundaries as surveyed by W. Webster. He also accepts the boundary of Olaa and Keauhou as given in the Decision of Keauhou.

No more witnesses on hand...

R.A. Lyman
Commissioner of Boundaries, 3d J.C.

Notes of survey filed, and Certificate of Boundaries issued January 21st A.D. 1875

See No. 60 Folio 109 Liber I... [page 306[18]]

18 Continued in Volume C, No. 3:109-111 Certificate No. 60.

Kai Lawaiʻa (Fisheries)

Hawaiian history leaves no doubt that Hawaiians have always been a people of the ocean. Their knowledge as navigators (crossing wide open seas when their western counterparts were afraid to go beyond sight of the shore), sustainable fishers of deep sea and nearshore fisheries, as builders of fishponds, and their skill as surfers and swimmers is widely known and well documented. It is staggering today, to contemplate that in ancient times, nearly every member of the Hawaiian population regularly participated in some form of fishing—and population figures in the islands, range from some 400,000 to 1,000,000 people in 1778. Native lore and early historical accounts tell us that through those traditional generations, the fisheries were resilient and healthy. These accounts are a reflection of the relationship between people and nature, and the management system that evolved through ancient times. Today, only a very small percentage of the population of the Hawaiian Islands fishes, yet, as the methods of fishing and management systems have evolved away from the traditional system, the fisheries themselves have diminished at alarming rates.

One unique method of aquaculture practiced by ancient Hawaiians occurred in the ponds of Waiākea, where both fish and kalo flourished and provide food year-round for the residents. During the Māhele some native tenants of Waiākea claimed "kipi" planting areas in the fishpond. Handy, Handy and Pukui (1972) described the practice in the following narrative:

> In the marshes surrounding Waiakea Bay, east of Hilo, taro was planted in a unique way, known as kanu kipi. Long mounds were built on the marshy bottom with their surface two or three feet above water level. Upon the top and along the sides of these mounds taro was planted. Flood waters which occasionally submerged the entire mound are said to have done no harm, as the flow was imperceptible. This swampy land is now abandoned to rank grass. Kipi (mounds) were also formerly made along Alenaio Stream above Hilo...[19]

As Hawaiʻi was driven to Annexation in 1898, followed by becoming a Territory of the United States in 1900, the federal government sought to identify all resources of economic value in the island. Among these resources were the kai lawaiʻa (fisheries). In 1901, the "Preliminary Report On An Investigation Of The Fishes And Fisheries Of The Hawaiian Islands" prepared by David Starr Jordan and Barton Warren Evermann, included a section on fishponds and identified the notable ponds of Waiākea for which they could gather information. Under the heading of "Commercial Fisheries Of The Hawaiian Islands" "Fish Ponds," they discussed types of loko iʻa (fishponds) that had been developed and managed sustainably over the generations—

[19] Handy, Handy and Pukui 1972:538-539.

...The most interesting of the fishery resources of the islands are the fishponds. This is the only place within the limits of the United States where they are found on such an immense scale and put to such general and beneficent use. The time of the building of many of these ponds goes back into the age of fable, the Hawaiians, for instance, attributing the construction of one of the most ancient, the deep-water fish-pond wall at the Huleia River on Kauai, to the Menehunes... Many of the very old ponds are still in practical use and look as though they would last for centuries yet. As the ponds were originally owned by the kings and chiefs, it is very probable that most of them were built by the forced labor of the common people...

...The ponds are found principally in the bays indenting the shores of the islands, the common method of construction having been to build a wall of lava rocks the narrowest part of the entrance to a small bay or bight of land and use the enclosed space for the pond. They were also built on the seashore itself, the wall in this case being run out from two points on the shore, some distance apart, in the shape of a half-circle... A few were constructed somewhat interior and these are filled by the fresh-water streams from the mountains or by tidal water from the sea carried to them by means of ditches... ...In the sea ponds the walls are about 5 feet in width and are built somewhat loosely in order that the water can percolate freely. The interior ponds have dirt sides generally, although a few have rock walls covered with dirt, while others have rock walls backed with dirt. The sea ponds generally have sluice gates which can be raised or lowered, or else which open and close like a door. In the interior ponds there are usually two small bulkheads with a space about 8 feet square between them. Each of these has a small door which usually slides up or down. When the tide is coming in both doors are opened and the fish are allowed to go in freely. When the tide turns the doors are closed. When the owner wishes to remove any of the fish he generally opens the inner door when the tide is ebbing. The fish rush [page 427] into the narrow space between the bulkheads, from which they are dipped out by means of hand dip nets. In the sea ponds the gate is opened when the tide is coming in and when it turns it is closed.

There is usually a small runway, built of two parallel rows of loosely piled stones from the gate to about 10 feet into the pond. As the fish congregate in this runway when the tide is going out, it is very easy to dip out the supply needed for market. Seines and gill nets are also swept around the inside of the ponds at times in taking fish from them, and as they are quite shallow this is done easily.

<u>The sea ponds usually contain only the amaama, or mullet, and the awa. In the fresh and the brackish water ponds gold-fish, china-fish, oopu, opai [‘ōpae], carp, aholehole, and okuhekuhe are kept. Practically no attempt at fish-culture is made with these ponds.</u> Besides the fish which come in through the open gates, the owner usually has men engaged at certain seasons of the year in catching young amaama and awa in the open

sea and bays, and transporting them alive to the fishponds. They are kept in the ponds until they attain a marketable size, and longer frequently if the prices quoted in the market are not satisfactory. They cost almost nothing to keep as the fish find their own food in the sea ponds. It is supposed that they eat a fine moss which is quite common in the ponds… [page 428]

…Island of Hawaii:

In Hilo:	Acres
Nameless pond, in lower part of Kukuau	.5
Waiolama Pond, in lower part of Kukuau	.10
Nameless pond, in lower part of Kukuau, filled water hyacinth.	
Hoakimau, in Waiakea	1.9
Waiakea, in Waiakea	25.5
Mohouli, in Waiakea	4.5
Kalepolepo, in Waiakea	1.5
Waihole [Waiāhole], in Waiakea	.5
Kanakea, in Waiakea, sea pond	2
** Lokowaka, in Waiakea, sea pond, almost as large as Waiakea… [page 430]	

3.4.4 1823 to 1913: Glimpses into Historical Events – Notes Describing Community, Land Use, and Families

After western contact in 1778, visitors to the islands initially remained infrequent, until 1800. The visitors were usually sailors, looking for safe wintering harbors, resources to resupply, opportunities to acquire items that might bring them economic gain, and eventually control over island assets. In 1820, shortly after the death of Kamehameha I American Protestant missionaries arrived, and the political-religious scene in Hawai‘i was primed for their settlement, and efforts in colonizing and “civilizing” the native population. Their action accompanied an irrevocable decline of the Hawaiian race, and radical changes in all aspects of Hawaiian life, economics and land use. Historical events in Hilo Town have been extensively covered in various publications and manuscripts, as a result, the selected narratives below provide some early examples of the history, and then include a few notable events in, and neighboring Waiākea. The narratives are found in the form of the historical journals, articles, and archival documents, and are presented in chronological order—some with introductory texts, others as documentation recorded at the time.

3.4.4.1 1823: A Visit to Waiākea and the Region that Became Hilo Town

In 1823, British missionary William Ellis and members of the American Board of Commissioners for Foreign Missions (ABCFM) toured the island of Hawai‘i seeking out community centers in which to establish church centers for the growing Calvinist mission. The

writings of Ellis and his companions (Ellis 1825, ver. 1963) are one of the earliest such descriptions of the 1820s and provide us with a glimpse into the nature of communities, agricultural fields, and natural landscape around the island. In 1823, Ellis estimated that around 2,000 people lived in 400 houses or huts along Hilo Bay. The village was a complex of kauhale residential compounds and planted fields among groves of trees: notably, ʻulu (breadfruit) and niu (coconut). The kīhāpai and māla (planted fields) were of kalo (taro) ʻuala (sweet potato), and other small crops, bordered by maiʻa (banana), kō (sugarcane), and wauke (paper mulberry). Spread across the landscape at various places, were also found hala (pandanus), milo and hau (tree-forms of the hibiscus), kukui (candlenut trees) and ʻōhiʻa ʻai. Traveling out of Keaʻau, Puna towards Waiākea, Ellis and party passed through —

> ...about two miles through a wood of pretty large timber, came to open country in the vicinity of Waiakea. At one p.m. we reached the house of the chief Maaro... (1963:213) ...Dense fogs and heavy rains are more frequent at Waiakea, and over the whole division of Hiro, than in any other part of the island... (ibid:215).
>
> The houses of the natives who we had visited today, like most in this part of the island, where the pandanus is abundant, were covered with the leaves of this plant, which, though it requires more labour in thatching, makes the most durable dwellings. The inhabitants of Waiakea are peculiarly favoured in having woods producing timber, such as they use for building within three or four miles of their settlement, while the natives in most parts of the islands have to fetch it from much greater distance... (ibid.:224). ...The river of Wairuku was also distinguished by the markets or fairs held at stated periods on its banks. At those times the people of Puna and the desolate shores of Kau, even from the south point of the island, brought mats, and mamake [māmaki] tapa... (ibid.:229-230)
>
> ...There are three streams of fresh water, which empty themselves into the bay. One on the western angle is called Wairuku. It rises near the summit of Mouna-Kea, and, after taking a circuitous course for several miles, runs rapidly into the seas.
>
> Two others, called Wairama and Waiakea, rise in springs, boiling up through the hollows of the lava, at a short distance from the shore, fill several large fish-ponds, and afterwards empty themselves into the sea. Waiakea, on the eastern side of the bay is tolerably deep, and is navigated by canoes and boats some distance inland.
>
> The face of the country in the vicinity of Waiakea is the most beautiful we have yet seen, which is probably occasioned by the humidity of the atmosphere, the frequent rains that fall here, and the long repose which the district has experienced from volcanic eruptions.
>
> The light fertile soil is formed by decomposed lava, with a considerable portion of vegetable mould. The whole is covered with luxuriant vegetation, and the greater part of it

formed into plantations, where plantains, bananas, sugar-cane, taro, potatoes, and melons, grow to the greatest perfection.

Groves of Cocoa-nut and breadfruit trees are seen in every direction loaded with fruit, or clothed with umbrageous foliage. The houses are mostly larger and better built than those of many districts through which we had passed. We thought the people generally industrious; for in several of the less fertile parts of the district we saw small pieces of lava thrown into heaps, and potato vines growing very well in the midst of them, though we could scarcely perceive a particle of soil. [1963:239]

Ducks and Fish in the Ponds

There are plenty of ducks in the ponds and streams, at a short distance from the sea, and several large ponds or lakes literally swarm with fish, principally of the mullet kind. The fish in these ponds belong to the king and chiefs and are tabued to the common people.

Along the stone walls which partly encircle these ponds, we saw a number of small huts, where the persons reside who have the care of the fish and are obliged frequently to feed them with a small kind of mussel, which they procure in the sands round the bay.

The district of Waiakea, though it does not include more than half the bay, is yet extensive. Kukuwau in the middle of the bay is its western boundary, from which, passing along the eastern side, it extends ten or twelve miles towards Kaau [Kea‘au], the last district in the division of Puna.

Recommended as a Mission Station

Taking every circumstance into consideration, this appears a most eligible spot for a missionary station. The fertility of the soil, the abundance of fresh water, the convenience of the harbour, the dense population, and the favourable reception we have met with, all combine to give it a stronger claim to immediate attention than any other place we have yet seen, except Kairua.

There are 400 houses in the bay, and probably not less than 2000 inhabitants, who would be immediately in the operations of a missionary station here, besides the populous places to the north and south, that might by occasionally visited by itinerant preachers from Waiakea… (1963:240).

By 1825, representatives of the American Board of Christion Foreign Missions (ABCFM) were at work establishing a church and school in what would become Hilo Town. The facilities, situated on lower lands of Pōnahawai and Punahoa, were being attended by growing numbers

of native students. This complex evolved into the Hilo Boarding School, which operated for nearly 100 years. This was a period of dramatic change in the Hawaiian Kingdom as well. Liholiho (Kamehameha II) and his wife Kamāmalu died while in England in 1824. Their bodies were returned to Hawaiʻi in May 1825 by Lord Byron (Kamakau 1961:257). While preparing for the return voyage to England, Lord Byron had the H.M.S. Blonde port in Hilo Bay for refitting. Several journals were recorded pertaining to this visit. One, by the American missionary, C.S. Stewart (1970), who accompanied Byron in Hawaiʻi, provides additional details on the nature of the land—dwellings, plantations, and population—shoreward and mauka of Waiākea. Upon departing from the ship, Stewart reports:

> Mission House, Hido, Monday, June 13. Yesterday morning, at the break of day, we were farther from the harbour of Waiakea than we had the evening before expected to be… [Stewart 1970:360] …As we approached the land after church, we were greatly delighted with the verdure, luxuriance, and beauty of the landscape opening to us, in the neighbourhood of the bay of Hido. The shore had lost in a great measure the abrupt and precipitous character of the coast along which we had been sailing on Saturday, and was only edged by a low cliff, richly mantled with shrubbery and creeping plants, and ornamented with several beautiful cascades. These in connection with the breakers which ran high upon the rocks, often dashing their spray many feet in the air, gave the cliff an uncommonly picturesque appearance. The land rose gradually from the cliff to the distance of ten or fifteen miles, to a heavy wood encircling the base of Mounakea.
>
> Though in a state of nature, this large district had the appearance of cultivation, being an open country covered with grass, and beautifully studded and sprinkled with clumps, and groves, and single trees, in the manner of park scenery, with a cottage here and there peeping from beneath their rich foliage. The mountains were entirely covered with clouds, or the prospect would have been rendered more delightful from their sublimity. Such was the scene on our right, as [Stewart 1970:361] we sailed close along the breakers to the narrow channel forming the entrance to the harbour, the gentlemen of the Blonde exclaiming "This is more like English scenery than anything we have yet seen!" and we equally ready to say, "This looks something like America, it has some of the features of a civilized land…!"
>
> …The beach is covered with varied vegetation and ornamented by clumps and single trees of lofty cocoa-nut, among which the habitations of the natives are seen, not in a village, but scattered everywhere among the plantations, like farm-houses in a thickly inhabited country. The Mission Houses were pointed out to us, pleasantly situated near the water, about the middle of the curvature forming the head of the bay.
>
> At a very short distance from the beach, the bread-fruit trees were seen in heavy groves, in every direction, intersected with the pandanus and tutui, or candle-tree, the hibiscus

and the acacia, &c. The tops [Stewart 1970:362] of these rising gradually one above another, as the country gently ascended towards the mountains in the interior, presented for twenty or thirty miles in the south-east, a delightful forest scene, totally different in extent from any thing I had before witnessed on the Islands… …After rowing half a mile, we entered a beautiful fresh-water creek [Waiolama], which winds its way close to the Missionary enclosure, and in a few minutes were welcomed to the cottage of Mr. Ruggles, where Mrs. Goodrich had resided during her husband's absence…

Tuesday, 14. …This afternoon I joined Lord Byron and party in a [Stewart 1970:364] visit to a large fish-pond [Waiākea and Wailoa], of which the creek or river is the outlet. It is a pretty sheet of water in its natural state, excepting strong stone dams, to prevent the escape of the fish. These are tabu to all but high chiefs; and no one of rank having lived here lately, the whole pond is literally alive with the finest of mullet; the surface of the water is almost in a constant ripple from their motions; and hundreds can be taken at any time by a single cast of a small net. Expressing our astonishment at the sight, Sir Joseph Banks*, who, from understanding and speaking some English, has been appointed by her majesty interpreter, caterer, gentleman in waiting, &c. to Lord Byron, very seriously says, "O dis noting, sir—noting—I see him before now;—he so full fish, I see one man, he fall backwards in him, he no sink at all!"

After satisfying our curiosity here, we rowed down the creek and across the bay, to another stream on the western side of the harbour, called Wairuku—river of destruction—where the ships get their water… [Stewart 1970:365] The inhabitants of Hido are in a state of much greater simplicity than those in many other parts of the Islands, owing to the infrequency of the visits of ships, and a less degree of the corrupting influence of foreign example in vice… We passed near the chapel on our return. It stands almost midway between the Mission House and the watering place, close to the beach, and although small, is well built, and neatly thatched. The thatching of the houses in general, here, is altogether more neat and beautiful than at the leeward islands. It is made from the leaves of the pandanus, and so put on as to conceal [Stewart 1970:366] all the rudeness of the timber and sticks on the inside; while on the outside, a deep edging of fern, along the peak and ends of the roof, and down the corners of the house; having something of the effect of the cornice and pilaster, give a finished and ornamental appearance, not seen in the common grass huts. The ease with which stout timber can be procured here, enables them also to build their dwellings much larger than at Lahaina and Oahu, where the wood most accessible is small and crooked… [Stewart 1970:367]

One additional brief comment from Stewart is offered here, in his description of passing through Waiākea on Lord Byron's journey to Kīlauea. We find that Ma'alo, the district chief

* A native so called.

mentioned by Ellis above is still alive and has been charged by Ka‘ahumanu with providing for the needs of Byron’s party (Stewart 1970:368). Stewart reports that the group marched in “single file along the narrow winding path which formed our only road,” out of Waiākea (Stewart 1970:369). Today, Kīlauea Avenue follows the same basic path as that of the main ancient trail out of Hilo to Puna and on up to the volcano at Kīlauea. Stewart noted:

> For the first four miles the country was open and uneven, and beautifully sprinkled with clumps, groves, and single trees of the bread-fruit, pandanus, and candle tree (Stewart 1970:369).

Another visitor in that year was Robert Dampier, a member of Byron’s crew. He too penned his observations of Hilo and environs, and again noted the important resource of the fishponds, and verdure of the land (Dampier 1971). The fishponds, villages and planting fields between Waiākea and Wailuku River, up to Hāla‘i were depicted on a map during the visit, by C.R. Malden (1825). A portion of that map is reproduced below as Figure 17. Dampier wrote:

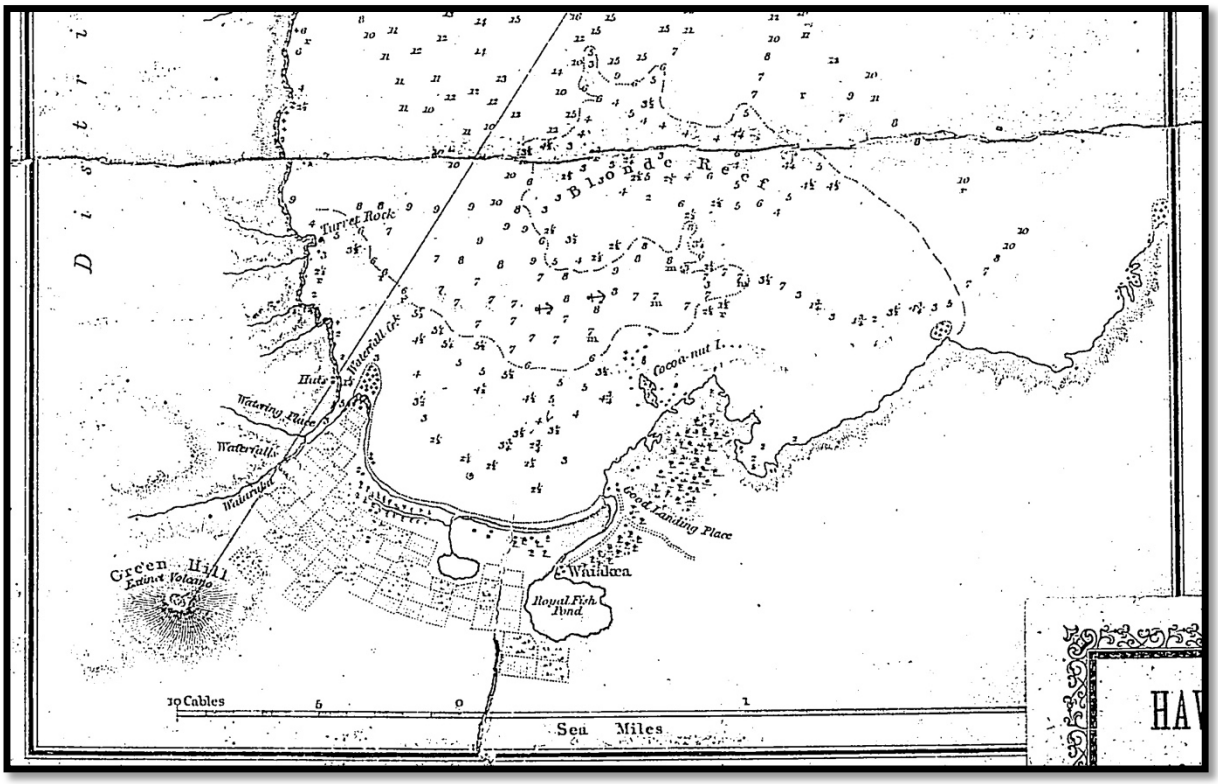


Figure 17. Portion of “Waiakea or Byron Bay” from original by Lt. C.R. Malden, 1825 Depicting Settlment and Land Use Across Waiākea, Kukuau, Ponahawai, Punahoa and Pi‘ihonua (Register Map No. 524)

...Hido (sic) may most appropriately be termed the Valparaiso of the Sandwich Islands. The view from the ship, a panoramic drawing of which I have taken, is peculiarly striking. On all sides the most lively verdure prevails, luxuriant breadfruit trees flourish to the water's edge; these are thickly intermingled with towering cocoanut trees; amongst these are scattered the neat looking huts of the natives. In the distance the gigantic forms of Mowna Kaah (sic), and Mowna Roa (sic), rear their towering crests to the clouds; the summits of the former are continually veiled in snow, and the eye, wandering from the sunny landscape below, enjoys a fine contrast when resting on the bleak and snow capt peaks of the neighbouring mountains.

At five on the following morning, I rose to go on shore. A sunrise at this place, is the most beautiful thing in nature I ever beheld: the tops of Mowna Kaah (sic), Mowna Roa (sic), become a complete mass of the liveliest crimson, their tints rendered more vivid & brilliant by the cold grey morning mists in which the woods and country at their base are thickly enveloped. I hastened on shore and was much gratified with my morning's excursion and amusement. We landed at the mouth of a beautiful freshwater stream, which empties itself into the sea, and along whose meandering banks, shaded by cocoanut and breadfruit trees, we pursued our walk until we came to a large reservoir, which had been formed for the purpose of rearing and keeping fish. As we went further into the country, we saw several of these ponds, which we afterwards understood belonged to Kahumanu [Kaahumanu], who indeed possesses a vast extent of land at Hido (sic).

All these lakes are most plenteously stocked with very fine fish, resembling mullet, which, taken from the neighbouring streams, are (Dampier 1971:53) fed and fattened here, and flourish so abundantly, that a native assured me, (I am not prepared to back his veracity by ocular demonstration) that he once tumbled into one of these ponds, and was literally buoyed up by the immense quantity of fish immediately beneath him. Still no Kanaka is allowed to touch them, indeed before our arrival, the two missionaries who are stationed here, could scarcely ever procure any. For us however, to whom in point of furnishing provisions, they have been at all times abundantly liberal, orders were immediately issued to draw the ponds, and during our stay here we had a constant supply of these excellent fish, daily furnished for our tables.

Owing to the woods being uncommonly thick, together with the rugged stratas (sic) of Lava, which everywhere abound in this neighbourhood, we were unable to extend our walk very far; we were however altogether amazingly pleased with the appearance of the country, and congratulated ourselves in having so snug a place to refit the ship in. Her rigging underwent in a very short time a thorough overhauling. In the meantime, Lord Byron having expressed a wish to Kahumanu that he should like to live on shore, she accordingly

assigned to him a large and commodious habitation which had just been built for one of the chiefs.

This house was most agreeably situated on the banks of the stream, I before mentioned: the floor which was strew'd with small pebbles was carefully covered with mats. It had two doors and several windows and when stocked with a few chairs and a table, presented to us a very original and comfortable dwelling place.

I was again kindly invited to live with his Lordship, as well as the surgeon, naturalist & chaplain. We all brought our cots on shore and suspended them from the corners of the house; in this as in all their dwellings there was no partition. His Lordship had therefore apart skreened (sic) off with Tapa for his bedroom.

Everything being thus arranged, we entirely deserted the ship and I do not know when I have spent my time so delightfully, as during the three weeks we sojourned at this place.

Kahumanu ordered several houses to be erected for herself and suite, immediately in the neighbourhood of our own. Her commands were most promptly executed and in the course of four and twenty hours three or four huts reared their pigmy heads. These notwithstanding the dispatch were well and firmly built. They were roofed and lined with banana and the broad thick leaf of the tea [ti] plant, and thus rendered completely impenetrable from rain for at least two months. After that time the leaves become devoured by insects which breed in them, and the hut then requires a new covering. Our habitation was roofed and lined with the leaf of the Pandanus tree, which will last, and completely defy the inclemency of the weather, for six or seven years… …All our supplies at this place, which consisted of fish, Poultry, yams, Pigs, Taro, plantains, etc., were furnished gratis, and without any difficulty whatever. Our indefatigable purveyor, backed with the all-powerful name of Kahumanu, provided for our wants at a moment's notice.

I amused myself during the time I remained here, in making as [Dampier 1971:54] many sketches as I possibly could: altho the scenery was beautiful, still it possessed little variety, and owing to the very difficult walking, sharp lava rocks springing up in all directions, it was tedious and fatiguing to advance into the country, added to which Hido (sic) is a notorious place for rain, which sometimes proved uncomfortable and inconvenient… (Dampier 1971:54)

1828-1829
Excerpts from a "Journal at Byron's Bay"
Joseph Goodrich; to Jeremiah Evarts

[Joseph Goodrich was stationed at Hilo as a member of the A.B.C.F.M. Sandwich Islands Mission Station. The excerpts from his journal include observations on the populations in the Waiākea Bay region, , early work in planting and processing of sugar cane molasses, and the uplands slopes behind the bay, and reports that upland agricultural fields extended several miles inland of the bay]:

...Dec. 22, 1828
We had the pleasure of witnessing the arrival of Kekauonohe [Kekauonohi], & her husband. They have taken a bold & divided stand on the side of virtue & religion. Their principle (sic) reason for coming here at this time is to cheer our hearts & strengthen our hand in propagating the gospel of peace among their people. A few days after their arrival they sent out word for all the people of Hilo to come together & hear what they had to say, on the day 3000 or 5000 assembled together to receive their instructions. [page 4] The meeting was opened by prayer. Kealiiahonui then made a spirited address to them...

January 9, 1829.
Finished making a year's supply of sugar & molasses, & probably more than I shall need for my own family; the mill being one of my own construction, consisting of 3 upright wooden cylinders about 14 inches in diameter; made I suppose similar to sugar mills in general; mine however is turned by hand. [page 5]

I generally used to grind out about 80 or 90 gallons in about 2 hours & a half or 3 hours & boil it the same day, making about 10 or 12 gallons of syrup some days it would nearly all grind to sugar, & others there would be but very little sugar. The difference I was unable to explain. The luxuriance of the cane here exceeding anything that I have read or heard of, as produce in other places where cane is cultivated. I had the curiosity to measure one of the largest of the canes, the length when broke off at the top fit for grinding was 12 feet; length of the joints 8 inches; diameter 3 inches; circumference 8 ½ inches; juice expressed measured in a pint measured a little exceeded 7 pints. I have counted 22 canes sprung from one cutting they would average 1 ½ inch in diameter, and 7 feet long. The natives take but very little pains in the cultivation of the cane, the land in many places is full of it, but it does not come to perfection, however, with very little attention to cultivation it yields a great abundance. Since writing the above I have taken 39 canes that had sprung from one cutting another of 37, another of 36, 39, 29 &c., all growing in a row; it was planted about 14 months since the former of 39 I ground by itself & it measured 14 galls 1 qt. & 1 & gill of juice the production of a simple cutting in the cane ill or cutting there remained 22 ratoons or suckers that will come in to maturity a year hence...

...May 12th, 1829
By the request of the Gov together with a desire to ascend the mountain directly from the bay at this place... ...Set out about day light to ascend to the higher regions, course about

west, the distance from the shore to the woody region is about 5 miles the region that is principally used for the cultivation of talo, potatoes, sugar canes, bananas &c. About 3 miles in the woods is one of the highest cataracts in this part of the island. I judge it to be 100 & 90 or 50 feet high in the heavy rains an immense body of water rushes down with tremendous violence at other times the stream of water is quite small, a little farther up the whole bed of the river underground for about 40 or 50 rods about midway of which is a dark & dismal hole 30 or 40 feet to the water called by the natives Puka o Maui the door, hole or entrance of Maui one of their former gods, the oven of this deity according to the natives is about a mile from the south west shore of the bay it is an old crater 60 or 70 feet deep & about 1/3 of mile in circumference, I now occupy it as pasture for my cows there are 3 craters that are directly back of me another in a right line the lower one is the oven, here he used to cook his food as the natives say. The road or path more properly lay along the river Wailuku, sometimes it led into the woods, then to the margin again into the woods & back…

	Males	Females	Total
Hilo	1522	1672	3194
Olaa	64	52	116
Puna	827	827	1654
	2413	2551	4964…

(A.B.C.F.M. Collection, Houghton Library, Harvard)

`The June 8th 1836 issue of the newspaper, Kumu Hawaii provided statistics on the adult-student population of the Hilo District. Four school in Waiākea were identified, with a student count of 87 student—

Piopio [Waiākea]	27
Ohele [Wailoa vicinity]	42
Keokea [Keaukaha]	6
Lokouaka [Keaukaha-Leleiwi]	12

1837: Hilo Tidal Wave

Missionary Titus Coan arrived in Hawai‘i in 1835 and became the head of the Hilo Mission. His rule was firm-fisted and relentless. Two years into his residency, a significant natural event in the form of a tidal wave (tsunami), washed through the Waiākea villages, destroying homes, agricultural fields and fishponds, and killing at least 62 people. Describing the event, Coan wrote that around 7:00 p.m. on November 7th, 1837—

God visited the people in judgment as well as in mercy. On the 7th of November, 1837, at the hour of evening prayers, we were startled by a heavy thud, and a sudden jar of the

earth. The sound was like the fall of some vast body upon the beach, and in a few seconds a noise of mingled voices rising for a mile along the shore thrilled us like the wail of doom. Instantly this was followed by a like wail from all the native houses around us. I immediately ran down to the sea, where a scene of wild ruin was spread out before me. The sea, moved by an unseen hand, had all on a sudden risen in a gigantic wave, and this wave, rushing in with the speed of a race-horse, had fallen upon the shore, sweeping everything not more than fifteen or twenty feet above high-water mark into indiscriminate ruin. Houses, furniture, calabashes, fuel, timber, canoes, food, clothing, everything floated wild upon the flood. The water rushed up valleys, carried away fishponds, and swept over many low plantations of food. About two hundred people, from the old man and woman of threescore years and ten, to the new-born infant, stripped of their earthly all, were struggling in the tumultuous waves. So sudden and unexpected was the catastrophe, that the people along the shore were literally "eating and drinking," and they "knew not, until the flood came and swept them all away." The harbor was full of strugglers calling for help, while frantic parents and children, wives and husbands ran to and fro along the beach, calling for their lost ones. As wave after wave came in and retired, the strugglers were brought near the shore, where the more vigorous landed with desperate efforts and the weaker and exhausted were carried back upon the retreating wave, some to sink and rise no more till the noise of judgment wakes them. Twelve individuals were picked up while drifting out of the bay by the boats of the Admiral Cockburn, an English whaler then in port. For a time the captain of the ship feared the loss of his vessel, but as the oscillating waves grew weaker and weaker, he lowered all his boats and went in search of those who were floating off upon the current. Had this catastrophe occurred at midnight when all were asleep, hundreds of lives would undoubtedly have been lost. Through the great mercy of God, only thirteen were drowned.

This event, falling as it did like a bolt of thunder from a clear sky, greatly impressed the people. It was as the voice of God speaking to them out of heaven, "Be ye also ready."

Day after day we buried the dead, as they were found washed up upon the beach, or thrown upon the rocky shores far from the harbor. We fed, comforted, and clothed the living, and God brought light out of darkness, joy out of grief, and life out of death. Our meetings were more and more crowded, and hopeful converts were multiplied...(see Missionary Herald, December 1838:477, and http://www.soest.hawaii.edu/GG/HCV/COAN/IV.html)

Waiākea Described in 1841

In 1841, members of the United States Exploring Expedition, under the command of Charles Wilkes, accompanied by a party of native Hawaiians and foreign residents (numbering nearly three hundred individuals) traveled to Waiākea, or Byron Bay, and from there, visited Kīlauea,

Mauna Kea and Mauna Loa. Excerpts from Wilkes' report (1845) include the following description of Waiākea and the emerging Hilo Town—

> [Arriving at Hilo Bay]
> ...The scene which the island presents as viewed from the anchorage in Hilo Bay, is both novel and splendid; the shores are studded with extensive groves of cocoa-nut and bread-fruit trees, interspersed with plantations of sugar-cane; through these, numerous streams are seen hurrying to the ocean; to this succeeds a belt of some miles in width, free from woods, but clothed in verdure ; beyond is a wider belt of forest, whose trees, as they rise higher and higher from the sea, change their characters from the vegetation of the tropics to that of polar regions; and above all tower the snow-capped summits of the mountains.
>
> From this point of view, Mauna Kea, distant about thirty-five miles, has the appearance of being by much the highest mountain on the island; while Mauna Loa, distant sixty miles, and rounded at its summit to the shape of a regular dome, requires an effort of reason to satisfy the observer that it really has as great an elevation. A conviction that this is the case may be reached by tracing with the eye the edge of the forest that encircles both mountains, and noting how large a portion of the dome of Mauna Loa rises above the woody region... [Wilkes, 1845:114]
>
> ... Hilo is a straggling of the village, and is rendered almost invisible by the luxuriant growth of the sugar cane, which the natives plant around their houses. A good road has been made through it for the extent of a mile, at one end of which the mission establishment is situated. This consists of several houses, most of which are of modern style, covered with zinc and shingles. One of them, however, the residence of the Rev. Mr. Coan, was very differently built, and derived importance in our eyes, from its recalling the associations of home. It was an old-fashioned, prim, red Yankee house, with white sills and casements, and double rows of small windows... ...The whole settlement forms a pretty cluster; the paths and roadsides are planted with pine-apples; the soil is deep and fertile, and through an excess of moisture, yields a rank vegetation... [Wilkes, 1845:115]

In 1848, the report to the Minister of Public Instruction reported that Barenaba was the teacher, and 79 students were in attendance (Hawaii State Archives, 1848 Public Instruction).

> **July 2, 1857:1**
> **Pacific Commercial Advertiser**
> **Sketches of Life in the Hawaiian Island – No. 3. Hilo, Hawaii**
> **(From Jarves' Scenes and Scenery.)**
>
> ...The population of the district of Hilo is nearly eight thousand. Stores have been established at the village, much to the benefit of the natives, in affording them a market

> for their produce, and foreign goods in return. A spirit of enterprise has been developing, which, no doubt, will soon make this place the garden of Hawaii; but it is here as elsewhere, through the influence of foreigners, that a better day appears to be dawning upon these islands. Seven miles inland there is a saw-mill[20], which, when water is abundant, can saw from six to eight hundred feet of boards [primarily koa] per day. Two sugar mills, by water power, capable of grinding from four hundred to six hundred pounds each, per day, have been erected…

Jarves continues his short narrative, and like so many of his counterparts describing the native population and their condition in derogatory comments. His notes on the demise of the population fail to acknowledge the rapid decline since establishment of the mission station thirty-four years earlier. We repeat his statement as they do describe the remains of the physical landscape of former native residency—

> From the traces of cultivation, the numerous stone pavements, and terraces partially overgrown with vines and trees, and the care bestowed in the erection of their habitations, now old and out of repair, this evidently was once a populous and flourishing district The wars of Kamehameha drained it of its able-bodied men, and a series of oppressive governors have consummated its desolation…

Nowemapa 16, 1878 (aoao 4)
Nupepa Kuokoa
Na Hiohiona o Hilo.

E ka Nupepa Kuokoa e; Aloha oe:— E oluolu mai oe i ka'u wahi ukana e hoouka iho maluna o kou kino lahilahi; i ike mai hoi ka poe i ike ole i keia aina. Ua Kaulana; mai ka la oili i ka ili kai a ka la komo i Lehua.

No Ke Taona o Hilo.
Aia keia taona, ke waiho nei ma ka Hema o Hilo, a mamua pono o kona alo ke Kai o Paikaka, a me ka lae o Leleiwi; ke huli pono aku oe i ka Hikina, e ike oe i ka Ohia o Panaewa, a hala loa ae ma ka Hema, huli ae hoi ma ke Komohana; ike i na puu o Halai; i na makemake oe e hele ma Puna, e ike ia no ka Muliwai o Wailoa, a me ke Onewali o Ohele.
A ina oe e makemake e pii i Kalua o Pele ; alaila, e ike ana oe ia Olaa kia manu…

James Holls.
Papaikou, Oct. 10, A. D. 1878

---

20 Situated at Pi‘ihonua uka; and operated by the Hitchcock brothers.

[Translation]
Hail to the Independent Newspaper; Aloha to you: -- Please accept the little items and place it upon your columns, that the of various places might know about this land. It is famous, from where the sun spreads across the ocean's surface to where it sets at Lehua.

About the Town of Hilo [Places of Waiākea].
This town is set there at southern Hilo, with its features open to the Ocean of Paikaka, and the point of Leleiwi, when you turn to the East. Then you will see the ʻŌhiʻa trees of Panaewa, passing far to the South. Then turn to the Wests, the hills of Halai are to be seen. Should you desire to go to Puna, you will see the estuary of Wailoa, and the fine sands of Ohele.

And if you desire to ascend to Kalua o Pele (The volcano), you shall then see Olaa of the bird catchers... James Holls... [Maly, translator]

Visitor's Guide of 1880

In 1880, the major statistical and tourists' guide compiled by Geo. Bowser provides a reference indicating that by that time, some tourists were venturing out to Keōkea Point and across Keaukaha to Leleiwi. He also provided an interesting account about Mokuola (historically known as "Cocoanut Island."

1880
The Hawaiian Kingdom Statistical and
Commercial Directory and Tourist's Guide

There are several short excursions which the tourist may make from Hilo before attempting the longer journey to the volcano or an expe [page 530] dition through the country. One of the pleasantest is to Cocoanut Island, which is quite close to the sore of the bay on its south side, a mile or a mile and a half from the town. As the place for a picnic nothing van be more enjoyable than this island. The natives have a tradition about this place, which is, I expect, founded on some mythical story, although I was unable to ascertain its origin. There is a large rock here which the natives call Mokuola. They believe that if anyone be ill (or as the Americans say, sick), no matter what the ailment he is suffering from, if he swim out around the rock Mokuola and back again, he will get better. Not a week passes but someone comes to this new pool of Siloam to be healed; but what the result are, I am not prepared to say. In my own opinion, anyone who is robust enough to undertake the swim, even in these tropical waters, has no ailment which a good sea-bath and the strength of his own constitution will not throw off very quickly.

> Further on than Cocoanut Island, still on the south side of the bay, is Keokea Point. The ride to this point can be made in about half an hour, and no one visiting Hilo should omit to visit it. Here you get a panoramic view of the town of Hilo and its surroundings… To vary the scene the visitor has only to go a couple of miles further to Leleiwi Point, from which he will see everything under a new aspect, and get at the same time a view of the southeast coast of the island [page 531]

Mauna Loa of 1880-1881 Endangers Hilo

One of the significant aspects of history around Hilo Town focuses on the eruptive events of Mauna Loa. In 1855-1856, an eruption occurred, and came within six miles of Hilo Bay. In 1880, Mauna Loa erupted and the flows steadily moved in the direction of Hilo Bay. By the time the 1881 eruption ended, the head of the flow was little more than one-half above the Waiākea fishponds and one mile above the Hilo Court House. It had crossed the lands of Kaūmana, Ponahawai, and Kūkūau, covering an area that extends below the present-day Komohana Street, in the vicinity of Mohouli Street (Figure 7).

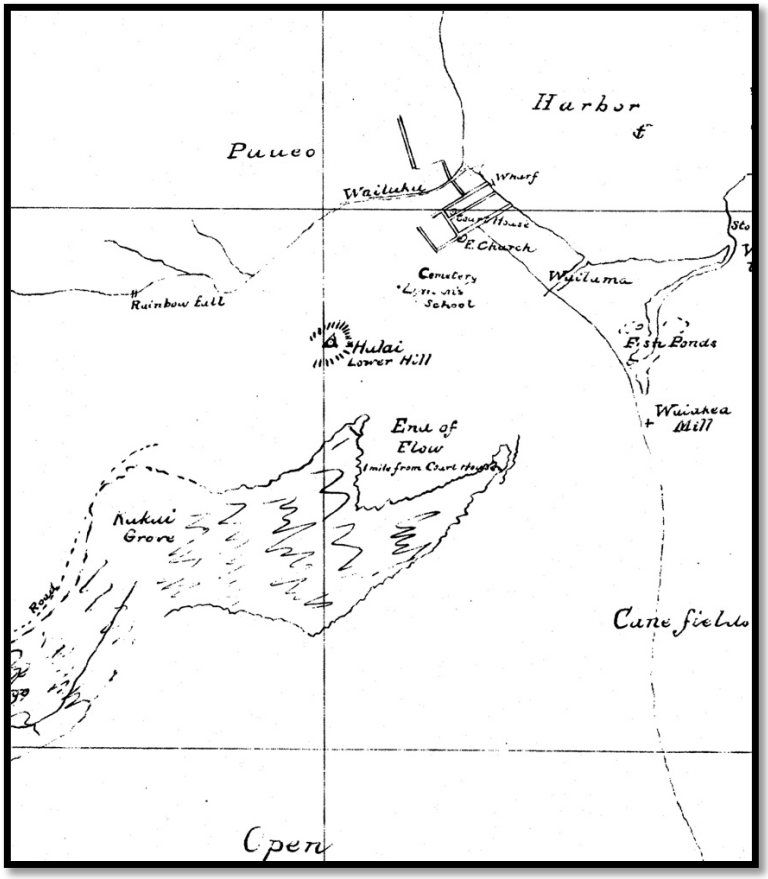


Figure 18. Portion of Register Map No. 892; C.J. Lyons, 1882. Sketch showing Lava Flow of 1881. Points fixed by previous survey flow, by information from F.S. Lyman, C. Furneaux, and others.

In 1942, and again in 1984, lava flows from Mauna Loa, moved to within four miles of Hilo Town. At the time of this writing, the latest eruption took place between March 25th to April 1st, 1984, following similar routes, causing Hilo residents to again be on watch.

The 1880-81 eruption received much attention in the local papers and drew both traditional Hawaiian religious beliefs and Christianity into the same field. By August 1881, the flow had descended into Kūkūau and came very close to the land area that now makes up UH complex (Figure 19). Below, are examples of articles published in both Hawaiian and English newspapers, which describe the flow and responses to its progress. Of particular interest will be discussions on native land use in the uplands, the visit by Chiefess Keelikolani and her appeal to Pele, asking that she spare Hilo Town.

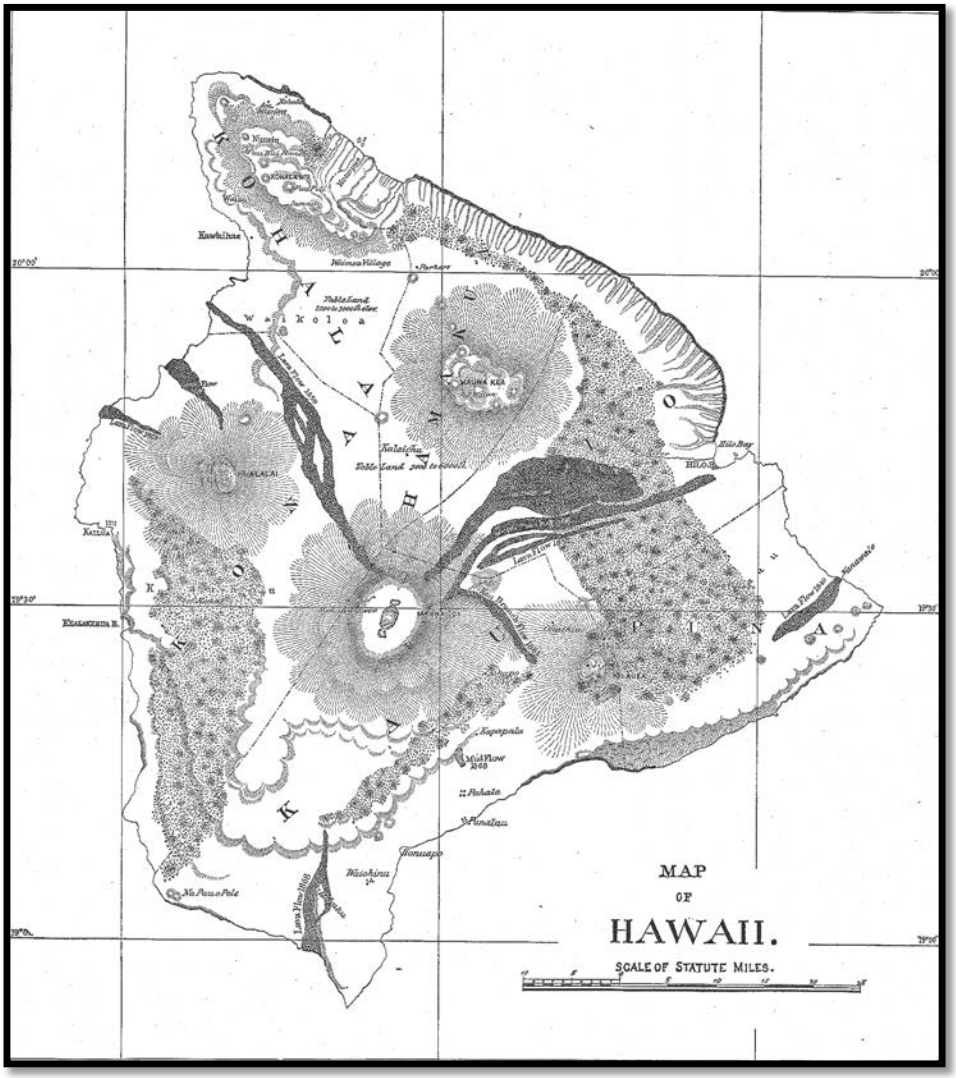


Figure 19. Map of Hawaii. USGS Annual Report 1883, Plate IV (C.E. Dutton, 1883:93)

Iulai 27, 1881 (aoao4-5)
Ka Elele Poakolu
No Ka Pele
Ke Ahi Weli A Ka Wahine.

Haalulu naka na Papakole o Waiakea-a me Waiolama,
I ka hoohanuu hoohake mai a ke Ahi a ka Wahine,
I Enaena ka papa, wela ka pahoehoe,
Owela ka nahele, kani ka hoe. a ka manu Oo o Haili,
I ka minamina i na Lehua o Mokaulele.

E ka Elele. Poakolu; Aloha oe: —
Ka Uwe aolelo iwaena o keia mau mokupuni, e wiki oe e telegarapa aku ma na kapa kahakai o keia mau Paemoku, i ike mai na kini makamaka o kaua, a puana ae i keia mau mapuna leo, "'e pau ana ka nani o Hanakahi i ka ai nomenome a ke Ahi Pele Ai Honua."

Ma ka Poakolu, Iulai 20, owau a me E. K. W., ua haalele maua i ke taona o Hilo no ka makaikai pele, a pela no me kekahi poe makaikai e ae he lehulehu wale.

Ia maua e pii nei, he ahua ia wahi, e hiki aku ai i Kukuinui, hoomaha iki ma ia wahi, huli nana i ke taona o Hilo, o ka waiho kahelahela mai a Hanakahi, o ae la koʻu hoa i keia wahi lalani mele,

Maemae Puna i ka hala me ka lehua,

A olelo aku la au i ke hoa, no Puna aku la ia wahi mele, mapu hou ae la no koʻu hoa.

Maemae Hanakahi kuhao i ka malie,
Me he kiaha puaniki la ke one o Punahoa,
A he hoa kaunu oe no Ka nuku o ka manu.

Haalele maua ia wahi, i ko maua hiki ana aku, e kahe a wai mai ana ke ahi pele, me he kahe ana la a ka wai o na kahawai e hoopiha ana i kekahi lua nui, aole no i liuliu ke kahe ana mai, piha ae la. Ma ia manawa no a ke ahi e hoohanini nei, hoea ana ka Hon. J. Nawahi a me ka makai nui, a me kekahi mau haole e ae, a me na haole paikii a puka mai la a lehulehu wale na mea a pau no ka makaikai i na hana ku i ka weliweli. A ma ia piha ana o ka lua mua, kahe mai la no ke ahi pele me ka ikaika a loaa hou mai he lua nui hou, hoopiha ia iho la no a i piha, kahe mai la no.

Ma keia wahi e kahe nei ke ahi pele he kahawai, oia ke kahawai mawaena o Kaumana a me Kaunuunumoa, oia kahawai o Waiola [Waiolama?], a ma ia la no a po, hiki mai la ke

ahi pele i ka mana ana o na kahawai e iho ai a hiki i ka Uwapo o Elenaio [Alenaio], e puka loa I Waiolama, a o kekahi mana hoi ma ke kahawai o Kulanakamaa [Kalanakamaa], e iho ai a loaa ka uwapo a puka aku no i Waiolama.

Aia ke ahi pele i ka ulu kukui o Kukuinui i keia wa kahi i hookahekahe ai i ke ahi wela a ka wahine, kupono ma ka aoao hema o na puu o Halai, o ka makamua keia o ke ahi e kahe nei, e kau nui aku ana o ka ai i ka anae o Waiolama a me Waiakea, a o ke ahi pele hoi mahope mai, ke nee mai la no ia me ka ikaika, oia paha ke ahi e pau loa ai ke taona o Hilo, no ka mea, me ka ikaika no ia ahi e nee mai la, me ka ai nomenome i ka ululaau, a ua neo.

Aloha ino ka waiwai o ka aina, aloha ino ke taona o Hilo, wahi a ka manao o kanaka.

Aole paha i manao no Iehova ka honua a me na mea e piha ai. E mahalo aku ko ka honua i ka mea nana i hana. Owau no me ka haahaa.
D. B. Wahine.

[Translation]

Quaking and trembling are the bones of Waiākea and Waiolama,
The fire of the Woman [Pele] is spurting and filling out,
The flat lands are burning in the heat of the pāhoehoe,
The forest is burned, the song of the ‘ō‘ō birds of Haili rings out,
Lamenting for the Lehua blossoms of Mokaulele.

O Wednesday Messenger, Aloha to you:
On the telegraph between these islands, send a telegraph to the shores of the archipelago, that our many friends may here and know that “the beautiful of Hanakahi is being eaten by the Volcanic Fires of Pele who Eats the Earth.”

On the 20th of July, E.K.W. and I departed for the town of Hilo to visit the eruptions, along with many other visitors.

We ascended a rise, and arrived at Kukuinui [situated on the boundary between Waiākea and Kūkūau]. We rested at that place, looking to the Town of Hilo, and Hanakahi spread out before us. My companion then spoke these lines of the mele,

Puna is perfect with the hala and lehua,

I then said to my companion, that section of the mele is for Puna, and then my companion spoke,

Perfect is Hanakahi, wonderous in the calm,
Like a cup of sand at Punahoa,
You are my companion who frequents Kanukuokamanu.

We then departed from that place, and then arrives where the fires flowed like water; like the flowing of stream filling a large pit, and in no time it was filled and flowing again. At the time that the fires overflowed, Hon. J. Nawahi and the high sheriff arrives, with some foreigners, also some foreigners who were taking photos, that the multitudes could see this fearsome work. Upon filling the first pit, the lava flowed with increased strength, and reached a second large pit, and after filling it, flowed on.

At this place where the lava flowed like a stream, it was at the gulch between Kaumana and Kaunuunumoa, that is the stream gulch of Waiola [Waiolama?]. That day and night the flow reached the fork of the stream that runs down to the Wharf at Elenaio [Alenaio], exiting at Waiolama, a branch of the stream of Kulanakamaa [Kalanakāma‘a] that descend to the wharf, existing at Waiolama.

The lava at the kukui grove of Kukuinui flowed with the fire of the woman just to the south of the hills of Halai. The front of the flowing lava, seemingly set to eat the mullet of Waiolama and Waiakea. After that, if the flow moves with strength, it might consume the town of Hilo, for the fires moving with force, eating the forest, leaving it bare.

“Aloha ‘ino” (Shameful loss) for the wealth of the land and the town of Hilo, are the thoughts of the people.

They do not remember that they earth and all therein is Jehovah’s. Appreciate the earth and the one who made it. I am with humbleness.
D.B. Wahine. [Maly, translator]

July 30, 1881 (page 3)
Pacific Commercial Advertiser
The Great Volcano Threatens to Destroy a City and Harbor.
Superstition of the People
The Goddess Pele—Kilauea in Action

The great eruption of Mauna Loa, or the Lofty Mountain, has been flowing for about eight months. The mighty mountain has poured forth from its upper vent, near Mokuaweoweo, the summit crater, a river of lava, about fifty miles long, and varying from half a mile to four miles in width, which is now distant a few miles from Hilo, threatening to destroy the

town, to fill up the harbor, and probably, as on a former occasion of eruption, invade the Pacific ocean and add many thousand acres to the area of the Archipelago. Whilst seeking for compensation in the view of a possible great misfortune, it may be interesting to note, that whilst King Kalakaua[21] is making the tour of the world, in order to bring more people under his beneficent sway, the goddess Pele may be adding a new appanage to His Majesty's dominions.

The latest reports from the eruption inform us, that the great lava flow that had reached within two miles of Hilo, had then broadened its stream to a width of about four miles; and banked it up in places to a height of over one hundred feet; and there halted, like a beleaguering force, before making a final assault, and storming the doomed city. Already it had sent off a skirmishing stream, the narrow flow running down the gulch of Kukuau; and should the great lava embankment burst forth along its front, the destruction of Hilo would be swift and overwhelming; with not a vestige upon the corrugated, and wavy surface of black glass and clinker, to show that over the spot, the aspirations and spires of a Christian community once pointed to heaven. But let us draw a more hopeful picture, that the capricious and changeful fire deity, whose sex was wisely determined by the ancient and observant Hawaiian mind, will find vent for the lava flow, down the ravines of Kukuau to the sea; or better still, simmer down the seething subterranean lake that feeds this flow, and allow beautiful Hilo to rejoice over the passing away of a great scare, and have her hilltops ringing with the rejoicings of a grateful people.

The Christian people of Hilo recently implored, in public prayer, the Almighty Ruler of the Universe to stay the devastating march of the lava flow, but a large portion of native minds still incline to the ancient superstition, and recognize in the upheavals and outpourings of the great Fire Mountain the operations of the mighty Fire Goddess, Pele; and we have before us, in the letter of a native correspondent, (E.K.W.) published in the native paper Ka Elele Poakolu a curious illustration of native superstition. The devastating lava had been for some time threatening the home stead of one Keoni Holo [John Hall], an old native, who had lived for thirty years on a pleasant kuleana of about twelve acres, flourishing with well irrigated taro patches, potato patches, and choice fruit trees, within a short distance of Hilo. Keoni had faith that, although great Pele might not heed the prayers

[21] Between January to October 1881, King Kalākaua was away from his kingdom, on a journey around the world, through which he sought to learn about the people and customs in various nations, and also to build alliances with other nations. He was the first ruler of any county to make such a journey. The journey has been commemorated in many mele (chants), and descendants of L. Kaina (who played an important role in the history of east Hawai‘i), have carried the name “Ke-li‘i-ka‘apuni-honua” (The King who traveled around the world), in honor of King Kalākaua’s journey (Oral History Interview with John Keli‘ika‘apunihoua Kaina, born at ‘Ōla‘a in 1923. August 7, 2003).

of foreigners, she would be touched by the offerings of a true keiki (son) of the soil. He offered his choicest pig to the advancing flood of fire, crying out:

Aloha o Pele. Mohai ia oe e Pele.
Hail to thee, O, Pele. Receive my gift, O, Pele.

And the dread goddess responded, with a puff of steam and a crackling flow of blood red fire, that smothered the squeak of the poor porker. Again Keoni stood before the advancing tide of fire; and offered chickens, ohia fruits, ohelo berries, and a lock of his hair; but Pele was not to be coaxed by Keoni. Her cohorts of red wrath moved onward, licked up with a moment's fizzle the flowing taro patches, crackled through the orchard, and with a flash and a flicker rolled over the old man's once smiling homestead; leaving overspread above its site, the burning floor of an inferno, a surface of twisted, serpentine folds, and coils of glassy black lava. Then our correspondent in company with Hon. D. B. Wahine witnessed the leap of the river of fire, into a small lake, or pond and contemplated with awe the terrific explosion and roaring vents of steam, as the death embracing fire, sent the spirit of the lakelet screaming away to the upper air.

We learn from recent visitors to the Halemaumau of Kilauea; or the Everlasting Home of Pele, many interesting particulars in regard to the present state of the great active crater which is distant about 30 miles from Hilo. Tourists to the volcano, for many years past, all remember certain active pools of lava, the North and South Lakes; which ordinarily bubbled and tossed a fiery flood at a depth of about 120 feet below the floor of the great crater; now these lakes have all been filled up, and there have arisen peaks and cones of hard lava, that rise over one hundred feet above the south bank of the great crater which is about one thousand feet high. But there has burst forth a new opening in the great crater floor, not far distant from the old lakes; and a new lake, almost round in form, about 600 feet across, and some 70 feet in depth in ordinary stages, below the surrounding brink. Here the great Hawaiian volcano presents the most varied fantastic play of liquid lava. The recent observers of the new lake find ordinary language insufficient to convey their emotion, and seek expression in fervent poetic effusion. But such has been the effect on all observers of the lively play of Pele in times past. And they have labored with overstrained description to describe the indescribable. Of course that which changes its form, feature and action, every minute of its existence since it has been observed, and evidently has done so in ages past, cannot well be described. There are certain displays of the action of our great volcano, that startle our sense of wonder, yet may be daguerreotyped by description.

Here are some of the phases of the play of a fire lake, as recently observed in the great crater of Kilauea. Sometimes it almost seems to sleep; and the disappointed visitor looks down into a black valley, and observes a smoking pit, giving no more evidence of

combustion than a tar kiln. But the observer stands on the brink of the pit, or great pool, or lake, as now appears, about 600 feet across, and whose surface Is about 70 feet below him. And what is this surface? It presents a dark silver grey hue, with a satiny shine. This is a crust of quiescent lava; and the observer, who has expected to have his sense of wonder strained to speechlessness, says: “Is this all?” No! look! the frozen glassy lake is alive. What a heave in the centre—some mighty beast lifting up that floor. Now a wave of undulation runs round the encrusted marge. And there is an outburst, a blood red fount, gushing and bubbling from one of earth's arteries. The broad disc of the lake heaves and trembles. Fitful gaseous flashes flit across. And now the moving floor cracks, and a serrated fissure like the suture of a skull, runs from margin to margin. And quick darting streaks, sudden cracks of the crust, shoot across in all directions. These serrated streaks are, at first, rosy lines on the grey surface; then they widen like crimson ribbons, broadening to the view. They undulate with the billowy motion of the whole upheaving surface. Another crimson fount springs up along the now fretting and roaring rim of the lake. And another, and another of now wildly upleaping fountains of fire toss high their gory crests; even casting gouts and clots of the red spray, that fall and harden near the observer’s feet. By this time, the spirit of our inferno is aroused. The whole fierce red lake is all boil and leap and roar. It is more than the roar of loud sea surfs beating bold bluffs. The surging tide of the molten earth, sounds a deeper, bellowing bass than any note of the sounding sea. And now the heaved up crust broken into fragments, is churned up and dissolved in the boiling flood. The roaring gulf is now indeed a vortex of in describable glories and terrors. Caves open on the sides of the surrounding wall, and man sees more of a hell than he ever imagined. A thousand demons are now holding high carnival in this bottomless pit: — and the leap and play of a fiery flood, the dance and swell of a red surging tide, and the roar and shriek of the dread forces issuing from the red hot pulsating heart of the planet, make a thoughtful observer hold his hand to his own heart and say: “This is enough; the Almighty is here.”

And then, the wild lake settles down to calm again; or to a milder display by and by; or perhaps simply upheaves, and overflows its bounds, and spreads abroad in the great crater. But at all times, it is wonderful; and is ready to satisfy the curious observer, that here in mid Pacific, in our Hawaiian islands, is the grandest, most varied and most momentous volcanic action to be seen on the surface of the globe.

The facilities for reaching this ever active volcanic display at Kilauea, about 30 miles distant from Hilo, are greater now than in former years. No doubt for some time to come, the curious traveller may satisfy his desire in respect to volcanic display in the vicinity of Hilo. The present eruption somewhat resembles that of 1859, which continued to flow for thirteen months. It will to all appearances flow for some months more, and may add a new promontory to the geography of Hawaii.

Chiefess Ke‘elikōlani Offers Supplications to Pele

One of the significant events associated with the 1880-81 eruption focuses on the Chiefess Ruth Keelikolani, a great granddaughter of Kamehameha I, who in August, traveled to Hawai‘i and ascended the slopes behind Hilo, and encamped atop Pu‘u Honu. While there, she recalled the history of her own grandfather, Kamehameha I and his appeals to Pele, made during the eruption of Hualālai 1800-1801[22]. Though most papers chose not to report on it, Keelikolani made a personal appeal and offerings to Pele, asking her to cease the flow and spare the valued lowlands of Waiākea and Hilo Town.[23]

Augate 10, 1881 (aoao 4 & 5)
Ka Elele Poakolu
Ka Huakai Alii.

Ua pae maalahi aku ka huakai a ke alii a Kahu Aupuni me alii e ae a me na ukali i Hilo, aohe me nana i hooinoino i ka huakai moana. A ua uluwehiwehi o Hilo o ka nui o na maka malihini. Ua halawai pu aku la ke alii me na hookipa aloha ana o ko Laila poe. I ka haalele ana aku o ka moku, he maikai no kona ola kino.

Ke luakaha ala ke Alii R. Keelikolani i kahi o ka Pele, ke ku haaheo ala kona mau hale lole ma kae o ka muliawai ahi. [aoao 4]

Ke Ahi a ka Wahine! Kau ka lia i ko Hilo!
300 Kapuai i ka Hora!

Ma ka lono hope loa mai ke kahua o ke ahi, ua loaa mai na mamala olelo mai kekahi mau makamaka; e hoike mai ana, ua hoomaka hou ke ahi a ka Wahine kupua o ka lua e oni, a ua hoea ae ka halialia o kahi poe no ko lakou mau home. Aloha wale. Eia na leta malalo nei:

Ua kokoke loa ka Pele mahope a ma aoao hema o ke kulanakauhale nei, ma ka manawa i hoomaka ai ka auwai pele e kahe ma ke kahawai o Kalanakamaa iloko o ka hora hookahi, ua ana ia ka loihi o ke kahe ana, 300 a oi kapuai; ina pela mau aku iloko o keia mau la,

---

22 Kamakau in *Nupepa Ku Okoa*, July 13-20, 1867 and 1961:184-186.

23 Additional coverage on the eruption, Keelikolani’s visit and appeal, and prayer meetings in Hilo may be found in other articles, including, but not limited to: *Ko Hawaii Pae Aina*, “Ka Pele Ai Honua ma Hilo” (Augate 13, 1881:3); *Ka Elele Poakalu*, “Ke Ahi a ka Wahine” & “Ke Kahu Aupuni” (Augate 17, 1881:1 & 5); *Nupepa Kuokoa*, “He Ahaaina Pele,” (Augate 19, 1882:3); *Ko Hawaii Pae Aina* “Ka Hoomana i Ka Pele o 1881, He Ahaaina Nui Ma Hilo!” (Augate 19, 1882:2); And Nupepa Kuokoa, “Ka Weli o Hilo” (Augate 20, 1881:1).

me he mea la, ke ku hou mai ka Likelike, ua au ka Pele i ke kai, a ua lewa aku paha makou ma kahi kaawale.

Aloha ka aina, aloha na home .kahi i noho loihi ai me na makua, aka, o ke Akua wale no kai ike i na hopena o Hilo Hanakahi. Ma keia pule ae e hai hou aku au ia oe.

Owau no, G.W.A. Hapai.

Ua kokoke loa ke ahi Pele i ke kaona nei o Hilo, o ka mana ma Kukuau, ua like loihi mai ka uapo a hiki i ka Wai Piula o ua o Maemae ma Honolulu. O ka mana ma Waiakea, ua like mai ka uapo a hiki i Peleula ma Honolulu, oia ka‘u koho ma ka hoohalike ana; aka, eia ka mea kupanaha, o na haole mahiko o Waiakea, aia ma ka hapalua oia wahi a‘u i hai ae nei maluna.

Ma keia wahi kekahi pa pohaku e pa ia nei e na kanaka a me na haole no ke pale ana aku i ke kahe ana mai a ka Pele e hiki i Waiakea, me ko lakou manao i hanini ma Kukuau ka muliwai ahi; aka, aole pela ko Pele manao, o Waiakea kona pahu hopu hope loa. A i kona wa e hoi ai, pulumi mua ae oia i kau wahi o Hilo nei.

O na kanaka a me na haole o Hilo nei, aole makau a pihoihoi ae, aka, ua piha mau ka auwaha Pele i ka makaikai ia e na kanaka a me na haole i ke ao a me ka po.
Ke ku nei na hale lole elua o ke ‘lii Keelikolani iluna o Puuhonua [Puuhonu], no ka makaikai ana i ke ahi Pele. O ke, kulana o ka iho ana o ka Pele, ua hala o Halai iuka, ua umi anana ka laula o ka iho ana ka Pele ma kau wahi a oi aku a emi mai no hoi ma kekahi wahi, oia ko‘u ike maka a oia ka‘u e hai pololei aku nei i ka poe i ike maka pololei aku ne ii ka poe i ike maka ole.

Ua koho au, ina e like me keia la a ka Pele e nee nei, alaila, ua helu ia na la i koe a halii ka waikahe ula a ke ahi ia kai o Hilo me ka haalele ana o na kamaaina o keia wahi i na home.

J.H. Makole.
Puueo, Hilo, Aug. 4, 1881

[Translation – Synthesis]

The royal procession of the Guardian of the nation and those attending her, arrived peaceably at Hilo. There were no troubles in crossing the ocean. Hilo was adorned for the eyes of the visitors…

Chiefess R. Keelikolani had a pleasant path to the place of the eruption, where her tents stood proudly along the edge of the lava lake. [page 4]

The fires of the Woman! A String Desire for Hilo!
(Moving) 300 Feet an Hour!

Latest news from the eruption site, received in bits and pieces from some of our friends reveal that the fires of the supernatural Woman of the volcano is moving and it is thought that it will reach the homes of some of the people. Such sorrow. Here are the letters below:

The Pele (Eruption) is very close to the south side of the town. When the lava stream began to flow in the stream of Kalanakāmaʻa it moved 300 feet or more in one hour. In cast that continues in the coming days, the *Likelike* has anchored, waiting to take us on to another place.

Love for the land, love for the homes, the place where the elders have long resided, but only Gid knows the end of Hilo Hanakahi. Next week I shall again speak to you.

I am G.W.A. Hapai.

The eruptions if very close to the town of Hilo. The branch at Kūkūau is like the distance from the wharf to Wai Piula at Maʻemaʻe in Honolulu. The branch at Waiākea is like from the wharf to Peleʻula in Honolulu. That is what I estimate it is by measurement. But here is the surprising thing, the foreign sugar growers, are there on about half of the place I spoke of above.

At this place are some stone walls that have been made by the kānaka (Hawaiians) and foreigners to try and ward off the flow of the lava from Waiākea. It is their thought that it will pour into the Kūkūau fire lace; but that is not Pele's thought, Waiākea is the place of her desire at the end. At the time she returns, she will first sweep through Hilo.

The kānaka (Hawaiians) and the foreigners of Hilo are not afraid or disturbed, but there are mutterings day and night by those kānaka and haole who visit.

Two tents of the chiefess Keelikolani are on top of Puʻuhonua (Puʻuhonu), for the visitors to the Eruption. The flow of Pele is past upper Hālaʻi, it is ten fathoms wide where it descends in one area, ad less in another area. That is what I have seen, and what I accurately describe to you, and those who have not seen it.

I suppose that if the Pele continues moving thus, the days are numbered before the red fire flow is at the shore of Hilo, and the natives of that place must leave their homes.

J.H. Makole
Puueo, Hilo, Aug. 4, 1881 [Maly, translator]

Augate 20, 1881 (aoao 1)
Nupepa Kuokoa
Ka Weli o Hilo

- Ai hamuhamu ke ahi Pele i na lehua a me ka papa pahoehoe o Mokaulele
- U-uina paapaaina ka leo o Pele i ka uluhala o Upeloa
- Ohuohu Puuhonu a me Kanahele o Upeloa i na makaikai
- Hoohahana o Pele i ke Taona
- Kokoke o Pele e luu i ka wai o Waiolama a e holapu hoi in a anae o Waiakea
- Hoao kanaka e keakea i ke alahele o Pele
- Haiolelo ke Kahu Aupuni ma ka Luakini o Haili...

...E oluolu mai kou e hoaiai ae au in a hana a Pele, ka wahine ai honua e hoohahana mai la ma ke kua o ke taona nani Hilo ke kula manu la i Haili i ike mai ai kou mau kini makamaka e noho mai la mai ka la puka i Haehae a ka welona i Lehua.

Ma ke ahiahi o ka Poalua, la 2 o Augate, i kau aku ai au ma ka oneki o Likelike no Kauakanilehua o Hilo, a no ka makaikai ana ike kahua Ahi Pele. A oiai hoi au e hiaai ana no ka ike aku ia Pele, ua laki loa ia hoi au no ko‘u komo ana aku ma ka huakai a ke Kahu Aupuni no ia alahele hookahi, a no ka ike hoi i na makaainana o Hawaii; a ua hoopiha ia ka manawa ma ka Likelike me na himeni hoonanea o na keiki o ka Puali Puhi Ohe o ke Aupuni, a me na leo hone o na ohe keleawe, ua paholaia na kapakai me na mele hooni puuwai a ua puali, me ia wale no ka ukali ana a hehi wale na wawae i ke one o Hanakahi... ...Hoi mai nae au no Honolulu, ua maalili iki ke ahi, a pehea aku la i keia wa?

Na hana a ke kanaka imua o ka Pele. Iloko o keia au malamalama. he nui na kanaka i kapa aku ia Pele he Akua, a no ia mea ua hele aku kekahi poe me na makana ia Pele, me ka i aku”

“Eia ka makana la, a e hoi no hoi oukou iuka; a haipule iho la hoi kahi mau kana imua o Pele me ka awa, omole rama, puaa maluna o kekahi punawai me ka mohai aku ia Pele, me mohai ana akua ia Pele e hoopakele i ka punawai, a e hoihoi i kona wahi i hele mai ai. “

Eia ka mea i hanaia mai e Pele, pau ka puaa i ke ahi a Pele, ka awa, ia, hoopiha ia iho la ka punawai me na ahua pohaku he nui. Aole no hoi he hoi o Pele iuka, ke neehele loa mai la o Pele i kai a he hapalua mile wale no ka mana oi koe. Ua ike maka au i kekahi o keia mau hana a kanaka…

David Keaweamahi (Honolulu, Aug. 15, 1881)

[Translation – synthesis]

The Terror in Hilo

- The fires of Pele consume the lehua and the pāhoehoe flats of Mokaulele
- The voice of Pele crackles and bursts forth in the pandanus grove of Ūpēloa
- Puʻuhonu and the forest of Ūpēloa are adorned with sightseers
- Pele warms the Town
- Pele is close to diving into the stream of Waiolama and disturbing the mullet of Waiākea
- People are trying to block the path of Pele
- Speech of the Guardian of the Kingdom at Haili Church…

…Please allow me to describe the doings of Pele, the woman who consumes the earth and who is warming the back of the beautiful town of Hilo, the plain of the birds at Haili, that your many friends from Haʻehaʻe where the sun arises, to its fluttering light at Lehua, may know.

On the evening of Tuesday, August 2nd, I boarded the Likelike on my way to the Resonating Rains on the Lehua of Hilo, and to visit Pele's eruption. I was fortunate enough to go see Pele, and on the way travel with the party of the Guardian of the Kingdom and people of Hawaiʻi. The Likelike was filled with music of the members of the Royal Band, the sweet voices and heart stirring songs of those who were traveling to tread upon the sands of Hanakahi… [the author describes various experiences and observations]

…I returned to Honolulu, and the fires had cooled off some, so what is it at this time?

The deed of the kānaka (Hawaiian) before the Eruption. In this enlightened time, there are still many kānaka who call Pele a God, and for this reason some people went to give offerings to Pele, saying:

"Here is the offering, you and yours return to the uplands;" some offered prayers before Pele, along with ʻawa, bottles of rum, a pig before a spring offering to Pele, that she

accept the offering and safe the spring, returning to the place from which she had come.

Here is what Pele did. The pig was consumed, along with the ‘awa, and the spring was filled, becoming a large hillock. Pele did not return to the uplands. Pele traveled further towards the ocean, now a half mile remains. I witness some of these thing being done by the kānaka…

David Keaweamahi
Honolulu, Aug. 15, 1881

Kepakemaba 10, 1881 (aoao 4)
Nupepa Kuokoa
Ka Pele Ma Hilo

Mai ka la 7 mai o Augate iho nei, ka ike ia ana aku o ke ahi pele ma Hilo nei ma ka emi ana mai o ka a ana, aole i nee ae makai, a ua ike no na kamahele malihini ma ka pa nui i hana ia e na haole mahiko oia no ka palena ma keia wahi.

O ka hapa nui o ka pahoehoe, ua maalili e hiki no i ka mea kamaa ole ke hele maluna me ka wela ole a ma kau wahi aole i pio ke ahi ikaika no ka a ana, aia maloko o ka lua, aia na Kukuinui a mauka aku olaila, he lua nui ua piha i ka pele, a maloko o ia lua ua ike ia aku he mau mea kupanaha ua like ke ano me he pahu kupapau ula me na pihipihi maluna o ke pani, a me ke kii ma ke poo o ka pahu, a elua keia mau pahu kupapau iloko o ka lua ahi pele. Kupanaha ka ke Akua mau hana ma o ka pele aia.

Ka noho ana o ko Hilo nei i keia manawa, me he ala ua hala ka hooilo, ua pau ka ua, ua pau ke kupilikii ana o ka manao no ke kaumaha no ka hana a ke ahi pele ai honua.

Ekolu mau mea nui ma ka olelo a kanaka no ka emi ana o ka pele.

1. No ka hiki ana mai o Keelikolani ke lii a ma kahi o ka pele, a olelo kaukau aku la imua o Pele a me kaoa wahi makana me ka hiki pu ana mai no hoi o ke Alii ke Kahu Aupuni a me ke alii Pauahi, pela na olelo.

2. No na mohai hoomanamana a kekahi poe, maloo ka puaa iluna o ka pahoehoe, me ka manao e pau ana ia Pele, aole mae, ahu wale na hana o ka pouli, ike ia ka niu, a me ka awa ke ahu mai iluna o ka pahoehoe pau ole ka epa ia Hawaii, e aho ka paeaina o Kilibati.

3. O ka pule a na haipule mai Hawaii nei a Kauai i Mano, a hala aku i na aina Kristiano o ka honua, e hoi ana imua o ke akua e malama ia keia kulanakauhale ma ka lokomaikai o ke Akua a me Kona aloha, ma ko ke Akua poe ia olelo.

A e hoolilo ia ana paha kekahi la ma keia mua aku i la hoomaikai i ke Akua no Kona lokomaikai pau ole, Oia ka Oiaio.

O ka a ana mae a ke ahi pele i keia manawa, aole i pio loa ke a nei no maloko o na lua...

Me ke aloha i ka Lunahooponopono a me na Keiki ulele hua Pai o ka Nupepa.

J S Kalana.
Hilo, Sept 1 1881.

[Translation – synthesis]

The Eruption at Hilo

On the 7th day of August inst., it was seen that the eruption at Hilo was slowing down, it had not moved further shoreward. Travelers also went to see the great wall made by the foreign sugar growers which is the boundary of this place.

More than half of the pāhoehoe has cooled and even those who have no shoes can travel on it without being burned. In other places the fire has not gone out, and is filled with fire below. In that pit an amazing thing has been seen, it looks like a red coffin, with something like buttons where it closes and an image at the top of the coffin. There are two of these coffins in the fire pit. Mysterious are the works of God in this eruption.

The dwelling in Hilo at this time is as if winter has passed, the rains are finished, and the distress and worries of whether the eruption will consume the earth are ended.

There are three primary things spoken of by the kānaka regarding the decreasing eruption.

1. The arrival of Keelikolani to the place of the eruption, her offering prayers before Pele, and her gifts when the Guardian of the Kingdom (Princess Lili‘uokalani) and Chiefess Pauahi arrived. So it is said.

2. The religious offerings made by some people, the offering of a pig on the pāhoehoe, with the belief that the eruptions would end. This work of darkness has not

disappeared. There were also seen coconuts and ‘awa mounded on the pāhoehoe. There is no end to this deceit in Hawai‘i, and as in the Gilbertese islands.

3. The prayers of the saints from Hawai‘i to Kaua‘i of Mano, and to the Christian lands of the earth that this town be preserved, through the grace of God by His love, and God’s word to his people.

The fires of the eruption are fading at this time. They have not entirely gone out from in the pit…

…With aloha to the Editor and the Youth who set each of the letter to publish the Newspaper…

J S Kalana.
Hilo, Sept 1 1881.

August 27, 1882 (page 3)
Pacific Commercial Advertiser
The State of the Lava Flow. Hilo Saved—Disappointed Tourists.

Hilo has not been engulphed and overflown with lava—to provide a Pompeii or an Herculaneum for Hawaiian exhumers of A.D. 3881.

However, there would not have been much of Hilo for the observation of future excavators if Madame Pele had taken the matter seriously in hand. There would not probably have been a splinter found to mark the site of temple of Christian faith, or of Justice ; or the mansions of a Coan, a Severance, a Lyman, or a genial Captain Tom Spencer; or of any other relic of the fair tropic city, seated on its hill-side of beauty, had the lava continued down in earnest.

The great fire mountain, after belching forth red hot molten lava, that amounted in volume to an area ten miles square, and several hundred feet high or about the extent of Kahoolawe—after running over sixty miles in its course, and after flowing to a point where it had not flowed Before—perhaps in a thousand years—stopped short within eight hundred yards of Hilo.

Why it stopped cannot be answered by any science, or observation of man. Some will believe in the efficacy of prayer in this instance; —and let not anyone, who knows no more than the believing, endeavor to unsettle the assurances of faith. However, the wonderful flow has stopped, much to the inexpressible relief and delight of Hiloites, and of all the country, with the exception of some tourists who missed the conflagration they went to

see. To witness a city overwhelmed by a volcano has not been observed since the first century ; and it must have been rather disappointing, when in the nineteenth century a city was imminently threatened with being overwhelmed, and the overwhelming did not come off. However, recent tourists to the lava flow have been compensated by the witnessing of a great many volcanic sights and demonstrations, and, like nearly all visitors to volcanic phenomena, have to relate a series of hair-breadth escapes, evidences of their daring, hardihood and endurance such a looking into hell-like blow holes with lava jets dropping around the person like a fiery hail on a burning plain; or springing from a ledge just ad it crumbled down into a seething cauldron of incandescence…

…The most of the surface of grand volcanic Hawaii—especially that of Puna, Kau, and Kona presents a variety of curiously-contrived grots, caves, channels and interstices produced by volcanic action. There are no doubt many subterranean caves, miles in extent, yet to be discovered; and in some certain arcana of Hawaiian history may be revealed to a great historic and ethnic student, and zealous exhumer, like Schliemann.

1882
Hawaiian Almanac and Annual for 1882
Thos. G. Thrum
(Mauna Loa Eruption Nov. 5, 1880 to Aug. 10, 1881)

On the evening of November 5, 1880, an eruption broke out near the summit of Mauna Loa, to which a brief allusion was made in the Annual for 1881, and in connection therewith it was stated that the indications were that the flow of lava would soon cease. This outbreak however proved to be one of the grandest efforts of the goddess Pele in her home in that old volcanic mountain, and continued with varying activity for a period of nine months.

The new crater is some twelve miles south-east of, and below the summit crater of Mokuaweoweo, and the point from which the lava stream issued. was six miles distant from the crater. For a few days after the outbreak there were three streams of lava. One flowed northward toward Mauna Kea, but lasted only a few days. The Kau stream flowed toward Kilauea, and during its short life of less than a week traveled, a torrent of liquid fire; a distance of twenty-five miles. The main body of the lava discharge then continued eastward towards the sea, and was known as the Hilo flow.

In January there was a great diminution in the activity at the crater, and the flow progressed very slowly until during the month of May, when the eruption broke out with renewed vigor and the river of lava began to move more rapidly. The heavy timber back of Hilo retarded its progress for a time, but at last this barrier was broken through, and the

fiery fluid pursued its way over the undulating stretch of country overgrown with ferns and grasses, towards the town of Hilo, which for a time seemed fated.

The first, and happily the only damage done to personal property, was the destruction of the grass house and taro patches of John Hall [Keoni Holo], a half-caste, about four and a half miles from Hilo, on the night of the 11th of June. The branch of the flow known as the Waiakea
stream was making directly for the Waiakea Mill, situated on the bay near the town of Hilo; and on the 9th of August, when the flow died out, it was nearly three-quarters of a mile distant. This was the largest and longest continued discharge of lava from Mauna Loa in recent years, and had it continued a few days longer and reached the sea, would have been the most destructive. Not only Hilo, but its harbor, were thus saved, as it were, by a miracle at the last moment.

This eruption will be of more interest historically than any previous one from the fact that Mr. Charles Furneaux, an artist, arrived here, from Boston just before the outbreak and made volcanic action a close study during a sojourn of several months on Hawaii while the flow continued. :A series of over forty sketches, faithfully portraying the appearance of the flow at different times and at various stages of its progress, will be invaluable to students of volcanic phenomena. A number of excellent photographic views were also obtained by our local photographers.

Sites of Waiākea Described to Visitors in 1913

1913
Town of Hilo
H. M. Whitney
Mokuola (Coconut Island), Makaoku and Keaukaha Vicinity Excerpts

...When the demigod Maui with his magic hook fished the island of Maui up from the seas, one of his brothers, who was in the canoe with him, disregarded his command not to look back, and consequently Maui's plan to connect Maui with Hawaii failed. The island of Maui slipped back to its present position, and only a small piece thereof, Coconut Island, remained on the hook. The mark of the hook is shown near the springboard.

Mokuola and Makaoku[24], the piece of the mainland opposite the island, formed a place of refuge, where warriors and others retired in times of defeat and had safety. It contained

[24] Maka-o-kū is described as the site of a heiau luakini (a temple of "state" worship), and Mokuola was the place of sanctuary and release from the kapu of Makaokū (see Thrum, 1908:40; and Hudson, Ms. 1932:236).

about 36 acres, a lava crack marking the boundary. Where the Kennedy house stands, east of the Island, human sacrifices were made and the remains fed to the sharks. The Island is now Hilo's famous bathing place. There are several public bath houses, and Hawaiians ferry visitors across the channel for a small sum…

Beyond the breakwater, which is reached by a continuation of Front Street, the road runs on to a point four miles from the post office, Lokoaka, where there is a fine bay, with an island and a pretty lagoon, as well as several extensive fish ponds. Here the demi-goddess Waka and her granddaughter Laieikawai (famous on Oahu), hid in a cave under the water of the pond, when they were pursued by priests who wanted Waka to remain at their temple. From Lokoaka the deities wet to Paliuli, the Hawaiian paradise, which is supposed to still exist in the forests mauka, but which has been found only once by a mortal, and he could not find it again.

From Lokoaka it is possible to proceed by foot (or with care on horseback) over the fishpond dike and by trail to Waiuli, a small fishing village, and thence, by a still poorer trail, to Waiokawa, where there was a village with a heiau, of which nothing remains. A few miles further on is Paukupahu, where there are a few grass houses, and a couple of miles further on still is Papae [Papai]. Hence a trail which cannot be found without a guide, leads to the old Puna trail, which from this point south is in good condition. It leads into Puna to the Shipman ranch house. The lava country between the road to Lokoaka and Puna is crossed by many trails… [page 23-25]

3.4.5 Waiākea Land Use (1860s – 1960s)

As described earlier, the land being considered for the USGS facility, within the larger UH-H complex is part of a ceded land – formerly the Crown Land of Waiākea. The coastal zone of Waiākea from the shore to the areas behind the fishponds of Kalepolepo, Waiāhole, Mohouli and Waiākea, to approximately one and one-half miles inland—the area above short distance mauka of the modern Kapiʻolani Street—was the primary area of native Hawaiian residency. Later historic development of the economic interests in Hilo Town also focused on this area thus, the most significant, early impacts on the biocultural landscape occurred in this area. While the area of primary traditional residency occurred fairly near the shore, early historical records recorded by both native Hawaiian and foreign visitors/residents reported on scattered residency and more extensive agriculture and resource management collections happening three to five mile mauka of the shore, and specialized use occurring up to the mountain tops.

Kō or sugar cane (Saccharum officinarum) is one of the important Hawaiian cultigens, brought with the ancestors when the settled this island group. The ancient mahi ʻai (farmers) develop hundreds of varieties of kō that were adapted to a wide range of environmental zones, and uses of selected kō included food, medicine, religious practices, sports and plaiting or

adornments. As described earlier in this study, the first foreign visitors to the Hilo-Waiākea region observed the luxuriant growth of sugar cane around homes and scattered on the landscape to the uplands. By 1825, the early members of the Hilo mission station reported on their use of native kō and processing it into molasses for sugar.

The initial efforts at industrial agriculture in Hilo, in the form of sugar plantations were set in motion in the nearby lands of Pōnahawai and Punahoa. In 1839 Governor Kuakini ordered land to be cleared in Ponahawai, and Hilo's largest sugar plantation at the time, was planted. Charles Wilkes, Commander of the United States Exploring Expedition, visited the Hawaiian Islands in 1840-1841, and reported on the cultivation of sugar cane in Ponahawai—including the use of a "small stream of water led from Wailuku river (an 'auwai)—and other foreign crops in the region. Describing the Hilo bay lands, Wilkes observed:

> I have before spoken of the fruitfulness of this side of the island of Hawaii; the sugar-cane grows here in abundance, and of a large size; coffee succeeds well, as do indigo and the taca, from which they make a quantity of arrow-root.
>
> For the manufacture of sugar, Governor Adams owns a small mill, in charge of two or three Chinamen; but it is in a wretched condition. It is worked by a small stream of water led from the Wailuku river. The quantity of sugar made in the year 1840 was about thirty tons; but with a well-adapted mill, and under good management, a much larger quantity might be made, for much of the cane is now suffered to rot from want of facilities to grind it. The natives now understand its culture well, and each has a small patch... Mr. Goodrich, the missionary who preceded Mr. Coan, was very desirous of introducing the culture of sugar-cane and coffee, became very active in promoting it. (Wilkes 1845:209)

Only a few years after Wilkes visit, land use in the larger Hilo Town vicinity was rapidly changing from the traditional subsistence system to one of industrialized agriculture. The lands extending mauka from the present-day Ululani Street to Hāla'i—had been planted with sugar cane, with planting continuing towards Kaūmana. On July 15,1861, the Crown Land of Waiākea was leased by Kamehameha IV to S. Kipi for grazing as a pasture lease, in the amount of $600 per year, payable semiannually, for a period of five years (Bureau of Conveyances Liber 14:266). Subsequently, Rufus Lyman, applied to John Dominis, Agent of Crown Lands, requesting that he be issued a lease of all the available Crown Land at Waiākea. Lyman wrote:

> Waiakea in Hilo, has been bringing in with ponds about $700. The dams to fishponds have been broken down several times by tidal waves & freshets and the fish lost. With the privilege of cutting say 300 cords of fire wood a year for sale, included in the lease of land, ponds & fisheries, the land would be worth about $1000. a year. There are two lands belonging to Est. [of] Kekuanaoa, and one to Govt. that come into the middle of Waiakea

> in three different places and cut it up somewhat. Ponahawai has a few town lots left, and quite a tract of land a short distance below the woods and a wood land… (Hawaii State Archives, Crown Lands: March 5, 1873).

Lyman replied to Dominis several days later, and made the following comments and offer for the land of Waiākea:

> I wish to lease the land of Waiakea in Hilo, with all the fisheries, streams, & fish ponds belonging to it, for a term of 20 years. I would like to have all the privileges belonging to the land included in the lease, and a privilege of cutting for sale, 300 cords of wood a year. I am willing to pay $1000. a year rent payable at the end of every six months. All improvements placed on the land, to revert to the Crown at the expiration of 20 years.
>
> I have already fenced in with stone walls about 80 acres, and propose to enclose about 80 acres more for the natives living on the land to cultivate.
>
> I would like to have the lease commence the 1st day of April next (Hawaii State Archives, Crown Lands: March 10, 1873).

Lyman's lease was made in September 1874, for a term of 25 years under General Lease 124-A[25]. Shortly after securing the Crown lease, Lyman exited the agreement, and in September 1877, it was reported that "The Waiakea Ranch near Hilo, comprising 80,000 acres of forest, pasture and rocky land, with 4,000 head of cattle, has been sold by the Hawaiian Agricultural Company, and purchased by .Mr. W. Shipman and Captain Elderts, for the sum of $33,000" (Hawaiian Gazette, Sept. 12, 1877:3).

3.4.5.1 Summary of Land Tenure of the Waiākea Mill Company

At the end of the Waiakea Mill Company's independent operation in 1948, Jared Smith of the *Honolulu Advertiser* prepared an excellent summary of the history of land tenure. Further research on the details may be made at a later date, but the general specifics in the article describe the setting in which the proposed USGS complex is found.

> June 19, 1948 (page 1)
> Honolulu Advertiser
> End of High Hopes
> Sale of Waiakea Mill, Finale of 70-Year Saga
> (by Jared G. Smith)

[25] At present, we do not have a copy of General Lease 124-A, which might offer some general background on the foundation of the leasehold interest. A review of Hawaii State Archives and Bureau of Conveyances records will provide useful background for this period of time.

It is now 70 years since the original Honolulu owners of Waiakea Mill Company contracted in 1878 to build a 10-ton mill and Factory to process cane grown by Hilo planters. Now, in 1948, comes the end of high hopes and high endeavor through the sale to Senator William HB. Hill of all rights, title and interest in any land owned by Waiakea Mill Company.

The First Lessee of the Ahupuaa of Waiakea. an area supposed to be 95.000 acres more or less, appears to have been R. A. Lyman of Hilo, he agreeing to pay an annual rental of $1,000 from 1868 to 1918.

King Kamehameha V had placed the control of all public land under an appointed board of three Commissioners of Crown Lands under authority of a law enacted by the Legislature: the Act of January 3, 1865, "To relieve the Royal Domain from Encumbrances and render the same inalienable."

A second, amended lease to R.A. Lyman under date of September 20, 1874 was more explicit, withdrawing certain areas of Waiakea for public purposes. The term, 50 years from 1868 and the annual rental, $1,000, remaining unchanged.

At Some Date In the next four years after September. 1874, Mr. Lyman appeals to have sold his leasehold to the founders, of Waiakea Mill Company. According to Thrurn's Annual this was in 1877.

I have just examined a time-yellowed document written with India ink on both sides of :legal cap" paper: the Indenture of Agreement.

Under this indenture of April 15, 1878 Theo H . Davies and Alexander Young of Honolulu agreed to build a mill with a dally capacity of 10 tons of sugar lo be ready for grinding by December, 1879, provided Charles E. Richard and Benjamin B Macy of Hilo would grow the cane.

The Hilo Partners were to plant 100 acres each year from 1878 to I888, and after four years the Honolulu partners could plant 50 acres annually. The contract provided that plant cane must be harvested before ratoons; and that the Hilo partners have the preference in harvesting the first 200 acres.

The Hilo partners were to plant the first 100 acres on the lowlands; the next 100 above, and so on until 1,000 acres were in cane by 1888. The Honolulu partners agreed to build a railroad from the mill to the top of the farthest cane field provide cars and pay the brakemen; but the planters were to load the cane on the cars and provide the mules to haul them.

> The Planters were to supply not leas titan eight tons of cane per day at the mill. When the sugar came out of the factory a cost of containers, freight and marketing was to be borne 50-50; and profits were to be divided 50-50 between the mill and the planters.
>
> Another old document shows that on February 20. 1879 the capital of the Waiakea Mill co-partnership was $120,000, of which Alexander Young contributed half; Davies a quarter; with the other $30,000 invested by the executors of the R. C. Janion estate.
>
> The Hilo Partners had bitten off more than they could chew, so in December 1879 they sold their planting contract and all assets to the Waiakea Mill copartners for $60,000 cash, Mr. Davies putting up $45,000 of the purchase price, and Young, $15,000.
>
> This made the capital on Dec. 1, 1879 $180,000, with Davies and Young each contributing $75,000, and Mrs. Janion $30,000.
>
> Thrum's Annual for 1879 reports Waiakea's estimate for 1880, the first crop, was 800 tons of sugar. Waiakea was the 24th Big Island sugar mill. Naalehu, now Hutchinson, and Haiku on Maui were the largest producers in the Kingdom of Hawaii, each estimating their 1880 crop at 2,000 tons.

The mill and headquarters were built on the lowland between the Volcano (Kīlauea) Road and Waiākea Fishpond (see Register Map No. 1561). The 1880 crop was produced from 350 acres of land, and by 1890, 2,240 acres of Waiākea land was under cultivation (Dorrance & Morgan 2000:105).

Describing early practices associated with clearing newly acquired plantation land for cultivation, J.M. Lydgate wrote:

> Breaking in new land, in those primitive days, was the bugbear of the sugar business. To clear a few acres a year of guava, puhala, amau fern, uluhi [sic], etc., burn off the refuse, and then plow the virgin soil, in even the most superficial way was a great undertaking (Lydgate IN Thrum's Hawaiian Annual for the Year 1917:77).

Many of the fields had rocks scattered throughout them, which over the years had to be cleared as well. These stones were sometimes used for plantation-related construction projects, and others were simply set into mounds which may still be seen in abandoned fields (as recorded in oral history interviews with elder kamaʻāina in 1995-96).

3.4.5.2 Changes in Land Use and Residency in Waiākea

The following excerpts from selected articles provide readers with an overview of the plantation history, covering the initial planting efforts to the close of the plantation. The narratives include background on development of the cultivated lands, subsequent Waiākea Homestead program, Canec manufacture, and transportation of the sugar via narrow gage rail lines ad barges over the fishponds to the mill and wharf for shipping. Some of the articles provide differing accounts of the plantation's history. One facet of the history that remains consistent is the land in the vicinity of proposed USGS UH-H complex, does not to appear to have been dedicated to sugar cultivation. Considered marginal, these lands were used as pasturage until at least 1961.

Early Hawaiian papers are silent on actual establishment of the Waiākea plantation. The earliest Pacific Commercial Advertiser article we found for the operation was part of a shore summary of plantation operations on the island. In February 1880 it was reported:

> **February 28, 1880 (page 2)**
> **Pacific Commercial Advertiser**
> **Waiakea Mill Co.**
>
> Sugar mill 30 by 60 inches, with doubling gearing and cane carrier, driven by an 18 by 42 inch Putnam steam engine, juice heater, six clarifiers, four cleaning pans, one concentrator (copper), three 2,080 gal. supple tanks, one 8 by 9 feet vacuum pan on iron staging, four Weston's patent centrifugals, one 9 by 18 inch engine to drive same, cooler tanks, blow-up pan, etc.; also one 7 by 25 feet combined Galloway and tubular boiler, one ditto 6 by 23 feet, one tubular boiler 6 by 16, and one Galloway boiler 6 by 29 feet, with two iron smoke stacks.

As discussed earlier in this study, by the time of the 1800-1881 Mauna Loa eruption and its steady progress towards Hilo Bay, coming within approximately three-quarters of a mile of the Waiākea Mill, there were numerous references to the mill and planation operation. Later in 1881, it was reported that Waiākea Mill commenced grinding sugar cane on November 21st (Hawaiian Gazette, Nav. 30, 1881:3). It is not until May 22nd, 1889, the reference to the Waiākea Mill Company's board of directors is found in the newspaper record — T.H. Davies, President,, Alex Young, Vice President, F.M. Swanzy, Treasurer, E.W,. Holdsworth, Secretary, and T.R. Keyworth, Auditor (Evening Bulletin, May 22, 1886:3).

> **November 30, 1901 (page 18)**
> **Evening Bulletin Industrial Edition**
> **Waiakea Mill Company.**
>
> Situated one mile from Hilo in a southerly direction lie the vast fields of sugar cane and mill of the Waiakea Mill Company, which controls 95,000 acres of land 5000 of which are

now in cane, the product from same being converted into sugar at the mill of the company, which has a capacity of seventy tons in twenty-four hours...

...During the year 1900 the company cleared 700 acres of land, but this year, owing to the scarcity of labor, will not be able to clear any additional land and make it ready for planting. The cane as It comes to the mill in cars of large capacity looks well and will average right through about four and one-half tons of sugar to the acre the year around.

As Is the case elsewhere in the Hilo district of Hawaii, no irrigation is required, at the rainfall is quite sufficient. Some thirty miles of railroad is maintained upon the plantation, and some 700 men find steady employment in the fields of cane and about the main works...

...As showing the life of the soil in the above district it may be stated that the first sugar cane was planted twenty-two years ago [1879], which was the time that Mr. Kennedy came to Hilo to erect the Waiakea mill and also to manage the property. He has made a careful study of the subject of cane culture in all its branches, and in his dally operations displays a practical knowledge of the subject in hand...

May 18, 1935 (page 9)
Honolulu Star Bulletin
No. 12, Waiakea, Island of Hawaii

One of the most progressive sugar mills of the early [18]80s in Hawaii, Waiakea Mill Co., in later years has been closely identified with government homestead enterprise.

Richardson and Shipman were the pioneer planters on the Waiakea lands, and when it was found that cane would grow advantageously, Alexander Young and Theo. H. Davies organized the milling company, erected a mill and began sugar production on a large scale.

C.C. Kennedy was manager of the Waiakea plantation for 35 years, succeeded in 1912 by David McHattie Forbes. W.L. Williams became the manager in 1924... ...Waiakea in 1885 was the first mill in the island to add the two roller mill with the automatic feed to the three roller mill... The maceration or application of hot water to the bagasse between rollers was also started at this time...

...Waiakea plantation occupied government land, 6,000 acres of it, under lease which expired in 1918. At that time the territory undertook its Hawaiian homestead project, surveying the land in home sites ranging from 10 to 50 acres. All but about 800 acres of the tillable land of the plantation was included in the homestead tract.

Homesteads Allotted [Figure 20]

The homesteads were allotted by Hawaiians through a system of drawing, and homesteaders entered a joint agreement and appointed trustees who obtained a milling contract with the Waiakea Milling Co. which allowed them 60 per cent of the sugar produced on their land, less milling expense.

Ensuing years were filled with litigation over the matter of contract; homesteaders became heavily involved in debt, the total obligation to the government abrogating more than a half million dollars…

…The present mill is equipped with an array of modern sugar milling machinery. A tunnel in the floor blows the bagasse direct to the factory of the Hawaiian Cane Products Co. where it is made into structural insulation material… …No irrigation is necessary, the plantation having an average annual rainfall of 145 inches at 50 feet elevation and 50 inches more on its upper fields… …The sugar output is shipped by means of barges across a fish pond and down the Wailoa river… (Honolulu Star Bulletin 1935:1).

July 2, 1941 (pages 1 & 15)
Honolulu Advertiser
Waiakea Mill Has Had Long, Stormy Career
(by Jared G. Smith)

Waiakea Mill company has had a stormy history for the last 30 years. Cane was grown here before the Civil War period and in 1865 or thereabouts a 50-year lease was negotiated from the reigning Monarch at a very low rental covering the entire government land of Waiakea from its frontage on Hilo harbor to the mountains. The advantage of nominal rentals and low taxes made Waiakea a gold mine.

Annexation [1898] brough land hunger and increasing demands for the breaking up of huge plantation holdings into smaller pieces. A movement which culminated in breaking up the Waiakea cane lands into homesteads. In 1916 the governor of Hawaii issues a proclamation cancelling an extension of a lease to the sugar company which it was charged, had been illegally secured from the Commissioner of Public Lands. This restored the title to the government. Waiakea was now in politics.

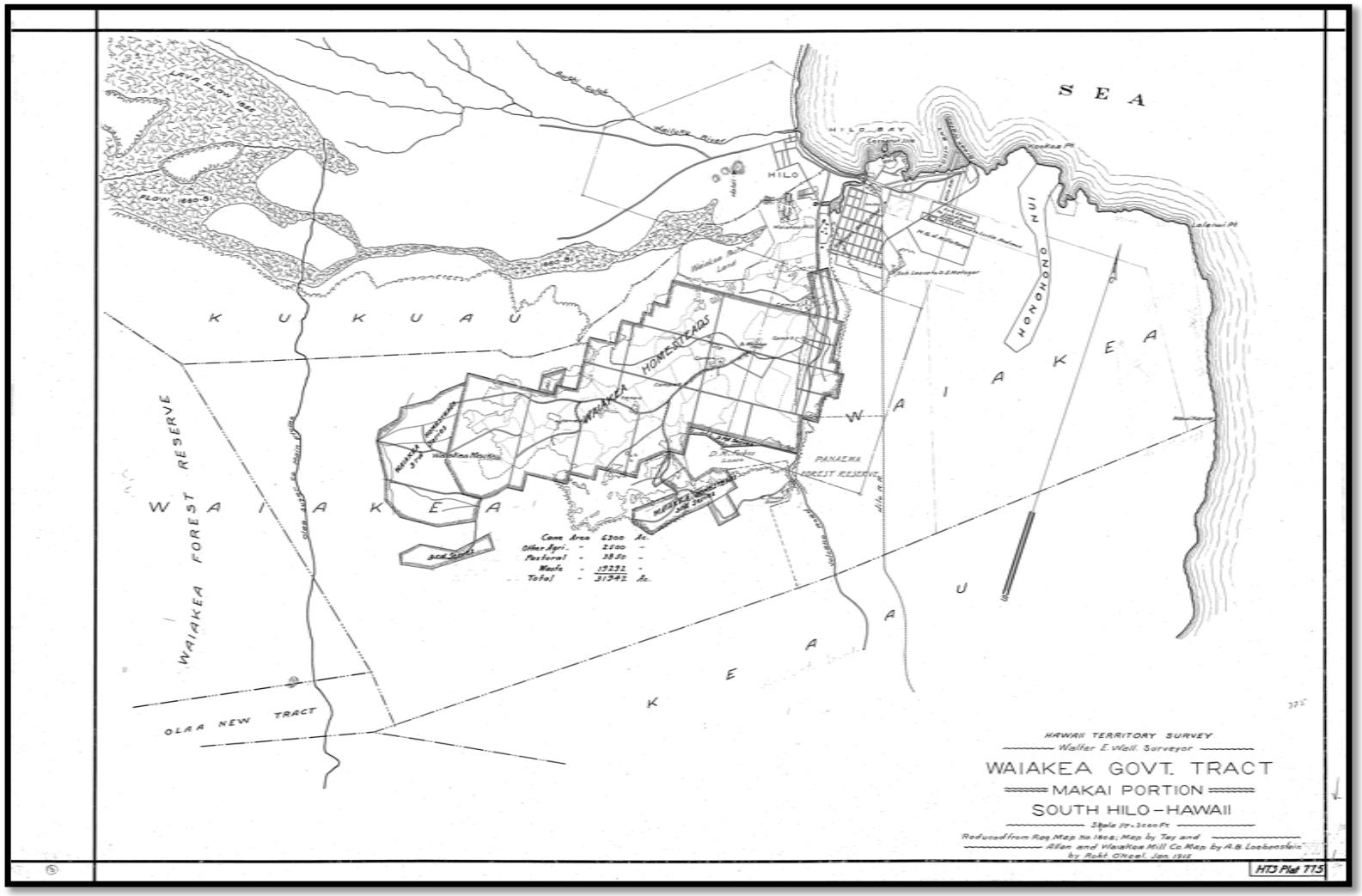


Figure 20. Waiākea Government Tract. Makai Portion, Hawaii Territorial Survey, January 1915. Locations of Planned Homestead and Agricultural Lots, the Waiakea Pasture Land, 1880-1881 Lava Flow, Existing Railroad and Other Features Depicted

The proposed homesteading venture smoldered during world War I, then flared after the armistice, the outcome being that the legislature of 19191 authorized the project and provided for a public drawing, or land lottery, open to all citizens. More than 5,000 applications were received and in due time the 250 or more cane farms were parceled by lot among as many holders of the lucky numbers.

The government set aside 800 acres for house lots, one to each successful drawee, and camp sites for the laborers… [Smith discusses sugar process, indebtedness of the homesteaders, government intervention, and initiatives of the homesteaders through 1938]

…Waiakea plantation extends into the suburbs of Hilo, or to put it another way, Hilo a rapidly growing city, must have room to expand. Already, homesteaders who have paid their debts, observed residence requirements and acquired title from the government, are subdividing their properties into city lots. The lower end of the plantation is slightly looking down on City and harbor, a panoramic view.

Owners are building streets into their subdivisions. City water is available and gas and electricity. Other homesteaders who have acquired title are raising poultry or pigs, and growing flowers and vegetables instead of cane. The plantation will lose more cane land as the Hilo grows…

June 5, 1948 (pages 1 & 4)
Honolulu Advertiser
Early Hardships at Waiakea Recalled
Died, June 5, 1948 at Hilo, Hawaii, the Waiakea Mill Company, aged 59 years and 41 days. The end came peacefully after a lingering illness dating from 1941.
(by Jared G. Smith)

Cane was first at Waiakea by Chinese, their names and the dates neither recovered nor remembered. In the 1860s two pioneers, Shipman and Richardson, are said to have started a sugar plantation to be called “Bide-a-Wee” but after planting a few acres the partners had a disagreement. The project was given up.

It is fairly well established the Theo. Ho. Davies, one of the founders of Waiakea plantation, with associates, took up where Shipman and Richardson left off. They leased all of Waiakea for 50-years from King Kamehameha V at an annual rental which then seemed generous for an area of 70,000 acres of virgin forest. When cane was planted, the rent was low.

> The plantation really got started in 1874 after the election of David Kalakaua to succeed King Lunalilo. Trade reciprocity with the United States was in the air. Venture capital was plentiful. Men were arriving from the four quarters of the clove to pioneer the land… …In 1889 it was decided to incorporate.
>
> Waiakea Mill Co.'s charter, dated April 25, 1889, was signed by Lorrin a Thurston, minister of the interior of the Hawaiian Islands, and attested by William L. Green, minister of finance, Jonathan Austin, minister of foreign affairs, and Clarence W, Ashford, attorney general.
>
> The charter was granted to Theophilus H. Davies, Alexander Young and Domitila R. Janion, operating as the Waiakea Mill Co., giving them the right to maintain a plantation for the period of 50 years for "planting, raising and cutting cane and converting it to sugar."
>
> The company was capitalized at $300,000 in 3,000 shares, par $100, with the privilege of expansion to $600,000.
>
> In the 59 years since Waiakea Mill Co. was incorporated the plantation had produced about 750,000 tons of sugar…

As early as May 1899, Waiākea Mill Company proposed to the Agent of Public Lands, that it be allowed to return 86,000 acres of its Waiākea lease "in consideration of a fee simple title to 9000 acres of land" in Waiākea (Hawaii State Archives; F.O. & Ex. file, Agent of Public Lands to President, May 4, 1899). On October 11, 1899, The application of Waiākea Mill Company to acquire in fee simple, 9000 acres of land in Waiākea was declined. Additionally, Waiākea Mill Company had applied "to retain the fisheries & fishing right of Waiakea under tenant-at-Will." No action was taken on this application (Hawaii State Archives; F.O. & Ex. file, Agent of Public Lands, May 15, 1899).

In 1911, Waiākea Mill Company applied to the Board of Public Lands for the lands upon which it's "Camp Sites in Waiakea" were situated (Hawaii State Archives; Ex. file, August 31, 1911). The request was submitted to a special committee, and on October 16, 1911, the Board of Public Lands reported that it was opposed to sale of the Waiākea camp and stable sites to the plantation (Hawaii State Archives; Ex. file, October 16, 1911).

As the terms of the General Lease with Waiākea Mill Company drew to a close, the government sought out innovative ways to employ people and get them on the land. In the Legislative Session of 1913, Act 167 was passed, Granting Waiākea Government lands for Homestead and Cane Lots Lease and Sale (Session Laws 1913:296-297). The homesteading laws required that the government lease land to homesteaders who would grow sugar cane and send it to Waiākea Mill which would be responsible for processing the sugar. By March 1914,

the Commissioner of Public Lands reported to the Governor that negotiation had been completed and that Waiākea Mill Company would surrender 230 acres of land in Waiākea, to be divided and sold into house lots (Hawaii State Archives; Ex. file, March, 9 1914). On November 16, 1915, Waiākea Mill Company applied to lease the ahupuaʻa of Waiākea at the cost of $35,050 per year (Hawaii State Archives; Ex. file). This application was denied, and by May 24, 1918, 110 individual applications were on file with the Commissioner of Public Lands to homestead (cultivate sugar) on more than 2,000 acres of land (Hawaii State Archives; Ex. file, May 24, 1918). The contract between the Territory of Hawaiʻi and Waiākea Mill Company for processing of sugar from the Homestead Lots was submitted for approval on August 15, 1918 (Hawaii State Archives; Ex. (C.P.L.) files).

With the Waiākea Homestead and Cane Lots agreement in place, leases were confirmed to individual homesteaders. On June 20, 1919, the Commissioner of Public Lands submitted a list of 181 names with Cane Lot and House Lot numbers to Governor McCarthy. The total area of Waiākea Cane Lot acreage for lease and cultivation was approximately 5,300 acres, with lots ranging between 9.56 to 55.59 acres (State Archives; Ex. / C.P.L. files). Cane Lots 15, 16, 17, 18, 19, and 20, to the south and west side of UH-H complex, are the closest lots covered in the homestead agreement. These six lots are situated south and west of the study area parcel which is identified as a large open space on the 1930 "Railroad and Flume Right of Ways Through Waiakea Homestead Lots & Government Land" (Figure 21)[26]. All railroad and/or flume branches and spurs also stop prior to entering the vacant area of land.

[26] Note the mid-right section of the map which identifies the location of L.C.A. properties to Keaniho (Helu 2402) and Kahue (Helu 2663).

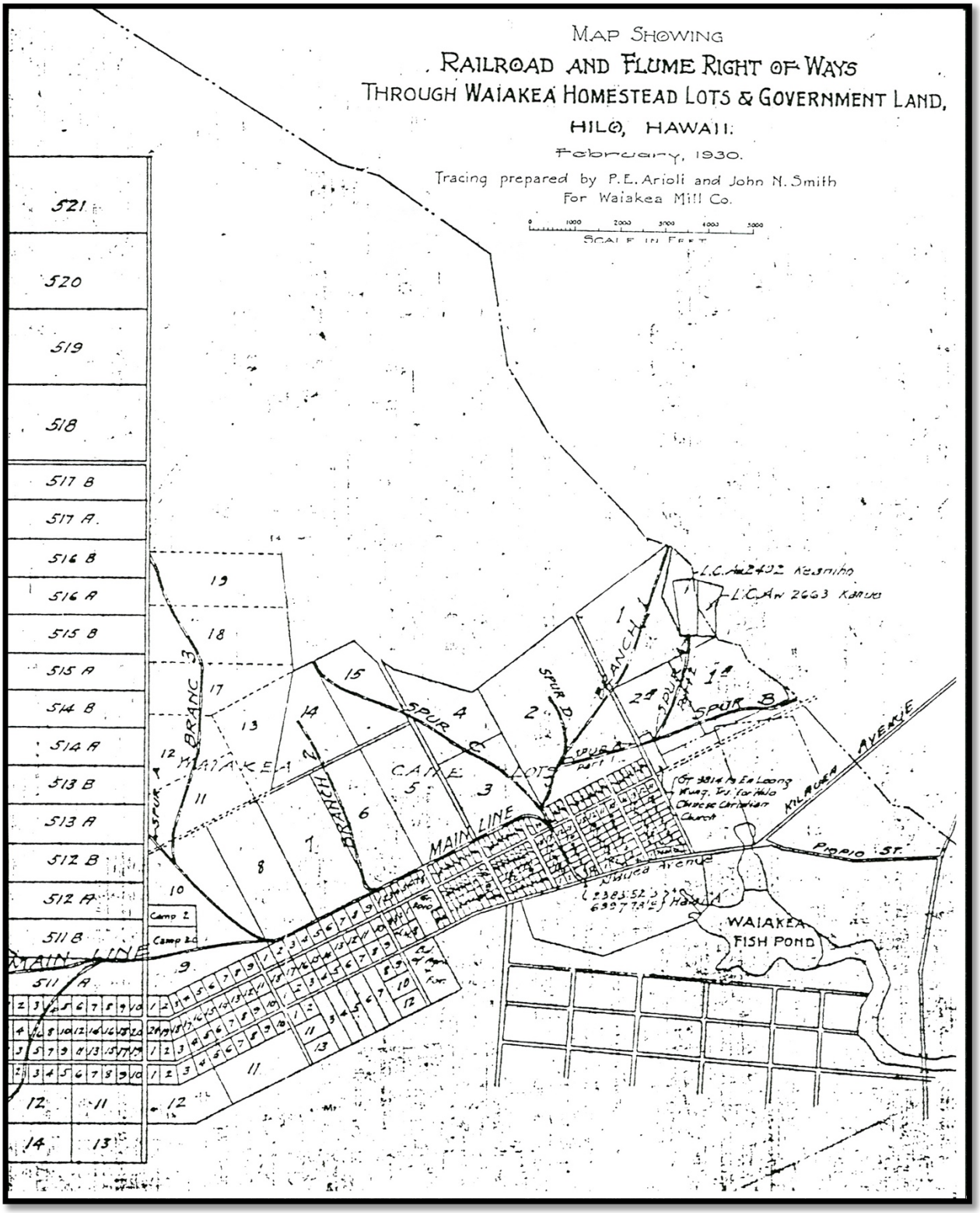


Figure 21. Portion of Railway and Flume Right of Ways, Through Waiākea Homestead Lots and Government Land; P.E. Arioli and J.N. Smith, February 1930 (Honolulu, Real Property Tax Office)

By 1920, grievances regarding failure of Waiākea Mill Company to fulfill the requirements of its contract with the Homesteaders were being raised. The special investigative commissions, the "Waiakea Homestead Commission" (WHC) was established. Matters brought before the commission by the homesteaders included:

> ...the cutting of cane, applying of fertilizer to the crop of 1920—the cost of which was absorbed by the Mill Company—discourtesy of the manager, failure of the Company to supply men and mules when needed, black list, etc... (WHC Chair, William Goodale to Governor Farrington, December 18, 1929).

While the Waiākea Mill Company failed to fulfill its contractual obligations to the homesteaders, the WHC also reported that substantial losses on the crops of 1920 and 1923 were due to:

> Ignorance, negligence and inability of the Homesteaders to properly care for their cane to produce good yields after they took over their lands in 1919 and 1920 were also contributory causes of the losses on those crops... (WHC Chair, William Goodale to Governor Farrington, December 18, 1929).

As settlement was reached regarding the above matter, and pursuant to the Organic Act, Section 72, Revised laws of Hawaii 1925, the homesteaders were given clear title to the Homestead land they paid for. Waiākea Mill Company and a majority of the Homesteaders continued in cultivation and milling operations through c. 1946 (see Hawai'i State Archives–letter: A. Lester Marks, Commissioner of Public Lands to Frank G. Serrao, Sub-Land Agent, Hilo; April 26, 1947).

3.4.5.3 Pasturage Military Use of the Upper UH-H Complex Parcel

The land area of interest to the proposed USGS complex, is identified as a large parcel of land—roughly 506—situated between Lots 12, 13, 17, 18, 19, 20, & 20-A and the southern boundary of Kukuau 1st Ahupua'a (Figure 22). Considered marginal land of little use for sugar cultivation, the area had never been used by the planation for that purpose. The large parcel, "Waiakea Pasture Land," was leased to Kazuo Miyasaki in 1939 in General Lease 2751. With the outbreak of World War II, the was taken and issued to John Matson in 1942 (TMK:2-4-01-41). As the war effort and the military presence in Hilo grew, the pasturage parcel was used for training by the United States Military (U.S. Army Corps Agreement RE-4761, July 10, 1942). during World War II. At the close of the war, communications between the Army and F.G. Serrao, Sub-Land Agent, Commissioner of Public Lands indicated that in 1946, larger part of the land covered under General Lease No. 2751 to John Matson was then being cleared of barbed-wire; and the Army was checking to see that all duds (explosives) had been removed. At that time, it was requested that two latrine buildings and three Quonset buildings be left

intact so that they could be relocated to the new prison site (Hawaii State Archives F.G. Serrao to A.L. Marks; January 22, 1946).

Additional documentation regarding the use of the neighboring Waiākea Cane Lots 12, 13, 17, 18, 19, 20, & 20-A, and a comment on the lots included within the Homestead program, is found a letter from A. Lester Marks, Commissioner of Public Lands, to Frank G. Serrao, Sub-Land Agent, Hilo:

> In the matter of L.W. Bryan's application to homestead Lots 20 and 20-A, Waiakea Cane Lots, referred to in his letter as being of the Waiakea Homesteads, these lots are covered by General Lease No. 2741 to Waiakea Mill Company, please be informed that these lots are not homesteads, and were never advertised as homesteads available for homestead entry.
>
> They happen to be marginal cane land outside of the homestead tract proper, which lots have been covered by General Leases to permit continued occupancy for cultivation of sugar cane. The only way these lots may be had is by lease.
>
> General Lease No. 2741 expires on October 15, 1955 and may be transferred by Waiakea Mill Company without consent if anyone is interested (Hawaii State Archives, A.L. Marks to F.G. Serrao; April 26, 1947).

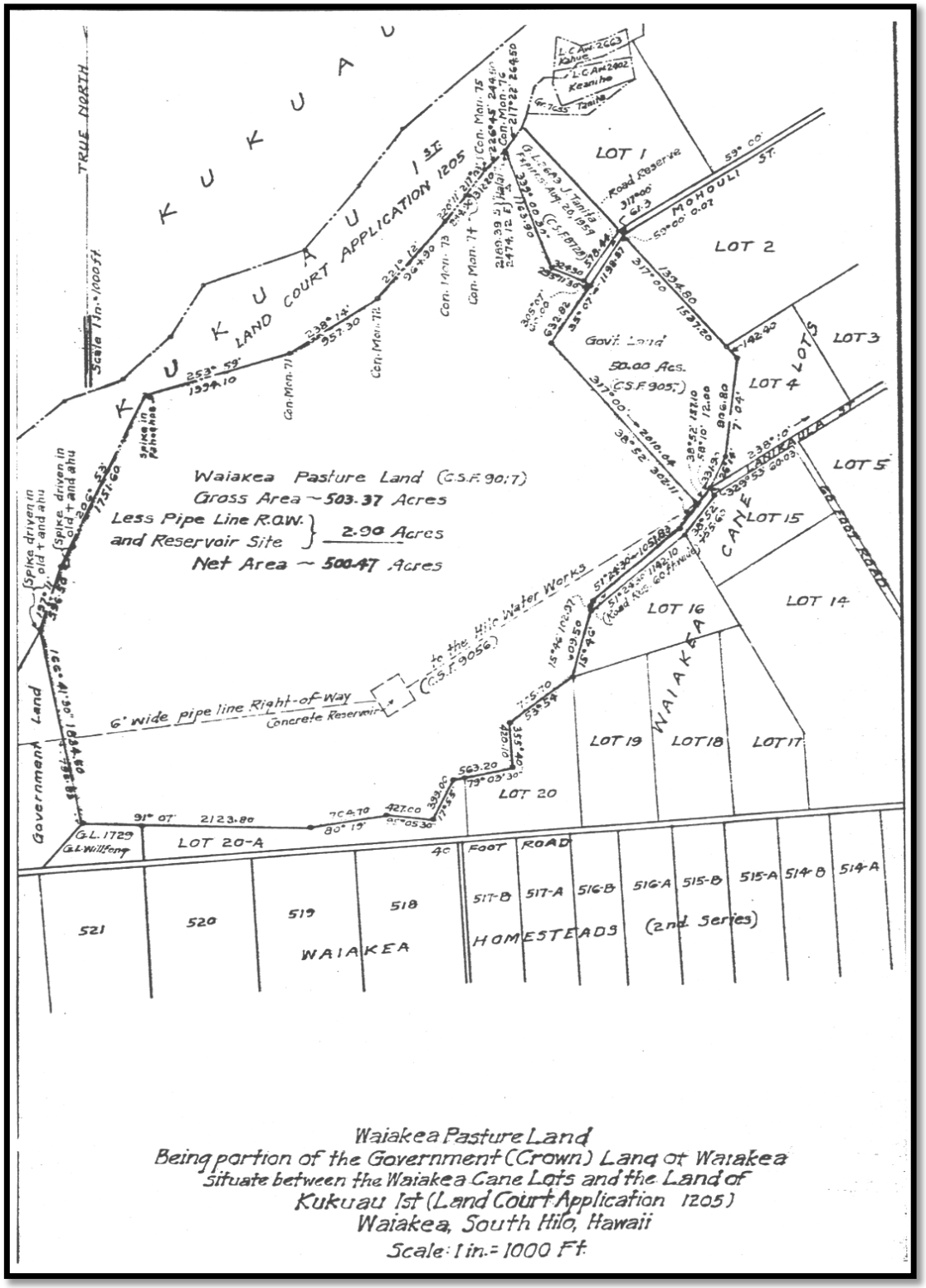


Figure 22. Waiakea Pasture Land (Land Court Application 1205), including an area of 506 acres. Note also the location of LCA 2663 and 2404 (State Survey Branch, C.S.F. No. 9017, June 4, 1940)

3.4.5.4 Fairview Dairy and William Kamau Grazing Leases

On November 12, 1949, Fairview Dairy secured at public auction a lease of Lots 11 to 20-A, of the Waiākea Cane Lots, for pasture purposes (letter: D. Furtado, Manager to F. Serrao, Comm. of Public Lands December 1, 1949). The lease (G.L. No. 3333) to Senator William "Doc" Hill was for a term of 21 years, on a total area of approximately 237.68 acres (Hawaii State Archives, L. Marks, Comm. of Pub. Lands to W. Hill; May 25, 1949).

In a communication to Frank G. Serrao, Commissioner of Public Lands, T.Y. Awana, Surveyor, Territory of Hawaii submitted the metes and bounds of Lots 11 to 20 Inclusive and 20-A, noting that all corners had been marked and pointed out to the lessee, Fairview Dairy so that they would be able to fence the said area (Hawaii State Archives, T.Y. Awana to F.G. Serrao; August 14, 1950). Records note that Lot No. 11 (TMK:2-4-01,5), General Lease 2734; now a portion of the Waiākea School Complex, also reserved there from a railroad right of way 20 ft. wide for the Lessees railroad. This is "Branch 3" of the railroad that extended through Lots 12, 17, 18, and 19 as well. G.L. 2734 for Lot 11 was canceled on or before December 31, 1948.

Fairview Dairy enclosed the lands covered under G.L. 3333 with fences and reportedly made use of rock enclosures as well (oral history interview with Gene Olivera). In 1959, Fairview Dairy transferred its lease to William Kamau, Sr., who used the land for grazing cattle and keeping his horses pastured. Mr. Kamau had been one of the early Homesteaders at Waiākea as well, with a house lot on Kīlauea Street (still lived on by his niece), and a cane lot (Lot 515-B), situated across the road, on the Puna side of Cane Lot No. 18 (oral history interviews with Josephine Kamau-Kunewa and Mary Kamau-Fragas).

3.4.5.5 Other Notable Economic Endeavors in Waiākea

While sugar played the most significant role in the economic development of Hilo-Waiākea, and was the activity most responsible for modifications to the landscape, other business endeavors were also underway. One such agricultural activity was the cultivation of pineapples.

3.4.5.5.1 Overview: Hilo Railroad Company and Hawaii Consolidated Railway, Ltd. 1899-1946

It is reported that as early as c. 1880, Theo. H. Davies employed a railway and locomotive for transporting cane, laborers, and supplies of the Waiākea fields (Conde and Best 1973:14 & 117). These early operations led to the organization of the Hilo Railroad Company, which chartered in March 1899, operated until to 1916, and was the forerunner of the Hawaii Consolidated Railway, Ltd. The Hilo Railroad Company serviced plantation and transportation

needs between the fields and communities of Waiākea and ‘Ōla’a Sugar Company and Puna Sugar Company, with railroad lines extending towards Kapoho (Thurston IN Thrum 1914). Oral history interview with Mr. Kenneth Bell provides readers with additional information regarding use of the rail system in the fields.

3.4.5.5.2 Pineapple and Canec—Hawaiian Cane Products

The interview with Mr. Kenneth Bell, identifies the location of one of the areas in Waiākea-uka where cultivation was still occurring in the 1920s. The location is in the vicinity of the old Waiākea Mill, Camp 6. A cannery was also built in Hilo. Pineapple grown on the island was primarily cultivated in small patches, with Japanese farmers cultivating the largest percentage of the crop. The old Hilo Pineapple Cannery was situated near the Waiākea Mill, where the Hilo Iron Works building is now located.

In the late 1920s a group of local businessmen produced an innovative approach to using the sugar cane by-product called bagasse. Early mill operations had used the bagasse as fuel for the boilers and fertilizer, but as fuel oils became available and mills converted, use of bagasse declined even though the by-product continued to be manufactured. In 1929, Hawaiian Cellulose Ltd., of the Waiākea Mill Company applied for a patent to manufacture wallboard, which came to be called “canec.” Senator William H. “Doc” Hill, and Wm. Williams, manager of the Waiākea mill were among the officers of the company. The canec plant was opened in 1932, close to the site of the Waiākea Mill. The operation of Hawaiian Cane Products (HCP) experienced a series of difficulties relating to durability of the product, marketing, and labor, and in 1948, HCP was purchased by the Flintkote Company of New York. In order to address the issues with termites and other insects finding canec an easy to access food, they Flintkote operation began to use highly toxic chemicals, which stabilized the canec and made it resistant to termites. This served the company until 1960 when a factory fire destroyed most of the facility. Toxic residue — e.g., sodium aluminate, alum and ethyl silicate, calcium arsenic, and arsenic acid from canec production lurks just below the surface of the mud bottom of the Waiākea fishpond and Wailoa estuary (see Kelly et al. 1981:136-141).

4.0 Cultural Resources

This section characterizes archaeological studies and results in and around the project area environs, in order to identify resources that may be of significance to the community. The first subsection provides an overview of studies and results within about one-half mile of the current project area. This is followed by a project-area specific summary. The cultural resources in this section focus primarily on tangible resources and the built environment.

4.1 Ka Nohona: Cultural and Historic Sites as Evidenced by Settlement

Archaeologists and historians describe the settling of these islands as resulting from great seafaring voyages taken across the vast open ocean, with people coming from small, isolated island groups. For many years archaeologists have proposed that early Polynesian settlement voyages between Kahiki (the ancestral homelands of the Hawaiian gods and people) and Hawaiʻi were underway by A.D. 300, with long distance voyages occurring fairly regularly through at least the thirteenth century. It has been generally reported that the sources of the early Hawaiian population—the Hawaiian "Kahiki"—were the Marquesas and Society Islands (Emory in Tatar 1982:16-18).

For generations following initial settlement, it appears that communities were clustered along the watered, windward (koʻolau) shores of the main Hawaiian Islands. It was on the koʻolau shores, in areas such as Waiākea-Piʻihonua, that streams flowed, rainfall could be relied upon, and agricultural production could become established. To a lesser extent, locations in Puna, such as in the Keaʻau and Hāʻena vicinity, and in the Kapoho vicinity, early settlers also found the resources necessary for establishing community centers. Along these koʻolau shores, sheltered bays offered access to both deep sea and near shore fisheries. The latter were enriched by nutrients carried in the fresh water flowing from the mountain streams, and in underground lava tube systems, and became areas in which fishponds and estuarine systems could be developed. In these early times, the residents generally engaged in subsistence practices in the form of fishing, and in agriculture on lands extending towards the uplands from the bays (see Handy, Handy and Pukui 1972:287).

Over a period of several centuries, areas with the richest natural resources became populated and perhaps crowded, and by ca. 900 to 1100 AD, the population began expanding to the more remote sections of Puna and the larger Kona (leeward) side of the island (Cordy 2000:130).

As a general summary of lowland residency and cultivation of food resources in Waiākea, Handy, Handy and Pukui (1972) reported that:

> Hilo as a major land division of Hawaii included the southeastern part of the windward coast…the northern portion, had many scattered settlements above streams running between high, forested kula lands, now planted with sugar cane. From Hilo Bay southeastward to Puna the shore and inland are rather barren and there were few settlements. The population of Hilo was anciently as now concentrated mostly around and out from Hilo Bay… The Hilo Bay region is one of lush tropical verdure and beauty, owing to the prevalence of nightly showers and moist warmth which prevail under the northeasterly trade winds into which it faces…
>
> In lava-strewn South Hilo there were no streams whose valleys or banks were capable of being developed in terraces, but cuttings were stuck into the ground and on the shores and islets for many miles along the course of the Wailuku River far up into the forest zone. In the marshes surrounding Waiakea Bay, east of Hilo, taro was planted in a unique way, known as kanu kipi. Long mounds were built on the marshy bottom with their surface two or three feet above water level. Upon the top and along the sides of these mounds taro was planted. Flood waters which occasionally submerged the entire mound are said to have done no harm, as the flow was imperceptible. This swampy land is now abandoned to rank grass… [Handy, Handy and Pukui 1972:538-539]

4.1.1 Traditional Cultural Properties

Since western contact, the cultural landscape has undergone dramatic changes. The native "backyard" gardens, and the inland groves and natural areas described by native residents and early visitors rapidly disappeared. Vast tracts of the native field system, scattered dwellings and associated sites, were cleared and cane was planted in their place, while other areas were abandoned as a result of the rapid decline of the native population.

Earlier inventories of "archaeological" sites conducted in the Hilo area were of a general nature, usually related to the city of Hilo, and tended to focus on the largest the largest piles of stones and bones, such as heiau (temples). In The Hawaiian Almanac and Annual for 1908, T.G. Thrum, provided readers with background on his field trips and observations of noted places on the landscape in the preceding years. Thrum listed only three heiau in Waiākea, one in the area of Panaʻewa, the other two near the Wailoa section of Waiākea. No doubt there were many more—like that reported in the Boundary Commission testimonies, as being a short distance inland from the coast near the Waiākea-Kūkūau boundary—and others destroyed by historic business development or kept secret and forgotten. The heiau in Waiākea included:

> Kapaieie. Near Honokawailani, Waiakea, famed in the Hilo-Puna wards. In existence at time of Byron's visit in the "Blonde." Size and class uncertain. Its ruins may still be seen.

> Makaoku. On the shore opposite Cocoanut Island [Mokuola], Hilo, of luakini class, connected with the noted Mokuola place of refuge; dimensions unknown, though it is said to have had a high pyramid of stone as if for a place of observation. The stones of this heiau were taken by Capt. Spencer in the [eighteen] sixties for a boat landing.
>
> Ohele. Site above the old Pitman store, at Waiakea; a small heiau of luakini class, about 60 ft. square; destroyed before Pitman's time. [Thrum, 1908:40]

In 1906-1907, J. F. G. Stokes of the Bishop Museum, traveled the island of Hawai'i, documenting the location, background and condition of heiau on the island (1991, Stokes and Dye). Only one heiau was listed in all of Waiākea, being a heiau at 'Ohele, near the shore of Wailoa Stream.

In between 1930, 1931, and 1932, A. E. Hudson conducted an archaeological and historical literature research for the eastern portion of Hawai'i Island (Hudson ms.). Hudson's work provides a detailed description of various sites including heiau, residences, fishponds, burials, and trails within the Hilo area. As others had before him, Hudson noted that "There was an important village and trading center around Hilo bay" (Hudson n.d.:20). Citing Thrum, several journals of historic visitors and residents, and informants at the time of his study, Hudson's manuscript provides some background on the Waiākea area. He observed that house sites were often found in close proximity to those temples located elsewhere away from the chiefly centers of habitation. Most of the heiau were built close to the sea. The majority are within a hundred yards of the beach. Very few are more than two miles inland and these were probably of a specialized class, such as the bird catchers' heiau... (Hudson Ms. n.d.:38).

> No archaeological remains are to be found in the city of Hilo itself except a few stones which are said to have been taken from heiaus [Hudson's Site 37, the heiau luakini of Maka-o-kū, the pu'uhonua (refuge) of Moku-ola, and Kaula'i-nā-iwi, a place where chief's bones were prepared for interment (Hudson Ms. n.d.:236)...

Also, in Waiākea, Hudson reported that at 'Ohele, Kalani'ōpu'u "took up residence...on the eve of his war with Imakakoloa of Puna" c. 1780 (Hudson Ms. n.d.:238). Hudson also reported that a heiau was located inland in Waiākea, along the old Hilo-'Ōla'a trail, not far from the route of modern-day Kīlauea Avenue:

> There was a heiau named Kapaieie near Honokawailani [Kawailani] in Waiakea. Bloxam who passed the site on his way from Hilo to the volcano says that its center was marked by a single coconut tree. At the time of his visit nothing remained but ruined walls choked with weeds. He was told that the priests would lie in wait for passersby and dispatch them with clubs [see the narratives cited above from the legend of Ka-Miki]. Thrum [1908:40] states that the site was famed in the Hilo-Puna wars but its size and

class are unknown. No remains of any kind could be found and no Hawaiians with whom I talked had ever heard of it (Hudson Ms. n.d.:240).

4.1.2 The Waiākea Forest Lands

In 1904, the territory developed the Hilo Forest Reserve in 1904, and in 1905 and 1913, added portions of the ʻŌlaʻa Tract to the reserve system. The territory also set aside the upland portions of Waiākea as a reserve. Thus, making a contiguous line of forest across the Hilo District, and adjoining the Puna District. A report by Ralph Hosmer dated June 6, 1913, provides us with background on why it was recommended that Waiākea be made a part of the reserve, and the potential for long-term benefits. Reading the communication below, reveals the sad reality that much has continued to be lost.

Honolulu, June 6, 1913.
The Upper Waiakea Forest Reserve.
Reports of the Superintendent of Forestry.

Gentlemen:—
I have the honor to submit as follows the recommendation that a forest reserve be created to cover the central forested portion of the government land of Waiakea, district of Hilo, island and county of Hawaii:

Location, Object and Area.

Waiakea is a large government land stretching from the sea at Hilo bay well up on the slopes of Mauna Loa. Much of the lower portion is in cane; the extreme upper part is more or less open grazing land, crossed by lava flows. Between is a section of heavy forest. The present recommendation is that the forested portion be set apart as a forest reserve, with the objects (1) of bringing the land under the management of the department of the Territory especially equipped to care for it, so that (2) it may be wisely administered in any way not inconsistent with its maintenance as a forest that may in the future be deemed best. [page 302]

Owing to the geological formation of the island of Hawaii there are no running streams south of the 1855 and 1881 lava flows that come down the side of Mauna Loa back of Hilo town on lands lying immediately to the north of Waiakea. It is quite possible that springs and water holes may later be discovered in the Waiakea forest; for at present almost nothing is known accurately about the interior of this tract; but there are no running streams coming from it.

The question of stream protection does not, therefore, figure on Waiakea, but there are other reasons why it is important that existing areas of forest should receive the care and protection of the government. Until many more scientific data than are now available have been collected, it is impossible to tell how far-reaching may be the influence exerted on the country immediately surrounding large bodies of continuous forest, but it is evident that such influence does exist and that it is beneficial. Particularly is this true in the tropics and sub-tropics.

Further, on Waiakea it may happen that in time the question may arise of devoting portions of this forest to commercial utilization. To safeguard the interests of the government in all these ways and to be ready for any sort of development that may come about, it is desirable that the Waiakea forest become the Waiakea forest reserve.

The area proposed to be set apart is 51,800 acres. Of this 600 acres is a part of the land of Piihonua, a remnant mainly covered with lava, between the boundaries of the Hilo forest reserve and Waiakea. Piihonua is now under lease No. 103 to Hon. John T. Baker, expiring on March 21, 1921.

At the present time all of the land of Waiakea is under an expiring 30-year lease to the Waiakea Mill Co. (No. 124) that runs out on June 1, 1918. No use is at present made of the forest. Beyond the general clause against waste, common to the leases of that time, the lessees are not obligated to protect the forest.

The forest on Waiakea is practically unexplored region. It is a dense stand of the rain-forest type. Ohia-lehua is the predominating tree. Along its lower side, where the forest is crossed by the Olaa flume, are numerous groups of loulu palms, growing in company with great tree ferns. And throughout, as far as the interior is known, there is a dense stand of the undergrowth characteristic of this type of Hawaiian forest.

Boundaries.
The upper and lower boundaries of the proposed Upper Waiakea forest reserve have been somewhat arbitrarily fixed by drawing lines across the land from known points on the outside boundaries, but it is believed that they serve the purpose at this time as well as if they had been run out on the ground. The makai line very nearly parallels the flume constructed to carry water [page 303] from upper Kaumana to the Olaa plantation. The upper line leaves out of the reserve the area suitable for grazing above the native forest.

The elevation of the makai boundary is approximately 1800 feet; that of the mauka line varies from 5000 feet at Puu Kulani to 4500 feet at the 1855 lava flow, where the proposed reserve joins and forms a continuation of the existing Hilo forest reserve.

Description.
A technical description of the boundary, prepared by the Government Survey Office as C.S.F. 2430, accompanies this report.

Recommendations.
For the reasons above set forth I do now recommend that the Board approve this project and call upon the governor of the Territory to set apart this government land as a forest reserve to be known as the Upper Waiakea forest reserve.

Very respectfully,

Ralph S. Hosmer
Superintendent of Forestry.
[Hawaiian Forester and Agriculturalist, 1913:304]

4.1.3 Archaeological Sites

Honua Consulting, LLC completed an archaeological literature review and field investigation (LRFI) for the project. The most relevant previous archaeological work for the purposes of the subject report is an archaeological inventory survey (AIS) by Escott (2004) of 258 acres that included the current project area (see Figure 23). Escott (2004) also completed mitigation work (data recovery) at two sites in the current project area (see below). As described in the Introduction (see LRFI Section 1.2 – Regulatory Context), there is an extensive record of formal decisions by the State Historic Preservation Division (SHPD) regarding the subject parcel (TMK [3] 2-4-001:122) to the effect that its historic preservation process has been completed (see LRFI, Appendix A).

The based on the extensive investigation into the area, the LRFI concluded there are no significant historic sites in the Project Area. The project would remove some of these historic properties and the following archaeological data was used in developing the questions for these interviews for this CIA.

4.1.3.1 Results of Previous Work in the Project Area

Escott's (2004) AIS identified 16 historic properties (State Inventory of Historic Places [SIHP] #s 50-10-35-24233 to -24248) comprising 80 component features. In addition, three (3) previously-identified sites (SIHP #s 50-10-35-18918, -18919 and -20681) were also recorded in the southeastern portion of Escott's (2004) project area (i.e., not in the subject project area).

Table 3 is a summary of the historic properties, which mostly consist of site complexes of above-ground rock structures built by sugar cane and/or ranching workers in and around old agricultural and/or pastureland fields. Escott's (2004) research shows that the current project area was once known as "Waiakea Pasture Land" with "Waiakea Mill Lot 20-A" located to the south, just above (north of) Pu'ainako Street. Military training site-features dating from around World War II were also documented.

In the current (subject) project area (13 acres), five (5) historic properties were documented:

- SIHP # 50-10-35-24243 – a complex of 12 features interpreted as a World War II-era military training (and possibly used later by dairy workers); features include several "foxholes" constructed of stacked and piled rocks, kerbstone footpaths and the concrete foundation of a small building;
- -24244 – a World War II-era military anti-aircraft gun emplacement;
- -24245 – a set of three isolated iron fence posts interpreted as related to historic-period ranching activities;
- -24247 – dirt road that traverses the project area;
- -24248 – portions of a dirt road that provides access to the eastern portion of -24243.

Escott's (2006) report described the results of data recovery at two sites in the current project area: SIHP #s 50-10-35-24243 and -24244. No other sites in Escott's (2004) project area required any mitigation (e.g., preservation). The SHPD accepted the data recovery report in 2006 (see LRFI Appendix A).

4.1.3.2 Results from Other Studies in the Vicinity of the Project Area

Previous studies completed within about one mile of the current project area are summarized in Table 3. The studies in the bullet point list below include only those closest to the current project area:

- Two AIS reports from project areas immediately to the south (Bush et al. 2000; McDermott and Hammatt 2001) documented (1) SIHP # 50-10-35-22080, a lava tube containing a single human femur; the site was treated as a human burial, and was eventually preserved in place with a 50-foot buffer; and (2) two historic-period plantation and/or ranching/dairy sites: SIHP # 50-10-35-22734 (rock platform interpreted as probable historic-period planting feature) and -22735 (rock causeway dating to first half of 20th century – related to agriculture, dairy or ranching activities).

- To the east of the current project area, Borthwick et al. (1993) identified four historic properties: SIHP # 50-10-35-18667 (historic-period agricultural field complex with above-ground, stacked & piled rock structures), -18668 (enclosure

interpreted as a 20th century camp structure), -18669 (enclosure/wall dating to 20th century) and -18670 (agricultural field dating to 20th century). Calma and Wolforth (2007), working in a portion of Borthwick et al.'s (1993) project area, identified six clearing mounds associated with the Waiakea Mill Company.

- Multiple surveys of a linear road corridor to the south (various phases of the Pu'ainako Street Extension/Realignment project) (Hunt 1992; Hunt and McDermott 1994; Robins and Spear 1996; Eble et al. 1997; Spear 1998; McGerty and Spear 1999) identified several dozen historic-period (sugar cane), above-ground, stacked and piled rock structures designated SIHP #s 50-10-35-18911 to 18923.

Table 2. Previous Historic Preservation Studies and Results near the Project Area

Author/Date[1]	Type of Study[2]	Location & Notes	Results & Comments[3]
Jensen 1991	AIS	NW of project area; Ponahawai Ahupua'a	2 historic properties identified: 14946 (early historic-period house & sugar cane site) & 14947 (Hilo Boarding School & Old Mission Ditch)
Smith 1991	Field inspection	UH-Hilo perimeter road alignment; Waiākea Ahupua'a	Described the presence of sites & recommended AIS be conducted
Hunt 1992	Archaeological reconnaissance	Pu'ainako Street Realignment/Extension project – S of current project area	31 features identified associated w. historic-period sugar cane (these features were formally assessed by Hunt & McDermott 1994 [see below])
Smith 1992	Field inspection	Waiākea Cane Lots – E of current project area	Identified numerous sugar cane features – walls, clearing mounds, a large rectangular enclosure & C-shaped enclosures

Author/Date[1]	Type of Study[2]	Location & Notes	Results & Comments[3]
Borthwick et al. 1993	AIS	University of Hawai‘i land just E of current project area	4 historic properties identified: 18667 (historic-period agricultural field complex), 18668 (enclosure - 20th century camp structure), 18669 (20th century enclosure/wall) & 18670 (20th century agricultural field)
Hunt & McDermott 1994	AIS	Pu‘ainako Street Realignment/Extension project – S of current project area	13 historic properties (18911 to 18923) associated w. historic-period sugar cane including mounds, stone walls, modified outcrops & alignments
Eble et al. 1997	Supplemental testing of Hunt & McDermott (1994) project area		Archaeological testing of sites 18911, 18912, 18914, 18915, 18916 & 18917 – excavation showed all subsurface evidence of pre-Contact Hawaiian use of the land had been destroyed by commercial agriculture
Robins & Spear 1996	AIS	Pu‘ainako Street Realignment/Extension project – expanded corridor	Additional historic-period sugar cane agricultural features identified from extension of Hunt & McDermott 1994 project area
Spear 1998	Archaeological reconnaissance	Mauka portion of Pu‘ainako Street Realignment/Extension	27 features associated w. site 18921 (Hunt & McDermott 1994) were identified
McGerty & Spear 1999	AIS		Identified features of site 18921

Author/Date[1]	Type of Study[2]	Location & Notes	Results & Comments[3]
Bush et al. 2000	AIS	20-acre parcel – immediately adjacent to (S of) current project area; Waiākea Ahupuaʻa	1 historic property identified: 22080 (lava tube containing 1 human femur); site was eventually preserved in situ w. a 50-foot buffer
Dega & Benson 1999	Archaeological reconnaissance	Puʻainako Street Realignment/Extension project – mauka of current project area	Several historic-period sugar cane features of 18921 identified; 1 possible pre-Contact ʻauwai (traditional irrigation ditch) also identified
Dega 2000	Addendum to AIS by McGerty & Spear (1999)	Same as Dega & Benson (1999)	Additional work at 18921: subsurface testing at possible pre-Contact ʻauwai, which was determined to be a historic-period feature
McDermott & Hammatt 2001		Additional 10 acres immediately adjacent to (west of) Bush et al. (2000) project area	2 historic properties identified: 22734 (rock platform - probable historic-period planting feature) & 22735 (rock causeway dating to first half of 20th century – related to agriculture, dairy or ranching activities)
Haun 2002	Field inspection	8 acres NNW of current project area	Historic-period sugar cane features and house site

Author/Date[1]	Type of Study[2]	Location & Notes	Results & Comments[3]
Escott 2004	AIS	258 acres of University of Hawai‘i-Hilo lands in Waiākea Ahupua‘a; **includes the current project area**	16 historic properties (24233-24248) comprising 80 component features were identified; 3 previously-identified sites (18918, 18919 & 20681) were also recorded; **data recovery was completed at 2 sites in current project area (24243 & 24244); no sites required any preservation**
Calma & Wolforth 2007	AIS	5.2-acre survey SE of current project area within Borthwick et al.'s (1993) survey area	1 historic property identified consisting of 6 sugar cane clearing mounds associated w. Waiakea Mill Company
Tulchin & Hammatt 2009	Monitoring	ESE of current project area	Monitoring of sugar cane features
Clark et al. 2012	AIS	Kapi‘olani Street Extension – linear corridor east of current project area	4 historic properties identified – all dating to historic period (likely early to middle 20th century): 29370 (modified drainage), 29371 (earthen ditch), 29372 (piled cobble mound) & 29373 (remnants of Hilo Dairy buildings)

[1] Arranged chronologically.
[2] AIS = archaeological inventory survey
[3] SIHP = State Inventory of Historic Places; complete numbers in the last column to the right (above) formally preceded by "50-10-35-."

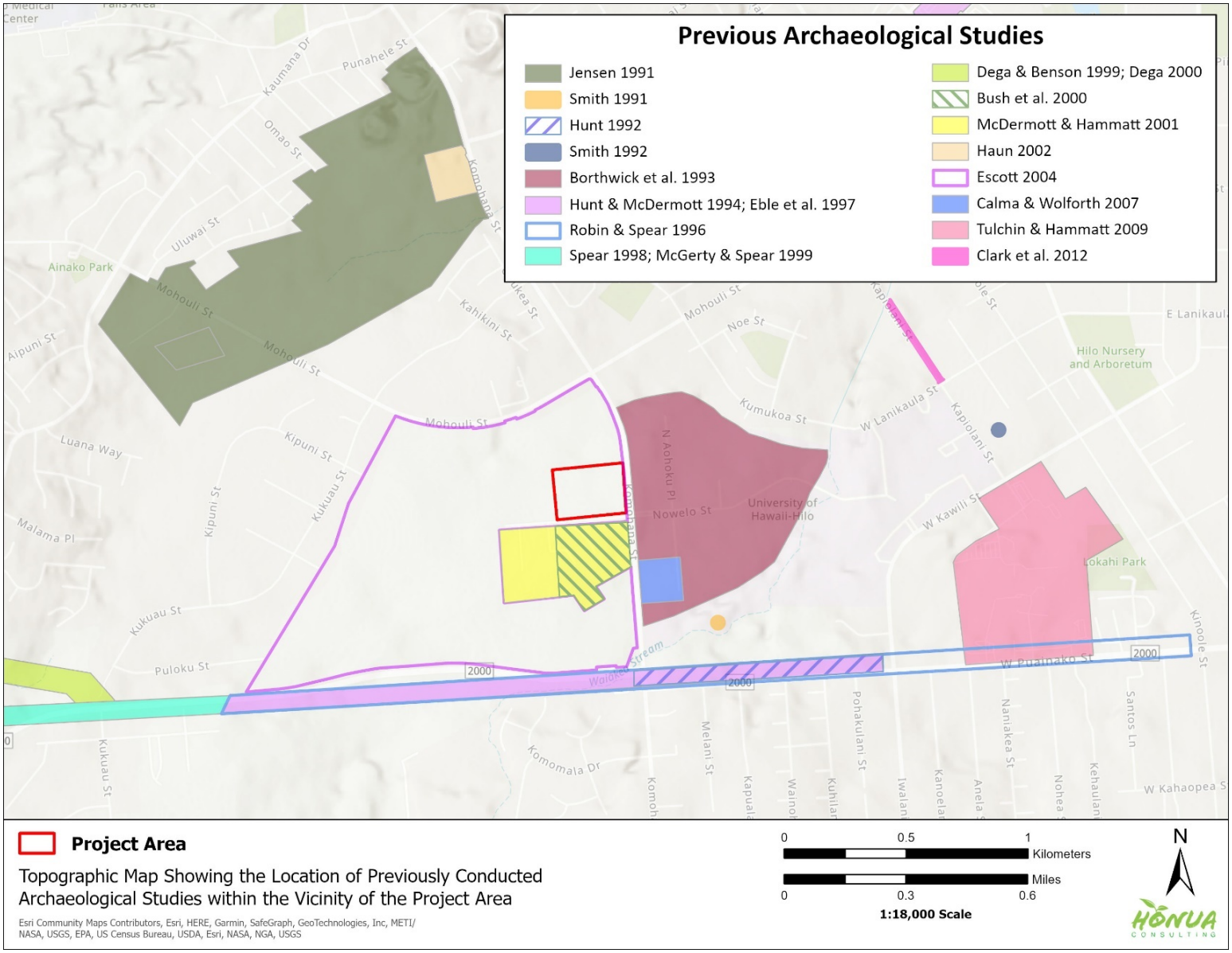


Figure 23. Previous historic-preservation studies near the project area (see table and text above for details)

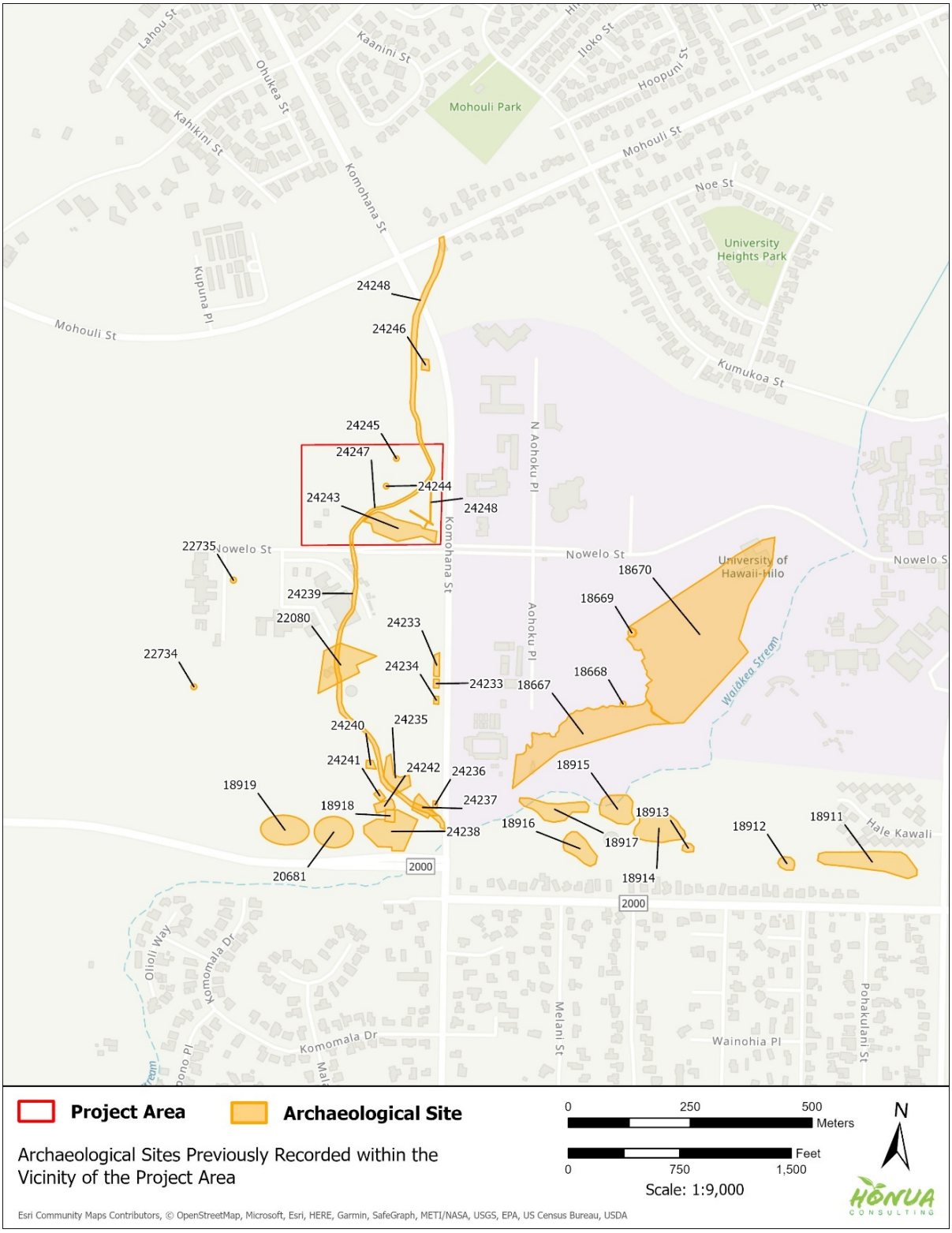


Figure 24. Previously identified archaeological sites in and near the project area

Table 3. Sites Identified in the Subject Parcel and Project Area by Escott (2004)

SIHP #[1]	*Description*	*Mitigation?*	*Current Disposition*
24233	*Rock alignment & rock concentration*	*No further work*	*Not in current project area*
24234	*Rock mound*	*No further work*	*Not in current project area*
24235	*11 above-ground, stacked & piled rock structures associated w. a sugar cane field*	*No further work*	*Not in current project area*
24236	*Lava tube opening w. semicircular alignment / enclosure at the opening*	*No further work*	*Not in current project area*
24237	*7 water catchment features related to an old sugar cane field & pastureland associated w. an old dairy farm*	*No further work*	*Not in current project area*
24238	*32 above-ground, stacked & piled rock structures associated w. a sugar cane field*	*No further work*	*Not in current project area*
24239	*Dirt road (appears on 1964 aerial)*	*No further work*	*Not in current project area*
24240	*Military fighting (training) positions ("foxholes") – 2 stacked rock features*	*No further work*	*Not in current project area*
24241	*Enclosure – interpreted as a rest or work location for sugar cane workers*	*No further work*	*Not in current project area*
24242	*5 above-ground, stacked & piled rock structures associated w. a sugar cane field*	*No further work*	*Not in current project area*
24243	*Complex of 12 features interpreted as a military training site (later possibly used by the dairy); includes several fighting (training) positions ("foxholes") & kerbstone footpaths; includes a concrete building foundation for a small building*	*Data Recovery (completed 2006)*	***In current project area***

24244	*Military – anti-aircraft gun emplacement overlooking Hilo Bay (likely built during World War II)*	*Data Recovery (completed 2006)*	***In current project area***
24245	*3 isolated iron fence posts – likely ranching / pasture feature*	*No further work*	***In current project area***
24246	*Rock alignment created by a bulldozer along a dirt road (site 24248)*	*No further work*	*Not in current project area*
24247	*Dirt road (appears on 1965 aerial)*	*No further work*	***In current project area***
24248	*Dirt road (partially on 1965 aerial)*	*No further work*	***Partially in project area***
18918	*4 above-ground, stacked & piled rock structures associated w. a sugar cane field*	*No further work*	*Not in current project area*
18919	*58 above-ground, stacked & piled rock structures (modified outcrops, mounds, retaining walls, terraces & platforms) associated w. a sugar cane field*	*No further work*	*Not in current project area*
20681	*16 above-ground, stacked & piled rock structures (modified outcrops, mounds & retaining walls) associated w. a sugar cane field*	*No further work*	*Not in current project area*

[1] *SIHP = State Inventory of Historic Places; complete numbers in the last column to the right (above) formally preceded by "50-10-35-."*

4.1.3.3 Survey Results

Fieldwork resulted in the following main findings:

1. Except for the shipping container area in the southwestern corner, the western half of the project area is a mix of graded/impacted basalt rock with thin soil deposits and areas of intact, gently undulating pāhoehoe lava flows. A very shallow (dry) ephemeral drainage was noted traversing roughly east to west in the central area of the western half of the project area.
2. The eastern half of the project area included the previously documented historic properties (SIHP #s 24243, 24244, 24245, 24247 and 2428). All of these sites were inspected, except for SIHP #24245, a set of three iron fence posts attributed by Escott (2004) to ranching or dairy workers. Inspected sites showed little to no change in condition since their original documentation, except for some damage from overgrown vegetation. Historic bottles were strewn about the area and a few historic-aged trash deposits are still present. The grounds in the

eastern half of the project are a mix of graded/impacted basalt rock with thin soil deposits and areas of intact, gently undulating pāhoehoe lava flows.

3. No new historic properties were observed in the project area.

4.1.3.4 SIHP # 50-10-35-24243

This site a complex of 12 features interpreted as a World War II-era military training (and possibly used later by dairy workers). Features at this site include several "foxholes" constructed of stacked and piled rocks, kerbstone footpaths and the concrete foundation of a small building. Data recovery was completed at this site (Escott 2006), which completed its historic preservation treatment (i.e., no preservation of this site).

4.1.3.5 SIHP # 50-10-35-24244

This site is a World War II-era military anti-aircraft gun emplacement. Data recovery was completed at this site (Escott 2006), which completed its historic preservation treatment (i.e., no preservation of this site).

4.1.3.6 SIHP # 50-10-35-24245

This site is a set of three isolated iron fence posts interpreted as related to historic-period ranching activities. It was not found (re-located) during the current fieldwork.
No further archaeological or historic preservation work was required for this site based on the original survey by Escott (2004).

4.1.3.7 SIHP # 50-10-35-24247

This site is a dirt road that traverses the project area; it appears on a 1965 aerial but not on a 1954 aerial. No further archaeological or historic preservation work was required for this site based on the original survey by Escott (2004).

4.1.3.8 SIHP # 50-10-35-24248

This site is a dirt road, portions of which traverse the project area; portions of it appear on a 1965 aerial but not on a 1954 aerial.

No further archaeological or historic preservation work was required for this site based on the original survey by Escott (2004).

4.2 Natural Historic and Natural Resources with Cultural Significance

Hawaiians, like most indigenous and local communities, ascribe great cultural value to the natural resources in the environment around them.

The islands of the Hawaiian Archipelago are all volcanic in origin. Lava flows in the vicinity of the USGS site in Waiākea Ahupuaʻa from as recent as 1881 to ca. 10,000 years before present.

The lava flows that form Waiākea-Leleiwi Point shape the shoreline, forming jagged headland points and small rocky islets such as Mokuola, Kaulaʻināiwi, Mahaikea (Mahikea), and others towards Pāpaʻi in Puna. Freshwater springs are common along this stretch of coast, often creating a cold freshwater lens near the surface and brackish conditions in the rocky pools behind the points. The region consists of shallow, well drained soils that formed in a thin mantle of organic material and small amounts of volcanic ash overlying pāhoehoe lava. Annual rainfall is about 154 inches, and the average annual temperature is 73 degrees Fahrenheit. ʻŌhiʻa lehua was the primary plant species of the ancient forest. Many other plant species, including, but not limited to ʻieʻie, maile, pū hala, loulu, and a number of ferns were also common. (see https://soilseries.sc. egov.usda.gov/OSD_Docs/K/KEAUKAHA.html)

Extensive development of the Hilo Bay region has significantly altered the shoreline and inland region between Wailuku River to the area where the Port of Hilo is situated. In earlier times, the coastline of Waiākea, extending from Kanukuokamanu/Wailoa Stream to beyond Leleiwi and the boundary between the Hilo and Puna districts, was noted for pockets of coral sand and pebble beaches. In addition to the region of Hilo One (Hilo of the sandy shore), other small bays and landing areas included, but were not limited to Kanakea (Reeds Bay), Puhi, Keōkea, Onekahakaha, Peue (Peiwe), Waiuli and other small coves along Leleiwi Point.

4.3 Intangible Cultural Resources

It is important to note that Honua Consulting's unique methodology divides cultural resources into two categories: biocultural resources and built environment resources. We define biocultural resources as elements that exist naturally in Hawaiʻi without human contact. These resources and their significance can be shown, proven, and observed through oral histories and literature. We define built environment resources as elements that exist through human interaction with biocultural resources whose existence and history can be defined, examined, and proven through anthropological and archaeological observation. Utilizing this methodology is critical in the preparation of a CIA as many resources, such as those related to akua, do not necessarily result in material evidence, but nonetheless are significant to members of the Native Hawaiian community.

Hawaiian culture views natural and cultural resources as being one and the same: without the resources provided by nature, cultural resources could and would not be procured. From a Hawaiian perspective, all natural and cultural resources are interrelated, and all natural and cultural resources are culturally significant. Kepā Maly, ethnographer and Hawaiian language scholar, points out, "In any culturally sensitive discussion on land use in Hawaii, one must understand that Hawaiian culture evolved in close partnership with its natural environment. Thus, Hawaiian culture does not have a clear dividing line of where culture ends and nature begins" (Maly 2001:1).

4.3.1 ʻŌlelo a me nā Mele Hoʻohiwahiwa

Hawaiians have always commemorated their relationship with the honua ola (living environment) through ʻōlelo noʻeau – ʻōlelo aʻo (poetical and instructive sayings), mele (chants), and later through songs. The sayings and mele celebrate all facets of life and death, and everything in between, both the tangible and intangible. In such ʻōlelo (sayings) and mele are found names of place, descriptions of resources, and events on the land or in people's lives. Among these ʻōlelo and mele which inform us about wahi pana (storied and sacred places) of Waiākea and neighboring lands, are the following lines.

Pele is Present in Hilo

One ancient mele from the Pele collection of Kupuna Hoohila Kawelo offers a beautiful description of Hilo, its relationship with Pele and the myriad natural forms of the goddess and her family. Mele like this recognize that Pele plays an important role in shaping the history of Hawaiʻi, particularly the island of Hawaiʻi and the districts of Hilo, Puna, Kaʻū and Kona. As recently as the 1980s, Pele's awakening on Mauna Loa stirred the populace of Hilo Town. Looking into recent history of the Mauna Loa eruption of 1880-81, we find numerous Hawaiian references to Pele and her creative forces of nature in the vicinity of the Waiākea project area. In fact, in August 1881, Chiefess Keelikolani ascended Puʻuhonu in the nearby land of Punahoa, and there, asked Pele to spare Hilo. Miraculously, the branch of the lava flow traveling through Kūkūau, along the boundary of Waiākea (adjoining the project area) slowed, and on August 9th stopped, thus saving the Waiākea ponds, mill site and the Hilo Town coastal lands.

Nani Hilo Noweo Ula ka Maka o ka Lehua[27]

Nani Hilo noweo ula ka maka o ka lehua o Kaliu	Beautiful is Hilo with the glowing centers of lehua at Kaliʻu
Puapuai ula i ka uka o Malama	The red glow pours forth to the uplands of Mālama
Ke okooko lehua a ka wahine i ka lua	Burning the lehua of the woman at the volcano
Ke okooko no ka lau ohia o Keaau	Burning the ʻōhiʻa leaves of Keaʻau
Mau no ka nani, ka maikai, ke onaona noho no i Hilo	Many are the attributes, fine qualities and fragrances which abound at Hilo
I Hilo ka Puulena me ka moani	At Hilo is the Puʻulena wind which blows with its' light fragrance
Aole wahi hoohalahala a ka maka	No place which the eye sees may be

27 Hoohila Kawelo Chant Collection (Maly, curator).

ke ike aku	criticized
Ke alawa iho ma ka uka o Puna	As you glance towards the uplands of Puna
Nani, hinu, maikai ka ili o ka laau	Beautiful, glistening and fine is the bark of the trees
I ka mili ia e ka makani Puulena	Which is caressed by the Pu'ulena
aala o ka lua	bearing its' light fragrance from the volcano
Paoa punia aala no i ka nae a ka mauu	Surrounded by the fragrant essence of the grasses
I ka mapu hanu ala a ka Ulumano	A wafting fragrance born on the Ulumano wind
Mahea la hoi ka puka ana mai nei	From where shall love come
a ke aloha	
Aloha ka ua, ka la, me ka makani...	Aloha to the rains, the sun and the winds...

He makamaka ka ua no Hilo One[28]

He makamaka ka ua no Hilo One,	The rain is a companion of Hilo One,
I ka hele no a kipa i Hanakahi,	It travels and greets Hanakahi,
Kipa aku 'oe na hala i Makakalo,	You are greeted by the pandanus groves of Makakalo,
Ua hele no a na ‘ale kekahi wai,	Pouring like the rippling waters,
E nana ana i ka hui kau o ka lehua,	Looking upon the profusion of lehua blossoms,
I ka luuluu o na pua i kanahele,	The flowers bear down on the forest,
Aia la i ke kai o Punahoa,	There at the sea of Punahoa,
He hoa ia la o ka nahunahu hewa ...	Is the companion do not be mistaken... [Maly, translator]

Many ali‘i are celebrated through mele which describe the ali‘i associating them with famous places, winds, rains, features and events in history. While Waiākea may not always be specifically named, much of Hilo is Waiākea and the mele are filled with the expressions of aloha for the ‘āina—

A Hilo au e lā[29]

[28] *Ka Hoku o Hawaii*, April 5, 1917, “He Mo’olelo Walohia no Keamalu, Kekahi o na Mo’olelo Hoonaue Puuwai o ka Lahui Hawaii.”

[29] Name chant for Liholiho, Kamehameha II, who was born in the Pi’opi’o vicinity of Waiākea in 1797.

(Traditional)

A Hilo au e la Hoolulu ka lehua la	I am at Hilo, In the shelter of the lehua groves
A Wailuku au la I ka lua kanaka la	I am at Wailuku At the pit of men
A Haili au la I ke kula manu la	I am at Haili On the open flat land of the birds
A Panaewa au la I ka moku lehua la	I am at Pana‘ewa In the lehua forest
A Leleiwi au la Auau i ke kai la…	I am at Leleiwi Swimming in the ocean… [Maly, translator]

He Lei no W. C. Lunalilo[30]

Lei Hanakahi i ke ala me ke onaona,	Hanakahi wears the sweet fragrance of the forest as a lei,
Puia okoa no Hilo i ka maikai,	Hilo is completely surround by goodness,
He luana ke kai o Huia na ka lehua,	The ocean of Huia is host to the lehua blossoms,
E hoomu ana i ka lau o ka ulu,	Gathered together under the leaves of the breadfruit trees,
Malama Punahoa ia Makakalo,	Punahoa cares for Makakalo,
He punalua Kapuulena na Kealahonua,	The Puulena breeze is the companion of the Alahonua breeze of Hilo,
He makani hoolawehala ua no ka nahele	Wind bearing rains that transgress upon the forest,
E hehi ana i ka liko o ka ohia,	Treading upon the budding leaves of the lehua
Moku ka polohinano o ka wai o Kanakea,	Breaking the pandanus flowers upon the water of Kanakea
I ka okia e Alanoho maka moani e -ilaila…	The fragrance is cut off there at Alanoho [Alenoho]… [Maly, translator]

30 *Ko Hawaii Ponoi*, Iulai 9, 1873:1, “He Lei no W. C. Lunalilo” (King of Hawai‘i).

Manu ʻŌʻō
(Traditional)

...No Hilo i ka ua Kani-lehua,	The Kanilehua rain belongs to Hilo,
Popohe lehua ai Hanakahi...	And the round lehua blossoms at Hanakahi...
	[Maly, translator]

ʻAno ʻai Kuʻu Wehi
(Traditional)

ʻAnoʻai kuʻu wehi lā,	Greetings my love,
I ka ua Kanilehua,	In the Kanilehua rains,
Pua nani ka lehua lā,	The lehua blossoms beautifully,
No Hilo Hanakahi,	At Hilo of Hanakahi,
Aʻo kuʻu ipo ia lā,	My beloved is there,
I ke kai aʻo Mokuola,	In the waters of Mokuola,
Hoʻonānā ʻana paha lā,	One looks to perhaps see,
I ka nani a ʻo Hōpoe,	The beauty of Hōpoe,
Kui ʻia me ke ʻala lā,	Stung together in the fragrance,
O nā hala aʻo Puna,	Of the pandanus of Puna,
Haʻina kuʻu wehi lā,	It is spoken of my adornment,
I ka ua Kanilehua.	In the Kanilehua rains.
	[Maly, translator]

Hilo March[31]

...ʻIke hou ana i ka nani aʻo Hilo	...Behold again the beauty of Hilo
I ka uluwehiwehi o ka lehua	Adorned by the lehua
Lei hoʻohihi	Cherished lei
Hiʻi a ka malihini	Born by visitors
Mea ʻole i ke kono a ke aloha	Nothing deters the invitation of love
E aloha aʻe ana i ka makani Puʻulena	Greeting the Puʻulena wind
Ka makani kaulana o ka ʻāina	Famous wind of the land
Home noho a na ʻiʻiwi pōlena	Home of scarlet honey-creepers
Mea ʻole i ke kono a ke aloha	Not indifferent to the call of love
Nani wale no Hilo	Hilo is so beautiful

[31] Mele by Joseph Aea (1881), commemorating the visit of Princess Liliʻuokalani to Hilo during the Mauna Loa Eruption.

I ka ua Kanilehua	With the rustling of lehua in the rain
Me he mea ala e i mai ana	As though saying
Eia iho a hiki mai…	Wait until the princess comes…

Hilo Hanakahi[32]

Hilo Hanakahi	Hilo of Hanakahi
I ka ua Kanilehua…	In the Kanilehua rain…
	[Maly, translator]

Kuhio Bay[33]

Akahi hoi a ike kuu maka	I have just seen with my eyes
I ka nani a o Waiakea	The Beauty of Waiākea
Aohe lua e like ai	There is nothing else like it
Me ka nani a me ka nani	Its own beauty and the beauty
A o Kuhio Bay	Of Kūhiō Bay
Mahalo ae au i ka nani a o Hilo	I greatly admire the beauty of Hilo
Me ka ua a e hoopulu nei	And the dampening rains
Oni ana Mokuola au i ke kai	Mokuola moves there in the sea
O ua aina e Kaulana nei	Of that famous land

Hilo E[34]

Aia e a i Hilo e	There are Hilo,
O ka nani e pua ka lehua e	Is the beautiful blossom of the lehua
I lei e no ka malihini e	Made at a lei for the visitor
Kipa aku ai e i ka aina e	Who visits this land
E ake au e a e ike e	I desire to see
I ka nani e o Waiakea e	The beauty of Waiākea

32 Mele by Keola Naumu.

33 Composed by Esther K. Bishaw. In ca. 1908, the bay fronting Hilo One and Waiākea Bay (also known as "Byron Bay") was renamed "Kūhiō Bay" in honor of Prince Jonah Kalaniaole Kuhio who advocated for, and secured funding from the U.S. Congress to develop of the Hilo Breakwater.

34 Mele by Mary Heanu.

Kilohi au e o ka nani e	Glancing to see the beauty
I ka ulu lehua e a o Panaewa e	The growth of lehua at Panaewa
Haina e mai ka puana e	So told is the story
O ka nani e pua ka lehua e	Of the beautiful lehua blossom.

(This section intentionally left blank.)

5.0 Traditional or Customary Practices Historically in the Study Area and Surrounding Area

In Hawaiian culture, natural and cultural resources are one and the same. Native traditions describe the formation (literally the birth) of the Hawaiian Islands and the presence of life on, and around them, in the context of genealogical accounts. All forms of the natural environment, from the skies and mountain peaks to the watered valleys and lava plains, and to the shoreline and ocean depths are believed to be embodiments of Hawaiian gods and deities. Hawaiian genealogical accounts describe the formation of the islands in a genealogical context, where each island was born. Wākea (the expanse of the sky) was the father of Hawaiʻi Island, and Papa-hānau-moku (Papa, who gave birth to the islands)—also called Haumea-nui-hānau-wāwā (Great Haumea, born time and time again)—was the mother. As the genealogical account continues, other gods and creative forces of nature, gave birth to the islands. Hawaiʻi, the largest of the islands, was the first-born of these island children. These same god-beings, or creative forces of nature who gave birth to Hawaiʻi, were also the parents of the first man (Hāloa), and from this ancestor all Hawaiian people are descended (David Malo, 1951; Beckwith, 1970; Pukui and Korn, 1973). It was in this context of kinship, that the ancient Hawaiians addressed their environment—it is the basis of the Hawaiian relationship with their honua ola (living environment)—and the foundation of their system of land use.

Indeed, over the generations of residency, the ancient Hawaiians developed a sophisticated system of land- and resource-management. By the time ʻUmi-a-Līloa rose to rule the island of Hawaiʻi in ca. 1525, the island (moku-puni) was divided into six districts or moku-o-loko (see Fornander 1973–Vol. II:100-102). The district of Hilo is one of six major moku-o-loko on the island of Hawaiʻi. The district of Hilo itself, extends from the shore up to the 9,000-foot level on Mauna Kea, and up to the summit of Mauna Loa, where it joins the districts of Kaʻū, Kona and Hāmākua. Towards the east, Hilo joins Puna at Māwae and Kawiakawa, and continues ma uka (towards the mountains), adjoining the land of ʻŌlaʻa; and on its northeastern boundary, Hilo joins Hāmākua at Kaʻula. The other islands in the Hawaiian group also went through a similar system of districting contemporaneously with Hawaiʻi.

Today, the Hilo District is simply identified as North and South Hilo. Though in ancient time, there were three major division of Hilo. The area from Waiākea, beyond Leleiwi to the Puna boundary was known as Hilo Hanakahi—Hilo, land of Hanakahi, one of the noted chiefs of Hilo, whose reign was noted for its peace. The middle section of Hilo, fronted by the sandy beach of Waiākea Bay, extending from Kanukuokamanu (at the mouth of Wailoa Stream) to Wailuku River was simply known as Hilo One—Hilo of the sandy shore. The remainder of Hilo, extending from the cliffs on Wailuku River to Kaʻula at the Hāmākua boundary was called Hilo Palikū—Hilo of the upright cliffs.

The entire district of Hilo has been most famed for its rains and is commemorated in many

traditional mele (chants) and ʻōlelo noʻeau (poetical sayings) by reference to the rains. This may seem to some to be an undesirable epitaph, but in the Hawaiian mind, the rains were god given—manifestations of the gods Kāne and Lono, and also forms of lesser gods and goddess of the forests and expanse of the land. Rains gave life to, and healed the land, thus a land of water was a rich one.

Native tradition records those lands with "wai" (water) names were themselves associated with the god Lono (G.W. Kahiolo in Ka Hae Hawaii, July 10, 1861). Another level of cultural significance might be associated with the land of Waiākea, interpreted as meaning "Expansive-waters," or the "Water of Ākea," (Wākea) progenitor of the Hawaiian race). We also find that one of the famous sayings of Hilo describes the beauty of the life-giving rains that seem to resonate from the leaves of the ʻōhiʻa lehua (Metrosideros polymorpha) trees which at one time grew luxuriantly from shore to mountains—

No ka pehi mau o ka ua iluna o ka lihilihi o ka lehua
i ka wā a nā manu e kani hone ana a mūkīkī i ka wai
e kilihune iho la i ka liko o ka lehua…
o ka ua kani lehua o Hilo ia!

Because the frequent pattering of rains upon the lehua blossoms
is accompanied by the sweet singing of the birds as they sip the nectar which drips
upon the young budding lehua leaves…
the rain of Hilo is called the rain which resounds upon the lehua blossoms of Hilo!
[Wise and Kihe in Ka Hoku o Hawaii; February 24, 1916 (Maly, translator)]

5.1 Moʻolelo

Moʻolelo is the practice of storytelling and developing oral histories for the purpose of transmitting knowledge information and values intergenerationally. Moʻolelo are particularly critical in protecting and preserving traditional culture in that they are the primary form through which information was transmitted over many generations in the Hawaiian Islands and particularly in the Native Hawaiian community.

Storytelling, oral histories, and oration are widely practiced throughout Polynesia and important in compiling the ethnohistory of the area. The Native Hawaiian newspapers were particularly valued for their regular publication of different moʻolelo about native Hawaiian history. Were it not for the newspapers having the foresight to allow for the printing and publication of moʻolelo, far less information about the cultural history of the Hawaiian people would be available today.

There are numerous moʻolelo about Waiākea and the geographic extent. These moʻolelo are provided in **Sections 3.1 (Traditional Period)** and in **Section 4.0 (Cultural Resources)**.

5.2 Habitation

Hawaiians lived extensively throughout the islands. Handy, Handy, and Pukui (1991) identify how different kānaka and their ʻohana lived in accordance with what the authors termed "occupational contrasts" (286), meaning that based on occupation (i.e., planter or fisherman, for example), habitation systems differed. They describe, "The typical homestead or *kauhale*… consisted of the sleeping or common house, the men's house, women's eating house, and storehouse, and generally stood in relative isolation in dispersed communities. It was only when topography or the physical character of an area required close proximity of homes that villages exist. There was no term for village. *Kauhale* meant homestead, and when there were a number of *kauhale* close together the same term was used. The old Hawaiians, in other words, had no conception of village or town as a corporate social entity. The terrain and the subsistence economy natural created the dispersed community of scattered homesteads" (284).

5.3 Travel and Trail Usage

The ability to travel was essential to Hawaiians and enabled their sustainability. Travel, and the freedom to move throughout different areas, had different names, including huakaʻi, kaʻapuni, or kaʻahele. Traveling by sea had distinct names as well, like ʻaumoana. Traveling through the mountains was sometimes referred to as hele mauna. Travel, and moving throughout various places and regions was an essential practice and way of life in traditional Hawaiʻi.

The freedom to travel safely was so important that Kamehameha I would come to pass a well-known law protecting travelers, Ke Kānāwai Māmalahoe (The Law of the Splintered Paddle). It is explained by the William S. Richardson School of Law as follows:

> As a young warrior chief, Kamehameha the Great came upon commoners fishing along the shoreline. He attacked the fishermen, but during the struggle caught his foot in a lava crevice. One of the fleeing fishermen turned and broke a canoe paddle over the young chief's head. The fisherman's act reminded Kamehameha that human life was precious and deserved respect, and that it is wrong for the powerful to mistreat those who may be weaker.
>
> Years later when Kamehameha became ruler of Hawaiʻi, he declared one of his first laws, *Ke Kānāwai Māmalahoe* (the Law of the Splintered Paddle), which guaranteed the safety of the highways to all. This royal edict was law over the entire Hawaiian kingdom during the reign of Kamehameha the Great. Considered one of the most important *kānāwai* (royal edict), the law gave the Hawaiian people an era of freedom from violent assault (William S. Richardson School of Law 2021).

The kānāwai (law) reads:

E nā kānaka	O my people
E mālama ʻoukou i ke akua	Honor thy god
A e mālama hoʻi	Respect alike, the rights of
Ke kānaka nui a me kānaka iki	All men great and humble
E hele ka ʻelemakule	See to it that our aged,
Ka luahine, a me ke kama	Our women, and children
A moe i ke ala	Lie down to sleep by the roadside
Aʻohe mea nana e hoʻopilikia	Without fear of harm
Hewa no, make	Disobey, and die

The law would have such long-lasting resonance that it would be expressly incorporated into the Hawaiʻi State Constitution.[35]

As traveling through traditional trails was the primary means by which people traveled on land throughout most of Hawaiian history, the traditional trail system is particularly important throughout the Hawaiian Islands. Throughout the islands, there were numerous trails that allowed for people to access different locations. This trail system was critical not only for maintaining a healthy population and managing this population, but it was also important for the traditional economic system of bartering. The trail system allowed for different localized communities to engage and interact. This also allowed for the trade of goods throughout island communities. A discussion of trail usage and the specifically linkage between the Kānāwai Māmalahoe and the Project Area is discussed in **Section 3.3.8**.

5.4 Loko Iʻa (Fishponds)

Fishponds sites have always been highly valued features of the landscape. Writing about loko iʻa, Kamakau (1976) observed:

> Fishponds, *loko iʻa*, were things that beautified the land, and a land with many fishponds was called a "fat" land (*ʻaina momona*). They date from very ancient times. Some freshwater ponds, *loko wai*, were made when the earth was made, but most of the *loko iʻa* and the shore ponds, *loko kuapa*, were made by *ka poʻe kahiko*.[25] The making of the walls (*kuapa*) of the shore ponds was heavy work, and required the labor of more than ten thousand men. Some of these fishponds covered an area of sixty or seventy acres, more or less. Walls had to

[35] Article IX. Section 10 of the Hawaii State Constitution reads: "The law of the splintered paddle, mamala-hoe kanawai, decreed by Kamehameha I--Let every elderly person, woman and child lie by the roadside in safety--shall be a unique and living symbol of the State's concern for public safety."

> be made on the seaward side sometimes in deep water and sometimes in shallow, and many stones were needed.
>
> Many *loko kuapa* were made on Oahu, Molokai, and Kauai, and a few on Hawaii and Maui. This shows how numerous the population must have been in the old days, and how they must have kept the peace, for how could they have worked together in unity and made these walls if they had been frequently at war and in opposition one against another? If they did not eat the fruit of their efforts how could they have let the *awa* fish grow to a fathom in length; the *ʻanae* to an *iwilei* (yard); the *ulua* to a meter or a *muku* (four and one half feet); the *aholehole* until its head was hard as coral (*koʻa ka lae*); and the *ʻoʻopu* until their scales were like the *uhu*? Peace in the kingdom was the reason that the walls could be built, the fish could grow big, and there were enough people to do this heavy work… (Kamakau 1976:47)

While there are no fishponds in the Project Area, the ahupuaʻa is known for many fishponds as discussed in **Section 3.3.9**. The practice is not associated with the specific Project Area, but it would have been a practice in the larger region.

5.5 Farming and Land Management

Since poi was the staple food for Native Hawaiians, it was of the utmost priority for the first settlers to establish loʻi. Kalo's prominence in the Hawaiian diet derived from its nutritional value, but even more so from its mythological significance. According to Hawaiian traditions, the first human (male) was born from the taro plant:

> The first born son of Wakea and Papa was of premature birth and was given the name Haloa-naka. The little thing died, however, and its body was buried in the ground at one end of the house. After a while, a taro plant shot up from the child's body, the leaf of which was named lau-kapa-lili, quivering leaf; but the steam was given the name Haloa.
>
> After that another child was born to them, whom they called Haloa, from the stalk of the taro. He is the progenitor of all the peoples of the earth. (Malo 1951:244)

As discussed in **Section 3.3 (Traditional Period) and 3.4 (Historic Period)**, the area has an extensive history of farming that extends well back into the pre-European contact era.

5.6 Haku Mele, Haku Oli, and Hula

This practice is related to the composition of song and chants. this is a practice that has existed for many centuries in the Hawaiian culture. When the Hawaiian culture primarily relied on an oral tradition to pass on knowledge and information, the ability to create songs and chants was essential to pass information from one generation to the next. As Donaghy (2013) notes, Hawaiians had hundreds of terms associated with this practice.

Songs and chants are largely influenced by the environment around them. As a pedagogical device it was important if not imperative that these songs or chants effectively captured data from the environment around the composer and passed on this information for others to utilize when managing natural resources. In a very real sense, the land and natural resources act as a muse for composers. The category of songs that provide information on or speak to natural resources are called mele ʻāina (songs of the land). As shown in the previous section, there are numerous traditional chants and songs about the project area and its surrounding landscape.

Much like mele and oli, hula serves as a way of both honoring place and telling the story of place. Many hula, especially those based on mele ʻāina, require intimate understanding of the place where the mele was composed, including the natural elements of that ʻāina. Hula hālau will regularly take huakaʻi, or journeys, to visit and honor the place a particular mele speaks of. The ability to visit the place and learn about it is important to the practice of hula.

Hula, as well as mele or oli, are also offered as gifts to kupuna or gods. This practice also requires access to traditional sites. Associated with hula would have been the practices of lei making and the use of plants to dye clothing. There are numerous mele created for the region that describes its history and resources. A selection of these are provided in Section 4.3.1.

(This area intentionally left blank.)

6.0 Ethnographic Data

As discussed previously in **Section 2.6 (Ethnographic Methodology)**, information was collected from a wide range of individuals and sources. The findings of those efforts are discussed in this section. Ethnographic data is utilized to supplement the other research methods utilized. It is one in a range of research tools employed to gather information about the project area.

Honua Consulting was tasked with gathering information from individuals with lineal and cultural ties to the area and its vicinity regarding regional biocultural resources, potential impacts to these biocultural resources, and mitigation measures to minimize and/or avoid these impacts.

The bulk of the information available from practitioners and kūpuna were drawn from native testimonies and Hawaiian language sources and integrated into the cultural and historic overview section of this assessment. Those sources, along with responses to this project, were considered when researching the traditional or customary practices discussed in a previous section. Interviews were conducted with five (5) individuals and additional moʻolelo from a sixth individual was included in this section. This data helped to identify additional resources and practices in the area; this information also helped to confirm research conducted for this report.

Additionally, as the project will include the removal of historic properties, interviewees were specifically asked to share any concerns about this action.

(This area intentionally left blank.)

6.1 Interview with Micah Alameda

Interviewer: Matthew Sproat
Interviewee: Micah Alameda
Date: 9/5/2022
Location: via telephone

Biography

Micah Alameda is Native Hawaiian. He was born and raised in Hilo, Hawai'i and currently resides in Hilo. He works as a communications consultant in the Hilo area. He has worked extensively with the communities across Hawai'i Island and was the Hawai'i Island representative to the Hawai'i Tourism Authority Board.

Overview

Living in Hilo all of his life, Micah shares his vast knowledge of the project area and the surrounding area near the project area. He shares that the project area is not a frequently visited location for many locals or outsiders. Micah mentions the only reason why one would go to this area is if they have an affiliation with the University of Hawai'i at Hilo or going to the Daniel K Inouye agriculture center. Mr. Alameda shares that there are not really any cultural resources or customary practices in the project area or near the project area besides the activities conducted at the University of Hawai'i Hilo. Micah also mentions that the USGS facility that is being proposed is a good proposition for USGS and also for the University. The location of this proposed facility is in the most ideal location and he highly supports the building of this facility.

Cultural Resources

Mr Alameda is not aware of any cultural resources in the project area or near the project area. There are some native plants like ohi'a lehua and some native ferns, but neither are endangered species. He mentions that just above the project area is a known flood zone during heavy rains, but no known steady flowing rivers or springs in the area.

Traditions and Customs

Mr. Alameda could not identify any cultural customary practices found in the project area or near the project area.

Impacts

Mr. Alameda states that the project will pose no impacts on any cultural resources or customary practices.

Mitigation Measures and Recommendations

Mr Alameda's only recommendation would be the flooding issues which occur during heavy rains. The possibility of run off from the project could affect the lower lying areas. A well looked after plan of containing run off during heavy rains would be recommended

Any Concerns Regarding Removal of the WWII Resources

No concerns. Mr. Alameda suggests that the items be removed.

(This area intentionally left blank.)

6.2 Interview with LaRae Mortensen

Interviewer: Matthew Sproat
Interviewee: LaRae Mortensen
Date: 9/4/2022
Location: via telephone

Biography

Mrs. Mortensen owns her own company in Hilo with her husband. She was born in Honolulu, raised in Punalu'u, and currently lives in Keaukaha, Hawai'i Island.

Overview

Mrs. Mortensen moved with her husband to Keaukaha over 20 years ago and raised their family in the Hilo area. She brings a wealth of knowledge of the project area and the surrounding areas due to a contract that her company manages just mauka of the project area. She explains that there are really not too many cultural resources or customary practices or traditions in the project area.

Cultural Resources

Mrs. Mortensen could not identify any cultural resources in the project area. Most of the plants in the area are invasive with the occasional ohi'a lehua trees which area found all throughout the Hilo area. The native Hawaiian bird population would gather further upland from the project area. She also noted that there are no fresh water sources in or near the project area.

Traditions and Customs

Mrs. Mortensen could not identify any traditions or customs in the project area

Impacts

Mrs. Mortensen states that there will be no significant impacts on any cultural resources or traditions and customary practices in the project area. She notes that a lot of the outer lying area has been previously developed such as the new saddle road recently completed.

Mitigation Measures and Recommendations

Mrs. Mortensen recommends being mindful of any native plants if they happen to come across any especially if they could be a rare species.

Any Concerns Regarding Removal of the WWII Resources

No concerns

6.3 Interview with Cameron Mortensen

Interviewer: Matthew Sproat
Interviewee: Cameron Mortensen
Date: 9/4/2022
Location: via telephone

Biography

Cameron currently lives in Honolulu, but grew up in Keaukaha on the east side of Hawai'i Island. He worked as a government contractor as a K9 trainer.

Overview

Mr. Mortensen grew up in the Hilo area all of his life and is aware of the project area being that he attended church which was located near the project area. He is not aware of many cultural resources or traditions in or near the project area.

Cultural Resources

Mr. Mortensen states being that the project area is considered the middle region which would be considered the top of the mountain or near the ocean side, the native Hawaiian plants are not really prevalent in that area. He could not identify any native Hawaiian bird nesting sites in the area with the exception of a few auku'u which he has seen in the area once or twice in his life. Otherwise Mr. Mortensen states the area has been developed and many tropical flower nurseries have taken the place of Native Hawaiian forests.

Traditions and Customs

Mr. Mortensen could not identify any traditions or customs in the area.

Impacts

Mr. Mortensen claims that the project should have no impacts on the cultural resources or traditions

Mitigation Measures and Recommendations

Mr. Mortensen recommends community input

Any Concerns Regarding Removal of the WWII Resources

No concerns. Mr. Mortensen suggests the removal of those military resources and contaminates such as heavy metals and lead.

6.4 Interview with Cyrus Johnasen

Interviewer: Matthew Sproat
Interviewee: Cyrus Johnasen
Date: 9/5/2022
Location: via telephone

Biography

Mr Johnsasen was born in Volcano, raised and currently lives in Hilo. Cyrus is the director of communications for the County of Hawai'i.

Overview

Mr Johnasen finds that there are no cultural resources or customary practices that are conducted in the project area or near the project area.

Cultural Resources

Mr Johnasen mentions that this area is a known flood zone with some streams nearby, otherwise the general area is filled with invasive plants and species with the exception of a few native plants.

Traditions and Customs

Mr. Johnasen shares the only traditional customary practices are what is being conducted by University of Hawai'i at Hilo campus.

Impacts

Mr. Alameda claims the project will pose no impacts to the cultural resources or the traditional and customary practices in the project area.

Mitigation Measures and Recommendations

No recommendations.

Any Concerns Regarding Removal of the WWII Resources

No concerns.

6.5 Interview with Ikaika Mahoe

Interviewer: Matthew Sproat
Interviewee: Ikaika Mahoe
Date: 9/5/2022
Location: via telephone

Biography
Ikaika Mahoe was born and raised in Hilo, Hawai'i in the ahupua'a of Waiākea, and currently resides in Honolulu. At present, Ikaika is a Deputy Chief of Staff for U.S. Congressman Kai Kahele, who represents the Congressional 2nd District.

Overview
Hilo is home to Mr. Mahoe and is familiar with the project area and the surrounding areas. He shares that prior to the building of the 'Imiloa facility, the area was considered vacant lots and not frequented by locals. Ikaika shares that there are not too many cultural resources found in and around the project area, and says there are no customary traditions practiced in or around the project area. Mr. Mahoe is in support of the USGS facility being built stating that Hawai'i island is one of the only places on earth in which an active volcano exists and the research that is being conducted through the USGS is invaluable for everyone.

Cultural Resources
Mr. Mahoe claims that there are no cultural resources within the project area besides a few 'ōhi'a and ferns but mostly invasive plant life in that area.

Traditions and Customs
Mr. Mahoe states there are no traditional customary practices conducted in the project area or near the project area

Impacts
Mr. Mahoe claims the project will pose no impacts on any cultural resources or customary practices.

Mitigation Measures and Recommendations
Ikaika suggests during the construction of the facility if there is any removal of 'ōhi'a that it is conducted in a way that the recent rapid 'ōhi'a death (ROD) disease be contained to limit the spread of the plant disease.

Any Concerns Regarding Removal of the WWII Resources
Care should be taken while removing any historic relics in the area regarding the WWII resources in the area. The developers should reach out to various veterans groups in the community for consultation of the removal of these relics.

7.0 *Ka Paʻakai* Analysis

It has long been the law of the land that the State of Hawaiʻi has an "obligation to protect the reasonable exercise of customary and traditionally exercised rights of Hawaiians to the extent feasible" *Public Access Shoreline Hawaiʻi v. Hawaiʻi County Planning Commission ("PASH")* 79 Hawaiʻi 425, 450 n. 43, 903 P.2d 1246, 1271 n. 43 (1995). In 2000, in the *Ka Paʻakai* decision, the Court established a framework "to help ensure the enforcement of traditional and customary Native Hawaiian rights while reasonably accommodating competition private development interests." 94 Hawaiʻi 31, 35, 7 P.3d 1068, 1972 (2000). This analysis is used here to fulfill the goal of this CIA (**Section 1.4**).

It is also imperative to emphasize that the State may not delegate their obligations under the *Ka Paʻakai* decision to another party, including but not limited to the federal government. While the *Ka Paʻakai* decision was specific to a private developer, the facts of that case would be applicable to the situation at hand because the Court's reasoning for this decision and applicable precedent apply – the issue being that another entity would not have the same public accountability as the State. That is the case herein, the public accountability of the federal government is not equal to that of the State of Hawaiʻi. More specifically, the federal government is not bound to the obligations of the State as set forth under the Hawaiʻi State Constitution, which is the document from which the rights protected under *Ka Paʻakai* emanate.

Based on the guidelines set forth in *Ka Paʻakai*, the Hawaiʻi Supreme Court provided government agencies an analytical framework to ensure the protection and preservation of traditional and customary Native Hawaiian rights while reasonably accommodating competing private development, or other, interests. The Court has stated: "that in order to fulfill its duty to preserve and protect customary and traditional Native Hawaiian rights to the extent feasible, as required by Article XII, Section 7 of the Hawaiʻi Constitution, an administrative agency must, at minimum, make specific findings of fact and conclusions of law as to the following:

1) The identification of valued cultural, historical, or natural resources in the project area, including the extent to which traditional and customary Native Hawaiian rights are exercised in the project area.
2) The extent to which those resources—including traditional and customary Native Hawaiian rights—will be affected or impaired by the proposed action; and
3) The feasible action, if any, to be taken to reasonably protect Native Hawaiian rights if they are found to exist. *Ka Paʻakai*, 94, Hawaii at 47, 7 P.3d at 1084. Cited in *Matter of Contested Case Hearing Re Conservation District Use Application (CDUA) HA-3568 for the Thirty Meter Telescope at the Mauna Kea Science Reserve, Kaʻohe Mauka, Hāmākua, Hawaiʻi*, 143 Hawaiʻi 379, 431 P.3d 752 (2018) ("*Mauna Kea II*").

In order to complete a thorough CIA that complies with statutory and case law, it is necessary to fully consider information available from, and provided by, Native Hawaiian cultural practitioners and cultural descendants from the project area.

The *Ka Pa'akai* analysis is largely a legal analysis, as the applicable tests are legal standards. Therefore, a strong analysis will be conducted by someone with sufficient legal training. Additionally, at the core of a thoughtful *Ka Pa'akai* analysis is a comprehensive understanding of traditional and customary practices. In breaking down the Court's tests, it is important to the different elements that contribute to each test.

The first test - "The identification of valued cultural, historical, or natural resources in the project area, including the extent to which traditional and customary Native Hawaiian rights are exercised in the project area" – actually consists of two separate elements. First, the simple identification and existence of valued cultural, historical, or natural resources. These resources are tangible in nature. They can include sacred places, culturally valuable plants, or a religious or historic site. This assessment how sought to exhaustively identified the great multitude of resources that may exist in the project area or adjacent areas.

As to this test, this assessment shows there are potentially resources within the Project Area, but they are limited to native plants in the area. While there are historic sites in the Project Area, they are not traditional (pre-contact) or significant. None of the interviewees expressed concern with their removal.

The second element of this first test is access. Access requires two things to occur. One is the existence of a resource. Whether a plant, an animal, a place, or site, the resource must exist in order a practitioner to access it. The second thing is physical access. This includes, but it is not limited to, the ability to physically access a plant, animal, site, or location associated with a particular practice. This can also include the traditional and customary route or path taken to access the resource. This can also include cultural protocols that existed in accessing a resource. These are often temporal, in that access protocols can be at a certain time of day or year. Makahiki would be a good example of a traditional custom that has specific cultural protocols associated with access. In the case of Makahiki, the custom takes place at a certain time of year.

Therefore, the first test under *Ka Pa'akai* should include not only a listing of resources, but the identification of ways in which those resources are accessed and utilized in association with a traditional and customary practice.

Therefore, the second test – "The extent to which those resources—including traditional and customary Native Hawaiian rights—will be affected or impaired by the proposed action" – also

looks at two separate elements. The first, does the proposed action and its alternatives have an adverse impact on the existence of resources? This would include the alteration, destruction, modification, or harm of sites, including biological resources, sacred places, burial sites, etc. It also includes a loss of species. Any adverse impact or harm to resources is alone an affect or impairment caused by the proposed action.

Under this element, adverse impacts to significant, traditional historic sites or culturally utilized plants would all be identified adverse impacts. There are no potential adverse effects due to the post-contact dating of the historic sites. There is also no indicator that native plants in the Project Area are currently accessed by practitioners.

In addition to this, any action that impacts traditional and customary access to resources, even if there is not direct adverse impact to the resource itself, would result in an affect or impairment resulting from the proposed action. Therefore, the limitations on access that could result from development or use of the project area could create an adverse impact under *Ka Pa'akai.*

While interviewees note the native plants in the area, there was no concern expressed by informants that the project would adversely impact native flora and fauna. Interviewees even requested the removal of diseased 'ōhi'a. Nonetheless, the project should incorporate the recommendations from the biological assessment to minimize any potential impacts to biological resources in the area, including any biological resources with potential cultural use.

The third part of the *Ka Pa'akai* framework aims to identify "[t]he feasible action, if any, to be taken to reasonably protect Native Hawaiian rights if they are found to exist." Determining whether or not action has been suitably "feasible" is a matter for the State. These feasible actions could include continued access to the project as needed to conduct cultural practices.

The third part of the test becomes moot in this case as there is minimal potential for impact to traditional or customary practices. While the project may result in the removal of native plants, in this case, the removal of diseased 'ōhi'a would have a net benefit for the region which has been severely impacted by ROD. The project should incorporate native plants in their landscaping as feasible.

8.0 Impact Assessment and Conclusion

Based on the information gathered and the ethnographic data, the proposed project has the minimal potential to adversely impact cultural resources and traditional or customary practices in the area.

USGS is encouraged to use native plants in their landscaping to restore the native flora that would have traditionally existed in the area. Careful consideration should be given to remove any ʻōhiʻa trees afflicted with ROD and potentially replace them with healthy ʻōhiʻa trees. Additionally, USGS is encouraged to work with Ka Haka ʻUla O Keʻelikōlani, which is located down the street from the Project Area regarding nomenclature and other programming to the extent feasible. Also, USGS is encouraged to work with the ʻImiloa Astronomy Center to develop public programs and educational opportunities that could support the public benefits of the facility.

Table 4. OEQC compliance requirements and their corresponding sections in this CIA

OEQC notes that in addition to the content requirements for the Draft EIS, which are set out in HAR Chapter 11-200.1 et seq., the CIA should address, but not necessarily be limited to, the following matters:	
A. A discussion of the methods applied and results of consultation with individuals and organizations identified by the preparer as being familiar with cultural practices and features associated with the project area, including any constraints or limitations which might have affected the quality of the information obtained.	A detailed methodology section is provided in **Section 2**, *Methodology*.
B. A description of methods adopted by the preparer to identify, locate, and select the persons interviewed, including a discussion of the level of effort undertaken.	A discussion of the effort to gather into from persons familiar with the area or other stakeholders is provided in **Section 2.6**, *Ethnographic Methodology*.
C. Ethnographic and oral history interview procedures, including the circumstances under which the interviews were conducted, and any constraints or limitations which might have affected the quality of the information obtained.	A discussion of procedures, including constraints or limitations, is provided in **Section 2.6**.

D. Biographical information concerning the individuals and organizations consulted, their expertise, and their historical and genealogical relationship to the project area, as well as information concerning the persons submitting information or interviewed, their particular knowledge and cultural expertise, if any, and their historical and genealogical relationship to the project area.	Biographical information was provided in and through the interviews, which are included with the individual interview summaries in **Section 6.0**.
E. A discussion concerning historical and cultural source materials consulted, the institutions and repositories searched and the level of effort undertaken. This discussion should include, if appropriate, the perspective of the authors, any opposing views, and any other relevant constraints, limitations or biases.	A discussion of the materials consulted is provided in **Section 2**. An extensive cultural and historical overview, which uses both Hawaiian and English language resources is also provided in **Section 2**.
F. A discussion concerning the cultural resources, practices and beliefs identified, and, for resources and practices, their location within the broad geographical area in which the proposed action is located, as well as their direct or indirect significance or connection to the project site.	In addition to the cultural and historical overview, an extensive discussion concerning cultural resources, practice and beliefs are provided throughout the document by subfield, specifically in **Section 3** and **Section 4.**
G. A discussion concerning the nature of the cultural practices and beliefs, and the significance of the cultural resources within the project area affected directly or indirectly by the proposed project.	A thorough discussion concerning the nature of traditional or customary practices and the significance of the cultural resources affected directly or indirectly by the proposed alternatives are provided in **Section 7.**
H. An explanation of confidential information that has been withheld from public disclosure in the assessment.	There has no confidential information withheld from public disclosure, except for personal emails, addresses, or phone numbers.

I. A discussion concerning any conflicting information regarding identified cultural resources, practices and beliefs.	There was no conflicting information regarding cultural resources, practices, or beliefs.
J. An analysis of the potential effect of any proposed physical alteration on cultural resources, practices or beliefs; the potential of the proposed action to isolate cultural resources, practices or beliefs from their setting; and the potential of the proposed action to introduce elements which may alter the setting in which cultural practices take place.	A thorough analysis is provided in **Section 7**.
K. A bibliography of references and attached records of interviews which were allowed to be disclosed.	References are included in **Section 9**. Interview summaries are provided in **Section 6**.

9.0 References

Akana C.L. and Gonzalez K.
2015 *Hānau Ka Ua: Hawaiian Rain Names*. Honolulu: Kamehameha Publishing.

Alexander, W.D.
1891 A Brief History of Land Titles in the Hawaiian Kingdom. Hawaiian Almanac and Annual for 1891. Honolulu. T.G. Thrum.

1902 Hawaiian Geographic Names. U.S. Coast and Geodetic Survey. Washington. Government Printing Office.

Beckwith, M.
1970 Hawaiian Mythology. Honolulu: University of Hawaii Press.

Boundary Commission Records
1873-1875 Hawaii State Archives (Digitized copy in collection of Kumu Pono Associates).

Bowser, G. (compiler)
1880 The Hawaiian Kingdom Statistical and Commercial Directory and Tourists Guide. Honolulu: Bowser and Co.

Buke Mahele
1848 "Buke Kakau Paa no ka Mahele Aina" (Land Division Book of 1848). Hawaii State Archives (Digitized copy in collection of Kumu Pono Associates).

Coan, Titus
1882 Life in Hawaii. New York: Anon Randolf & Co.

Ellis, Wm.
1963 Journal of William Ellis. Advertiser Publishing Co., Ltd. Honolulu, Hawaii.

Dutton, C. E. Capt.
1883 Hawaiian Volcanoes. United State Geological Survey Annual Report 1883.

Emerson, N.B.
1915 Pele and Hiiaka: A Myth From Hawaii. Honolulu. (Reprint 1993, 'Ai Pōhaku Press. Honolulu).

Emory, K. P. in E. Tatar

1982 Nineteenth Century Hawaiian Chant. Pacific Anthropological Records No. 33, B.P. Bishop Mus. Honolulu.

Fornander, A.
1917-1919 Fornander Collection of Hawaiian Antiquities and Folklore. (9 vols.). Honolulu: Bishop Museum Press.

l973 An Account of the Polynesian Race: Its Origin and Migrations. Tokyo: Charles E. Tuttle Co., Inc.

Handy, E.S.C., and E.G. Handy (with M. K. Pukui)
1972 Native Planters in Old Hawaii. B.P. Bishop Museum Bulletin 233. Bishop Museum Press, Honolulu.

Hudson, A.E.
(1932) Ms. Archaeology of East Hawaii. Manuscript on file. Dept. Anthro., B. P. Bishop Museum.

Ii, J.P.
1959 Fragments of Hawaiian History. Honolulu: Bishop Museum Press.

Jordan, D. S. and C. W. Everman
1901 Preliminary Report On An Investigation Of The Fishes And Fisheries Of The Hawaiian Islands."

Kamakau, S.
1961 Ruling Chiefs of Hawaii. Honolulu: The Kamehameha Schools Press.

Kameʻeleihiwa, L.
1992 Native Land, and Foreign Desires. Bishop Museum Press.

Kelsey, Theo.
1922-25 Manuscripts in the collections of the Hawaiʻi State Archived (Series M-445)

Kingdom of Hawaiʻi
1850 Kanawai Hoopai Karaima no ko Hawaii Pae Aina [Penal Code].

Lyons, C.J.
1875 Land Matters in Hawaii. Islander, Honolulu.

Mahele Aina

1848-1855 Records of the Claims for Kuleana in the Hawaiian Islands (Native & Foreign Register; Native & Foreign Testimony; Mahele Award Book Surveys; and Royal Patents Issued on Awards: "Buke Kakau Paa no ka Mahele Aina" (Land Division Book of 1848). Hawaii State Archives (Digitized records in collection of Kumu Pono Associates).

Malo, D.
1951 Hawaiian Antiquities. Honolulu, B.P. Bishop Museum.

Pukui, Mary Kawena
1983 ʻŌlelo Noʻeau: Hawaiian Proverbs & Poetical Sayings. Bishop Museum Press. Honolulu.

Pukui, M.K., and S. Elbert
1971 Hawaiian Dictionary. Honolulu: University of Hawaii Press.

State of Hawaiʻi
Ms. Files cited in text from the collections of the:
Hawaiʻi State Archives
Department of Land and Natural Resources — Bureau of Conveyances
Department of Land and Natural Resources — Land Management Division
Department of Land and Natural Resources — State Survey Division

Stewart, C.S.
1970 Journal of a Residence in the Sandwich Islands, During the Years 1823, 1824 and 1825…. University of Hawaii Press, Honolulu.

Stokes, J.F.G., and T. Dye
1991 Heiau of the Island of Hawaiʻi. Bishop Museum Bulletin in Anthropology 2. Bishop Museum Press, Honolulu.

Thrum, Thos. G.
1908 "Tales from the Temples." Hawaiian Almanac and Annual for 1907:48-78. Honolulu.

Whitney, H. M.
1913 The Hawaiian Guide Book for Travelers. Honolulu.

Appendix I: Glossary of Hawaiian Terms

The following list of terms were used frequently throughout this report. All definitions were compiled using Pukui and Elbert's *Hawaiian Dictionary* (1986).

Ahupuaʻa	Land division usually extending from the uplands to the sea, so called because the boundary was marked by a heap (ahu) of stones surmounted by an image of a pig (puaʻa), or because a pig or other tribute was laid on the altar as tax to the chief.
ʻĀina	Land, earth. *Lit.* That which feeds.
Akua	1. God, goddess, spirit, ghost. 2. Divine, supernatural, godly.
Ala	Path, road, trail.
Aliʻi	1. Chief, chiefess, ruler, monarch. 2. Royal, regal. 3. To act as chief, reign.
ʻAumakua	Family or personal gods, deified ancestors who might assume the shape of sharks, owls, hawks, dogs, plants, etc. A symbiotic relationship existed; mortals did not harm or eat them, and the ʻaumakua warned or reprimanded mortals in dreams, visions, and calls.
ʻAumākua	Plural of ʻaumakua.
ʻAuwai	Irrigation ditch, canal, waterway.
Hālau	1. Long house, as for canoes or hula instruction; meeting house. 2. Large, numerous; much.
Hale pili	House thatched with pili grass.
Heiau	Pre-Christian place of worship, shrine. Some heiau were elaborately constructed stone platforms, other simple earth terraces.
Hoʻi	1. To leave, go or come back; to cause to come back. 2. To enter, as an institution or last resting place. 3. A parting chant to which hula dancers dance as they leave the audience. 4. Marriage of a chief with the daughter of a brother or sister; to do so (a means of increasing offspring).
Hula	A Hawaiian dance form accompanied by chant or song.
ʻIli	Land section, next in importance to ahupuaʻa and usually a subdivision of an ahupuaʻa.
ʻIli kū	Shorted form of ʻili kūpono.
ʻIli kūpono	A nearly independent ʻili land division within an ahupuaʻa, paying tribute to the ruling chief and not to the chief of the ahupuaʻa. Transfer of the ahupuaʻa from one chief to another did not include the ʻili kūpono located within its boundaries. Sometimes shorted to ʻili kū.

Kanaka	Human being, person, individual, party, humankind, population; often used for man.
Kānaka	Plural of kanaka.
Kāne	Male, husband, male sweetheart, man; brother-in-law of a woman.
Kanikau	1. Dirge, lamentation, chant of mourning, lament. 2. To chant, wail, mourn.
Kapu	1. Taboo, prohibition. 2. Special privilege or exemption from ordinary taboo. 3. Sacredness, prohibited, forbidden, sacred, holy, consecrated. 4. No trespassing, keep out.
Kuleana	Right, privilege, concern, responsibility, title, business, property, estate, portion, jurisdiction, authority, liability, interest, claim, ownership, tenure, affair, province.
Kupuna	Grandparent, ancestor, relative or close friend of the grandparent's generation, grandaunt, granduncle.
Kūpuna	Plural of kupuna.
Limu	A general name for all kinds of plants living under water, both fresh and salt, also algae growing in any damp place in the air, as on the ground, on rocks, and on other plants; also mosses, liverworts, lichens.
Loʻi	Irrigated terrace, especially for taro, but also for rice and paddy.
Loko iʻa	Traditional Hawaiian fishpond.
Makai	On the seaside, toward the sea, in the direction of the sea.
Mālama	To take care of, tend, attend, care for, preserve, protect, beware, save, maintain.
Mauka	Inland, upland, towards the mountain.
Mele	1. Song, anthem, or chant of any kind. 2. Poem, poetry. 3. To sing, chant.
Mele mākaʻikaʻi	Travel chant.
Mōʻī	King, sovereign, monarch, majesty, ruler, queen.
Moku	1. District, island, islet, section, forest, grove, clump, fragment. 2. To be cut, severed, amputated, broken in two.
Moʻo	Lizard, reptile of any kind, dragon, serpent.
Moʻolelo	Story, tale, myth, history, tradition, literature, legend, journal, log, yard, fable, essay, chronicle, record, article.
Moʻowahine	Female lizard deity.
Nīʻaupiʻo	Offspring of the marriage of a high-born brother and sister, or half-brother and half-sister.
ʻŌlelo noʻeau	Proverb, wise saying, traditional saying.
Oli	Chant that was not danced to, especially with prolonged phrases chanted in one breath, often with a trill at the end of each phrase; to chant thus.
Piʻo	Marriage of full brother and sister of nīʻaupiʻo rank, presumably the highest possible rank. Their offspring had the rank of naha, which is less

	than piʻo but probably more than nīʻaupiʻo. Later piʻo included marriage with half-sibling.
Pueo	Hawaiian short-eared owl (*Asio flammeus sandwichensis*), regarded often as a benevolent ʻaumakua.
ʻŪniki	Graduation exercises, as for hula, lua fighting, and other ancient arts (probably related to niki, to tie, as the knowledge was bound to the student).
Wahi pana	A legendary place; a place made special celebrated in stories associated with it. Often sacred.
Wahine	Woman, lady, wife; sister-in-law, female cousin-in-law of a man, female.
Wao	1. Realm. 2. A general term for inland region usually forested but not precipitous and often uninhabited.

APPENDIX E

Traffic Impact Analysis Report

USGS Hilo Facility

Final Draft

October 21, 2022

TRAFFIC IMPACT ANALYSIS REPORT
USGS HILO FACILITY
HILO, BIG ISLAND, HAWAII

FINAL DRAFT

October 21, 2022

Prepared for:

HHF Planners
733 Bishop Street, Suite 2590
Honolulu, Hawaii 96813

Austin, Tsutsumi & Associates, Inc.
Civil Engineers • Surveyors
501 Sumner Street, Suite 521
Honolulu, Hawaii 96817-5031
Telephone: (808) 533-3646
Facsimile: (808) 526-1267
E-mail: atahnl@atahawaii.com
Honolulu • Wailuku, Hawaii

TRAFFIC IMPACT ANALYSIS REPORT
USGS HILO FACILITY

Hilo, Big Island, Hawaii

FINAL DRAFT

Prepared for

HHF Planners
733 Bishop Street, Suite 2590
Honolulu, Hawaii 96813

Prepared by
Austin, Tsutsumi & Associates, Inc.
Civil Engineers • Surveyors
Honolulu • Wailuku, Hawaii

October 21, 2022

TABLE OF CONTENTS

		Page
1.	INTRODUCTION	1-3
	1.1 Project Location	1
	1.2 Project Description	1
2.	METHODOLOGY	4
	2.1 Study Methodology	4
	2.2 Analysis Methodology	4
	2.3 Study Area Intersection Analysis	4
3.	EXISTING CONDITIONS	5-10
	3.1 Roadway System	5
	3.2 Existing Multimodal Facilities	5
	3.2.1 Pedestrian Facilities	5
	3.2.2 Bicycle Facilities	6
	3.2.3 Transit Facilities	6
	3.3 Existing Traffic Volumes	6
	3.4 Existing Observations and Intersection Analysis	6
4.	BASE YEAR 2025 TRAFFIC CONDITIONS	11-17
	4.1 De Facto Growth Rate	11
	4.2 Background Developments	11
	4.3 Base Year 2025 Analysis	14
5.	FUTURE YEAR 2025 TRAFFIC CONDITIONS	18-23
	5.1 Project Description	18
	5.2 Trip Generation & Distribution	18
	5.3 Future Year 2025 Analysis	20

TABLE OF CONTENTS
Cont'd

6. CONCLUSION 24-25

6.1 Existing Conditions 24

6.2 Base Year 2025 Conditions 24

6.3 Future Year 2025 Conditions 25

7. REFERENCES 26

TABLE OF CONTENTS
Cont'd

TABLES

3.1 LOS SUMMARY TABLE EXISTING CONDITIONS 10

4.1 BASE YEAR BACKGROUND DEVELOPMENT TRIP GENERATION..... 12

4.2 LOS SUMMARY TABLE EXISTING CONDITIONS AND BASE YEAR 2025 16-17

5.1 PROJECT TRIP GENERATION RATES 18

5.2 PROJECT TRIP GENERATION 18

5.3 LOS SUMMARY TABLE EXISTING CONDITIONS, BASE YEAR 2025 AND FUTURE YEAR 2025 22-23

FIGURES

1.1 LOCATION MAP 2

1.2 SITE PLAN 3

3.1 EXISTING PEDESTRIAN, BICYCLE AND TRANSIT FACILITIES..... 8

3.2 EXISTING LANE CONFIGURATION, VOLUMES, AND LOS 9

4.1 BACKGROUND PROJECTS 13

4.2 BASE YEAR 2025 LANE CONFIGURATION, VOLUMES, AND LOS..... 15

5.1 PROJECT TRIPS 19

5.2 FUTURE YEAR 2025 LANE CONFIGURATION, VOLUMES, AND LOS.... 21

TABLE OF CONTENTS
Cont'd

APPENDICES

A. TRAFFIC COUNT DATA

B. LOS CRITERIA

C. LOS WORKSHEETS

AUSTIN, TSUTSUMI & ASSOCIATES, INC. CIVIL ENGINEERS • SURVEYORS
CONTINUING THE ENGINEERING PRACTICE FOUNDED BY H. A. R. AUSTIN IN 1934

TERRANCE S. ARASHIRO, P.E.
ADRIENNE W.L.H. WONG, P.E., LEED AP
DEANNA M.R. HAYASHI, P.E.
PAUL K. ARITA, P.E.
ERIK S. KANESHIRO, L.P.L.S., LEED AP
MATT K. NAKAMOTO, P.E.
GARRETT K. TOKUOKA, P.E.

TRAFFIC IMPACT ANALYSIS REPORT

USGS Hilo Facility

Hilo, Big Island, Hawaii

1. INTRODUCTION

This report documents the findings of a traffic study conducted by Austin, Tsutsumi, and Associates, Inc. (ATA) to evaluate the potential traffic impacts resulting from the proposed U.S. Geological Survey (USGS) Hilo Facility (hereinafter referred to as the "Project") located in Hilo on the Big Island of Hawaii.

1.1 Project Location

The Project proposes a new USGS facility on the northwest corner of the Komohana Street/Nowelo Street intersection, across the existing U.S. Department of Agriculture (USDA) Pacific Basin Agricultural Research Center facility. The Project will be situated on a 13-acre portion of currently vacant State lands specifically identified as (3) 2-4-001:122 por. See Figure 1.1 for the Location Map.

1.2 Project Description

The Project will consist of two (2) buildings totaling approximately 60,000 SF. The primary building will provide office space, conference rooms, laboratories, storage space and operations/monitoring center. The secondary building size and use is subject to change due to funding, but is anticipated to provide additional storage and ancillary use. Direct access to the Project site will be provided by two (2) future driveways along Nowelo Street. The Project is planned to service approximately 50 staff and volunteers for the USGS Hawaii Volcano Observatory (HVO) and 53 staff and volunteers for the Pacific Island Ecosystems Research Center (PIERC). Primary operations for both HVO and PIERC is monitoring, research and testing for their respective fields of study.

See Figure 1.2 for the Project Site Plan.

USGS HILO FACILITY

AustinTsutsumi & ASSOCIATES, INC.
Engineers & Surveyors

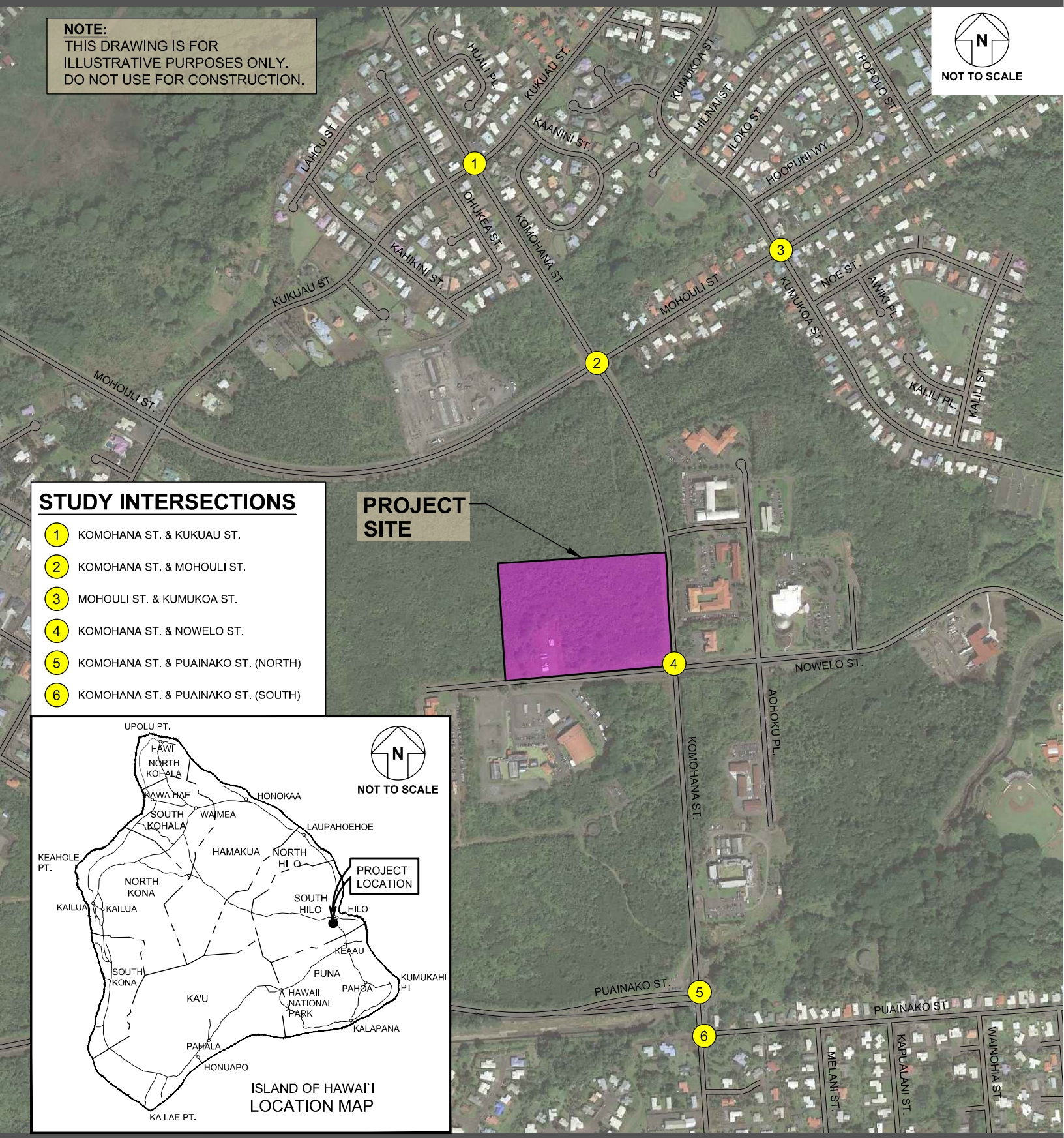


FIGURE 1.1

LOCATION MAP

USGS HILO FACILITY

AustinTsutsumi & ASSOCIATES, INC.
Engineers & Surveyors

NOTE:
THIS DRAWING IS FOR
ILLUSTRATIVE PURPOSES ONLY.
DO NOT USE FOR CONSTRUCTION.

N
NOT TO SCALE

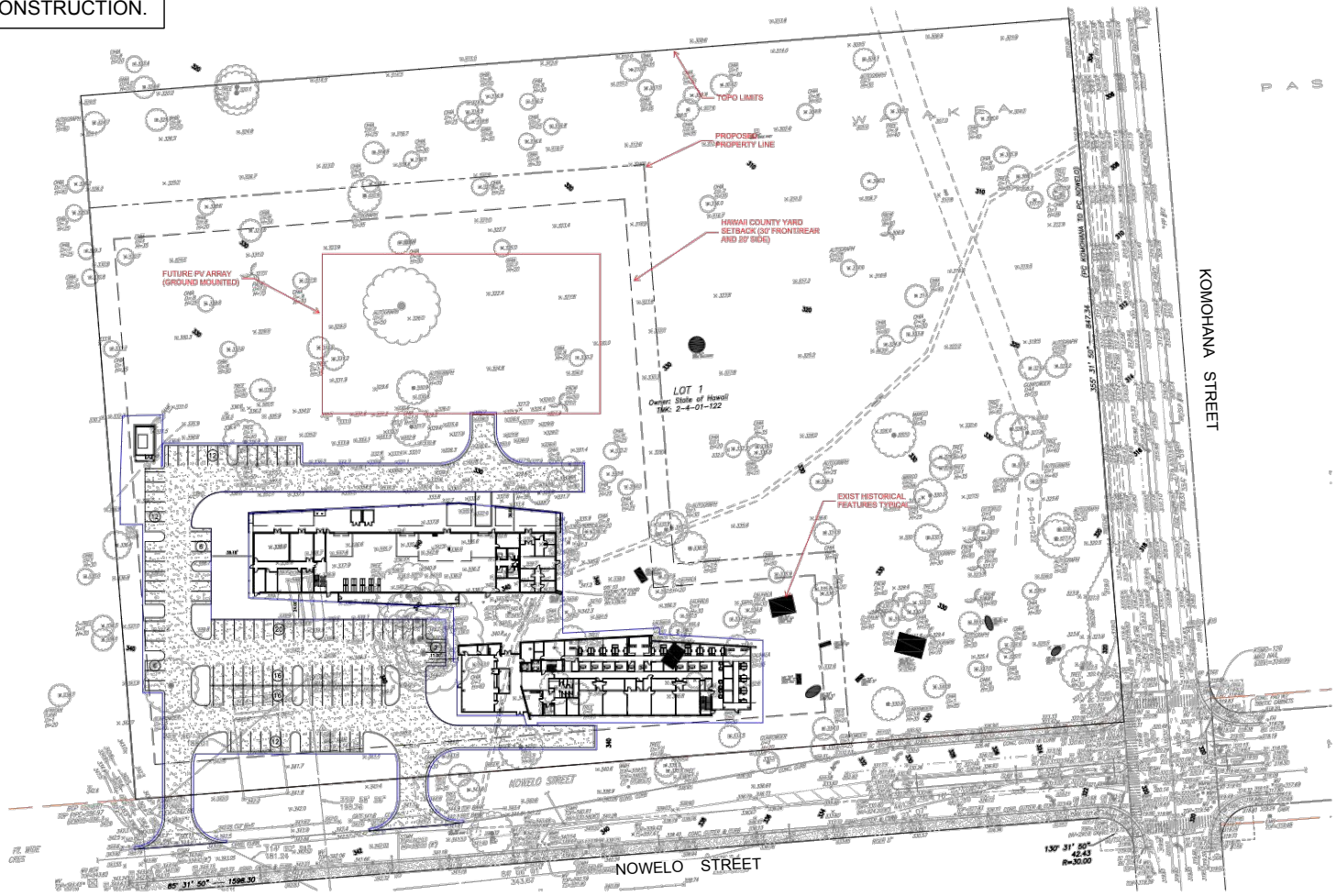


FIGURE 1.2

SITE PLAN

2. METHODOLOGY

2.1 Study Methodology

This study will address the following:

- Assess existing traffic operating conditions during the weekday AM and PM peak hours of traffic within the study area.
- Traffic Projections for Base Year 2025 (without the Project), including traffic generated by other known developments in the vicinity of the Project in addition to an ambient growth rate.
- Trip generation and traffic assignment characteristics for the proposed Project.
- Traffic projections for the Future Year 2025 (with Project).
- Provide recommendations for roadway improvements or other mitigative measures, as appropriate, to reduce or eliminate the adverse impacts resulting from traffic generated by the Project.

2.2 Analysis Methodology

Level of Service (LOS) is a qualitative measure used to describe the conditions of traffic flow at intersections, with values ranging from free-flow conditions at LOS A to congested conditions at LOS F. The Highway Capacity Manual (HCM), 6th Edition, includes methods for calculating volume-to-capacity (v/c) ratios, delays, and corresponding LOS that were used in this study. See Appendix B for LOS Criteria.

Analysis for the study intersections were performed using the traffic analysis software Synchro, which is able to prepare reports based on the methodologies described in the HCM. These reports contain control delay results as based on intersection lane geometry, signal timing, and hourly traffic volumes. Based on the vehicular delay at each intersection, a LOS is assigned to each approach and intersection movement as a qualitative measure of performance. These results constitute the technical analysis that will form the basis of the recommendations outlined in this report.

2.3 Study Area Intersection Analysis

Intersection analysis within the Project's study area was performed on the following intersections due to their proximity to the Project:

- Komohana Street/Kukuau Street (unsignalized)
- Komohana Street/Mohouli Street (signalized)
- Mohouli Street/Kumukoa Street (signalized)
- Komohana Street/Nowelo Street (signalized)
- Komohana Street/Puainako Street (North) (signalized)
- Komohana Street/Puainako Street (South) (signalized)

3. EXISTING CONDITIONS

3.1 Roadway System

The following are brief descriptions of the existing roadways studied within the vicinity of the Project:

Komohana Street is generally a north-south, two-way, two lane, undivided County roadway, beginning to the north at its intersection with Waianuenue Avenue and terminating to the south at its intersection with Ainaola Drive. In the study area, Komohana Street has a posted speed limit of 45 miles per hour (mph) and reduces to 35 mph further south of Puainako Street.

Kukuau Street is generally an east-west, two-way, two lane, undivided County roadway with a posted speed limit of 25 mph. Kukuau Street begins to the northeast at its intersection with Kilauea Avenue providing access through Downtown Hilo, continuing to the southeast until it terminates just past its intersection with Kimokimo Place.

Mohouli Street is generally an east-west, two-way, two lane, undivided County roadway with a posted speed limit of 35 mph within the study area. Mohouli Street begins to the east at its intersection with Kilauea Avenue near Chiefess Kapiolani Elementary School and Café 100, continuing to the southwest until it becomes Ainako Avenue at its intersection with Kaumana Drive.

Kumukoa Street is generally a north-south, two-way, two lane, undivided County roadway with a posted speed limit of 25 mph. Kumukoa Street begins to the north at this intersection with Kukuau Street and continues to the south where it becomes Lanikaula Street near its intersection with Kalili Street. Kumukoa Street provides access to Mohouli Park as well as residential neighborhoods.

Nowelo Street is generally an east-west, two-way, two lane, divided County roadway. Nowelo Street begins to the east at its intersection with Lanikaula Street and traverses through the UH Hilo campus before intersecting with Komohana Street. Further west of Komohana Street, Nowelo Street provides access to the USDA Pacific Basin Agricultural Research facility and the USDA Institute of Pacific Islands Forestry facility. The posted speed limit is 20 mph.

Puainako Street is generally an east-west, two-way, two-lane, undivided State roadway with a posted speed limit of 35 mph. Puainako Street begins to the west at its intersection with Saddle Road and Kaumana Drive and continues to the east, terminating at its intersection with Railroad Avenue. Puainako Street provides access to Saddle Road, Waiakea Intermediate School, Waiakea Elementary School, and Prince Kuhio Plaza, as well as residential neighborhoods.

3.2 Existing Multimodal Facilities

3.2.1 Pedestrian Facilities

Continuous sidewalks are generally provided along the entire stretch of Nowelo Street, since it primarily services the UH Hilo campus. West of Komohana Street, the sidewalk continues on the south side of Nowelo Street, servicing both USDA facilities. No sidewalks are provided along the Project's north frontage on Nowelo Street.

Along Komohana Street, sidewalks are only provided on a short segment between Waianuenue Avenue and Punahele Street before transitioning to paved shoulder space on both sides of Komohana Street. Shoulder widths vary along the entire stretch, but appear to provide between 6 to 8 feet of paved shoulder space from Punahele Street to Puainako Street. Further south along Komohana Street, paved shoulders slim down, but there are non-continuous long segments of roadways that provide wide striped paved shoulder space.

Marked crosswalks across Komohana Street are provided at all signalized study intersections with the exception of the Komohana Street/Puainako Street (South) intersection. Pedestrian facilities are shown in Figure 3.1.

3.2.2 Bicycle Facilities

There are currently no designated bike markings or routes identified in the study area. Bike use along Komohana Street occurs on the paved shoulders.

3.2.3 Transit Facilities

Hawaii County operates the Hele-On Bus, which provides 13 different routes in the East Hawaii region. Service is provided Monday through Saturday with limited service on Sundays and holidays. There is one bus route, Intra-Hilo Mohouli (Route 104), that travels through the study area along Mohouli Street, Komohana Street, and Kukuau Street. Two bus stops are present along Mohouli Street in the vicinity of the study area. Transit facilities are shown in Figure 3.1.

3.3 Existing Traffic Volumes

Weekday AM and PM turning movement counts were collected on Thursday, March 23-24, 2022. At the time of this traffic count, all DOE schools and UH Hilo were in session. However, based on a comparison of peak hour counts taken by HDOT in September 2019 along Komohana Street, between Puainako Street and Nowelo Street, HDOT's 2019 counts yielded 166(314) more total AM(PM) peak hour vehicles along Komohana Street. While 2022 conditions may be the new normal, this TIAR added the 166(314) AM)(PM) vehicles to Komohana Street to remain conservative and reflect pre-covid conditions. These additional trips were distributed based on existing traffic patterns.

Based on the traffic count data, the weekday AM and PM peak hours of traffic were determined to occur generally between 7:15 AM and 8:15 AM and between 4:15 PM to 5:15 PM, respectively. See the traffic count data provided in Appendix A.

3.4 Existing Observations and Intersection Analysis

At the Komohana Street/Kukuau Street intersection, the eastbound approach and westbound left-turn movement operate at LOS E but below capacity conditions, due to heavy through traffic along Komohana Street. Volumes along the eastbound and westbound Kukuau Street approaches are relatively low with 82(20) eastbound(westbound) left-turn and through vehicles. Observations indicate queues only range from 1-4 vehicles long on the heavier eastbound approach from Sunrise Ridge.

At the Komohana Street/Mohouli Street intersection, all left-turn movements are protected-permissive except for the eastbound left-turn movement, which is protected only. As a result, the eastbound left-turn movement operates at LOS E, but services a low peak hour volume of only 18-23 vehicles, so no lengthy queues occur. All other movements operate at LOS D or better and

below capacity. Based on observations, some congestion occurs on the east and west through lanes along Mohouli Street during both peaks, occasionally requiring two cycles to clear.

At the Komohana Street/Nowelo Street intersection, mainline turn movements and eastbound/westbound approach volumes along Nowelo Street are very low, resulting in no observed issues.

At the Komohana Street/Puainako Street (North and South) intersections, heavy northbound commuter traffic occurs during the AM peak hour, resulting in the northbound through movement operating at LOS E and over-capacity conditions, and the westbound approach on Puainako Street operating at LOS E conditions. Based on observations northbound and westbound queues generally lasted from 6:55 to 8:15 AM at varying lengths. Northbound Komohana Street vehicles queued as far back about 0.85 miles to Uilani Place and westbound Puainako Street vehicles queued as far back about 0.25 miles to Kapualani Street. During the PM peak hour, some slowdowns occurred on the southbound Komohana Street approach, but no lengthy congestion was observed.

Figure 3.2 illustrates the existing lane configuration, existing traffic volumes, and LOS for each study intersection. Table 3.1 summarizes the existing LOS at the study intersections. LOS worksheets are provided in Appendix C.

USGS HILO FACILITY

AustinTsutsumi & ASSOCIATES, INC.
Engineers & Surveyors

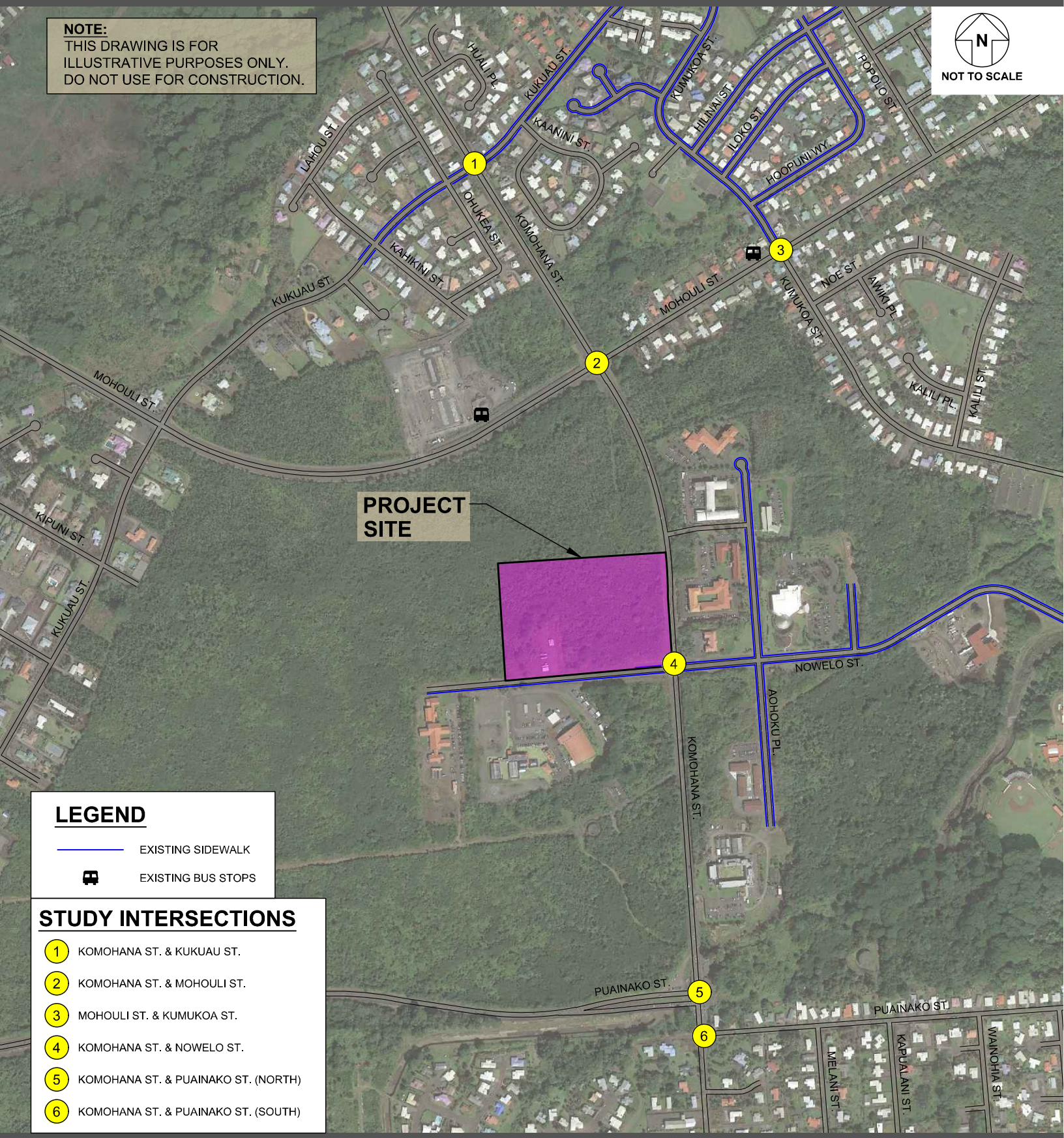


FIGURE 3.1

EXISTING PEDESTRIAN, BICYCLE AND TRANSIT FACILITIES

AustinTsutsumi & ASSOCIATES, INC.
Engineers & Surveyors

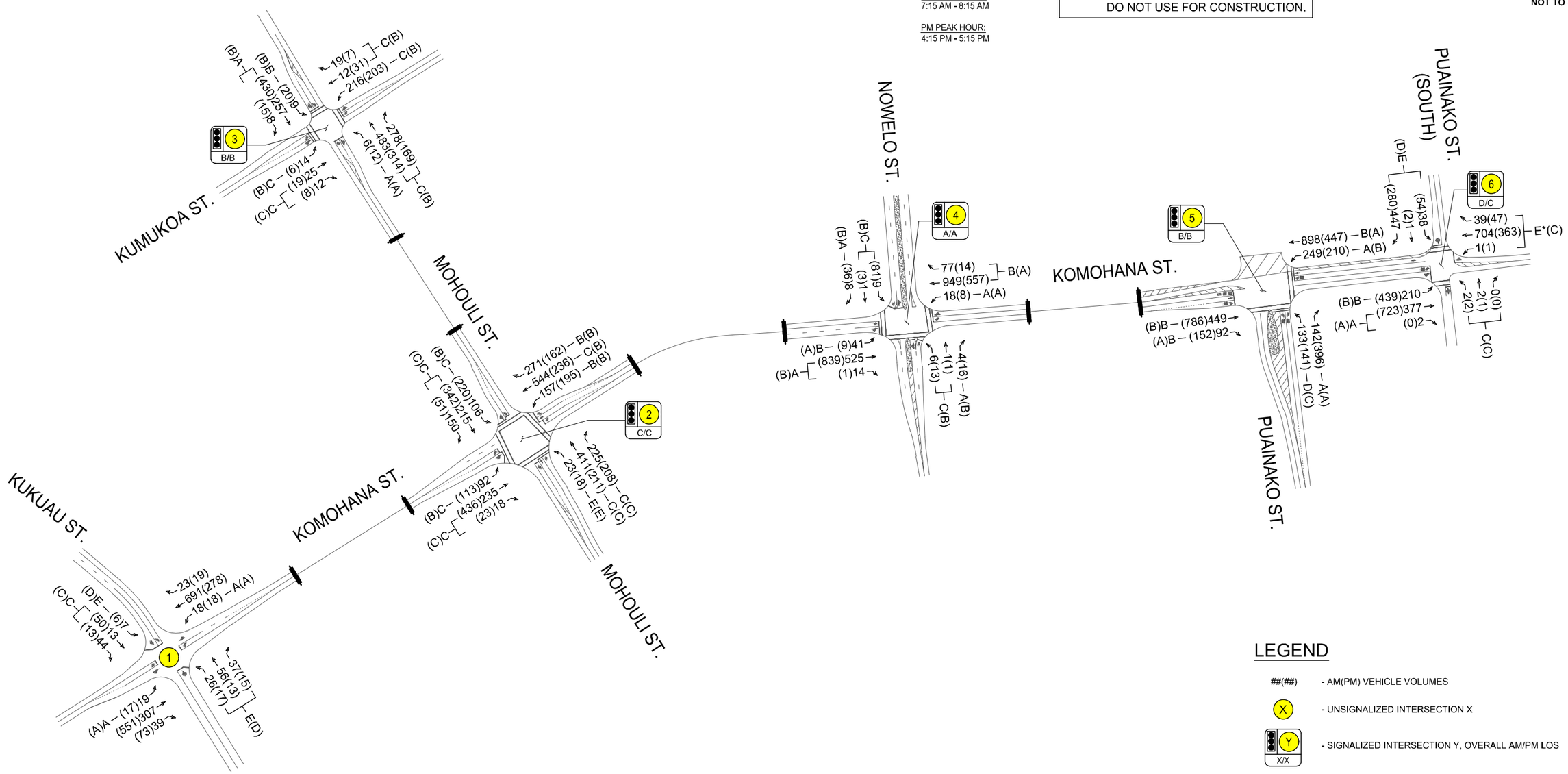
DATE OF COUNTS:
THURSDAY, MARCH 24, 2022

AM PEAK HOUR:
7:15 AM - 8:15 AM

PM PEAK HOUR:
4:15 PM - 5:15 PM

NOTES:
1. THIS DRAWING IS FOR ILLUSTRATIVE PURPOSES ONLY. DO NOT USE FOR CONSTRUCTION.

N
NOT TO SCALE



LEGEND

##(##)	- AM(PM) VEHICLE VOLUMES
X	- UNSIGNALIZED INTERSECTION X
Y (X/X)	- SIGNALIZED INTERSECTION Y, OVERALL AM/PM LOS
X(X)	- AM(PM) LOS

EXISTING LANE CONFIGURATION, VOLUMES, AND LOS

TABLE 3.1: LOS SUMMARY TABLE
EXISTING CONDITIONS

Intersection	Existing 2022 Conditions					
	AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
1: Komohana St & Kukuau St						
NB LT	8.1	0.02	A	9.0	0.02	A
EB TH/RT	49.5	0.64	E	25.5	0.22	D
WB LT	44.4	0.08	E	25.2	0.04	D
WB TH/RT	19.5	0.20	C	24.7	0.27	C
SB LT	9.4	0.03	A	8.0	0.02	A
OVERALL	6.0	-	-	2.9	-	-
2: Komohana St & Mohouli St						
NB LT	16.0	0.36	B	16.4	0.61	B
NB TH	26.6	0.91	C	17.3	0.42	B
NB RT	18.6	0.29	B	15.3	0.10	B
EB LT	70.7	0.84	E	77.8	0.88	E
EB TH	31.1	0.86	C	28.8	0.75	C
EB RT	21.3	0.15	C	23.8	0.15	C
WB LT	20.0	0.45	C	18.6	0.59	B
WB TH/RT	23.6	0.67	C	24.1	0.81	C
SB LT	20.1	0.44	C	14.7	0.25	B
SB TH/RT	21.5	0.44	C	24.1	0.88	C
OVERALL	24.8	-	C	22.1	-	C
3: Kumukoa St & Mohouli St						
NB LT	23.2	0.56	C	14.8	0.46	B
NB TH/RT	22.0	0.05	C	14.7	0.09	B
EB LT	8.0	0.01	A	10.0	0.04	A
EB TH/RT	22.2	0.90	C	14.2	0.79	B
WB LT	13.6	0.05	B	10.3	0.08	B
WB TH/RT	9.3	0.30	A	12.9	0.70	B
SB LT	29.5	0.08	C	19.7	0.03	B
SB TH/RT	31.3	0.29	C	20.5	0.19	C
OVERALL	19.9	-	B	13.9	-	B
4: Komohana St & Nowelo St						
NB LT	3.6	0.03	A	8.6	0.04	A
NB TH/RT	10.8	0.93	B	7.0	0.61	A
EB LT/TH	25.0	0.05	C	18.3	0.05	B
EB RT	0.0	0.00	A	18.1	0.01	B
WB LT/TH	25.0	0.07	C	19.5	0.32	B
WB RT	0.0	0.00	A	18.2	0.01	B
SB LT	11.2	0.19	B	5.6	0.02	A
SB TH/RT	4.5	0.48	A	10.1	0.90	B
OVERALL	8.8	-	A	9.5	-	A
5: Komohana St & Puainako St (N)						
NB LT	5.1	0.43	A	10.1	0.51	B
NB TH	16.2	0.96	B	7.2	0.40	A
EB LT	35.5	0.37	D	32.7	0.41	C
EB RT	1.0	0.11	A	1.4	0.30	A
SB TH	12.0	0.25	B	12.2	0.43	B
SB RT	10.7	0.06	B	9.8	0.11	A
OVERALL	13.8	0.85	B	10.1	0.52	B
6: Komohana St & Puainako St (S)						
NB LT/TH/RT	71.8	1.05	E*	32.7	0.74	C
EB LT/TH/RT	33.7	0.01	C	31.0	0.01	C
WB LT/TH/RT	60.0	0.84	E	46.1	0.76	D
SB LT	19.2	0.49	B	13.6	0.66	B
SB TH/RT	3.5	0.33	A	5.5	0.63	A
OVERALL	48.3	0.91	D	20.4	0.73	C

4. BASE YEAR 2025 TRAFFIC CONDITIONS

Base Year 2025 was selected to reflect the anticipated completion year for the Project. The Base Year 2025 scenario represents the traffic conditions within the study area without the Project. Traffic conditions were formulated by applying a defacto growth rate to the existing traffic count volumes as well as trips generated by known future developments in the vicinity of the Project.

4.1 De Facto Growth Rate

Background traffic growth in the study area was determined based on the HDOT Island of Hawaii 2035 Travel Demand Forecasting Model (TDFM). The forecasting model uses population forecasts from the Hawaii County General Plan to distribute households and vehicular trips across predetermined Traffic Analysis Zones (TAZs) based upon existing TAZ household distributions. Based on the TDFM, a conservative annual ambient growth rate of 1.0% was applied to the studied intersections.

4.2 Background Developments

In addition to redevelopment accounted for in the de facto growth rates, traffic projections from all known background projects in the vicinity of the Project at the time of this study were added to the existing roadway network to account for intersection turning movements. Trips from the following developments were added to the existing AM and PM peak hour volumes to reflect Base Year conditions. See Figure 4.1 for the location of the background developments and Table 4.1 for anticipated trips generated by the background developments.

Wailani Development – This project is a master planned community bordered by Komohana Street to the east and Mohouli Street to the west. The project proposes approximately 420,000 square feet of combined retail space, medical-office space and business/tech park space, 208 single-family residential units, 324 multi-family residential units and 296 senior housing residential units. A 2009 TIAR was completed for this development, but since land use allocations have changed, new trips were generated based on the current plan, as shown in Table 4.1. For purposes of this TIAR, ultimate build-out is anticipated to occur over a 10-year period to Year 2031.

Hale Ola O Mohouli Affordable Residential Project – This project is located north of Mohouli Street and just east of its intersection with Kukuau Street. The project proposes to construct 90 affordable residential units and is expected to be completed by 2025. A TIAR for the Hale Ola O Mohouli Affordable Residential Project was completed by AECOM dated November 2020.

County of Hawaii Fire Administration Support Complex – The project proposes to construct a Fire Administration Support Complex on 5.0 acres of land adjacent and to the east of the proposed Hale Ola O Mohouli Affordable Residential Project. A TIAR for the County of Hawaii Fire Administration Support Complex was completed by M&E Pacific, Inc dated February 2008.

Hilo Hillside Phase II – This project is located along the Puainako Street Extension, east of Puainako Heights. Phase I of the development includes 56 single-family homes, the majority of which were constructed and occupied at the time of data collection. Phase II proposes to construct an additional 56 single-family homes.

Puainako Heights – This project is located along the Puainako Street Extension, east of Wilder Road. The project proposes to construct 49 single family homes under Phase 1A and 1B. The remaining phases of the project do not currently have a timeframe for completion.

Kaiaulu O Kapiolani Apartments – This project proposed to construct 64 affordable multi-family residential units bordered by Kukuau Street, Kapiolani Street and Kupukupu Street.

HMC Cancer Center Expansion – At the time of the traffic count, HMC was constructing the new 17,295 SF Cancer Center Expansion building adjacent to the existing HMC Cancer Center.

Hilo Medical Center Expansion – This project proposes to expand the HMC Campus in two phases of development, the first of which is anticipated to be completed by 2025. Phase I will includes the relocation of the existing 11-bed ICU space to a new 18-bed facility with offices and ancillary uses. It will also include the construction of a new 18,900 SF facility above the North Parking Lot, connected to the existing HMC Primary Acute Care Facility via two pedestrian bridges/walkways. The existing ground level parking lot will be redesigned to accommodate the overhead Phase I ICU Expansion Facility. The existing ICU space will be reprogrammed to care for more noncritical patients.

Table 4.1: Base Year Background Development Trip Generation

Background Development	AM			PM		
	Enter	Exit	Total	Enter	Exit	Total
Wailani Development	511	368	879	777	917	1,694
Hale Ola O Mohouli Affordable Residential Project	10	38	48	44	24	68
County of Hawaii Fire Administration Support Complex	51	6	57	23	50	73
Hilo Hillside Phase II	11	34	45	34	20	54
Puainako Heights Phase I	10	30	40	30	17	47
Kaiaulu O Kapiolani Apartments	7	25	32	25	15	40
HMC Cancer Center	9	4	13	5	9	14
Hilo Medical Center Expansion Phase I	18	8	26	9	17	26
Total	**627**	**513**	**1,140**	**947**	**1,069**	**2,016**

Notes:

1. Majority of trips shown in Table 3.1 will not travel through the study area due to the location of each background development and forecast trip distribution throughout the Hilo region.

USGS HILO FACILITY

AustinTsutsumi & ASSOCIATES, INC.
Engineers & Surveyors

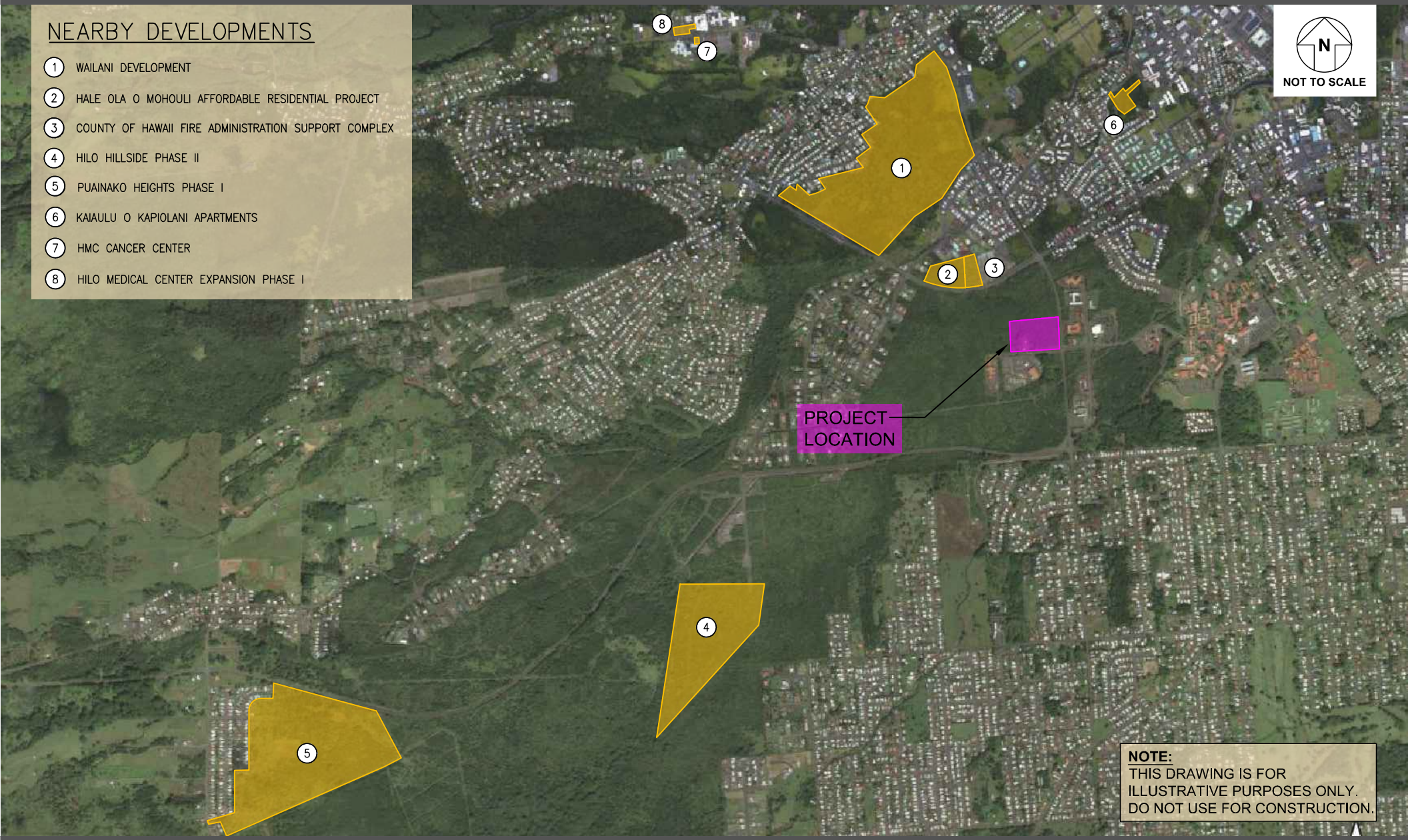


FIGURE 4.1

BACKGROUND PROJECTS

4.3 Base Year 2025 Analysis

For Base Year 2025, traffic will increase over existing conditions; Komohana Street 20-30% (110-170 vehicles/hour/direction), Mohouli Street 10% (15-35 vehicles/hour/direction), and Puainako Street 15% (25-50 vehicles/hour/direction). All intersections are anticipated to operate at LOS D or better and below capacity, with the exception of the following:

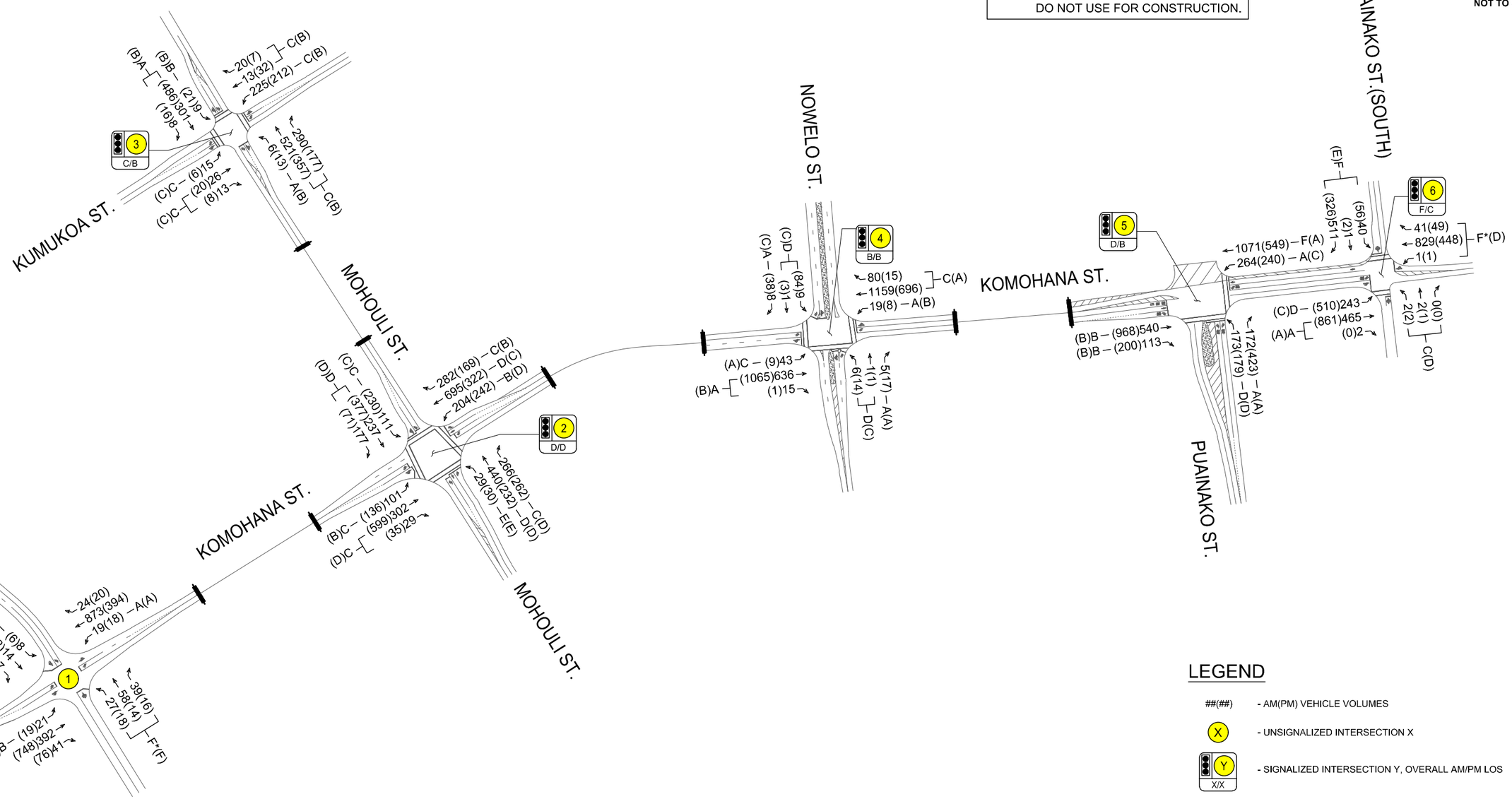
- Komohana Street & Kukuau Street – LOS E/F movements worsen primarily from increased through traffic along Komohana Street with no major increases on the eastbound or westbound approaches.
    - AM peak hour - Eastbound approach and westbound left-turn movement is anticipated to worsen from LOS E to LOS F, with overcapacity conditions for eastbound approach.
    - PM peak hour – Eastbound and westbound approaches worsen from LOS D to LOS E/F, but below capacity conditions.
- Komohana Street & Mohouli Street
    - EB LT is anticipated to continue operating at LOS E and below capacity similar to existing conditions.
- Komohana Street & Puainako Street (North and South)
    - AM northbound through flows will continue operating at LOS F and over-capacity conditions, similar to existing conditions.
    - PM conditions will continue to operate adequately.

Figure 4.2 shows the Base Year 2025 lane configuration, traffic volumes, and LOS for each study intersection, respectively. Table 4.2 summarizes the Base Year 2025 LOS at the study intersections. LOS worksheets are provided in Appendix C

AustinTsutsumi & ASSOCIATES, INC.
Engineers & Surveyors

NOTES:
1. THIS DRAWING IS FOR ILLUSTRATIVE PURPOSES ONLY. DO NOT USE FOR CONSTRUCTION.

N
NOT TO SCALE



LEGEND

##(##)	- AM(PM) VEHICLE VOLUMES
X	- UNSIGNALIZED INTERSECTION X
Y / X/X	- SIGNALIZED INTERSECTION Y, OVERALL AM/PM LOS
X(X)	- AM(PM) LOS

BASE YEAR 2025 LANE CONFIGURATION, VOLUMES, AND LOS

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
CIVIL ENGINEERS • SURVEYORS

TABLE 4.1: LOS SUMMARY TABLE
EXISTING CONDITIONS AND BASE YEAR 2025

Intersection	Existing 2022 Conditions						Base Year 2025					
	AM			PM			AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
1: Komohana St & Kukuau St												
NB LT	8.1	0.02	A	9.0	0.02	A	8.4	0.02	A	9.9	0.03	A
EB TH/RT	49.5	0.64	E	25.5	0.22	D	161.1	1.05	F*	55.6	0.43	F
WB LT	44.4	0.08	E	25.2	0.04	D	100.7	0.19	F	43.5	0.07	E
WB TH/RT	19.5	0.20	C	24.7	0.27	C	28.1	0.30	D	45.5	0.46	E
SB LT	9.4	0.03	A	8.0	0.02	A	10.3	0.03	B	8.3	0.02	A
OVERALL	6.0	-	-	2.9	-	-	14.7	-	-	4.5	-	-
2: Komohana St & Mohouli St												
NB LT	16.0	0.36	B	16.4	0.61	B	18.1	0.46	B	41.5	0.90	D
NB TH	26.6	0.91	C	17.3	0.42	B	48.1	0.95	D	21.0	0.44	C
NB RT	18.6	0.29	B	15.3	0.10	B	21.2	0.31	C	17.8	0.11	B
EB LT	70.7	0.84	E	77.8	0.88	E	74.1	0.79	E	70.0	0.80	E
EB TH	31.1	0.86	C	28.8	0.75	C	54.7	0.91	D	41.6	0.74	D
EB RT	21.3	0.15	C	23.8	0.15	C	30.3	0.18	C	36.2	0.27	D
WB LT	20.0	0.45	C	18.6	0.59	B	29.5	0.58	C	28.9	0.69	C
WB TH/RT	23.6	0.67	C	24.1	0.81	C	42.6	0.81	D	52.3	0.92	D
SB LT	20.1	0.44	C	14.7	0.25	B	27.4	0.60	C	17.4	0.30	B
SB TH/RT	21.5	0.44	C	24.1	0.88	C	25.7	0.49	C	42.1	0.94	D
OVERALL	24.8	-	C	22.1	-	C	39.4	-	D	37.9	-	D
3: Kumukoa St & Mohouli St												
NB LT	23.2	0.56	C	14.8	0.46	B	25.3	0.59	C	16.1	0.48	B
NB TH/RT	22.0	0.05	C	14.7	0.09	B	23.7	0.05	C	15.8	0.09	B
EB LT	8.0	0.01	A	10.0	0.04	A	8.1	0.01	A	10.3	0.05	B
EB TH/RT	22.2	0.90	C	14.2	0.79	B	27.7	0.93	C	14.7	0.81	B
WB LT	13.6	0.05	B	10.3	0.08	B	15.3	0.06	B	10.7	0.09	B
WB TH/RT	9.3	0.30	A	12.9	0.70	B	9.6	0.34	A	13.4	0.74	B
SB LT	29.5	0.08	C	19.7	0.03	B	32.0	0.09	C	21.3	0.03	C
SB TH/RT	31.3	0.29	C	20.5	0.19	C	34.0	0.30	C	22.2	0.19	C
OVERALL	19.9	-	B	13.9	-	B	23.3	-	C	14.5	-	B

TABLE 4.1: LOS SUMMARY TABLE
EXISTING CONDITIONS AND BASE YEAR 2025 CONT'D

Intersection	Existing 2022 Conditions						Base Year 2025					
	AM			PM			AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
4: Komohana St & Nowelo St												
NB LT	3.6	0.03	A	8.6	0.04	A	3.0	0.04	A	13.5	0.05	B
NB TH/RT	10.8	0.93	B	7.0	0.61	A	26.4	0.98	C	6.5	0.63	A
EB LT/TH	25.0	0.05	C	18.3	0.05	B	36.1	0.07	D	26.4	0.06	C
EB RT	0.0	0.00	A	18.1	0.01	B	0.0	0.00	A	0.0	0.00	A
WB LT/TH	25.0	0.07	C	19.5	0.32	B	36.2	0.09	D	28.2	0.40	C
WB RT	0.0	0.00	A	18.2	0.01	B	0.0	0.00	A	26.1	0.01	C
SB LT	11.2	0.19	B	5.6	0.02	A	21.9	0.29	C	5.5	0.02	A
SB TH/RT	4.5	0.48	A	10.1	0.90	B	3.7	0.50	A	16.7	0.94	B
OVERALL	8.8	-	A	9.5	-	A	18.7	-	B	13.4	-	B
5: Komohana St & Puainako St (N)												
NB LT	5.1	0.43	A	10.1	0.51	B	5.8	0.51	A	26.9	0.65	C
NB TH	16.2	0.96	B	7.2	0.40	A	85.7	1.16	F	7.8	0.48	A
EB LT	35.5	0.37	D	32.7	0.41	C	37.4	0.44	D	40.6	0.53	D
EB RT	1.0	0.11	A	1.4	0.30	A	0.9	0.13	A	1.2	0.32	A
SB TH	12.0	0.25	B	12.2	0.43	B	14.0	0.30	B	15.4	0.53	B
SB RT	10.7	0.06	B	9.8	0.11	A	12.2	0.08	B	11.9	0.16	B
OVERALL	13.8	0.85	B	10.1	0.52	B	46.7	1.01	D	14.0	0.65	B
6: Komohana St & Puainako St (S)												
NB LT/TH/RT	71.8	1.05	E*	32.7	0.74	C	185.2	1.32	F*	41.3	0.82	D
EB LT/TH/RT	33.7	0.01	C	31.0	0.01	C	34.5	0.01	C	36.9	0.01	D
WB LT/TH/RT	60.0	0.84	E	46.1	0.76	D	82.3	0.95	F	65.4	0.87	E
SB LT	19.2	0.49	B	13.6	0.66	B	47.9	0.60	D	29.2	0.79	C
SB TH/RT	3.5	0.33	A	5.5	0.63	A	4.3	0.41	A	8.4	0.73	A
OVERALL	48.3	0.91	D	20.4	0.73	C	103.3	1.09	F	30.1	0.83	C

5. FUTURE YEAR 2025 TRAFFIC CONDITIONS

5.1 Project Description

The Project will consist of two (2) buildings totaling approximately 60,000 SF. The primary building will provide office space, conference rooms, laboratories, storage space and operations/monitoring center. The secondary building size and use is subject to change due to funding, but is anticipated to provide additional storage and ancillary use. Direct access to the Project site will be provided by two (2) future driveways along Nowelo Street. The Project is planned to service approximately 50 staff and volunteers for the USGS Hawaii Volcano Observatory (HVO) and 53 staff and volunteers for the Pacific Island Ecosystems Research Center (PIERC). Primary operations for both HVO and PIERC is monitoring, research and testing for their respective fields of study. Future Year 2025 was selected to reflect the anticipated completion year for the Project.

5.2 Trip Generation & Distribution

The ITE Trip Generation Manual, 11th Edition was used to estimate the number of vehicular trips generated by the Project. The ITE rate was selected based on the Project's proposed land use description for Research and Development Center (ITE 760) – *A research and development center is a facility or group of facilities devoted almost exclusively to research and development activities… Research and development centers may contain offices and light fabrication areas.* The Project is expected to generate 83(81) new trips during the AM(PM) peak hours of traffic. Based on a comparison of employees, the existing USDA facilities on Nowelo Street employ approximately 87 employees and generate an existing 44(42) vehicle trips. The Project is forecast to employ approximately 103 employees and ITE trip rates calculate vehicle trips that are about double that of the existing USDA facilities. Therefore, Project trips are comparable but conservative when compared to existing USDA land uses.

Forecast Project trips were distributed based on existing traffic patterns, with approximately 50% north of Nowelo Street and 45% south of Nowelo Street. Table 5.1 and 5.2 shows the Project trip generation formula and vehicle trip projections for the Project, respectively. Figure 5.1 shows the Project Trips generated for FY 2025.

Table 5.1 Project Trip Generation Rates

Land Use (ITE Code)	Independent Variable	AM Peak Hour		PM Peak Hour	
		Trip Rate	% Enter	Trip Rate	% Enter
Research and Development Center (760)	1,000 SF GFA	[a]	82%	[b]	16%

[a] T = 0.89(X) + 24.54 [b] T = 0.84(X) + 25.08

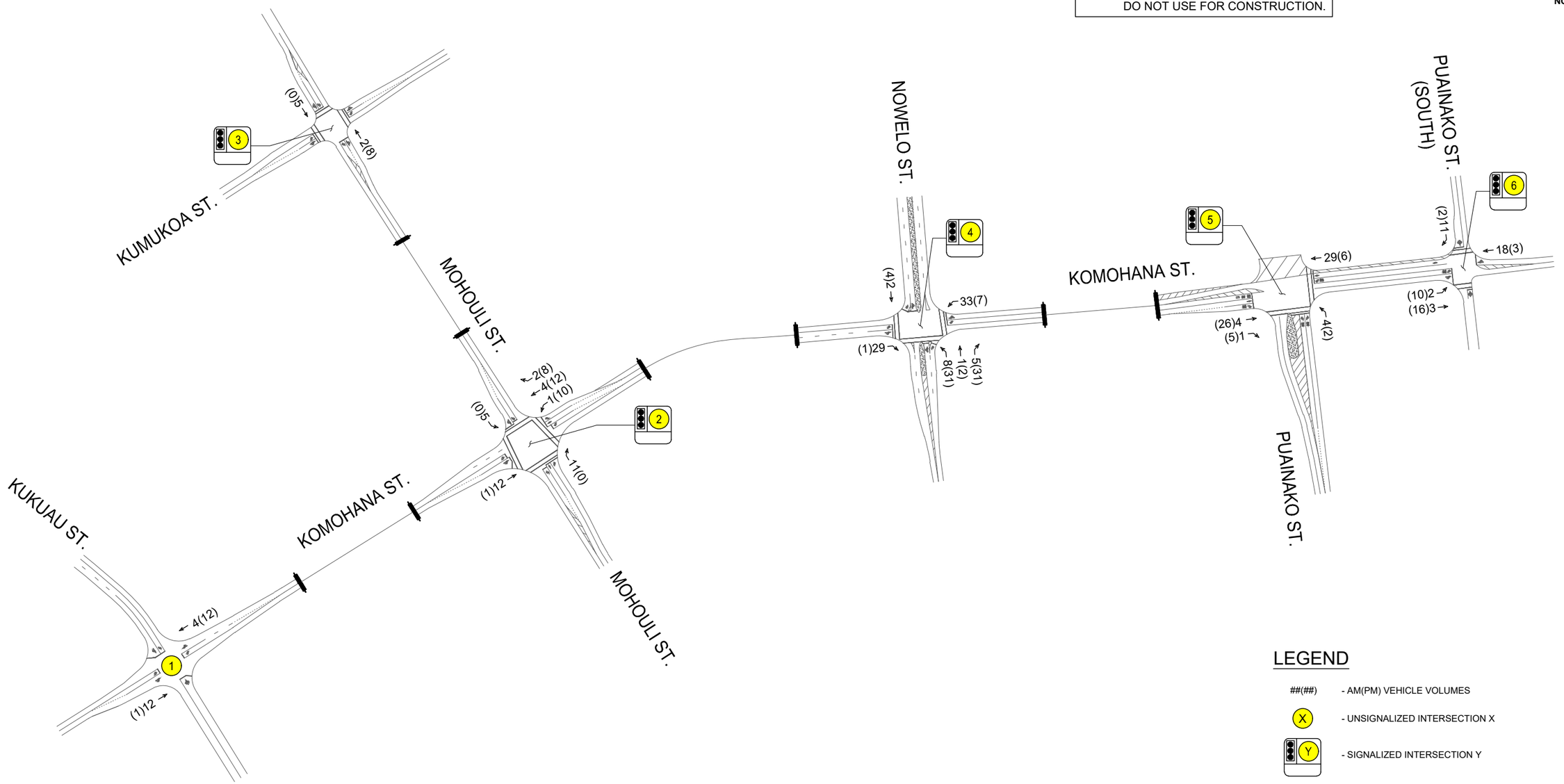
Table 5.2: Project Trip Generation

Land Use (ITE Code)	Units	Variable	AM Peak Hour			PM Peak Hour		
			Enter	Exit	Total	Enter	Exit	Total
Research and Development Center (760)	60	1,000 SF GFA	64	14	78	12	64	76

AustinTsutsumi & ASSOCIATES, INC.
Engineers & Surveyors

NOTES:
1. THIS DRAWING IS FOR ILLUSTRATIVE PURPOSES ONLY. DO NOT USE FOR CONSTRUCTION.

N
NOT TO SCALE



PROJECT TRIPS

5.3 Future Year 2025 Analysis

It is anticipated that Project trips will have minimal impacts to the overall study roadway network. By Future Year 2025, the Project will only increase traffic along Komohana Street by 1 to 2% from Base Year 2025 conditions, or as much as 5-30 vehicles/hour/direction.

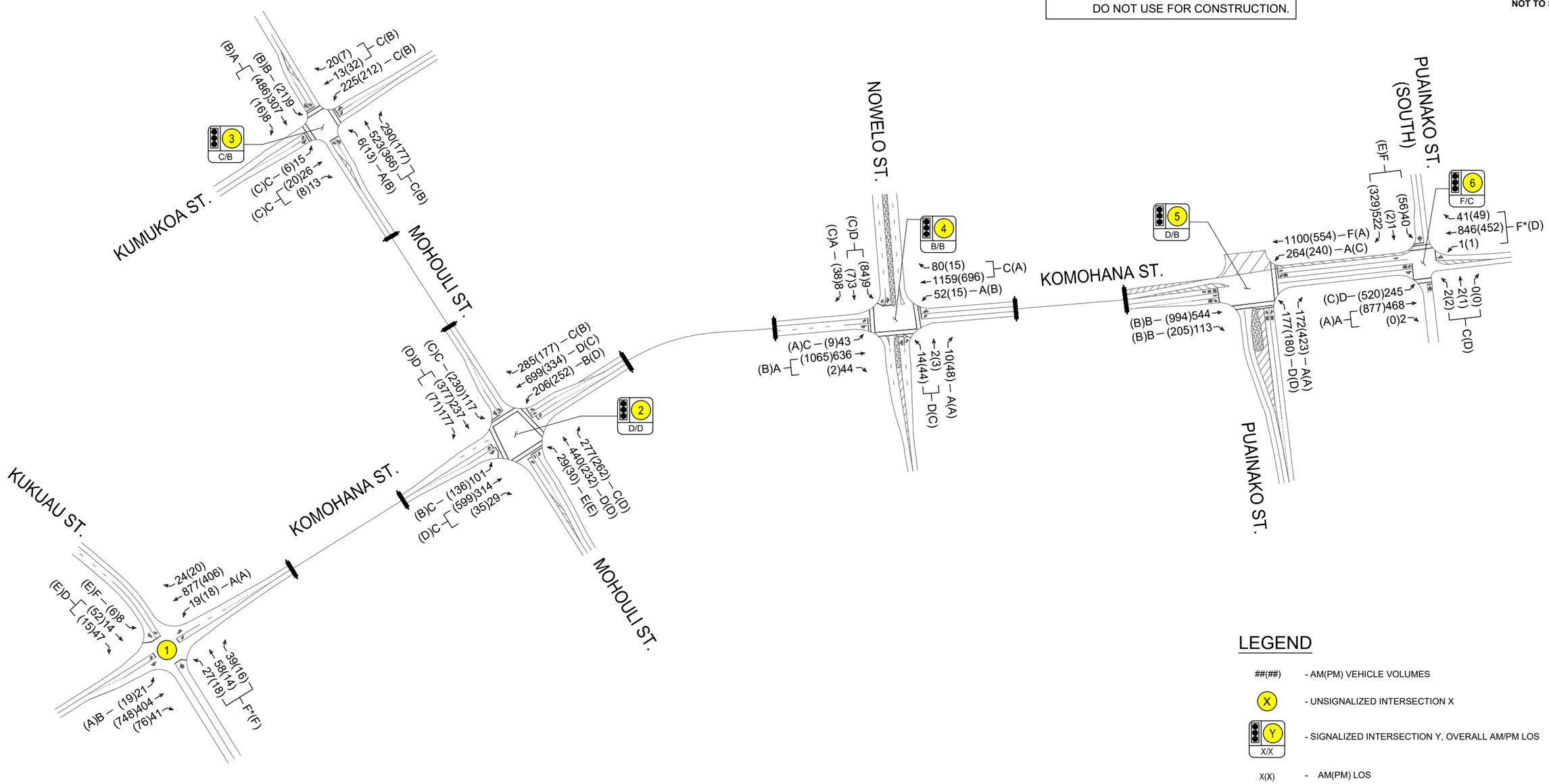
All movements that are forecast to operate at LOS E/F or over-capacity conditions for Base Year 2025 scenario will continue to operate at similar conditions with the Project. The Project will not worsen any additional movements to LOS E/F conditions from Base Year 2025. The Project minimally increases most individual movement delays by 1 second or less and a couple movements by only 4 seconds. Since the Komohana Street/Nowelo Street intersection is currently underutilized, the additional Project turning movement volumes will not significantly worsen operations at this intersection.

Figure 5.2 illustrates the Future Year 2025 lane configuration, traffic volumes, and LOS for each study intersection. Table 5.3 summarizes the Existing, Base Year and Future Year LOS at the study intersections. LOS worksheets are provided in Appendix C.

AustinTsutsumi & ASSOCIATES, INC.
Engineers & Surveyors

NOTES:
1. THIS DRAWING IS FOR ILLUSTRATIVE PURPOSES ONLY. DO NOT USE FOR CONSTRUCTION.

N
NOT TO SCALE



LEGEND

##(##)	- AM(PM) VEHICLE VOLUMES
X	- UNSIGNALIZED INTERSECTION X
Y / X/X	- SIGNALIZED INTERSECTION Y, OVERALL AM/PM LOS
X(X)	- AM(PM) LOS

FIGURE 5.2

FUTURE YEAR 2025 LANE CONFIGURATION, VOLUMES, AND LOS

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
CIVIL ENGINEERS • SURVEYORS

TABLE 5.3: LOS SUMMARY TABLE
EXISTING CONDITIONS, BASE YEAR 2025 AND FUTURE YEAR 2025

Intersection	Existing 2022 Conditions						Base Year 2025						Future Year 2025					
	AM			PM			AM			PM			AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
1: Komohana St & Kukuau St																		
NB LT	8.1	0.02	A	9.0	0.02	A	8.4	0.02	A	9.9	0.03	A	8.4	0.02	A	9.9	0.03	A
EB TH/RT	49.5	0.64	E	25.5	0.22	D	161.1	1.05	F*	55.6	0.43	F	170.9	1.08	F*	57.7	0.44	F
WB LT	44.4	0.08	E	25.2	0.04	D	100.7	0.19	F	43.5	0.07	E	106.0	0.20	F	44.3	0.07	E
WB TH/RT	19.5	0.20	C	24.7	0.27	C	28.1	0.30	D	45.5	0.46	E	28.6	0.30	D	46.4	0.46	E
SB LT	9.4	0.03	A	8.0	0.02	A	10.3	0.03	B	8.3	0.02	A	10.3	0.03	B	8.3	0.02	A
OVERALL	6.0	-	-	2.9	-	-	14.7	-	-	4.5	-	-	15.3	-	-	4.6	-	-
2: Komohana St & Mohouli St																		
NB LT	16.0	0.36	B	16.4	0.61	B	18.1	0.46	B	41.5	0.90	D	18.7	0.48	B	46.5	0.90	D
NB TH	26.6	0.91	C	17.3	0.42	B	48.1	0.95	D	21.0	0.44	C	49.9	0.96	D	21.2	0.45	C
NB RT	18.6	0.29	B	15.3	0.10	B	21.2	0.31	C	17.8	0.11	B	21.6	0.31	C	17.8	0.11	B
EB LT	70.7	0.84	E	77.8	0.88	E	74.1	0.79	E	70.0	0.80	E	75.2	0.79	E	71.2	0.79	E
EB TH	31.1	0.86	C	28.8	0.75	C	54.7	0.91	D	41.6	0.74	D	54.4	0.91	D	42.9	0.74	D
EB RT	21.3	0.15	C	23.8	0.15	C	30.3	0.18	C	36.2	0.27	D	31.0	0.19	C	37.3	0.26	D
WB LT	20.0	0.45	C	18.6	0.59	B	29.5	0.58	C	28.9	0.69	C	30.2	0.60	C	30.2	0.70	C
WB TH/RT	23.6	0.67	C	24.1	0.81	C	42.6	0.81	D	52.3	0.92	D	40.3	0.77	D	55.0	0.92	D
SB LT	20.1	0.44	C	14.7	0.25	B	27.4	0.60	C	17.4	0.30	B	28.2	0.61	C	17.9	0.30	B
SB TH/RT	21.5	0.44	C	24.1	0.88	C	25.7	0.49	C	42.1	0.94	D	26.5	0.50	C	44.1	0.94	D
OVERALL	24.8	-	C	22.1	-	C	39.4	-	D	37.9	-	D	39.6	-	D	39.7	-	D
3: Kumukoa St & Mohouli St																		
NB LT	23.2	0.56	C	14.8	0.46	B	25.3	0.59	C	16.1	0.48	B	25.3	0.59	C	16.3	0.48	B
NB TH/RT	22.0	0.05	C	14.7	0.09	B	23.7	0.05	C	15.8	0.09	B	23.8	0.05	C	16.0	0.10	B
EB LT	8.0	0.01	A	10.0	0.04	A	8.1	0.01	A	10.3	0.05	B	8.1	0.01	A	10.2	0.05	B
EB TH/RT	22.2	0.90	C	14.2	0.79	B	27.7	0.93	C	14.7	0.81	B	27.9	0.93	C	14.8	0.82	B
WB LT	13.6	0.05	B	10.3	0.08	B	15.3	0.06	B	10.7	0.09	B	15.3	0.06	B	10.8	0.09	B
WB TH/RT	9.3	0.30	A	12.9	0.70	B	9.6	0.34	A	13.4	0.74	B	9.7	0.35	A	13.3	0.73	B
SB LT	29.5	0.08	C	19.7	0.03	B	32.0	0.09	C	21.3	0.03	C	32.1	0.09	C	21.6	0.03	C
SB TH/RT	31.3	0.29	C	20.5	0.19	C	34.0	0.30	C	22.2	0.19	C	34.1	0.30	C	22.5	0.20	C
OVERALL	19.9	-	B	13.9	-	B	23.3	-	C	14.5	-	B	23.3	-	C	14.6	-	B
4: Komohana St & Nowelo St																		
NB LT	3.6	0.03	A	8.6	0.04	A	3.0	0.04	A	13.5	0.05	B	3.5	0.10	A	14.2	0.09	B
NB TH/RT	10.8	0.93	B	7.0	0.61	A	26.4	0.98	C	6.5	0.63	A	28.6	0.98	C	6.6	0.63	A
EB LT/TH	25.0	0.05	C	18.3	0.05	B	36.1	0.07	D	26.4	0.06	C	36.6	0.13	D	27.6	0.20	C
EB RT	0.0	0.00	A	18.1	0.01	B	0.0	0.00	A	0.0	0.00	A	0.0	0.00	A	0.0	-0.01	A
WB LT/TH	25.0	0.07	C	19.5	0.32	B	36.2	0.09	D	28.2	0.40	C	36.5	0.10	D	28.7	0.41	C
WB RT	0.0	0.00	A	18.2	0.01	B	0.0	0.00	A	26.1	0.01	C	0.0	0.00	A	26.7	0.01	C
SB LT	11.2	0.19	B	5.6	0.02	A	21.9	0.29	C	5.5	0.02	A	22.8	0.31	C	5.6	0.02	A
SB TH/RT	4.5	0.48	A	10.1	0.90	B	3.7	0.50	A	16.7	0.94	B	4.6	0.54	A	18.0	0.95	B
OVERALL	8.8	-	A	9.5	-	A	18.7	-	B	13.4	-	B	19.9	-	B	14.5	-	B

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
CIVIL ENGINEERS • SURVEYORS

TABLE 5.3: LOS SUMMARY TABLE
EXISTING CONDITIONS, BASE YEAR 2025 AND FUTURE YEAR 2025 CONT'D

Intersection	Existing 2022 Conditions						Base Year 2025						Future Year 2025					
	AM			PM			AM			PM			AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
5: Komohana St & Puainako St (N)																		
NB LT	5.1	0.43	A	10.1	0.51	B	5.8	0.51	A	26.9	0.65	C	5.7	0.51	A	27.7	0.66	C
NB TH	16.2	0.96	B	7.2	0.40	A	85.7	1.16	F	7.8	0.48	A	99.6	1.19	F	7.9	0.48	A
EB LT	35.5	0.37	D	32.7	0.41	C	37.4	0.44	D	40.6	0.53	D	37.6	0.45	D	40.8	0.53	D
EB RT	1.0	0.11	A	1.4	0.30	A	0.9	0.13	A	1.2	0.32	A	0.9	0.13	A	1.2	0.32	A
SB TH	12.0	0.25	B	12.2	0.43	B	14.0	0.30	B	15.4	0.53	B	14.0	0.30	B	16.1	0.55	B
SB RT	10.7	0.06	B	9.8	0.11	A	12.2	0.08	B	11.9	0.16	B	12.1	0.08	B	12.3	0.17	B
OVERALL	13.8	0.85	B	10.1	0.52	B	46.7	1.01	D	14.0	0.65	B	53.5	1.03	D	14.4	0.66	B
6: Komohana St & Puainako St (S)																		
NB LT/TH/RT	71.8	1.05	E*	32.7	0.74	C	185.2	1.32	F*	41.3	0.82	D	198.5	1.35	F*	41.6	0.83	D
EB LT/TH/RT	33.7	0.01	C	31.0	0.01	C	34.5	0.01	C	36.9	0.01	D	34.6	0.01	C	37.1	0.01	D
WB LT/TH/RT	60.0	0.84	E	46.1	0.76	D	82.3	0.95	F	65.4	0.87	E	87.2	0.96	F	66.8	0.87	E
SB LT	19.2	0.49	B	13.6	0.66	B	47.9	0.60	D	29.2	0.79	C	49.2	0.61	D	32.3	0.81	C
SB TH/RT	3.5	0.33	A	5.5	0.63	A	4.3	0.41	A	8.4	0.73	A	4.4	0.42	A	9.1	0.75	A
OVERALL	48.3	0.91	D	20.4	0.73	C	103.3	1.09	F	30.1	0.83	C	110.4	1.11	F	31.3	0.83	C

6. CONCLUSION

The Project proposes a new USGS facility on the northwest corner of the Komohana Street/Nowelo Street intersection, across the existing U.S. Department of Agriculture (USDA) Pacific Basin Agricultural Research Center facility. The Project will consist of two (2) buildings totaling approximately 60,000 SF. The primary building will provide office space, conference rooms, laboratories, storage space and operations/monitoring center. The secondary building size and use is subject to change due to funding, but is anticipated to provide additional storage and ancillary use. Direct access to the Project site will be provided by two (2) future driveways along Nowelo Street. The Project is planned to service approximately 50 staff and volunteers for the USGS Hawaii Volcano Observatory (HVO) and 53 staff and volunteers for the Pacific Island Ecosystems Research Center (PIERC). Primary operations for both HVO and PIERC is monitoring, research and testing for their respective fields of study.

6.1 Existing Conditions

Turning movement counts were collected on Thursday, March 23-24, 2022. At the time of this traffic count, all DOE schools and UH Hilo were in session. However, based on a comparison of peak hour counts taken by HDOT in September 2019 along Komohana Street, between Puainako Street and Nowelo Street, HDOT's 2019 counts yielded 166(314) more total AM(PM) peak hour vehicles along Komohana Street. While 2022 conditions may be the new normal, this TIAR added the 166(314) AM)(PM) vehicles to Komohana Street to remain conservative and reflect pre-covid conditions. These additional trips were distributed based on existing traffic patterns.

At the Komohana Street intersections with Kukuau Street and Mohouli Street, various movements operate at LOS E but below capacity conditions, due to heavy through traffic along Komohana Street. These LOS E movements service relatively low volumes, so no lengthy queues occur. Based on observations, some congestion occurs on the east and west through lanes along Mohouli Street during both peaks, occasionally requiring two cycles to clear.

At the Komohana Street/Nowelo Street intersection, mainline turn movements and eastbound/westbound approach volumes along Nowelo Street are very low, resulting in no observed issues.

At the Komohana Street/Puainako Street (North and South) intersections, heavy northbound commuter traffic occurs during the AM peak hour, resulting in the northbound through movement operating at LOS E and over-capacity conditions, and the westbound approach on Puainako Street operating at LOS E conditions. Based on observations northbound and westbound queues generally lasted from 6:55 to 8:15 AM at varying lengths. Northbound Komohana Street vehicles queued as far back about 0.85 miles to Uilani Place and westbound Puainako Street vehicles queued as far back about 0.25 miles to Kapualani Street. During the PM peak hour, some slowdowns occurred on the southbound Komohana Street approach, but no lengthy congestion was observed.

6.2 Base Year 2025 Traffic Conditions

For Base Year 2025, traffic will over existing conditions; Komohana Street 20-30% (110-170 vehicles/hour/direction), Mohouli Street 10% (15-35 vehicles/hour/direction), and Puainako Street 15% (25-50 vehicles/hour/direction). Some side street movements along Kukuau Street at its intersection with Komohana Street will worsen to LOS E/F conditions. Due to higher forecast through traffic along Komohana Street.

6.3 Future Year 2025 Conditions

The Project is expected to generate 78(76) new trips during the AM(PM) peak hours of traffic. Project trips will have minimal impacts to the overall study roadway network. By Future Year 2025, the Project will only increase traffic along Komohana Street by 1 to 2% from Base Year 2025 conditions, or as much as 5-30 vehicles/hour/direction.

All movements that are forecast to operate at LOS E/F or over-capacity conditions for Base Year 2025 scenario will continue to operate at similar conditions with the Project. The Project will not worsen any additional movements to LOS E/F conditions from Base Year 2025. The Project minimally increases most individual movement delays by 1 second or less and a couple movements by only 4 seconds. Since the Komohana Street/Nowelo Street intersection is currently underutilized, the additional Project turning movement volumes will not significantly worsen operations at this intersection.

7. REFERENCES

1. AECOM, Hale Ola O Mohouli Affordable Residential Traffic Impact Analysis Report, November 2020.

2. Austin, Tsutsumi & Associates, Inc, Hilo Medial Center Expansion Traffic Impact Analysis Report, December 2021.

3. Austin, Tsutsumi & Associates, Inc, Kaiaulu O Kapiolani Apartments Traffic Impact Analysis Report, June 21, 2019.

4. Geometrician Associates, LLC, Final Environmental Assessment for Hilo Medical Center Hawaii Pacific Oncology Center Addition and Rural & Telehealth Center Unit, March 2020.

5. Institute of Transportation Engineers, Trip Generation, 11th Edition, 2021.

6. M&E Pacific, Inc., County of Hawaii Fire Administration Support Complex Traffic Impact Analysis Report, February 13, 2008.

7. The American Association of State Highway and Transportation Officials, A Policy on Geometric Design of Highways and Streets, 2011.

8. Transportation Research Board, Highway Capacity Manual, 6th Edition.

APPENDICES

APPENDIX A

TRAFFIC COUNT DATA

Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
Phone: (808)533-3646 Fax: (808)526-1267

File Name : Komohana St-Kukuau St
Site Code : 22-506 USGS Hilo TIAR
Start Date : 3/24/2022
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

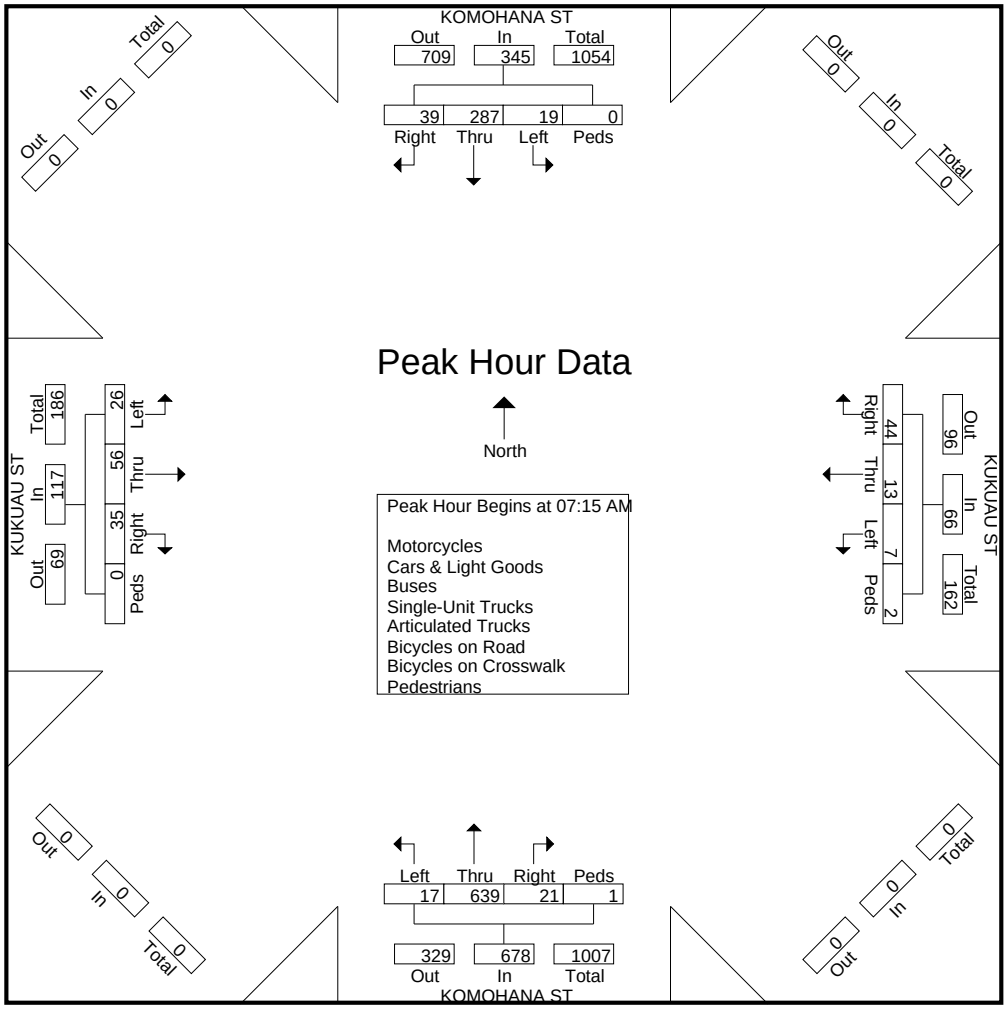
	KOMOHANA ST Southbound				KUKUAU ST Westbound				KOMOHANA ST Northbound				KUKUAU ST Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:45 AM	1	38	5	0	4	0	5	0	2	143	0	1	11	6	3	0	219
Total	1	38	5	0	4	0	5	0	2	143	0	1	11	6	3	0	219
07:00 AM	2	49	4	0	0	3	7	0	2	128	2	0	6	7	8	0	218
07:15 AM	2	65	7	0	2	6	15	0	3	171	0	0	6	9	12	0	298
07:30 AM	8	82	12	0	2	4	14	0	2	168	10	1	9	20	7	0	339
07:45 AM	5	71	11	0	3	1	12	2	4	160	5	0	7	17	9	0	307
Total	17	267	34	0	7	14	48	2	11	627	17	1	28	53	36	0	1162
08:00 AM	4	69	9	0	0	2	3	0	8	140	6	0	4	10	7	0	262
08:15 AM	3	70	14	1	2	8	2	0	3	108	5	0	8	6	5	0	235
08:30 AM	0	52	10	0	0	2	3	1	5	83	2	0	3	7	5	0	173
Grand Total	25	496	72	1	13	26	61	3	29	1101	30	2	54	82	56	0	2051
Apprch %	4.2	83.5	12.1	0.2	12.6	25.2	59.2	2.9	2.5	94.8	2.6	0.2	28.1	42.7	29.2	0	
Total %	1.2	24.2	3.5	0	0.6	1.3	3	0.1	1.4	53.7	1.5	0.1	2.6	4	2.7	0	
Motorcycles	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0	0	3
% Motorcycles	0	0.2	0	0	0	0	0	0	0	0.1	0	0	0	1.2	0	0	0.1
Cars & Light Goods	25	484	72	0	13	25	60	0	29	1086	30	0	53	79	55	0	2011
% Cars & Light Goods	100	97.6	100	0	100	96.2	98.4	0	100	98.6	100	0	98.1	96.3	98.2	0	98
Buses	0	1	0	0	0	0	1	0	0	1	0	0	1	1	1	0	6
% Buses	0	0.2	0	0	0	0	1.6	0	0	0.1	0	0	1.9	1.2	1.8	0	0.3
Single-Unit Trucks	0	7	0	0	0	0	0	0	0	10	0	0	0	0	0	0	17
% Single-Unit Trucks	0	1.4	0	0	0	0	0	0	0	0.9	0	0	0	0	0	0	0.8
Articulated Trucks	0	2	0	0	0	0	0	0	0	2	0	0	0	0	0	0	4
% Articulated Trucks	0	0.4	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0.2
Bicycles on Road	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	4
% Bicycles on Road	0	0.2	0	0	0	3.8	0	0	0	0.1	0	0	0	1.2	0	0	0.2
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	1	0	0	0	3	0	0	0	2	0	0	0	0	6
% Pedestrians	0	0	0	100	0	0	0	100	0	0	0	100	0	0	0	0	0.3

Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
Phone: (808)533-3646 Fax: (808)526-1267

File Name : Komohana St-Kukuau St
Site Code : 22-506 USGS Hilo TIAR
Start Date : 3/24/2022
Page No : 2

	KOMOHANA ST Southbound					KUKUAU ST Westbound					KOMOHANA ST Northbound					KUKUAU ST Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:45 AM to 08:30 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	2	65	7	0	74	2	**6**	**15**	0	**23**	3	**171**	0	0	174	6	9	**12**	0	27	298
07:30 AM	**8**	**82**	**12**	0	**102**	2	4	14	0	20	2	168	**10**	**1**	**181**	**9**	**20**	7	0	**36**	**339**
07:45 AM	5	71	11	0	87	**3**	1	12	**2**	18	4	160	5	0	169	7	17	9	0	33	307
08:00 AM	4	69	9	0	82	0	2	3	0	5	**8**	140	6	0	154	4	10	7	0	21	262
Total Volume	19	287	39	0	345	7	13	44	2	66	17	639	21	1	678	26	56	35	0	117	1206
% App. Total	5.5	83.2	11.3	0		10.6	19.7	66.7	3		2.5	94.2	3.1	0.1		22.2	47.9	29.9	0		
PHF	.594	.875	.813	.000	.846	.583	.542	.733	.250	.717	.531	.934	.525	.250	.936	.722	.700	.729	.000	.813	.889



Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
Phone: (808)533-3646 Fax: (808)526-1267

File Name : Komohana St-Kukuau St
Site Code : 22-506 USGS Hilo TIAR
Start Date : 3/23/2022
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

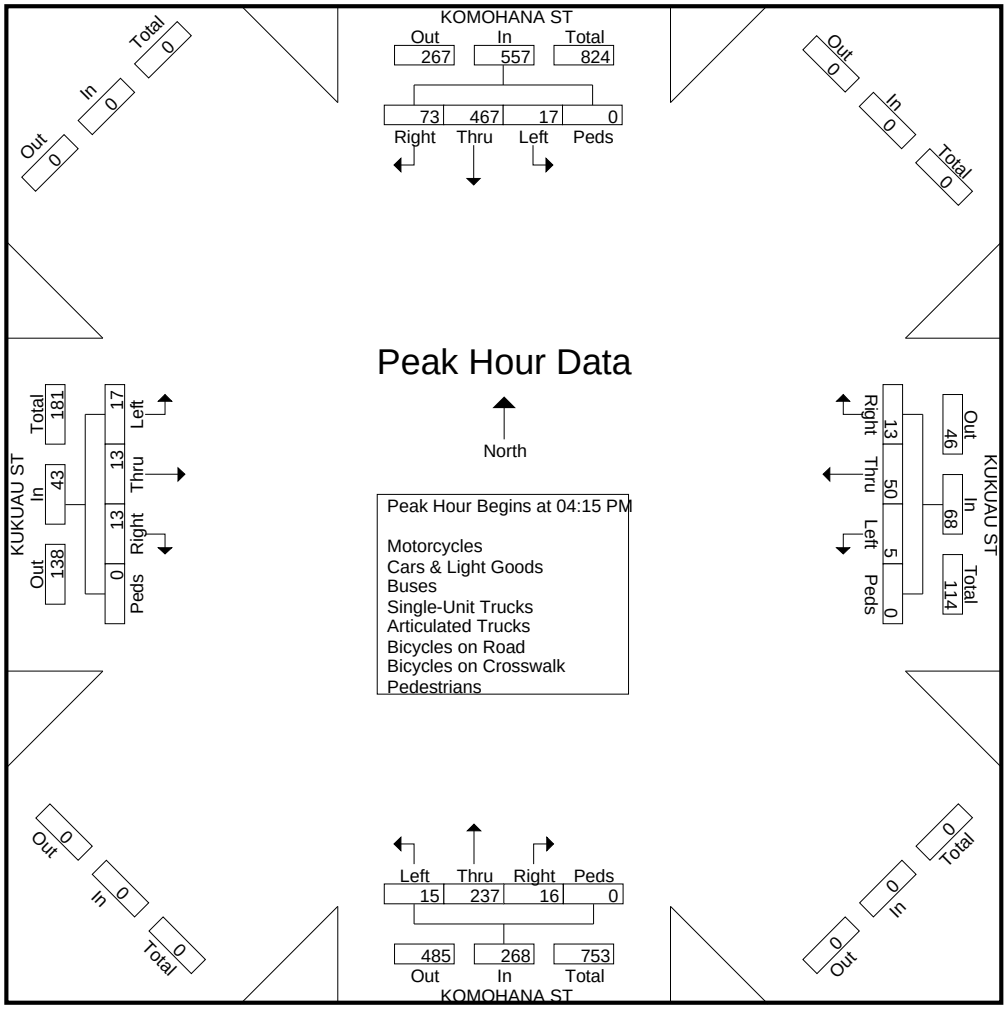
	KOMOHANA ST Southbound				KUKUAU ST Westbound				KOMOHANA ST Northbound				KUKUAU ST Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
03:30 PM	8	159	14	0	3	9	3	0	9	52	1	0	3	7	7	0	275
03:45 PM	4	75	21	2	4	9	1	0	1	66	1	0	3	7	3	0	197
Total	12	234	35	2	7	18	4	0	10	118	2	0	6	14	10	0	472
04:00 PM	1	116	15	0	5	5	6	0	4	63	3	0	3	6	5	0	232
04:15 PM	1	109	13	0	1	13	1	0	6	63	3	0	4	0	4	0	218
04:30 PM	4	158	21	0	0	13	2	0	4	66	6	0	5	3	5	0	287
04:45 PM	4	98	14	0	3	10	5	0	1	56	1	0	6	7	2	0	207
Total	10	481	63	0	9	41	14	0	15	248	13	0	18	16	16	0	944
05:00 PM	8	102	25	0	1	14	5	0	4	52	6	0	2	3	2	0	224
05:15 PM	4	85	10	0	3	6	1	0	7	60	3	0	6	1	3	0	189
Grand Total	34	902	133	2	20	79	24	0	36	478	24	0	32	34	31	0	1829
Apprch %	3.2	84.2	12.4	0.2	16.3	64.2	19.5	0	6.7	88.8	4.5	0	33	35.1	32	0	
Total %	1.9	49.3	7.3	0.1	1.1	4.3	1.3	0	2	26.1	1.3	0	1.7	1.9	1.7	0	
Motorcycles	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
% Motorcycles	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Cars & Light Goods	34	896	133	0	20	79	24	0	36	472	24	0	32	34	29	0	1813
% Cars & Light Goods	100	99.3	100	0	100	100	100	0	100	98.7	100	0	100	100	93.5	0	99.1
Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
% Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6.5	0	0.1
Single-Unit Trucks	0	4	0	0	0	0	0	0	0	4	0	0	0	0	0	0	8
% Single-Unit Trucks	0	0.4	0	0	0	0	0	0	0	0.8	0	0	0	0	0	0	0.4
Articulated Trucks	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	3
% Articulated Trucks	0	0.1	0	0	0	0	0	0	0	0.4	0	0	0	0	0	0	0.2
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
% Pedestrians	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0.1

Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
Phone: (808)533-3646 Fax: (808)526-1267

File Name : Komohana St-Kukuau St
Site Code : 22-506 USGS Hilo TIAR
Start Date : 3/23/2022
Page No : 2

	KOMOHANA ST Southbound					KUKUAU ST Westbound					KOMOHANA ST Northbound					KUKUAU ST Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:15 PM to 05:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	1	109	13	0	123	1	13	1	0	15	**6**	63	3	0	72	4	0	4	0	8	218
04:30 PM	4	**158**	21	0	**183**	0	13	2	0	15	4	**66**	**6**	0	**76**	5	3	**5**	0	13	**287**
04:45 PM	4	98	14	0	116	**3**	10	**5**	0	18	1	56	1	0	58	**6**	**7**	2	0	**15**	207
05:00 PM	**8**	102	**25**	0	135	1	**14**	5	0	**20**	4	52	6	0	62	2	3	2	0	7	224
Total Volume	17	467	73	0	557	5	50	13	0	68	15	237	16	0	268	17	13	13	0	43	936
% App. Total	3.1	83.8	13.1	0		7.4	73.5	19.1	0		5.6	88.4	6	0		39.5	30.2	30.2	0		
PHF	.531	.739	.730	.000	.761	.417	.893	.650	.000	.850	.625	.898	.667	.000	.882	.708	.464	.650	.000	.717	.815



Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
Phone: (808)533-3646 Fax: (808)526-1267

File Name : Komohana St-Mohouli St
Site Code : 22-506 USGS Hilo TIAR
Start Date : 3/24/2022
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

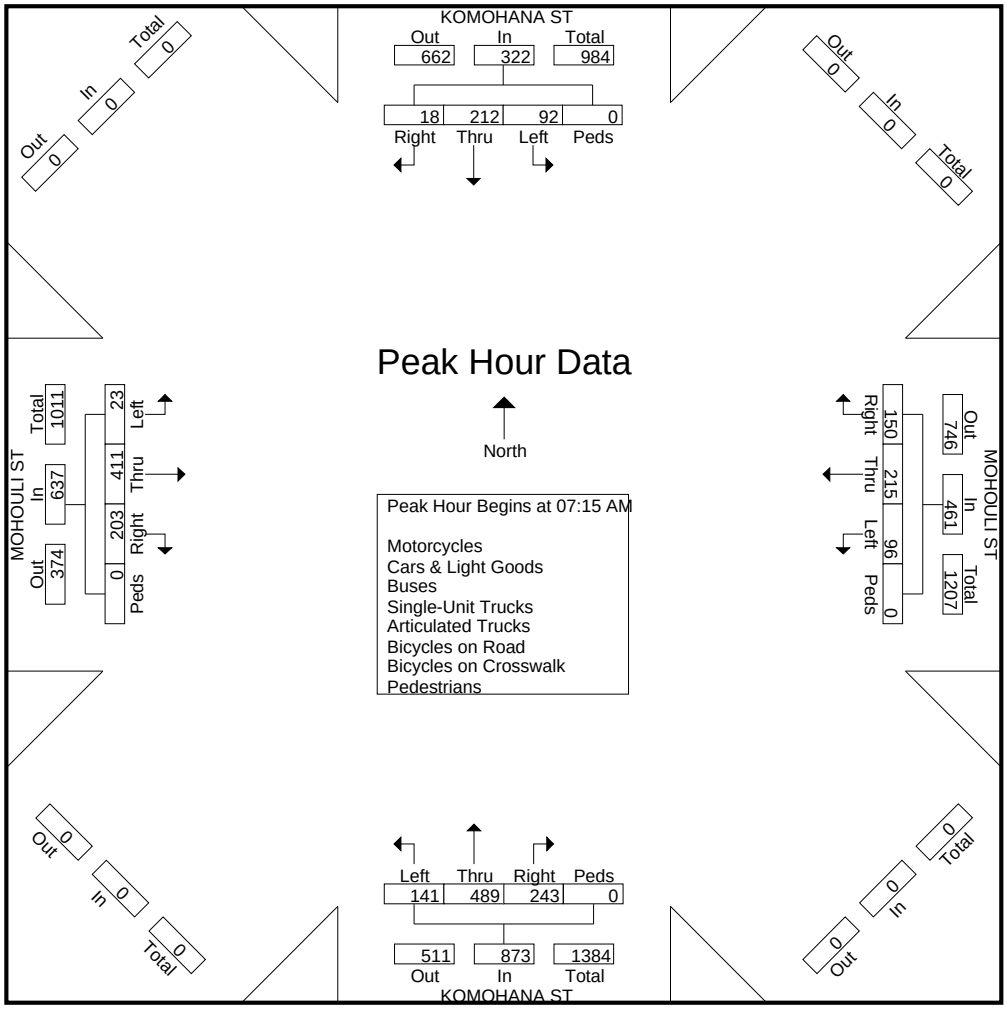
	KOMOHANA ST Southbound				MOHOULI ST Westbound				KOMOHANA ST Northbound				MOHOULI ST Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:45 AM	14	23	2	0	21	21	21	0	27	121	38	0	1	77	51	0	417
Total	14	23	2	0	21	21	21	0	27	121	38	0	1	77	51	0	417
07:00 AM	21	41	1	0	14	41	22	0	51	114	37	0	2	72	57	0	473
07:15 AM	18	54	3	0	15	41	41	0	31	116	72	0	5	105	60	0	561
07:30 AM	28	58	6	0	22	52	51	0	39	134	73	0	4	108	51	0	626
07:45 AM	27	53	4	0	35	68	34	0	30	123	59	0	7	102	56	0	598
Total	94	206	14	0	86	202	148	0	151	487	241	0	18	387	224	0	2258
08:00 AM	19	47	5	0	24	54	24	0	41	116	39	0	7	96	36	0	508
08:15 AM	22	48	8	1	19	47	17	0	28	92	42	0	4	55	31	0	414
08:30 AM	25	33	3	0	18	39	12	0	19	76	42	0	8	59	31	0	365
Grand Total	174	357	32	1	168	363	222	0	266	892	402	0	38	674	373	0	3962
Apprch %	30.9	63.3	5.7	0.2	22.3	48.2	29.5	0	17.1	57.2	25.8	0	3.5	62.1	34.4	0	
Total %	4.4	9	0.8	0	4.2	9.2	5.6	0	6.7	22.5	10.1	0	1	17	9.4	0	
Motorcycles	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
% Motorcycles	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Cars & Light Goods	170	350	31	0	166	347	217	0	262	883	399	0	37	670	368	0	3900
% Cars & Light Goods	97.7	98	96.9	0	98.8	95.6	97.7	0	98.5	99	99.3	0	97.4	99.4	98.7	0	98.4
Buses	2	1	0	0	0	2	1	0	0	0	0	0	0	0	1	0	7
% Buses	1.1	0.3	0	0	0	0.6	0.5	0	0	0	0	0	0	0	0.3	0	0.2
Single-Unit Trucks	1	5	1	0	2	11	4	0	3	7	3	0	1	2	3	0	43
% Single-Unit Trucks	0.6	1.4	3.1	0	1.2	3	1.8	0	1.1	0.8	0.7	0	2.6	0.3	0.8	0	1.1
Articulated Trucks	1	1	0	0	0	3	0	0	1	1	0	0	0	1	0	0	8
% Articulated Trucks	0.6	0.3	0	0	0	0.8	0	0	0.4	0.1	0	0	0	0.1	0	0	0.2
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.3	0	0.1
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
% Pedestrians	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0

Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
Phone: (808)533-3646 Fax: (808)526-1267

File Name : Komohana St-Mohouli St
Site Code : 22-506 USGS Hilo TIAR
Start Date : 3/24/2022
Page No : 2

	KOMOHANA ST Southbound					MOHOULI ST Westbound					KOMOHANA ST Northbound					MOHOULI ST Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:45 AM to 08:30 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	18	54	3	0	75	15	41	41	0	97	31	116	72	0	219	5	105	**60**	0	**170**	561
07:30 AM	**28**	**58**	**6**	0	**92**	22	52	**51**	0	125	39	**134**	**73**	0	**246**	4	**108**	51	0	163	**626**
07:45 AM	27	53	4	0	84	**35**	**68**	34	0	**137**	30	123	59	0	212	**7**	102	56	0	165	598
08:00 AM	19	47	5	0	71	24	54	24	0	102	**41**	116	39	0	196	7	96	36	0	139	508
Total Volume	92	212	18	0	322	96	215	150	0	461	141	489	243	0	873	23	411	203	0	637	2293
% App. Total	28.6	65.8	5.6	0		20.8	46.6	32.5	0		16.2	56	27.8	0		3.6	64.5	31.9	0		
PHF	.821	.914	.750	.000	.875	.686	.790	.735	.000	.841	.860	.912	.832	.000	.887	.821	.951	.846	.000	.937	.916



Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
Phone: (808)533-3646 Fax: (808)526-1267

File Name : Komohana St-Mohouli St
Site Code : 22-506 USGS Hilo TIAR
Start Date : 3/23/2022
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

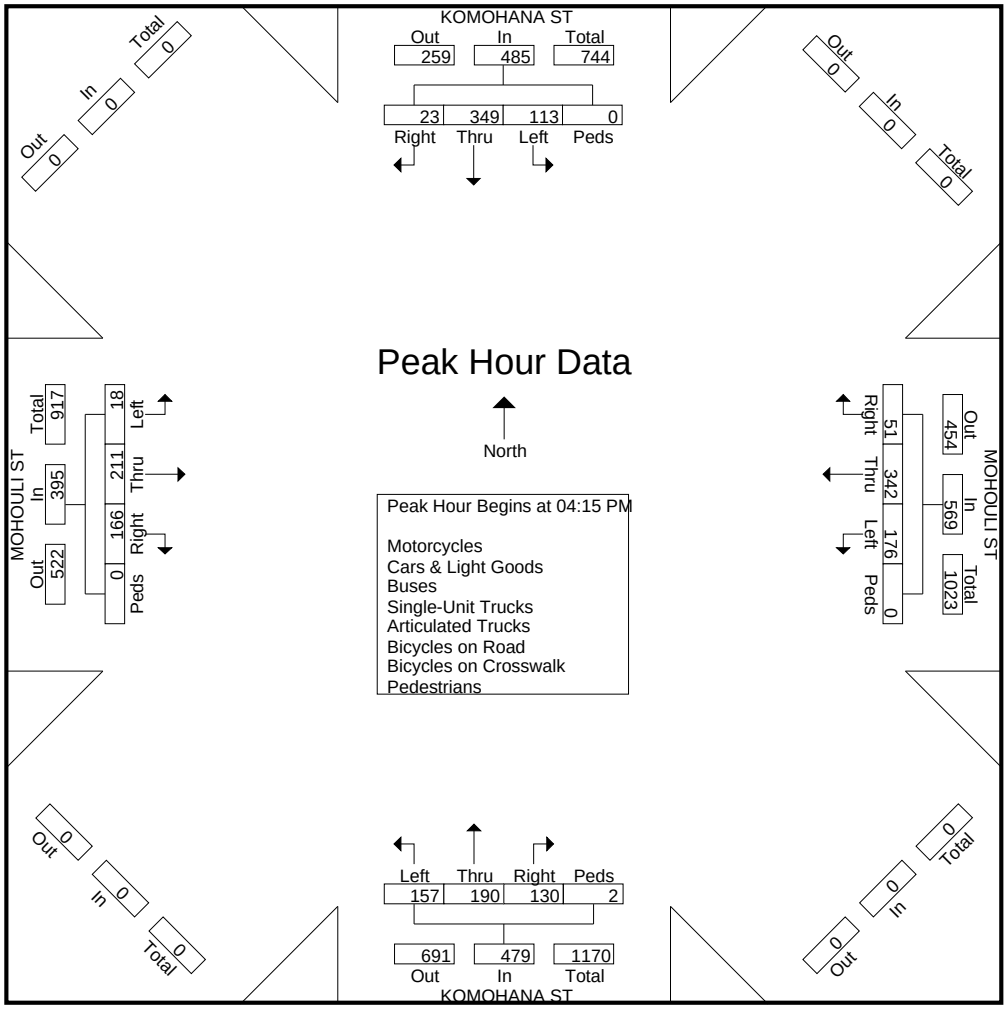
	KOMOHANA ST Southbound				MOHOULI ST Westbound				KOMOHANA ST Northbound				MOHOULI ST Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
03:30 PM	38	107	4	0	31	83	14	0	37	34	35	0	8	44	60	0	495
03:45 PM	21	74	2	0	32	90	10	0	58	61	35	1	1	45	31	0	461
Total	59	181	6	0	63	173	24	0	95	95	70	1	9	89	91	0	956
04:00 PM	28	85	4	0	45	87	18	0	33	47	21	0	1	55	56	0	480
04:15 PM	28	92	3	0	40	70	14	0	37	59	32	0	8	50	42	0	475
04:30 PM	35	110	7	0	38	71	14	0	37	44	35	0	6	52	33	0	482
04:45 PM	22	79	9	0	52	97	13	0	45	46	38	0	0	63	58	0	522
Total	113	366	23	0	175	325	59	0	152	196	126	0	15	220	189	0	1959
05:00 PM	28	68	4	0	46	104	10	0	38	41	25	2	4	46	33	0	449
05:15 PM	15	77	5	0	46	95	11	0	48	58	31	0	2	39	43	0	470
Grand Total	215	692	38	0	330	697	104	0	333	390	252	3	30	394	356	0	3834
Apprch %	22.8	73.2	4	0	29.2	61.6	9.2	0	34	39.9	25.8	0.3	3.8	50.5	45.6	0	
Total %	5.6	18	1	0	8.6	18.2	2.7	0	8.7	10.2	6.6	0.1	0.8	10.3	9.3	0	
Motorcycles	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2
% Motorcycles	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0.1
Cars & Light Goods	209	690	38	0	329	693	103	0	331	384	248	0	30	393	352	0	3800
% Cars & Light Goods	97.2	99.7	100	0	99.7	99.4	99	0	99.4	98.5	98.4	0	100	99.7	98.9	0	99.1
Buses	2	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	5
% Buses	0.9	0	0	0	0	0.3	0	0	0	0	0	0	0	0	0.3	0	0.1
Single-Unit Trucks	3	1	0	0	0	2	1	0	2	4	3	0	0	1	2	0	19
% Single-Unit Trucks	1.4	0.1	0	0	0	0.3	1	0	0.6	1	1.2	0	0	0.3	0.6	0	0.5
Articulated Trucks	0	1	0	0	0	0	0	0	0	2	1	0	0	0	0	0	4
% Articulated Trucks	0	0.1	0	0	0	0	0	0	0	0.5	0.4	0	0	0	0	0	0.1
Bicycles on Road	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
% Bicycles on Road	0	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	66.7	0	0	0	0	0.1
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	33.3	0	0	0	0	0

Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
Phone: (808)533-3646 Fax: (808)526-1267

File Name : Komohana St-Mohouli St
Site Code : 22-506 USGS Hilo TIAR
Start Date : 3/23/2022
Page No : 2

	KOMOHANA ST Southbound					MOHOULI ST Westbound					KOMOHANA ST Northbound					MOHOULI ST Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:15 PM to 05:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	28	92	3	0	123	40	70	**14**	0	124	37	**59**	32	0	128	**8**	50	42	0	100	475
04:30 PM	**35**	**110**	7	0	**152**	38	71	14	0	123	37	44	35	0	116	6	52	33	0	91	482
04:45 PM	22	79	**9**	0	110	**52**	97	13	0	**162**	**45**	46	**38**	0	**129**	0	**63**	**58**	0	**121**	**522**
05:00 PM	28	68	4	0	100	46	**104**	10	0	160	38	41	25	**2**	106	4	46	33	0	83	449
Total Volume	113	349	23	0	485	176	342	51	0	569	157	190	130	2	479	18	211	166	0	395	1928
% App. Total	23.3	72	4.7	0		30.9	60.1	9	0		32.8	39.7	27.1	0.4		4.6	53.4	42	0		
PHF	.807	.793	.639	.000	.798	.846	.822	.911	.000	.878	.872	.805	.855	.250	.928	.563	.837	.716	.000	.816	.923



Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
Phone: (808)533-3646 Fax: (808)526-1267

File Name : Kumukoa St-Mohouli St
Site Code : 22-506 USGS Hilo TIAR
Start Date : 3/24/2022
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

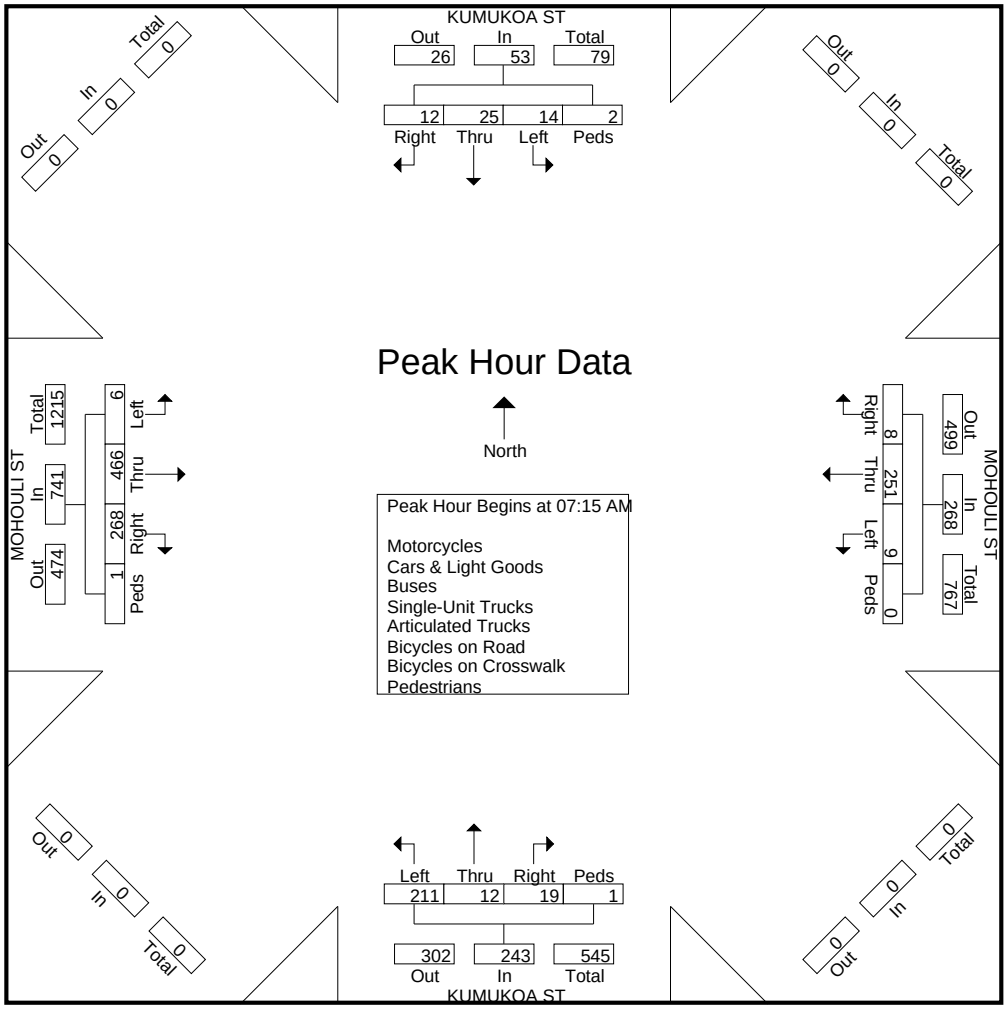
	KUMUKOA ST Southbound				MOHOULI ST Westbound				KUMUKOA ST Northbound				MOHOULI ST Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:45 AM	1	4	3	0	2	42	1	0	20	4	1	0	0	81	51	0	210
Total	1	4	3	0	2	42	1	0	20	4	1	0	0	81	51	0	210
07:00 AM	1	3	3	0	3	44	0	0	31	2	4	0	2	83	47	0	223
07:15 AM	3	3	1	0	1	58	3	0	43	2	7	0	0	123	73	0	317
07:30 AM	3	8	4	0	3	74	2	0	63	4	5	0	2	135	73	1	377
07:45 AM	6	9	4	2	2	63	1	0	51	3	4	1	2	122	64	0	334
Total	13	23	12	2	9	239	6	0	188	11	20	1	6	463	257	1	1251
08:00 AM	2	5	3	0	3	56	2	0	54	3	3	0	2	86	58	0	277
08:15 AM	3	1	2	1	2	56	2	0	24	4	2	0	1	90	38	0	226
08:30 AM	1	7	3	0	2	48	1	0	20	3	3	0	3	96	29	0	216
Grand Total	20	40	23	3	18	441	12	0	306	25	29	1	12	816	433	1	2180
Apprch %	23.3	46.5	26.7	3.5	3.8	93.6	2.5	0	84.8	6.9	8	0.3	1	64.7	34.3	0.1	
Total %	0.9	1.8	1.1	0.1	0.8	20.2	0.6	0	14	1.1	1.3	0	0.6	37.4	19.9	0	
Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cars & Light Goods	19	39	21	0	17	434	10	0	292	24	28	0	10	810	427	0	2131
% Cars & Light Goods	95	97.5	91.3	0	94.4	98.4	83.3	0	95.4	96	96.6	0	83.3	99.3	98.6	0	97.8
Buses	1	1	1	0	1	1	1	0	1	0	1	0	1	1	0	0	10
% Buses	5	2.5	4.3	0	5.6	0.2	8.3	0	0.3	0	3.4	0	8.3	0.1	0	0	0.5
Single-Unit Trucks	0	0	1	0	0	5	0	0	11	1	0	0	0	4	4	0	26
% Single-Unit Trucks	0	0	4.3	0	0	1.1	0	0	3.6	4	0	0	0	0.5	0.9	0	1.2
Articulated Trucks	0	0	0	0	0	1	1	0	2	0	0	0	0	1	1	0	6
% Articulated Trucks	0	0	0	0	0	0.2	8.3	0	0.7	0	0	0	0	0.1	0.2	0	0.3
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	2
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	8.3	0	0.2	0	0.1
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	3	0	0	0	0	0	0	0	1	0	0	0	1	5
% Pedestrians	0	0	0	100	0	0	0	0	0	0	0	100	0	0	0	100	0.2

Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
Phone: (808)533-3646 Fax: (808)526-1267

File Name : Kumukoa St-Mohouli St
Site Code : 22-506 USGS Hilo TIAR
Start Date : 3/24/2022
Page No : 2

	KUMUKOA ST Southbound					MOHOULI ST Westbound					KUMUKOA ST Northbound					MOHOULI ST Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:45 AM to 08:30 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	3	3	1	0	7	1	58	**3**	0	62	43	2	**7**	0	52	0	123	**73**	0	196	317
07:30 AM	3	8	**4**	0	15	**3**	**74**	2	0	**79**	**63**	**4**	5	0	**72**	**2**	**135**	73	**1**	**211**	**377**
07:45 AM	**6**	**9**	4	**2**	**21**	2	63	1	0	66	51	3	4	**1**	59	2	122	64	0	188	334
08:00 AM	2	5	3	0	10	3	56	2	0	61	54	3	3	0	60	2	86	58	0	146	277
Total Volume	14	25	12	2	53	9	251	8	0	268	211	12	19	1	243	6	466	268	1	741	1305
% App. Total	26.4	47.2	22.6	3.8		3.4	93.7	3	0		86.8	4.9	7.8	0.4		0.8	62.9	36.2	0.1		
PHF	.583	.694	.750	.250	.631	.750	.848	.667	.000	.848	.837	.750	.679	.250	.844	.750	.863	.918	.250	.878	.865



Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
Phone: (808)533-3646 Fax: (808)526-1267

File Name : Kumukoa St-Mohouli St
Site Code : 22-506 USGS Hilo TIAR
Start Date : 3/23/2022
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

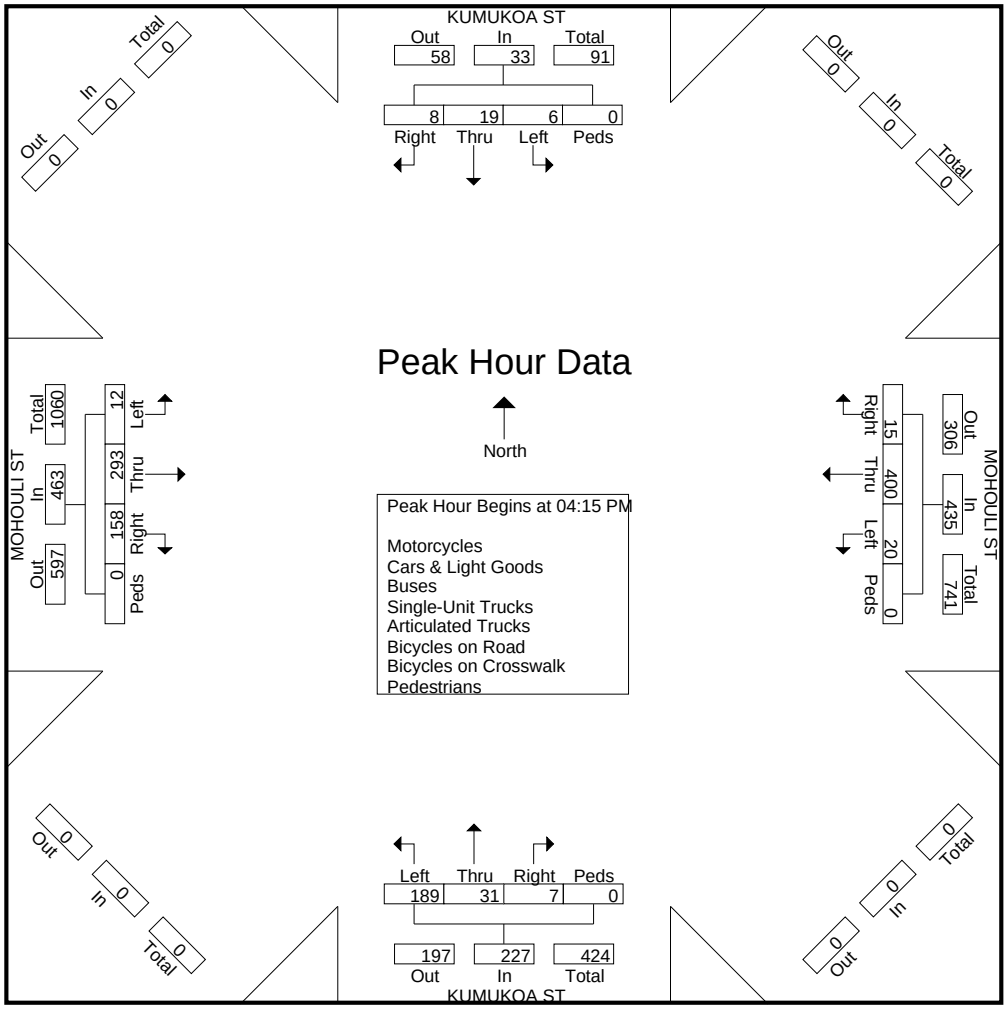
	KUMUKOA ST Southbound				MOHOULI ST Westbound				KUMUKOA ST Northbound				MOHOULI ST Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
03:30 PM	1	5	3	0	2	77	5	0	55	5	3	0	5	72	42	0	275
03:45 PM	2	8	0	0	4	79	8	2	48	5	3	0	3	73	31	0	266
Total	3	13	3	0	6	156	13	2	103	10	6	0	8	145	73	0	541
04:00 PM	0	3	4	0	2	93	6	0	50	8	1	0	2	74	34	0	277
04:15 PM	0	4	3	0	5	87	4	0	42	7	1	0	2	75	40	0	270
04:30 PM	0	7	2	0	2	100	1	0	46	10	1	0	3	77	40	0	289
04:45 PM	5	4	1	0	9	119	5	0	46	6	2	0	5	79	40	0	321
Total	5	18	10	0	18	399	16	0	184	31	5	0	12	305	154	0	1157
05:00 PM	1	4	2	0	4	94	5	0	55	8	3	0	2	62	38	0	278
05:15 PM	1	7	4	0	4	100	2	0	36	6	3	0	0	64	29	0	256
Grand Total	10	42	19	0	32	749	36	2	378	55	17	0	22	576	294	0	2232
Apprch %	14.1	59.2	26.8	0	3.9	91.5	4.4	0.2	84	12.2	3.8	0	2.5	64.6	33	0	
Total %	0.4	1.9	0.9	0	1.4	33.6	1.6	0.1	16.9	2.5	0.8	0	1	25.8	13.2	0	
Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
% Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0
Cars & Light Goods	10	42	19	0	32	745	36	0	376	55	16	0	22	570	287	0	2210
% Cars & Light Goods	100	100	100	0	100	99.5	100	0	99.5	100	94.1	0	100	99	97.6	0	99
Buses	0	0	0	0	0	2	0	0	0	0	0	0	0	2	0	0	4
% Buses	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0.3	0	0	0.2
Single-Unit Trucks	0	0	0	0	0	2	0	0	2	0	1	0	0	2	5	0	12
% Single-Unit Trucks	0	0	0	0	0	0.3	0	0	0.5	0	5.9	0	0	0.3	1.7	0	0.5
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7	0	0.1
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2
% Pedestrians	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0.1

Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
Phone: (808)533-3646 Fax: (808)526-1267

File Name : Kumukoa St-Mohouli St
Site Code : 22-506 USGS Hilo TIAR
Start Date : 3/23/2022
Page No : 2

	KUMUKOA ST Southbound					MOHOULI ST Westbound					KUMUKOA ST Northbound					MOHOULI ST Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	0	4	**3**	0	7	5	87	4	0	96	42	7	1	0	50	2	75	**40**	0	117	270
04:30 PM	0	**7**	2	0	9	2	100	1	0	103	46	**10**	1	0	57	3	77	40	0	120	289
04:45 PM	**5**	4	1	0	**10**	**9**	**119**	**5**	0	**133**	46	6	2	0	54	**5**	**79**	40	0	**124**	**321**
05:00 PM	1	4	2	0	7	4	94	5	0	103	**55**	8	**3**	0	**66**	2	62	38	0	102	278
Total Volume	6	19	8	0	33	20	400	15	0	435	189	31	7	0	227	12	293	158	0	463	1158
% App. Total	18.2	57.6	24.2	0		4.6	92	3.4	0		83.3	13.7	3.1	0		2.6	63.3	34.1	0		
PHF	.300	.679	.667	.000	.825	.556	.840	.750	.000	.818	.859	.775	.583	.000	.860	.600	.927	.988	.000	.933	.902



Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
Phone: (808)533-3646 Fax: (808)526-1267

File Name : Komohana St-Nowelo St
Site Code : 22-506 USGS Hilo TIAR
Start Date : 3/24/2022
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

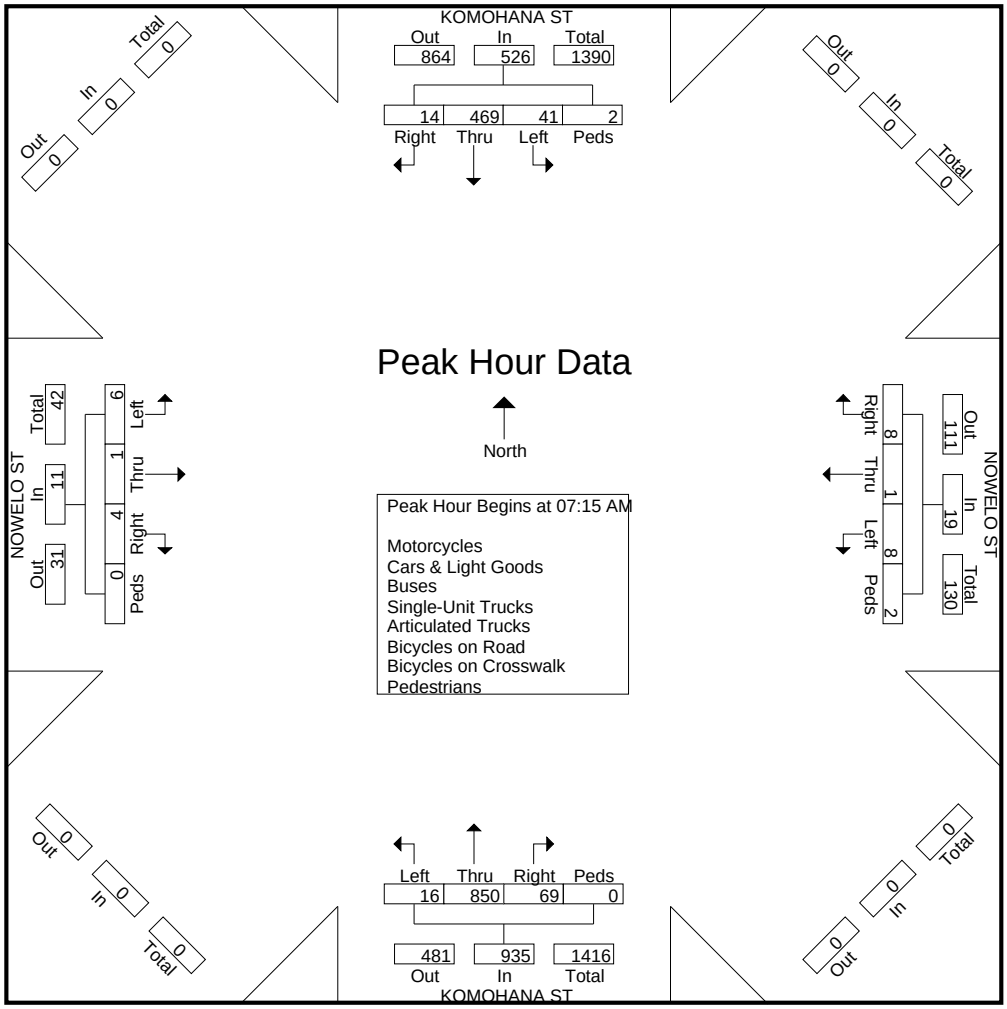
	KOMOHANA ST Southbound				NOWELO ST Westbound				KOMOHANA ST Northbound				NOWELO ST Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:45 AM	6	94	1	0	2	0	3	0	6	189	12	0	0	0	1	1	315
Total	6	94	1	0	2	0	3	0	6	189	12	0	0	0	1	1	315
07:00 AM	4	100	2	0	5	0	4	0	2	198	4	0	0	0	1	0	320
07:15 AM	8	125	3	2	1	0	1	0	2	214	11	0	2	0	0	0	369
07:30 AM	9	118	5	0	1	0	1	2	2	250	17	0	1	0	1	0	407
07:45 AM	15	122	4	0	5	1	3	0	5	209	28	0	0	0	3	0	395
Total	36	465	14	2	12	1	9	2	11	871	60	0	3	0	5	0	1491
08:00 AM	9	104	2	0	1	0	3	0	7	177	13	0	3	1	0	0	320
08:15 AM	4	87	5	0	7	0	2	0	2	159	15	0	2	0	2	0	285
08:30 AM	2	78	3	0	1	0	0	0	5	143	9	0	0	0	0	0	241
Grand Total	57	828	25	2	23	1	17	2	31	1539	109	0	8	1	8	1	2652
Apprch %	6.2	90.8	2.7	0.2	53.5	2.3	39.5	4.7	1.8	91.7	6.5	0	44.4	5.6	44.4	5.6	
Total %	2.1	31.2	0.9	0.1	0.9	0	0.6	0.1	1.2	58	4.1	0	0.3	0	0.3	0	
Motorcycles	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2
% Motorcycles	0	0.1	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0.1
Cars & Light Goods	57	814	25	0	23	1	17	0	31	1520	108	0	8	1	8	0	2613
% Cars & Light Goods	100	98.3	100	0	100	100	100	0	100	98.8	99.1	0	100	100	100	0	98.5
Buses	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
% Buses	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Single-Unit Trucks	0	10	0	0	0	0	0	0	0	12	0	0	0	0	0	0	22
% Single-Unit Trucks	0	1.2	0	0	0	0	0	0	0	0.8	0	0	0	0	0	0	0.8
Articulated Trucks	0	1	0	0	0	0	0	0	0	3	0	0	0	0	0	0	4
% Articulated Trucks	0	0.1	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0.2
Bicycles on Road	0	1	0	0	0	0	0	0	0	3	1	0	0	0	0	0	5
% Bicycles on Road	0	0.1	0	0	0	0	0	0	0	0.2	0.9	0	0	0	0	0	0.2
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0
Pedestrians	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	4
% Pedestrians	0	0	0	100	0	0	0	100	0	0	0	0	0	0	0	0	0.2

Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
Phone: (808)533-3646 Fax: (808)526-1267

File Name : Komohana St-Nowelo St
Site Code : 22-506 USGS Hilo TIAR
Start Date : 3/24/2022
Page No : 2

	KOMOHANA ST Southbound					NOWELO ST Westbound					KOMOHANA ST Northbound					NOWELO ST Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:15 AM to 08:00 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	8	**125**	3	**2**	138	1	0	1	0	2	2	214	11	0	227	2	0	0	0	2	369
07:30 AM	9	118	**5**	0	132	1	0	1	**2**	4	2	**250**	17	0	**269**	1	0	1	0	2	**407**
07:45 AM	**15**	122	4	0	**141**	**5**	**1**	**3**	0	**9**	5	209	**28**	0	242	0	0	**3**	0	3	395
08:00 AM	9	104	2	0	115	1	0	3	0	4	**7**	177	13	0	197	**3**	**1**	0	0	**4**	320
Total Volume	41	469	14	2	526	8	1	8	2	19	16	850	69	0	935	6	1	4	0	11	1491
% App. Total	7.8	89.2	2.7	0.4		42.1	5.3	42.1	10.5		1.7	90.9	7.4	0		54.5	9.1	36.4	0		
PHF	.683	.938	.700	.250	.933	.400	.250	.667	.250	.528	.571	.850	.616	.000	.869	.500	.250	.333	.000	.688	.916



Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
Phone: (808)533-3646 Fax: (808)526-1267

File Name : Komohana St-Nowelo St
Site Code : 22-506 USGS Hilo TIAR
Start Date : 3/23/2022
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

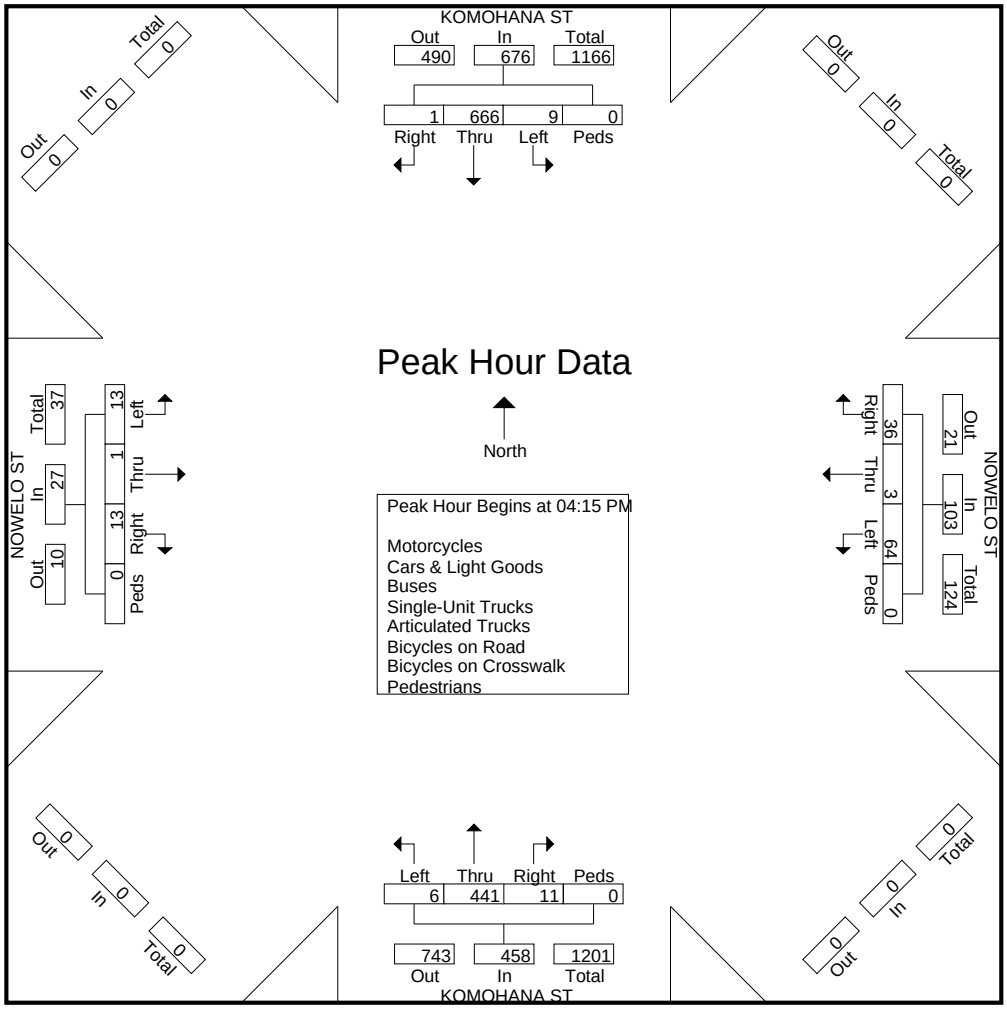
	KOMOHANA ST Southbound				NOWELO ST Westbound				KOMOHANA ST Northbound				NOWELO ST Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
03:30 PM	5	205	1	0	11	0	6	1	3	102	7	1	1	0	3	0	346
03:45 PM	1	133	0	0	11	0	7	0	0	138	6	0	0	0	2	0	298
Total	6	338	1	0	22	0	13	1	3	240	13	1	1	0	5	0	644
04:00 PM	2	180	1	0	10	0	7	0	0	100	2	0	1	2	2	0	307
04:15 PM	4	178	1	0	7	1	7	0	1	113	2	0	4	0	2	0	320
04:30 PM	0	165	0	0	21	1	16	0	1	107	1	0	2	0	4	0	318
04:45 PM	1	169	0	0	14	1	7	0	2	116	3	0	4	1	6	0	324
Total	7	692	2	0	52	3	37	0	4	436	8	0	11	3	14	0	1269
05:00 PM	4	154	0	0	22	0	6	0	2	105	5	0	3	0	1	0	302
05:15 PM	3	188	0	0	10	0	7	0	2	117	5	0	5	0	5	0	342
Grand Total	20	1372	3	0	106	3	63	1	11	898	31	1	20	3	25	0	2557
Apprch %	1.4	98.4	0.2	0	61.3	1.7	36.4	0.6	1.2	95.4	3.3	0.1	41.7	6.2	52.1	0	
Total %	0.8	53.7	0.1	0	4.1	0.1	2.5	0	0.4	35.1	1.2	0	0.8	0.1	1	0	
Motorcycles	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
% Motorcycles	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cars & Light Goods	20	1366	3	0	105	2	63	0	11	886	31	0	20	3	25	0	2535
% Cars & Light Goods	100	99.6	100	0	99.1	66.7	100	0	100	98.7	100	0	100	100	100	0	99.1
Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Single-Unit Trucks	0	3	0	0	0	1	0	0	0	9	0	0	0	0	0	0	13
% Single-Unit Trucks	0	0.2	0	0	0	33.3	0	0	0	1	0	0	0	0	0	0	0.5
Articulated Trucks	0	1	0	0	0	0	0	0	0	3	0	0	0	0	0	0	4
% Articulated Trucks	0	0.1	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0.2
Bicycles on Road	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2
% Bicycles on Road	0	0.1	0	0	0.9	0	0	0	0	0	0	0	0	0	0	0	0.1
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	2
% Pedestrians	0	0	0	0	0	0	0	100	0	0	0	100	0	0	0	0	0.1

Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
Phone: (808)533-3646 Fax: (808)526-1267

File Name : Komohana St-Nowelo St
Site Code : 22-506 USGS Hilo TIAR
Start Date : 3/23/2022
Page No : 2

	KOMOHANA ST Southbound					NOWELO ST Westbound					KOMOHANA ST Northbound					NOWELO ST Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:15 PM to 05:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	**4**	**178**	**1**	0	**183**	7	**1**	7	0	15	1	113	2	0	116	**4**	0	2	0	6	320
04:30 PM	0	165	0	0	165	21	1	**16**	0	**38**	1	107	1	0	109	2	0	4	0	6	318
04:45 PM	1	169	0	0	170	14	1	7	0	22	**2**	**116**	3	0	**121**	4	**1**	**6**	0	**11**	**324**
05:00 PM	4	154	0	0	158	**22**	0	6	0	28	2	105	**5**	0	112	3	0	1	0	4	302
Total Volume	9	666	1	0	676	64	3	36	0	103	6	441	11	0	458	13	1	13	0	27	1264
% App. Total	1.3	98.5	0.1	0		62.1	2.9	35	0		1.3	96.3	2.4	0		48.1	3.7	48.1	0		
PHF	.563	.935	.250	.000	.923	.727	.750	.563	.000	.678	.750	.950	.550	.000	.946	.813	.250	.542	.000	.614	.975



Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
Phone: (808)533-3646 Fax: (808)526-1267

File Name : Komohana St-Puainako St (N)
Site Code : 22-506 USGS Hilo TIAR
Start Date : 3/24/2022
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

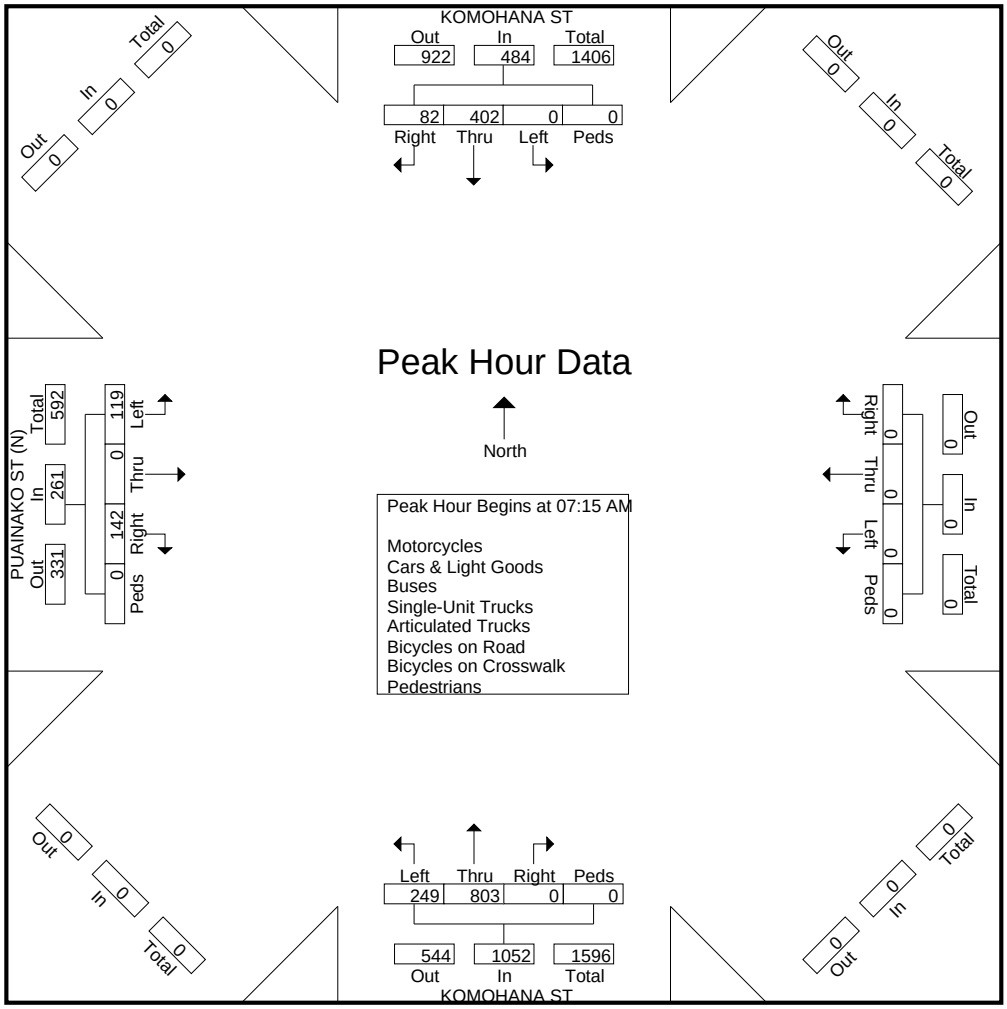
	KOMOHANA ST Southbound				Westbound				KOMOHANA ST Northbound				PUAINAKO ST (N) Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:45 AM	0	87	11	0	0	0	0	0	56	184	0	0	20	0	55	0	413
Total	0	87	11	0	0	0	0	0	56	184	0	0	20	0	55	0	413
07:00 AM	0	98	18	0	0	0	0	0	55	182	0	0	20	0	44	0	417
07:15 AM	0	103	7	0	0	0	0	0	55	189	0	0	36	0	43	0	433
07:30 AM	0	103	29	0	0	0	0	0	54	228	0	0	46	0	40	0	500
07:45 AM	0	108	24	0	0	0	0	0	72	200	0	0	17	0	27	0	448
Total	0	412	78	0	0	0	0	0	236	799	0	0	119	0	154	0	1798
08:00 AM	0	88	22	0	0	0	0	0	68	186	0	0	20	0	32	0	416
08:15 AM	0	71	21	0	0	0	0	0	56	145	0	0	23	0	34	0	350
08:30 AM	0	69	12	0	0	0	0	0	83	130	0	0	22	0	41	0	357
Grand Total	0	727	144	0	0	0	0	0	499	1444	0	0	204	0	316	0	3334
Apprch %	0	83.5	16.5	0	0	0	0	0	25.7	74.3	0	0	39.2	0	60.8	0	
Total %	0	21.8	4.3	0	0	0	0	0	15	43.3	0	0	6.1	0	9.5	0	
Motorcycles	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2
% Motorcycles	0	0.1	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0.1
Cars & Light Goods	0	717	141	0	0	0	0	0	450	1426	0	0	201	0	297	0	3232
% Cars & Light Goods	0	98.6	97.9	0	0	0	0	0	90.2	98.8	0	0	98.5	0	94	0	96.9
Buses	0	0	0	0	0	0	0	0	3	0	0	0	0	0	3	0	6
% Buses	0	0	0	0	0	0	0	0	0.6	0	0	0	0	0	0.9	0	0.2
Single-Unit Trucks	0	8	3	0	0	0	0	0	29	9	0	0	3	0	4	0	56
% Single-Unit Trucks	0	1.1	2.1	0	0	0	0	0	5.8	0.6	0	0	1.5	0	1.3	0	1.7
Articulated Trucks	0	1	0	0	0	0	0	0	17	3	0	0	0	0	12	0	33
% Articulated Trucks	0	0.1	0	0	0	0	0	0	3.4	0.2	0	0	0	0	3.8	0	1
Bicycles on Road	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	5
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0.1
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
Phone: (808)533-3646 Fax: (808)526-1267

File Name : Komohana St-Puainako St (N)
Site Code : 22-506 USGS Hilo TIAR
Start Date : 3/24/2022
Page No : 2

	KOMOHANA ST Southbound					Westbound					KOMOHANA ST Northbound					PUAINAKO ST (N) Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:15 AM to 08:00 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	0	103	7	0	110	0	0	0	0	0	55	189	0	0	244	36	0	**43**	0	79	433
07:30 AM	0	103	**29**	0	**132**	0	0	0	0	0	54	**228**	0	0	**282**	**46**	0	40	0	**86**	**500**
07:45 AM	0	**108**	24	0	132	0	0	0	0	0	**72**	200	0	0	272	17	0	27	0	44	448
08:00 AM	0	88	22	0	110	0	0	0	0	0	68	186	0	0	254	20	0	32	0	52	416
Total Volume	0	402	82	0	484	0	0	0	0	0	249	803	0	0	1052	119	0	142	0	261	1797
% App. Total	0	83.1	16.9	0		0	0	0	0		23.7	76.3	0	0		45.6	0	54.4	0		
PHF	.000	.931	.707	.000	.917	.000	.000	.000	.000	.000	.865	.880	.000	.000	.933	.647	.000	.826	.000	.759	.899



Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
Phone: (808)533-3646 Fax: (808)526-1267

File Name : Komohana St-Puainako St (N)
Site Code : 22-506 USGS Hilo TIAR
Start Date : 3/23/2022
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

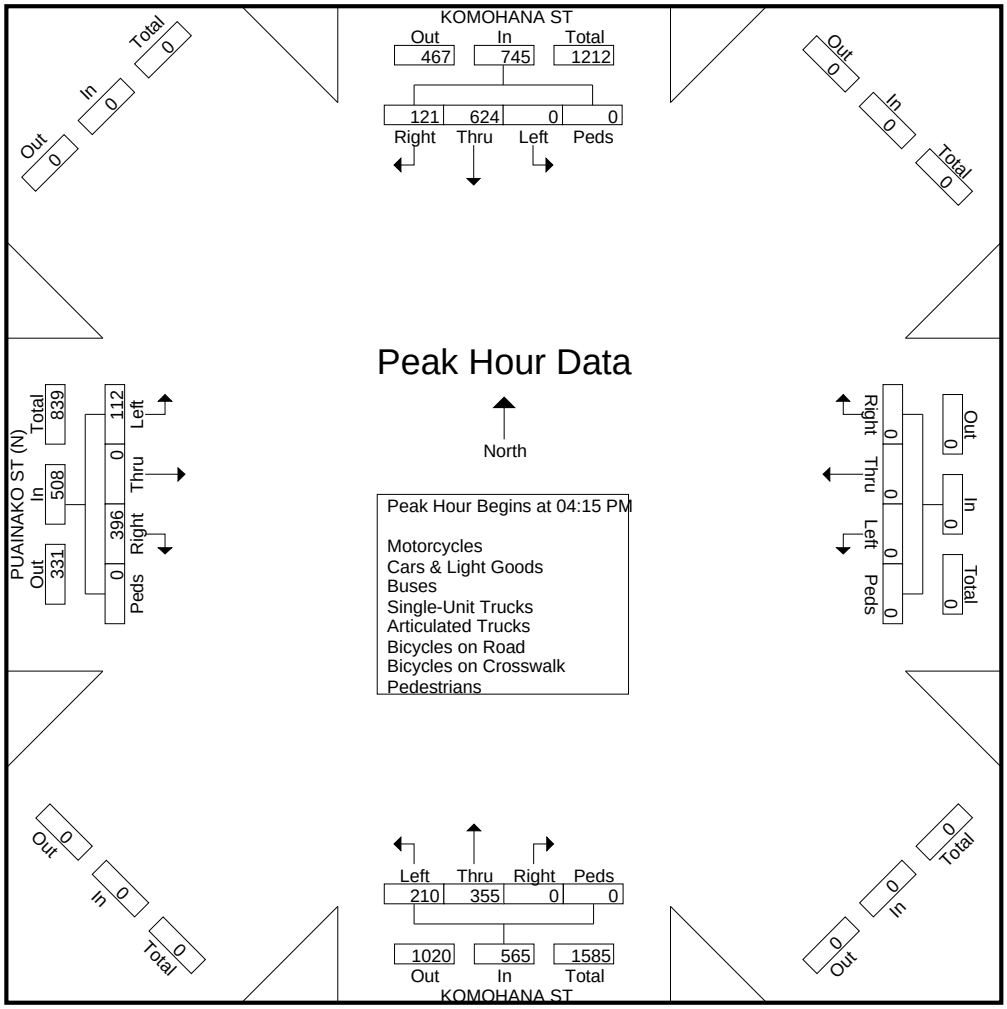
	KOMOHANA ST Southbound				Westbound				KOMOHANA ST Northbound				PUAINAKO ST (N) Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
03:30 PM	0	177	31	0	0	0	0	0	61	85	0	0	28	0	64	0	446
03:45 PM	0	143	24	0	0	0	0	0	58	117	0	0	22	0	72	0	436
Total	0	320	55	0	0	0	0	0	119	202	0	0	50	0	136	0	882
04:00 PM	0	163	28	0	0	0	0	0	56	85	0	0	22	0	72	0	426
04:15 PM	0	151	34	0	0	0	0	0	55	91	0	0	28	0	84	0	443
04:30 PM	0	179	22	0	0	0	0	0	55	90	0	0	22	0	104	0	472
04:45 PM	0	151	34	0	0	0	0	0	47	86	0	0	31	0	97	0	446
Total	0	644	118	0	0	0	0	0	213	352	0	0	103	0	357	0	1787
05:00 PM	0	143	31	0	0	0	0	0	53	88	0	0	31	0	111	0	457
05:15 PM	0	184	33	0	0	0	0	0	45	89	0	0	25	0	81	0	457
Grand Total	0	1291	237	0	0	0	0	0	430	731	0	0	209	0	685	0	3583
Apprch %	0	84.5	15.5	0	0	0	0	0	37	63	0	0	23.4	0	76.6	0	
Total %	0	36	6.6	0	0	0	0	0	12	20.4	0	0	5.8	0	19.1	0	
Motorcycles	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
% Motorcycles	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cars & Light Goods	0	1281	237	0	0	0	0	0	422	726	0	0	203	0	645	0	3514
% Cars & Light Goods	0	99.2	100	0	0	0	0	0	98.1	99.3	0	0	97.1	0	94.2	0	98.1
Buses	0	1	0	0	0	0	0	0	1	0	0	0	0	0	3	0	5
% Buses	0	0.1	0	0	0	0	0	0	0.2	0	0	0	0	0	0.4	0	0.1
Single-Unit Trucks	0	5	0	0	0	0	0	0	2	5	0	0	3	0	21	0	36
% Single-Unit Trucks	0	0.4	0	0	0	0	0	0	0.5	0.7	0	0	1.4	0	3.1	0	1
Articulated Trucks	0	1	0	0	0	0	0	0	5	0	0	0	3	0	16	0	25
% Articulated Trucks	0	0.1	0	0	0	0	0	0	1.2	0	0	0	1.4	0	2.3	0	0.7
Bicycles on Road	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
% Bicycles on Road	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
Phone: (808)533-3646 Fax: (808)526-1267

File Name : Komohana St-Puainako St (N)
Site Code : 22-506 USGS Hilo TIAR
Start Date : 3/23/2022
Page No : 2

	KOMOHANA ST Southbound					Westbound					KOMOHANA ST Northbound					PUAINAKO ST (N) Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:15 PM to 05:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	0	151	**34**	0	185	0	0	0	0	0	**55**	**91**	0	0	**146**	28	0	84	0	112	443
04:30 PM	0	**179**	22	0	**201**	0	0	0	0	0	55	90	0	0	145	22	0	104	0	126	**472**
04:45 PM	0	151	34	0	185	0	0	0	0	0	47	86	0	0	133	**31**	0	97	0	128	446
05:00 PM	0	143	31	0	174	0	0	0	0	0	53	88	0	0	141	31	0	**111**	0	**142**	457
Total Volume	0	624	121	0	745	0	0	0	0	0	210	355	0	0	565	112	0	396	0	508	1818
% App. Total	0	83.8	16.2	0		0	0	0	0		37.2	62.8	0	0		22	0	78	0		
PHF	.000	.872	.890	.000	.927	.000	.000	.000	.000	.000	.955	.975	.000	.000	.967	.903	.000	.892	.000	.894	.963



Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
Phone: (808)533-3646 Fax: (808)526-1267

File Name : Komohana St-Puainako St (S)
Site Code : 22-506 USGS Hilo TIAR
Start Date : 3/24/2022
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

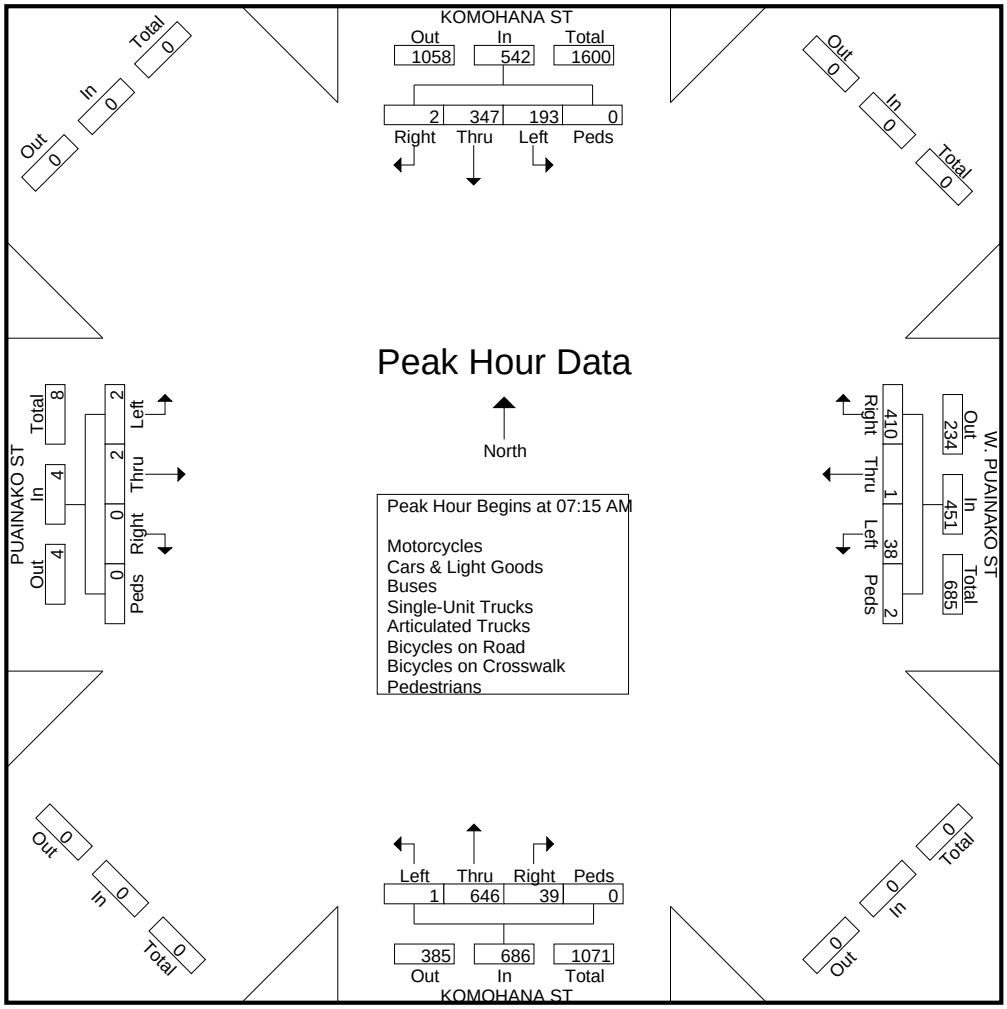
	KOMOHANA ST Southbound				W. PUAINAKO ST Westbound				KOMOHANA ST Northbound				PUAINAKO ST Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
06:45 AM	63	82	0	0	6	0	82	0	0	160	10	0	0	0	0	0	403
Total	63	82	0	0	6	0	82	0	0	160	10	0	0	0	0	0	403
07:00 AM	50	79	0	0	7	0	74	1	0	165	13	0	0	0	0	0	389
07:15 AM	63	86	0	0	8	0	100	1	0	143	12	0	0	1	0	0	414
07:30 AM	43	101	0	0	8	1	115	0	1	169	7	0	1	0	0	0	446
07:45 AM	34	90	1	0	7	0	114	0	0	163	13	0	1	0	0	0	423
Total	190	356	1	0	30	1	403	2	1	640	45	0	2	1	0	0	1672
08:00 AM	53	70	1	0	15	0	81	1	0	171	7	0	0	1	0	0	400
08:15 AM	49	53	0	0	8	2	63	0	0	138	13	0	0	1	0	0	327
08:30 AM	54	46	0	0	7	0	93	0	0	116	12	0	0	0	0	0	328
Grand Total	409	607	2	0	66	3	722	3	1	1225	87	0	2	3	0	0	3130
Apprch %	40.2	59.6	0.2	0	8.3	0.4	90.9	0.4	0.1	93.3	6.6	0	40	60	0	0	
Total %	13.1	19.4	0.1	0	2.1	0.1	23.1	0.1	0	39.1	2.8	0	0.1	0.1	0	0	
Motorcycles	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2
% Motorcycles	0.2	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0.1
Cars & Light Goods	387	598	2	0	65	3	673	0	1	1210	87	0	2	3	0	0	3031
% Cars & Light Goods	94.6	98.5	100	0	98.5	100	93.2	0	100	98.8	100	0	100	100	0	0	96.8
Buses	3	2	0	0	0	0	0	0	0	3	0	0	0	0	0	0	8
% Buses	0.7	0.3	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0.3
Single-Unit Trucks	4	7	0	0	1	0	30	0	0	8	0	0	0	0	0	0	50
% Single-Unit Trucks	1	1.2	0	0	1.5	0	4.2	0	0	0.7	0	0	0	0	0	0	1.6
Articulated Trucks	14	0	0	0	0	0	19	0	0	1	0	0	0	0	0	0	34
% Articulated Trucks	3.4	0	0	0	0	0	2.6	0	0	0.1	0	0	0	0	0	0	1.1
Bicycles on Road	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0.1
Bicycles on Crosswalk	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
% Bicycles on Crosswalk	0	0	0	0	0	0	0	33.3	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2
% Pedestrians	0	0	0	0	0	0	0	66.7	0	0	0	0	0	0	0	0	0.1

Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
Phone: (808)533-3646 Fax: (808)526-1267

File Name : Komohana St-Puainako St (S)
Site Code : 22-506 USGS Hilo TIAR
Start Date : 3/24/2022
Page No : 2

	KOMOHANA ST Southbound					W. PUAINAKO ST Westbound					KOMOHANA ST Northbound					PUAINAKO ST Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:45 AM to 08:30 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	**63**	86	0	0	**149**	8	0	100	**1**	109	0	143	12	0	155	0	**1**	0	0	**1**	414
07:30 AM	43	**101**	0	0	144	8	**1**	**115**	0	**124**	**1**	169	7	0	177	**1**	0	0	0	1	**446**
07:45 AM	34	90	**1**	0	125	7	0	114	0	121	0	163	**13**	0	176	1	0	0	0	1	423
08:00 AM	53	70	1	0	124	**15**	0	81	1	97	0	**171**	7	0	**178**	0	1	0	0	1	400
Total Volume	193	347	2	0	542	38	1	410	2	451	1	646	39	0	686	2	2	0	0	4	1683
% App. Total	35.6	64	0.4	0		8.4	0.2	90.9	0.4		0.1	94.2	5.7	0		50	50	0	0		
PHF	.766	.859	.500	.000	.909	.633	.250	.891	.500	.909	.250	.944	.750	.000	.963	.500	.500	.000	.000	1.00	.943



Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
Phone: (808)533-3646 Fax: (808)526-1267

File Name : Komohana St-Puainako St (S)
Site Code : 22-506 USGS Hilo TIAR
Start Date : 3/23/2022
Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

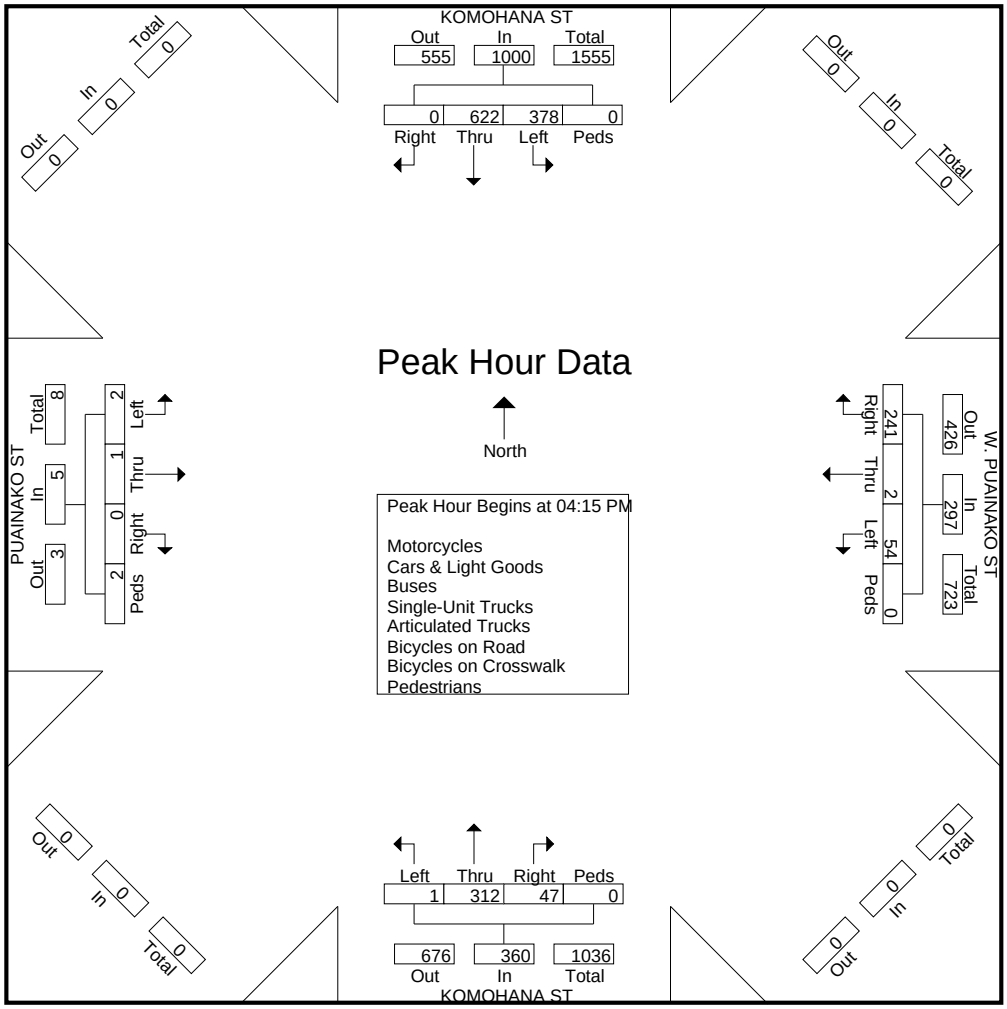
	KOMOHANA ST Southbound				W. PUAINAKO ST Westbound				KOMOHANA ST Northbound				PUAINAKO ST Eastbound				
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Int. Total
03:30 PM	105	136	1	0	28	0	62	0	0	84	5	0	0	1	0	0	422
03:45 PM	81	127	0	0	25	0	61	0	0	113	9	0	0	0	0	0	416
Total	186	263	1	0	53	0	123	0	0	197	14	0	0	1	0	0	838
04:00 PM	89	150	0	0	18	0	58	0	0	82	14	0	0	0	0	0	411
04:15 PM	102	130	0	0	12	0	59	0	1	86	12	0	0	0	0	0	402
04:30 PM	103	174	0	0	7	0	67	0	0	78	11	0	0	0	0	0	440
04:45 PM	84	158	0	0	21	2	57	0	0	65	15	0	2	0	0	0	404
Total	378	612	0	0	58	2	241	0	1	311	52	0	2	0	0	0	1657
05:00 PM	89	160	0	0	14	0	58	0	0	83	9	0	0	1	0	2	416
05:15 PM	86	180	1	0	18	0	47	0	0	75	7	0	0	0	0	0	414
Grand Total	739	1215	2	0	143	2	469	0	1	666	82	0	2	2	0	2	3325
Apprch %	37.8	62.1	0.1	0	23.3	0.3	76.4	0	0.1	88.9	10.9	0	33.3	33.3	0	33.3	
Total %	22.2	36.5	0.1	0	4.3	0.1	14.1	0	0	20	2.5	0	0.1	0.1	0	0.1	
Motorcycles	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
% Motorcycles	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cars & Light Goods	693	1209	2	0	142	2	461	0	1	661	82	0	2	1	0	0	3256
% Cars & Light Goods	93.8	99.5	100	0	99.3	100	98.3	0	100	99.2	100	0	100	50	0	0	97.9
Buses	4	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	5
% Buses	0.5	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0.2
Single-Unit Trucks	25	4	0	0	1	0	2	0	0	5	0	0	0	0	0	0	37
% Single-Unit Trucks	3.4	0.3	0	0	0.7	0	0.4	0	0	0.8	0	0	0	0	0	0	1.1
Articulated Trucks	17	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	22
% Articulated Trucks	2.3	0	0	0	0	0	1.1	0	0	0	0	0	0	0	0	0	0.7
Bicycles on Road	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2
% Bicycles on Road	0	0.1	0	0	0	0	0	0	0	0	0	0	0	50	0	0	0.1
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0.1
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Austin Tsutsumi & Associates

501 Sumner St, Suite 521
Honolulu, Hawaii 96817
Phone: (808)533-3646 Fax: (808)526-1267

File Name : Komohana St-Puainako St (S)
Site Code : 22-506 USGS Hilo TIAR
Start Date : 3/23/2022
Page No : 2

	KOMOHANA ST Southbound					W. PUAINAKO ST Westbound					KOMOHANA ST Northbound					PUAINAKO ST Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:15 PM to 05:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	102	130	0	0	232	12	0	59	0	71	**1**	**86**	12	0	**99**	0	0	0	0	0	402
04:30 PM	**103**	**174**	0	0	**277**	7	0	**67**	0	74	0	78	11	0	89	0	0	0	0	0	**440**
04:45 PM	84	158	0	0	242	**21**	**2**	57	0	**80**	0	65	**15**	0	80	**2**	0	0	0	2	404
05:00 PM	89	160	0	0	249	14	0	58	0	72	0	83	9	0	92	0	**1**	0	**2**	**3**	416
Total Volume	378	622	0	0	1000	54	2	241	0	297	1	312	47	0	360	2	1	0	2	5	1662
% App. Total	37.8	62.2	0	0		18.2	0.7	81.1	0		0.3	86.7	13.1	0		40	20	0	40		
PHF	.917	.894	.000	.000	.903	.643	.250	.899	.000	.928	.250	.907	.783	.000	.909	.250	.250	.000	.250	.417	.944



APPENDIX B

LEVEL OF SERVICE CRITERIA

LEVEL OF SERVICE (LOS) CRITERIA

VEHICULAR LEVEL OF SERVICE FOR SIGNALIZED INTERSECTIONS (HCM 6th Edition)

Level of service for vehicles at signalized intersections is directly related to delay values and is assigned on that basis. Level of Service is a measure of the acceptability of delay values to motorists at a given intersection. The criteria are given in the table below.

Level-of Service Criteria for Signalized Intersections

Level of Service	Control Delay per Vehicle (sec./veh.)
A	< 10.0
B	>10.0 and ≤ 20.0
C	>20.0 and ≤ 35.0
D	>35.0 and ≤ 55.0
E	>55.0 and ≤ 80.0
F	> 80.0

Delay is a complex measure, and is dependent on a number of variables, including the quality of progression, the cycle length, the green ratio, and the v/c ratio for the lane group or approach in question.

VEHICULAR LEVEL OF SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS (HCM 6th Edition)

The level of service criteria for vehicles at unsignalized intersections is defined as the average control delay, in seconds per vehicle.

LOS delay threshold values are lower for two-way stop-controlled (TWSC) and all-way stop-controlled (AWSC) intersections than those of signalized intersections. This is because more vehicles pass through signalized intersections, and therefore, drivers expect and tolerate greater delays. While the criteria for level of service for TWSC and AWSC intersections are the same, procedures to calculate the average total delay may differ.

Level of Service Criteria for Two-Way Stop-Controlled Intersections

Level of Service	Average Control Delay (sec/veh)
A	≤ 10
B	>10 and ≤15
C	>15 and ≤25
D	>25 and ≤35
E	>35 and ≤50
F	> 50

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

Existing AM

Intersection	
Int Delay, s/veh	6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	26	56	37	7	13	44	18	691	23	19	307	39
Future Vol, veh/h	26	56	37	7	13	44	18	691	23	19	307	39
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	200	-	-	260	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	28	61	40	8	14	48	20	751	25	21	334	42

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1232	1213	355	1252	1222	764	376	0	0	776	0	0
Stage 1	397	397	-	804	804	-	-	-	-	-	-	-
Stage 2	835	816	-	448	418	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	154	182	689	149	180	404	1182	-	-	840	-	-
Stage 1	629	603	-	377	396	-	-	-	-	-	-	-
Stage 2	362	391	-	590	591	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	123	174	689	99	172	404	1182	-	-	840	-	-
Mov Cap-2 Maneuver	123	174	-	99	172	-	-	-	-	-	-	-
Stage 1	618	588	-	371	389	-	-	-	-	-	-	-
Stage 2	302	384	-	486	576	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	49.5	22.2	0.2	0.5
HCM LOS	E	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1182	-	-	203	99	309	840	-	-
HCM Lane V/C Ratio	0.017	-	-	0.637	0.077	0.201	0.025	-	-
HCM Control Delay (s)	8.1	-	-	49.5	44.4	19.5	9.4	-	-
HCM Lane LOS	A	-	-	E	E	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	3.7	0.2	0.7	0.1	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	411	225	106	215	150	157	544	271	92	235	18
Future Volume (veh/h)	23	411	225	106	215	150	157	544	271	92	235	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	25	447	67	115	234	147	171	591	157	100	255	6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	30	521	442	256	350	220	475	647	548	229	573	13
Arrive On Green	0.02	0.28	0.28	0.06	0.33	0.33	0.09	0.35	0.35	0.06	0.32	0.32
Sat Flow, veh/h	1781	1870	1585	1781	1074	675	1781	1870	1585	1781	1820	43
Grp Volume(v), veh/h	25	447	67	115	0	381	171	591	157	100	0	261
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1749	1781	1870	1585	1781	0	1863
Q Serve(g_s), s	1.1	17.7	2.5	3.4	0.0	14.6	4.9	23.6	5.6	2.9	0.0	8.7
Cycle Q Clear(g_c), s	1.1	17.7	2.5	3.4	0.0	14.6	4.9	23.6	5.6	2.9	0.0	8.7
Prop In Lane	1.00		1.00	1.00		0.39	1.00		1.00	1.00		0.02
Lane Grp Cap(c), veh/h	30	521	442	256	0	570	475	647	548	229	0	587
V/C Ratio(X)	0.84	0.86	0.15	0.45	0.00	0.67	0.36	0.91	0.29	0.44	0.00	0.44
Avail Cap(c_a), veh/h	480	818	693	621	0	764	685	1295	1097	494	0	1294
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	38.3	26.7	21.2	19.6	0.0	22.6	15.8	24.4	18.5	19.6	0.0	21.3
Incr Delay (d2), s/veh	32.4	4.4	0.1	0.5	0.0	0.9	0.2	2.2	0.1	0.5	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	8.1	0.9	1.4	0.0	5.9	1.9	10.2	2.0	1.2	0.0	3.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	70.7	31.1	21.3	20.0	0.0	23.6	16.0	26.6	18.6	20.1	0.0	21.5
LnGrp LOS	E	C	C	C	A	C	B	C	B	C	A	C
Approach Vol, veh/h		539			496			919			361	
Approach Delay, s/veh		31.7			22.8			23.3			21.1	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.4	33.0	9.0	27.6	10.8	30.6	5.3	31.3
Change Period (Y+Rc), s	* 4	6.0	* 4	* 5.9	* 4	* 6	* 4	* 5.9
Max Green Setting (Gmax), s	* 16	54.0	* 21	* 34	* 16	* 54	* 21	* 34
Max Q Clear Time (g_c+I1), s	4.9	25.6	5.4	19.7	6.9	10.7	3.1	16.6
Green Ext Time (p_c), s	0.0	1.4	0.0	2.1	0.1	0.5	0.0	1.8

Intersection Summary	
HCM 6th Ctrl Delay	24.8
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	483	278	9	257	8	216	12	19	14	25	12
Future Volume (veh/h)	6	483	278	9	257	8	216	12	19	14	25	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	7	525	287	10	279	8	235	13	3	15	27	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	581	583	319	183	931	27	420	275	63	195	93	0
Arrive On Green	0.00	0.51	0.51	0.01	0.51	0.51	0.15	0.19	0.19	0.01	0.05	0.00
Sat Flow, veh/h	1781	1137	622	1781	1809	52	1781	1470	339	1781	1870	0
Grp Volume(v), veh/h	7	0	812	10	0	287	235	0	16	15	27	0
Grp Sat Flow(s),veh/h/ln	1781	0	1758	1781	0	1861	1781	0	1809	1781	1870	0
Q Serve(g_s), s	0.1	0.0	27.5	0.2	0.0	5.8	7.7	0.0	0.5	0.5	0.9	0.0
Cycle Q Clear(g_c), s	0.1	0.0	27.5	0.2	0.0	5.8	7.7	0.0	0.5	0.5	0.9	0.0
Prop In Lane	1.00		0.35	1.00		0.03	1.00		0.19	1.00		0.00
Lane Grp Cap(c), veh/h	581	0	902	183	0	958	420	0	338	195	93	0
V/C Ratio(X)	0.01	0.00	0.90	0.05	0.00	0.30	0.56	0.00	0.05	0.08	0.29	0.00
Avail Cap(c_a), veh/h	899	0	1148	498	0	1215	646	0	577	503	596	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	8.0	0.0	14.5	13.5	0.0	9.2	22.8	0.0	22.0	29.4	30.2	0.0
Incr Delay (d2), s/veh	0.0	0.0	7.7	0.0	0.0	0.1	0.4	0.0	0.0	0.1	1.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	11.0	0.1	0.0	2.1	3.1	0.0	0.2	0.2	0.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	8.0	0.0	22.2	13.6	0.0	9.3	23.2	0.0	22.0	29.5	31.3	0.0
LnGrp LOS	A	A	C	B	A	A	C	A	C	C	C	A
Approach Vol, veh/h		819			297			251			42	
Approach Delay, s/veh		22.1			9.4			23.1			30.7	
Approach LOS		C			A			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	4.6	17.7	4.4	39.2	13.7	8.7	4.3	39.3
Change Period (Y+Rc), s	* 4	* 5.4	* 4	* 5.4	* 4	* 5.4	* 4	* 5.4
Max Green Setting (Gmax), s	* 12	* 21	* 12	* 43	* 18	* 21	* 12	* 43
Max Q Clear Time (g_c+I1), s	2.5	2.5	2.2	29.5	9.7	2.9	2.1	7.8
Green Ext Time (p_c), s	0.0	0.0	0.0	4.3	0.0	0.0	0.0	1.4

Intersection Summary	
HCM 6th Ctrl Delay	19.9
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	1	4	9	1	8	18	949	77	41	525	14
Future Volume (veh/h)	6	1	4	9	1	8	18	949	77	41	525	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	7	1	0	10	1	0	20	1032	83	45	571	15
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	161	4	37	164	3	37	576	1108	89	235	1198	31
Arrive On Green	0.02	0.02	0.00	0.02	0.02	0.00	0.01	0.65	0.65	0.02	0.66	0.66
Sat Flow, veh/h	1359	194	1585	1375	138	1585	1781	1708	137	1781	1814	48
Grp Volume(v), veh/h	8	0	0	11	0	0	20	0	1115	45	0	586
Grp Sat Flow(s),veh/h/ln	1553	0	1585	1513	0	1585	1781	0	1846	1781	0	1862
Q Serve(g_s), s	0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.0	27.9	0.4	0.0	8.1
Cycle Q Clear(g_c), s	0.2	0.0	0.0	0.3	0.0	0.0	0.2	0.0	27.9	0.4	0.0	8.1
Prop In Lane	0.87		1.00	0.91		1.00	1.00		0.07	1.00		0.03
Lane Grp Cap(c), veh/h	166	0	37	167	0	37	576	0	1197	235	0	1230
V/C Ratio(X)	0.05	0.00	0.00	0.07	0.00	0.00	0.03	0.00	0.93	0.19	0.00	0.48
Avail Cap(c_a), veh/h	694	0	610	691	0	610	1277	0	2084	915	0	2102
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	24.9	0.0	0.0	25.0	0.0	0.0	3.6	0.0	8.1	11.1	0.0	4.4
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	2.7	0.1	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	7.1	0.2	0.0	1.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.0	0.0	0.0	25.0	0.0	0.0	3.6	0.0	10.8	11.2	0.0	4.5
LnGrp LOS	C	A	A	C	A	A	A	A	B	B	A	A
Approach Vol, veh/h		8			11			1135			631	
Approach Delay, s/veh		25.0			25.0			10.7			5.0	
Approach LOS		C			C			B			A	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	5.2	40.0		6.8	4.6	40.6		6.8
Change Period (Y+Rc), s	* 4	* 6.3		* 5.6	* 4	* 6.3		* 5.6
Max Green Setting (Gmax), s	* 21	* 59		* 20	* 21	* 59		* 20
Max Q Clear Time (g_c+I1), s	2.2	29.9		2.2	2.2	10.1		2.3
Green Ext Time (p_c), s	0.0	3.8		0.0	0.0	1.4		0.0

Intersection Summary	
HCM 6th Ctrl Delay	8.8
HCM 6th LOS	A

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

Existing PM

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	17	13	15	6	50	13	18	278	19	17	551	73
Future Vol, veh/h	17	13	15	6	50	13	18	278	19	17	551	73
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	200	-	-	260	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	18	14	16	7	54	14	20	302	21	18	599	79

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1062	1038	639	1043	1067	313	678	0	0	323	0	0
Stage 1	675	675	-	353	353	-	-	-	-	-	-	-
Stage 2	387	363	-	690	714	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	201	231	476	207	222	727	914	-	-	1237	-	-
Stage 1	444	453	-	664	631	-	-	-	-	-	-	-
Stage 2	637	625	-	435	435	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	154	222	476	185	214	727	914	-	-	1237	-	-
Mov Cap-2 Maneuver	154	222	-	185	214	-	-	-	-	-	-	-
Stage 1	434	446	-	649	617	-	-	-	-	-	-	-
Stage 2	557	611	-	401	428	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	25.5	24.7	0.5	0.2
HCM LOS	D	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	914	-	-	224	185	250	1237	-	-
HCM Lane V/C Ratio	0.021	-	-	0.218	0.035	0.274	0.015	-	-
HCM Control Delay (s)	9	-	-	25.5	25.2	24.7	8	-	-
HCM Lane LOS	A	-	-	D	D	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.8	0.1	1.1	0	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	211	208	220	342	51	195	236	162	113	436	23
Future Volume (veh/h)	18	211	208	220	342	51	195	236	162	113	436	23
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	20	229	38	239	372	52	212	257	52	123	474	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	23	306	259	402	457	64	346	618	523	485	538	6
Arrive On Green	0.01	0.16	0.16	0.13	0.28	0.28	0.11	0.33	0.33	0.07	0.29	0.29
Sat Flow, veh/h	1781	1870	1585	1781	1606	224	1781	1870	1585	1781	1847	19
Grp Volume(v), veh/h	20	229	38	239	0	424	212	257	52	123	0	479
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1830	1781	1870	1585	1781	0	1867
Q Serve(g_s), s	0.7	7.7	1.4	6.9	0.0	14.2	5.3	7.0	1.5	3.1	0.0	16.1
Cycle Q Clear(g_c), s	0.7	7.7	1.4	6.9	0.0	14.2	5.3	7.0	1.5	3.1	0.0	16.1
Prop In Lane	1.00		1.00	1.00		0.12	1.00		1.00	1.00		0.01
Lane Grp Cap(c), veh/h	23	306	259	402	0	521	346	618	523	485	0	544
V/C Ratio(X)	0.88	0.75	0.15	0.59	0.00	0.81	0.61	0.42	0.10	0.25	0.00	0.88
Avail Cap(c_a), veh/h	568	968	820	731	0	947	585	1533	1299	793	0	1536
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	32.5	26.3	23.6	18.1	0.0	21.9	15.7	17.1	15.3	14.6	0.0	22.3
Incr Delay (d2), s/veh	45.4	2.5	0.2	0.5	0.0	2.2	0.7	0.2	0.0	0.1	0.0	1.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	3.5	0.5	2.6	0.0	5.9	2.0	2.8	0.5	1.2	0.0	6.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	77.8	28.8	23.8	18.6	0.0	24.1	16.4	17.3	15.3	14.7	0.0	24.1
LnGrp LOS	E	C	C	B	A	C	B	B	B	B	A	C
Approach Vol, veh/h		287			663			521			602	
Approach Delay, s/veh		31.5			22.1			16.7			22.2	
Approach LOS		C			C			B			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.6	27.8	12.8	16.7	11.2	25.2	4.8	24.7
Change Period (Y+Rc), s	* 4	6.0	* 4	* 5.9	* 4	* 6	* 4	* 5.9
Max Green Setting (Gmax), s	* 16	54.0	* 21	* 34	* 16	* 54	* 21	* 34
Max Q Clear Time (g_c+I1), s	5.1	9.0	8.9	9.7	7.3	18.1	2.7	16.2
Green Ext Time (p_c), s	0.0	0.5	0.1	1.1	0.1	1.1	0.0	2.0

Intersection Summary	
HCM 6th Ctrl Delay	22.1
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	12	314	169	20	430	15	203	31	7	6	19	8
Future Volume (veh/h)	12	314	169	20	430	15	203	31	7	6	19	8
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	13	341	166	22	467	15	221	34	1	7	21	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	310	433	211	280	666	21	484	360	11	251	113	0
Arrive On Green	0.01	0.36	0.36	0.01	0.37	0.37	0.14	0.20	0.20	0.00	0.06	0.00
Sat Flow, veh/h	1781	1188	578	1781	1802	58	1781	1808	53	1781	1870	0
Grp Volume(v), veh/h	13	0	507	22	0	482	221	0	35	7	21	0
Grp Sat Flow(s),veh/h/ln	1781	0	1766	1781	0	1860	1781	0	1861	1781	1870	0
Q Serve(g_s), s	0.2	0.0	11.5	0.3	0.0	9.9	4.8	0.0	0.7	0.2	0.5	0.0
Cycle Q Clear(g_c), s	0.2	0.0	11.5	0.3	0.0	9.9	4.8	0.0	0.7	0.2	0.5	0.0
Prop In Lane	1.00		0.33	1.00		0.03	1.00		0.03	1.00		0.00
Lane Grp Cap(c), veh/h	310	0	644	280	0	688	484	0	370	251	113	0
V/C Ratio(X)	0.04	0.00	0.79	0.08	0.00	0.70	0.46	0.00	0.09	0.03	0.19	0.00
Avail Cap(c_a), veh/h	774	0	1696	735	0	1786	946	0	873	722	877	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	10.0	0.0	12.7	10.3	0.0	12.0	14.5	0.0	14.6	19.7	20.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	1.5	0.0	0.0	0.9	0.2	0.0	0.1	0.0	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	3.8	0.1	0.0	3.4	1.6	0.0	0.3	0.1	0.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.0	0.0	14.2	10.3	0.0	12.9	14.8	0.0	14.7	19.7	20.5	0.0
LnGrp LOS	A	A	B	B	A	B	B	A	B	B	C	A
Approach Vol, veh/h		520			504			256			28	
Approach Delay, s/veh		14.1			12.8			14.8			20.3	
Approach LOS		B			B			B			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	4.2	14.3	4.6	21.7	10.4	8.1	4.3	22.0
Change Period (Y+Rc), s	* 4	* 5.4	* 4	* 5.4	* 4	* 5.4	* 4	* 5.4
Max Green Setting (Gmax), s	* 8	* 21	* 12	* 43	* 18	* 21	* 12	* 43
Max Q Clear Time (g_c+I1), s	2.3	2.7	2.3	13.5	6.8	2.5	2.2	11.9
Green Ext Time (p_c), s	0.0	0.1	0.0	2.9	0.0	0.0	0.0	2.6

Intersection Summary	
HCM 6th Ctrl Delay	13.9
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	1	16	81	3	36	8	557	14	9	839	1
Future Volume (veh/h)	13	1	16	81	3	36	8	557	14	9	839	1
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	14	1	1	88	3	2	9	605	14	10	912	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	288	15	134	283	4	134	241	987	23	429	1014	1
Arrive On Green	0.08	0.08	0.08	0.08	0.08	0.08	0.00	0.54	0.54	0.01	0.54	0.54
Sat Flow, veh/h	1510	181	1585	1412	48	1585	1781	1821	42	1781	1868	2
Grp Volume(v), veh/h	15	0	1	91	0	2	9	0	619	10	0	913
Grp Sat Flow(s),veh/h/ln	1690	0	1585	1460	0	1585	1781	0	1863	1781	0	1870
Q Serve(g_s), s	0.0	0.0	0.0	2.3	0.0	0.1	0.1	0.0	9.8	0.1	0.0	18.9
Cycle Q Clear(g_c), s	0.3	0.0	0.0	2.6	0.0	0.1	0.1	0.0	9.8	0.1	0.0	18.9
Prop In Lane	0.93		1.00	0.97		1.00	1.00		0.02	1.00		0.00
Lane Grp Cap(c), veh/h	304	0	134	287	0	134	241	0	1010	429	0	1015
V/C Ratio(X)	0.05	0.00	0.01	0.32	0.00	0.01	0.04	0.00	0.61	0.02	0.00	0.90
Avail Cap(c_a), veh/h	847	0	733	827	0	733	1097	0	2529	1285	0	2538
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	18.3	0.0	18.1	19.3	0.0	18.1	8.6	0.0	6.8	5.6	0.0	8.8
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.2	0.0	0.0	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.0	0.8	0.0	0.0	0.0	0.0	2.5	0.0	0.0	5.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.3	0.0	18.1	19.5	0.0	18.2	8.6	0.0	7.0	5.6	0.0	10.1
LnGrp LOS	B	A	B	B	A	B	A	A	A	A	A	B
Approach Vol, veh/h		16			93			628			923	
Approach Delay, s/veh		18.3			19.5			7.0			10.0	
Approach LOS		B			B			A			B	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	4.2	29.8		9.2	4.2	29.8		9.2
Change Period (Y+Rc), s	* 4	* 6.3		* 5.6	* 4	* 6.3		* 5.6
Max Green Setting (Gmax), s	* 21	* 59		* 20	* 21	* 59		* 20
Max Q Clear Time (g_c+I1), s	2.3	11.8		2.3	2.1	20.9		4.6
Green Ext Time (p_c), s	0.0	1.5		0.0	0.0	2.6		0.2

Intersection Summary	
HCM 6th Ctrl Delay	9.5
HCM 6th LOS	A

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

Base Year 2025 AM

Intersection	
Int Delay, s/veh	16.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	28	59	40	9	14	47	20	874	24	21	402	41
Future Vol, veh/h	28	59	40	9	14	47	20	874	24	21	402	41
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	200	-	-	260	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	30	64	43	10	15	51	22	950	26	23	437	45

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1546	1526	460	1566	1535	963	482	0	0	976	0	0
Stage 1	506	506	-	1007	1007	-	-	-	-	-	-	-
Stage 2	1040	1020	-	559	528	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	93	118	601	90	116	310	1081	-	-	707	-	-
Stage 1	549	540	-	290	319	-	-	-	-	-	-	-
Stage 2	278	314	-	513	528	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	67	112	601	44	110	310	1081	-	-	707	-	-
Mov Cap-2 Maneuver	67	112	-	44	110	-	-	-	-	-	-	-
Stage 1	538	522	-	284	313	-	-	-	-	-	-	-
Stage 2	216	308	-	404	511	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	175.7	38.7	0.2	0.5
HCM LOS	F	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1081	-	-	126	44	219	707	-	-
HCM Lane V/C Ratio	0.02	-	-	1.096	0.222	0.303	0.032	-	-
HCM Control Delay (s)	8.4	-	-	175.7	108.8	28.4	10.3	-	-
HCM Lane LOS	A	-	-	F	F	D	B	-	-
HCM 95th %tile Q(veh)	0.1	-	-	8	0.7	1.2	0.1	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	25	430	246	112	229	177	174	701	283	101	323	19
Future Volume (veh/h)	25	430	246	112	229	177	174	701	283	101	323	19
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	27	467	58	122	249	191	189	762	208	110	351	8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	33	513	434	210	314	241	470	799	677	183	729	17
Arrive On Green	0.02	0.27	0.27	0.06	0.32	0.32	0.08	0.43	0.43	0.05	0.40	0.40
Sat Flow, veh/h	1781	1870	1585	1781	982	753	1781	1870	1585	1781	1821	42
Grp Volume(v), veh/h	27	467	58	122	0	440	189	762	208	110	0	359
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1735	1781	1870	1585	1781	0	1863
Q Serve(g_s), s	1.7	26.4	3.0	5.2	0.0	25.3	6.6	43.1	9.5	3.9	0.0	15.7
Cycle Q Clear(g_c), s	1.7	26.4	3.0	5.2	0.0	25.3	6.6	43.1	9.5	3.9	0.0	15.7
Prop In Lane	1.00		1.00	1.00		0.43	1.00		1.00	1.00		0.02
Lane Grp Cap(c), veh/h	33	513	434	210	0	554	470	799	677	183	0	746
V/C Ratio(X)	0.81	0.91	0.13	0.58	0.00	0.79	0.40	0.95	0.31	0.60	0.00	0.48
Avail Cap(c_a), veh/h	342	618	523	405	0	554	590	924	783	350	0	923
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	53.4	38.4	29.9	28.5	0.0	33.9	17.6	30.3	20.7	25.8	0.0	24.4
Incr Delay (d2), s/veh	25.4	15.2	0.1	0.9	0.0	7.5	0.2	17.3	0.1	1.2	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	14.1	1.2	2.2	0.0	11.6	2.7	22.5	3.5	1.7	0.0	6.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	78.9	53.6	30.0	29.5	0.0	41.4	17.8	47.6	20.8	27.0	0.0	24.5
LnGrp LOS	E	D	C	C	A	D	B	D	C	C	A	C
Approach Vol, veh/h		552			562			1159			469	
Approach Delay, s/veh		52.4			38.8			37.9			25.1	
Approach LOS		D			D			D			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.8	52.7	11.0	35.9	12.7	49.8	6.1	40.8
Change Period (Y+Rc), s	* 4	6.0	* 4	* 5.9	* 4	* 6	* 4	* 5.9
Max Green Setting (Gmax), s	* 16	54.0	* 19	* 36	* 16	* 54	* 21	* 34
Max Q Clear Time (g_c+I1), s	5.9	45.1	7.2	28.4	8.6	17.7	3.7	27.3
Green Ext Time (p_c), s	0.0	1.6	0.0	1.6	0.1	0.8	0.0	1.3

Intersection Summary	
HCM 6th Ctrl Delay	38.8
HCM 6th LOS	D

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
3: Kumukoa St & Mohouli St

06/01/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	7	510	291	10	293	9	226	13	20	15	27	13
Future Volume (veh/h)	7	510	291	10	293	9	226	13	20	15	27	13
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	8	554	302	11	318	9	246	14	4	16	29	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	561	601	327	164	958	27	419	268	76	189	94	0
Arrive On Green	0.00	0.53	0.53	0.01	0.53	0.53	0.15	0.19	0.19	0.01	0.05	0.00
Sat Flow, veh/h	1781	1138	620	1781	1810	51	1781	1399	400	1781	1870	0
Grp Volume(v), veh/h	8	0	856	11	0	327	246	0	18	16	29	0
Grp Sat Flow(s),veh/h/ln	1781	0	1759	1781	0	1861	1781	0	1798	1781	1870	0
Q Serve(g_s), s	0.1	0.0	31.8	0.2	0.0	7.1	8.8	0.0	0.6	0.6	1.1	0.0
Cycle Q Clear(g_c), s	0.1	0.0	31.8	0.2	0.0	7.1	8.8	0.0	0.6	0.6	1.1	0.0
Prop In Lane	1.00		0.35	1.00		0.03	1.00		0.22	1.00		0.00
Lane Grp Cap(c), veh/h	561	0	928	164	0	985	419	0	344	189	94	0
V/C Ratio(X)	0.01	0.00	0.92	0.07	0.00	0.33	0.59	0.00	0.05	0.08	0.31	0.00
Avail Cap(c_a), veh/h	855	0	1066	454	0	1128	602	0	532	473	554	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	8.1	0.0	15.4	15.0	0.0	9.5	24.5	0.0	23.4	31.6	32.5	0.0
Incr Delay (d2), s/veh	0.0	0.0	11.5	0.1	0.0	0.1	0.5	0.0	0.0	0.1	1.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	13.7	0.1	0.0	2.6	3.6	0.0	0.2	0.3	0.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	8.2	0.0	26.9	15.1	0.0	9.7	25.0	0.0	23.5	31.7	33.8	0.0
LnGrp LOS	A	A	C	B	A	A	C	A	C	C	C	A
Approach Vol, veh/h		864			338			264			45	
Approach Delay, s/veh		26.7			9.8			24.9			33.0	
Approach LOS		C			A			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	4.7	19.0	4.4	42.8	14.7	9.0	4.3	42.9
Change Period (Y+Rc), s	* 4	* 5.4	* 4	* 5.4	* 4	* 5.4	* 4	* 5.4
Max Green Setting (Gmax), s	* 8	* 21	* 12	* 43	* 18	* 21	* 12	* 43
Max Q Clear Time (g_c+I1), s	2.6	2.6	2.2	33.8	10.8	3.1	2.1	9.1
Green Ext Time (p_c), s	0.0	0.0	0.0	3.7	0.0	0.1	0.0	1.6

Intersection Summary	
HCM 6th Ctrl Delay	22.8
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	7	2	5	10	2	9	19	1134	81	43	636	15
Future Volume (veh/h)	7	2	5	10	2	9	19	1134	81	43	636	15
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	8	2	0	11	2	0	21	1233	87	47	691	16
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	121	8	40	124	6	40	555	1271	90	167	1359	31
Arrive On Green	0.03	0.03	0.00	0.03	0.03	0.00	0.01	0.74	0.74	0.02	0.75	0.75
Sat Flow, veh/h	1263	316	1585	1302	237	1585	1781	1727	122	1781	1821	42
Grp Volume(v), veh/h	10	0	0	13	0	0	21	0	1320	47	0	707
Grp Sat Flow(s),veh/h/ln	1579	0	1585	1539	0	1585	1781	0	1848	1781	0	1863
Q Serve(g_s), s	0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.0	48.2	0.5	0.0	11.3
Cycle Q Clear(g_c), s	0.4	0.0	0.0	0.5	0.0	0.0	0.2	0.0	48.2	0.5	0.0	11.3
Prop In Lane	0.80		1.00	0.85		1.00	1.00		0.07	1.00		0.02
Lane Grp Cap(c), veh/h	129	0	40	130	0	40	555	0	1360	167	0	1390
V/C Ratio(X)	0.08	0.00	0.00	0.10	0.00	0.00	0.04	0.00	0.97	0.28	0.00	0.51
Avail Cap(c_a), veh/h	498	0	434	495	0	434	1049	0	1485	642	0	1497
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	34.9	0.0	0.0	34.9	0.0	0.0	3.2	0.0	8.9	20.1	0.0	3.8
Incr Delay (d2), s/veh	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	15.8	0.3	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	0.0	0.2	0.0	0.0	0.0	0.0	17.4	0.6	0.0	2.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	35.0	0.0	0.0	35.1	0.0	0.0	3.2	0.0	24.7	20.5	0.0	3.9
LnGrp LOS	C	A	A	D	A	A	A	A	C	C	A	A
Approach Vol, veh/h		10			13			1341			754	
Approach Delay, s/veh		35.0			35.1			24.4			4.9	
Approach LOS		C			D			C			A	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	5.5	60.0		7.5	4.8	60.8		7.5
Change Period (Y+Rc), s	* 4	* 6.3		* 5.6	* 4	* 6.3		* 5.6
Max Green Setting (Gmax), s	* 21	* 59		* 20	* 21	* 59		* 20
Max Q Clear Time (g_c+I1), s	2.5	50.2		2.4	2.2	13.3		2.5
Green Ext Time (p_c), s	0.0	3.6		0.0	0.0	1.8		0.0

Intersection Summary	
HCM 6th Ctrl Delay	17.6
HCM 6th LOS	B

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

Base Year 2025 PM

Intersection	
Int Delay, s/veh	4.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	18	14	17	7	53	15	19	403	21	19	751	77
Future Vol, veh/h	18	14	17	7	53	15	19	403	21	19	751	77
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	200	-	-	260	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	20	15	18	8	58	16	21	438	23	21	816	84

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1429	1403	858	1409	1434	450	900	0	0	461	0	0
Stage 1	900	900	-	492	492	-	-	-	-	-	-	-
Stage 2	529	503	-	917	942	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	112	140	357	116	134	609	755	-	-	1100	-	-
Stage 1	333	357	-	558	548	-	-	-	-	-	-	-
Stage 2	533	541	-	326	342	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	68	134	357	97	128	609	755	-	-	1100	-	-
Mov Cap-2 Maneuver	68	134	-	97	128	-	-	-	-	-	-	-
Stage 1	324	350	-	542	533	-	-	-	-	-	-	-
Stage 2	450	526	-	290	336	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	58.5	47.6	0.4	0.2
HCM LOS	F	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	755	-	-	118	97	155	1100	-	-
HCM Lane V/C Ratio	0.027	-	-	0.451	0.078	0.477	0.019	-	-
HCM Control Delay (s)	9.9	-	-	58.5	45.2	47.8	8.3	-	-
HCM Lane LOS	A	-	-	F	E	E	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	2	0.2	2.2	0.1	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	19	221	221	230	361	71	211	343	169	137	613	25
Future Volume (veh/h)	19	221	221	230	361	71	211	343	169	137	613	25
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	21	240	32	250	392	73	229	373	72	149	666	9
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	25	311	263	365	438	81	282	775	656	474	712	10
Arrive On Green	0.01	0.17	0.17	0.13	0.29	0.29	0.10	0.41	0.41	0.07	0.39	0.39
Sat Flow, veh/h	1781	1870	1585	1781	1533	286	1781	1870	1585	1781	1841	25
Grp Volume(v), veh/h	21	240	32	250	0	465	229	373	72	149	0	675
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1819	1781	1870	1585	1781	0	1866
Q Serve(g_s), s	1.1	11.3	1.6	10.2	0.0	22.6	6.9	13.4	2.6	4.6	0.0	32.0
Cycle Q Clear(g_c), s	1.1	11.3	1.6	10.2	0.0	22.6	6.9	13.4	2.6	4.6	0.0	32.0
Prop In Lane	1.00		1.00	1.00		0.16	1.00		1.00	1.00		0.01
Lane Grp Cap(c), veh/h	25	311	263	365	0	519	282	775	656	474	0	722
V/C Ratio(X)	0.84	0.77	0.12	0.68	0.00	0.90	0.81	0.48	0.11	0.31	0.00	0.94
Avail Cap(c_a), veh/h	407	694	588	534	0	675	418	1098	931	659	0	1100
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	45.2	36.7	32.6	25.9	0.0	31.5	20.6	19.7	16.5	15.6	0.0	27.1
Incr Delay (d2), s/veh	37.3	2.8	0.1	0.9	0.0	11.3	4.4	0.2	0.0	0.1	0.0	8.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	5.3	0.6	4.3	0.0	11.2	3.0	5.7	0.9	1.8	0.0	15.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	82.6	39.5	32.8	26.7	0.0	42.9	25.0	19.9	16.6	15.7	0.0	35.2
LnGrp LOS	F	D	C	C	A	D	C	B	B	B	A	D
Approach Vol, veh/h		293			715			674			824	
Approach Delay, s/veh		41.8			37.2			21.3			31.7	
Approach LOS		D			D			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.5	44.1	16.3	21.2	13.0	41.6	5.3	32.1
Change Period (Y+Rc), s	* 4	6.0	* 4	* 5.9	* 4	* 6	* 4	* 5.9
Max Green Setting (Gmax), s	* 16	54.0	* 21	* 34	* 16	* 54	* 21	* 34
Max Q Clear Time (g_c+I1), s	6.6	15.4	12.2	13.3	8.9	34.0	3.1	24.6
Green Ext Time (p_c), s	0.0	0.8	0.1	1.1	0.1	1.6	0.0	1.7

Intersection Summary	
HCM 6th Ctrl Delay	31.7
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	346	177	21	470	16	213	33	8	7	20	9
Future Volume (veh/h)	13	346	177	21	470	16	213	33	8	7	20	9
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	14	376	176	23	511	16	232	36	1	8	22	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	296	465	218	265	706	22	483	371	10	243	115	0
Arrive On Green	0.01	0.39	0.39	0.01	0.39	0.39	0.15	0.20	0.20	0.00	0.06	0.00
Sat Flow, veh/h	1781	1205	564	1781	1804	56	1781	1811	50	1781	1870	0
Grp Volume(v), veh/h	14	0	552	23	0	527	232	0	37	8	22	0
Grp Sat Flow(s),veh/h/ln	1781	0	1769	1781	0	1860	1781	0	1861	1781	1870	0
Q Serve(g_s), s	0.2	0.0	13.4	0.4	0.0	11.6	5.4	0.0	0.8	0.2	0.5	0.0
Cycle Q Clear(g_c), s	0.2	0.0	13.4	0.4	0.0	11.6	5.4	0.0	0.8	0.2	0.5	0.0
Prop In Lane	1.00		0.32	1.00		0.03	1.00		0.03	1.00		0.00
Lane Grp Cap(c), veh/h	296	0	683	265	0	728	483	0	381	243	115	0
V/C Ratio(X)	0.05	0.00	0.81	0.09	0.00	0.72	0.48	0.00	0.10	0.03	0.19	0.00
Avail Cap(c_a), veh/h	727	0	1584	687	0	1666	888	0	814	680	818	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	10.2	0.0	13.2	10.7	0.0	12.4	15.6	0.0	15.5	21.0	21.4	0.0
Incr Delay (d2), s/veh	0.0	0.0	1.6	0.1	0.0	0.9	0.3	0.0	0.1	0.0	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	4.6	0.1	0.0	4.0	1.9	0.0	0.3	0.1	0.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.3	0.0	14.8	10.7	0.0	13.4	15.8	0.0	15.6	21.0	21.9	0.0
LnGrp LOS	B	A	B	B	A	B	B	A	B	C	C	A
Approach Vol, veh/h		566			550			269			30	
Approach Delay, s/veh		14.6			13.2			15.8			21.7	
Approach LOS		B			B			B			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	4.2	15.2	4.6	23.9	11.1	8.4	4.4	24.2
Change Period (Y+Rc), s	* 4	* 5.4	* 4	* 5.4	* 4	* 5.4	* 4	* 5.4
Max Green Setting (Gmax), s	* 8	* 21	* 12	* 43	* 18	* 21	* 12	* 43
Max Q Clear Time (g_c+I1), s	2.3	2.8	2.4	15.4	7.4	2.5	2.2	13.6
Green Ext Time (p_c), s	0.0	0.1	0.0	3.2	0.0	0.0	0.0	2.9

Intersection Summary	
HCM 6th Ctrl Delay	14.5
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	14	2	18	85	4	38	8	686	15	10	1039	2
Future Volume (veh/h)	14	2	18	85	4	38	8	686	15	10	1039	2
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	15	2	0	92	4	1	9	746	16	11	1129	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	235	24	135	238	5	135	178	1172	25	409	1201	2
Arrive On Green	0.08	0.08	0.00	0.08	0.08	0.08	0.00	0.64	0.64	0.01	0.64	0.64
Sat Flow, veh/h	1423	288	1585	1404	61	1585	1781	1824	39	1781	1866	3
Grp Volume(v), veh/h	17	0	0	96	0	1	9	0	762	11	0	1131
Grp Sat Flow(s),veh/h/ln	1711	0	1585	1465	0	1585	1781	0	1863	1781	0	1870
Q Serve(g_s), s	0.0	0.0	0.0	3.3	0.0	0.0	0.1	0.0	14.7	0.1	0.0	32.5
Cycle Q Clear(g_c), s	0.5	0.0	0.0	3.8	0.0	0.0	0.1	0.0	14.7	0.1	0.0	32.5
Prop In Lane	0.88		1.00	0.96		1.00	1.00		0.02	1.00		0.00
Lane Grp Cap(c), veh/h	259	0	135	243	0	135	178	0	1197	409	0	1203
V/C Ratio(X)	0.07	0.00	0.00	0.40	0.00	0.01	0.05	0.00	0.64	0.03	0.00	0.94
Avail Cap(c_a), veh/h	624	0	532	601	0	532	797	0	1836	1027	0	1842
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	25.2	0.0	0.0	26.6	0.0	25.0	12.7	0.0	6.5	5.6	0.0	9.6
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.2	0.0	0.0	5.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	0.0	1.3	0.0	0.0	0.1	0.0	4.0	0.0	0.0	10.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.2	0.0	0.0	27.0	0.0	25.0	12.8	0.0	6.7	5.6	0.0	15.2
LnGrp LOS	C	A	A	C	A	C	B	A	A	A	A	B
Approach Vol, veh/h		17			97			771			1142	
Approach Delay, s/veh		25.2			27.0			6.7			15.1	
Approach LOS		C			C			A			B	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	4.4	44.6		10.7	4.3	44.6		10.7
Change Period (Y+Rc), s	* 4	* 6.3		* 5.6	* 4	* 6.3		* 5.6
Max Green Setting (Gmax), s	* 21	* 59		* 20	* 21	* 59		* 20
Max Q Clear Time (g_c+I1), s	2.1	16.7		2.5	2.1	34.5		5.8
Green Ext Time (p_c), s	0.0	2.0		0.0	0.0	3.8		0.2

Intersection Summary	
HCM 6th Ctrl Delay	12.6
HCM 6th LOS	B

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

Future Year 2025 AM

Intersection	
Int Delay, s/veh	15.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	27	58	39	8	14	47	19	877	24	21	404	41
Future Vol, veh/h	27	58	39	8	14	47	19	877	24	21	404	41
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	200	-	-	260	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	29	63	42	9	15	51	21	953	26	23	439	45

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1549	1529	462	1568	1538	966	484	0	0	979	0	0
Stage 1	508	508	-	1008	1008	-	-	-	-	-	-	-
Stage 2	1041	1021	-	560	530	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	93	117	600	90	116	309	1079	-	-	705	-	-
Stage 1	547	539	-	290	318	-	-	-	-	-	-	-
Stage 2	278	314	-	513	527	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	67	111	600	44	110	309	1079	-	-	705	-	-
Mov Cap-2 Maneuver	67	111	-	44	110	-	-	-	-	-	-	-
Stage 1	537	521	-	284	312	-	-	-	-	-	-	-
Stage 2	216	308	-	405	510	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	170.9	37.6	0.2	0.5
HCM LOS	F	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1079	-	-	125	44	218	705	-	-
HCM Lane V/C Ratio	0.019	-	-	1.078	0.198	0.304	0.032	-	-
HCM Control Delay (s)	8.4	-	-	170.9	106	28.6	10.3	-	-
HCM Lane LOS	A	-	-	F	F	D	B	-	-
HCM 95th %tile Q(veh)	0.1	-	-	7.7	0.6	1.2	0.1	-	-

HCM 6th Signalized Intersection Summary
2: Komohana St & Mohouli St

10/21/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	29	440	277	117	237	177	206	699	285	101	314	29
Future Volume (veh/h)	29	440	277	117	237	177	206	699	285	101	314	29
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	32	478	83	127	258	174	224	760	210	110	341	19
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	40	524	444	211	336	227	470	794	673	180	679	38
Arrive On Green	0.02	0.28	0.28	0.07	0.32	0.32	0.09	0.42	0.42	0.05	0.39	0.39
Sat Flow, veh/h	1781	1870	1585	1781	1042	702	1781	1870	1585	1781	1755	98
Grp Volume(v), veh/h	32	478	83	127	0	432	224	760	210	110	0	360
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1744	1781	1870	1585	1781	0	1853
Q Serve(g_s), s	2.0	27.9	4.5	5.5	0.0	25.1	8.2	44.4	9.9	4.2	0.0	16.7
Cycle Q Clear(g_c), s	2.0	27.9	4.5	5.5	0.0	25.1	8.2	44.4	9.9	4.2	0.0	16.7
Prop In Lane	1.00		1.00	1.00		0.40	1.00		1.00	1.00		0.05
Lane Grp Cap(c), veh/h	40	524	444	211	0	563	470	794	673	180	0	717
V/C Ratio(X)	0.79	0.91	0.19	0.60	0.00	0.77	0.48	0.96	0.31	0.61	0.00	0.50
Avail Cap(c_a), veh/h	332	632	535	362	0	563	561	895	759	338	0	890
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	54.8	39.3	30.8	29.2	0.0	34.4	18.4	31.4	21.5	26.9	0.0	26.3
Incr Delay (d2), s/veh	20.4	15.1	0.1	1.0	0.0	6.0	0.3	18.5	0.1	1.2	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	14.8	1.7	2.4	0.0	11.5	3.3	23.5	3.7	1.8	0.0	7.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	75.2	54.4	31.0	30.2	0.0	40.3	18.7	49.9	21.6	28.2	0.0	26.5
LnGrp LOS	E	D	C	C	A	D	B	D	C	C	A	C
Approach Vol, veh/h		593			559			1194			470	
Approach Delay, s/veh		52.2			38.0			39.1			26.9	
Approach LOS		D			D			D			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.0	53.9	11.4	37.5	14.2	49.7	6.6	42.3
Change Period (Y+Rc), s	* 4	6.0	* 4	* 5.9	* 4	* 6	* 4	* 5.9
Max Green Setting (Gmax), s	* 16	54.0	* 17	* 38	* 16	* 54	* 21	* 34
Max Q Clear Time (g_c+I1), s	6.2	46.4	7.5	29.9	10.2	18.7	4.0	27.1
Green Ext Time (p_c), s	0.0	1.5	0.0	1.7	0.1	0.8	0.0	1.3

Intersection Summary	
HCM 6th Ctrl Delay	39.6
HCM 6th LOS	D

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
3: Kumukoa St & Mohouli St

10/21/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	6	523	290	9	307	8	225	13	20	15	26	13
Future Volume (veh/h)	6	523	290	9	307	8	225	13	20	15	26	13
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	7	568	301	10	334	9	245	14	4	16	28	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	552	613	325	159	968	26	417	266	76	187	93	0
Arrive On Green	0.00	0.53	0.53	0.01	0.53	0.53	0.15	0.19	0.19	0.01	0.05	0.00
Sat Flow, veh/h	1781	1151	610	1781	1813	49	1781	1399	400	1781	1870	0
Grp Volume(v), veh/h	7	0	869	10	0	343	245	0	18	16	28	0
Grp Sat Flow(s),veh/h/ln	1781	0	1761	1781	0	1862	1781	0	1798	1781	1870	0
Q Serve(g_s), s	0.1	0.0	32.7	0.2	0.0	7.5	8.8	0.0	0.6	0.6	1.0	0.0
Cycle Q Clear(g_c), s	0.1	0.0	32.7	0.2	0.0	7.5	8.8	0.0	0.6	0.6	1.0	0.0
Prop In Lane	1.00		0.35	1.00		0.03	1.00		0.22	1.00		0.00
Lane Grp Cap(c), veh/h	552	0	937	159	0	994	417	0	342	187	93	0
V/C Ratio(X)	0.01	0.00	0.93	0.06	0.00	0.35	0.59	0.00	0.05	0.09	0.30	0.00
Avail Cap(c_a), veh/h	843	0	1056	447	0	1117	596	0	527	468	548	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	8.1	0.0	15.5	15.3	0.0	9.5	24.9	0.0	23.8	32.0	32.9	0.0
Incr Delay (d2), s/veh	0.0	0.0	12.4	0.1	0.0	0.1	0.5	0.0	0.0	0.1	1.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	14.3	0.1	0.0	2.7	3.6	0.0	0.2	0.3	0.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	8.1	0.0	27.9	15.3	0.0	9.7	25.3	0.0	23.8	32.1	34.1	0.0
LnGrp LOS	A	A	C	B	A	A	C	A	C	C	C	A
Approach Vol, veh/h		876			353			263			44	
Approach Delay, s/veh		27.7			9.8			25.2			33.4	
Approach LOS		C			A			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	4.7	19.0	4.4	43.6	14.8	8.9	4.3	43.7
Change Period (Y+Rc), s	* 4	* 5.4	* 4	* 5.4	* 4	* 5.4	* 4	* 5.4
Max Green Setting (Gmax), s	* 12	* 21	* 12	* 43	* 18	* 21	* 12	* 43
Max Q Clear Time (g_c+I1), s	2.6	2.6	2.2	34.7	10.8	3.0	2.1	9.5
Green Ext Time (p_c), s	0.0	0.0	0.0	3.5	0.0	0.0	0.0	1.7

Intersection Summary	
HCM 6th Ctrl Delay	23.3
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
4: Komohana St & Nowelo St

10/21/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	14	2	10	9	3	8	52	1159	80	43	636	44
Future Volume (veh/h)	14	2	10	9	3	8	52	1159	80	43	636	44
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	15	2	0	10	3	0	57	1260	86	47	691	47
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	130	6	49	121	11	49	543	1284	88	151	1279	87
Arrive On Green	0.03	0.03	0.00	0.03	0.03	0.00	0.02	0.74	0.74	0.02	0.74	0.74
Sat Flow, veh/h	1352	180	1585	1227	368	1585	1781	1731	118	1781	1731	118
Grp Volume(v), veh/h	17	0	0	13	0	0	57	0	1346	47	0	738
Grp Sat Flow(s),veh/h/ln	1532	0	1585	1595	0	1585	1781	0	1849	1781	0	1849
Q Serve(g_s), s	0.2	0.0	0.0	0.0	0.0	0.0	0.6	0.0	53.1	0.5	0.0	13.4
Cycle Q Clear(g_c), s	0.8	0.0	0.0	0.5	0.0	0.0	0.6	0.0	53.1	0.5	0.0	13.4
Prop In Lane	0.88		1.00	0.77		1.00	1.00		0.06	1.00		0.06
Lane Grp Cap(c), veh/h	135	0	49	132	0	49	543	0	1372	151	0	1366
V/C Ratio(X)	0.13	0.00	0.00	0.10	0.00	0.00	0.10	0.00	0.98	0.31	0.00	0.54
Avail Cap(c_a), veh/h	469	0	412	476	0	412	987	0	1411	601	0	1411
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	36.5	0.0	0.0	36.4	0.0	0.0	3.5	0.0	9.4	22.4	0.0	4.4
Incr Delay (d2), s/veh	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	19.2	0.4	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.0	0.2	0.0	0.0	0.1	0.0	20.4	0.6	0.0	3.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	36.6	0.0	0.0	36.5	0.0	0.0	3.5	0.0	28.6	22.8	0.0	4.6
LnGrp LOS	D	A	A	D	A	A	A	A	C	C	A	A
Approach Vol, veh/h		17			13			1403			785	
Approach Delay, s/veh		36.6			36.5			27.6			5.7	
Approach LOS		D			D			C			A	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	5.6	63.4		8.0	5.8	63.1		8.0
Change Period (Y+Rc), s	* 4	* 6.3		* 5.6	* 4	* 6.3		* 5.6
Max Green Setting (Gmax), s	* 21	* 59		* 20	* 21	* 59		* 20
Max Q Clear Time (g_c+I1), s	2.5	55.1		2.8	2.6	15.4		2.5
Green Ext Time (p_c), s	0.0	2.0		0.0	0.0	1.9		0.0

Intersection Summary	
HCM 6th Ctrl Delay	19.9
HCM 6th LOS	B

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM Signalized Intersection Capacity Analysis
5: Komohana St & Puainako St (N)

10/21/2022

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	177	172	264	1100	544	113
Future Volume (vph)	177	172	264	1100	544	113
Ideal Flow (vphpl)	1900	1900	1900	1600	1900	1900
Total Lost time (s)	4.4	4.0	4.0	5.2	5.2	5.2
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1569	3539	1583
Flt Permitted	0.95	1.00	0.39	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	728	1569	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	192	187	287	1196	591	123
RTOR Reduction (vph)	0	0	0	0	0	55
Lane Group Flow (vph)	192	187	287	1196	591	68
Turn Type	Prot	pt+ov	custom	NA	NA	Perm
Protected Phases	7	1 7	1	2	2	
Permitted Phases		2	1 2	1		2
Actuated Green, G (s)	27.6	105.9	73.9	73.9	63.4	63.4
Effective Green, g (s)	27.6	101.5	73.9	73.9	63.4	63.4
Actuated g/C Ratio	0.24	0.88	0.64	0.64	0.55	0.55
Clearance Time (s)	4.4		4.0	5.2	5.2	5.2
Vehicle Extension (s)	1.5		1.0	1.5	1.5	1.5
Lane Grp Cap (vph)	424	1450	562	1007	1949	871
v/s Ratio Prot	c0.11	0.04	0.05	c0.65	0.17	
v/s Ratio Perm		0.08	0.28	0.11		0.04
v/c Ratio	0.45	0.13	0.51	1.19	0.30	0.08
Uniform Delay, d1	37.3	0.9	9.0	20.6	13.9	12.1
Progression Factor	1.00	1.00	0.63	0.69	1.00	1.00
Incremental Delay, d2	0.3	0.0	0.0	85.5	0.0	0.0
Delay (s)	37.6	0.9	5.7	99.6	14.0	12.1
Level of Service	D	A	A	F	B	B
Approach Delay (s)	19.5			81.4	13.7	
Approach LOS	B			F	B	

Intersection Summary			
HCM 2000 Control Delay	53.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	115.1	Sum of lost time (s)	18.2
Intersection Capacity Utilization	86.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	2	0	40	1	522	1	846	41	245	468	2
Future Volume (vph)	2	2	0	40	1	522	1	846	41	245	468	2
Ideal Flow (vphpl)	1900	1900	1900	1500	1500	1500	1600	1600	1600	1900	1900	1900
Total Lost time (s)		6.0			6.0			7.5		4.7	4.7	
Lane Util. Factor		1.00			1.00			1.00		1.00	1.00	
Frt		1.00			0.87			0.99		1.00	1.00	
Flt Protected		0.98			1.00			1.00		0.95	1.00	
Satd. Flow (prot)		1817			1282			1559		1770	1862	
Flt Permitted		0.77			0.98			1.00		0.19	1.00	
Satd. Flow (perm)		1435			1257			1558		347	1862	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	2	0	43	1	567	1	920	45	266	509	2
RTOR Reduction (vph)	0	0	0	0	338	0	0	1	0	0	0	0
Lane Group Flow (vph)	0	4	0	0	273	0	0	965	0	266	511	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases		3			3			6		5	5 6	
Permitted Phases	3			3			6			5 6		
Actuated Green, G (s)		26.0			26.0			52.8		70.9	75.6	
Effective Green, g (s)		26.0			26.0			52.8		70.9	75.6	
Actuated g/C Ratio		0.23			0.23			0.46		0.62	0.66	
Clearance Time (s)		6.0			6.0			7.5		4.7		
Vehicle Extension (s)		1.5			1.5			1.5		1.0		
Lane Grp Cap (vph)		324			283			714		437	1222	
v/s Ratio Prot										c0.10	0.27	
v/s Ratio Perm		0.00			c0.22			c0.62		0.28		
v/c Ratio		0.01			0.96			1.35		0.61	0.42	
Uniform Delay, d1		34.6			44.1			31.1		15.2	9.3	
Progression Factor		1.00			1.00			1.00		3.12	0.46	
Incremental Delay, d2		0.0			43.1			167.3		1.6	0.1	
Delay (s)		34.6			87.2			198.5		49.2	4.4	
Level of Service		C			F			F		D	A	
Approach Delay (s)		34.6			87.2			198.5			19.7	
Approach LOS		C			F			F			B	

Intersection Summary			
HCM 2000 Control Delay	110.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.11		
Actuated Cycle Length (s)	115.1	Sum of lost time (s)	18.2
Intersection Capacity Utilization	139.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

APPENDIX C

LEVEL OF SERVICE CALCULATIONS

Future Year 2025 PM

Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	18	14	16	6	52	15	18	406	20	19	748	76
Future Vol, veh/h	18	14	16	6	52	15	18	406	20	19	748	76
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	200	-	-	260	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	20	15	17	7	57	16	20	441	22	21	813	83

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1426	1400	855	1405	1430	452	896	0	0	463	0	0
Stage 1	897	897	-	492	492	-	-	-	-	-	-	-
Stage 2	529	503	-	913	938	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	113	140	358	117	135	608	757	-	-	1098	-	-
Stage 1	334	358	-	558	548	-	-	-	-	-	-	-
Stage 2	533	541	-	328	343	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	70	134	358	98	129	608	757	-	-	1098	-	-
Mov Cap-2 Maneuver	70	134	-	98	129	-	-	-	-	-	-	-
Stage 1	325	351	-	543	534	-	-	-	-	-	-	-
Stage 2	452	527	-	293	336	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	57.7	46.2	0.4	0.2
HCM LOS	F	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	757	-	-	118	98	157	1098	-	-
HCM Lane V/C Ratio	0.026	-	-	0.442	0.067	0.464	0.019	-	-
HCM Control Delay (s)	9.9	-	-	57.7	44.3	46.4	8.3	-	-
HCM Lane LOS	A	-	-	F	E	E	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	1.9	0.2	2.2	0.1	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	232	262	230	377	71	252	334	177	136	599	35
Future Volume (veh/h)	30	232	262	230	377	71	252	334	177	136	599	35
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	33	252	76	250	410	73	274	363	76	148	651	21
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	42	339	288	359	444	79	303	808	685	491	690	22
Arrive On Green	0.02	0.18	0.18	0.13	0.29	0.29	0.12	0.43	0.43	0.07	0.38	0.38
Sat Flow, veh/h	1781	1870	1585	1781	1546	275	1781	1870	1585	1781	1802	58
Grp Volume(v), veh/h	33	252	76	250	0	483	274	363	76	148	0	672
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1821	1781	1870	1585	1781	0	1860
Q Serve(g_s), s	1.9	13.4	4.3	11.5	0.0	27.1	10.3	14.4	3.0	5.2	0.0	36.7
Cycle Q Clear(g_c), s	1.9	13.4	4.3	11.5	0.0	27.1	10.3	14.4	3.0	5.2	0.0	36.7
Prop In Lane	1.00		1.00	1.00		0.15	1.00		1.00	1.00		0.03
Lane Grp Cap(c), veh/h	42	339	288	359	0	523	303	808	685	491	0	712
V/C Ratio(X)	0.79	0.74	0.26	0.70	0.00	0.92	0.90	0.45	0.11	0.30	0.00	0.94
Avail Cap(c_a), veh/h	356	606	514	485	0	590	365	960	814	640	0	958
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	51.1	40.7	37.0	28.9	0.0	36.4	26.2	21.1	17.8	17.8	0.0	31.4
Incr Delay (d2), s/veh	20.1	2.2	0.3	1.2	0.0	18.6	20.4	0.1	0.0	0.1	0.0	12.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	6.3	1.7	5.0	0.0	14.5	5.9	6.2	1.1	2.1	0.0	18.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	71.2	42.9	37.3	30.2	0.0	55.0	46.5	21.2	17.8	17.9	0.0	44.1
LnGrp LOS	E	D	D	C	A	D	D	C	B	B	A	D
Approach Vol, veh/h		361			733			713			820	
Approach Delay, s/veh		44.3			46.5			30.6			39.4	
Approach LOS		D			D			C			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.2	51.4	17.6	25.0	16.4	46.3	6.5	36.1
Change Period (Y+Rc), s	* 4	6.0	* 4	* 5.9	* 4	* 6	* 4	* 5.9
Max Green Setting (Gmax), s	* 16	54.0	* 21	* 34	* 16	* 54	* 21	* 34
Max Q Clear Time (g_c+I1), s	7.2	16.4	13.5	15.4	12.3	38.7	3.9	29.1
Green Ext Time (p_c), s	0.0	0.8	0.1	1.2	0.1	1.5	0.0	1.1

Intersection Summary	
HCM 6th Ctrl Delay	39.7
HCM 6th LOS	D

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	366	177	21	486	16	212	32	7	6	20	8
Future Volume (veh/h)	13	366	177	21	486	16	212	32	7	6	20	8
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	14	398	176	23	528	16	230	35	1	7	22	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	295	488	216	261	726	22	476	366	10	236	112	0
Arrive On Green	0.01	0.40	0.40	0.01	0.40	0.40	0.15	0.20	0.20	0.00	0.06	0.00
Sat Flow, veh/h	1781	1229	543	1781	1806	55	1781	1809	52	1781	1870	0
Grp Volume(v), veh/h	14	0	574	23	0	544	230	0	36	7	22	0
Grp Sat Flow(s),veh/h/ln	1781	0	1773	1781	0	1861	1781	0	1861	1781	1870	0
Q Serve(g_s), s	0.2	0.0	14.2	0.4	0.0	12.1	5.5	0.0	0.8	0.2	0.5	0.0
Cycle Q Clear(g_c), s	0.2	0.0	14.2	0.4	0.0	12.1	5.5	0.0	0.8	0.2	0.5	0.0
Prop In Lane	1.00		0.31	1.00		0.03	1.00		0.03	1.00		0.00
Lane Grp Cap(c), veh/h	295	0	704	261	0	748	476	0	377	236	112	0
V/C Ratio(X)	0.05	0.00	0.82	0.09	0.00	0.73	0.48	0.00	0.10	0.03	0.20	0.00
Avail Cap(c_a), veh/h	717	0	1554	674	0	1632	868	0	797	665	801	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	10.2	0.0	13.2	10.7	0.0	12.4	16.0	0.0	15.9	21.6	21.9	0.0
Incr Delay (d2), s/veh	0.0	0.0	1.6	0.1	0.0	0.9	0.3	0.0	0.1	0.0	0.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	4.8	0.1	0.0	4.2	2.0	0.0	0.3	0.1	0.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.2	0.0	14.8	10.8	0.0	13.3	16.3	0.0	16.0	21.6	22.5	0.0
LnGrp LOS	B	A	B	B	A	B	B	A	B	C	C	A
Approach Vol, veh/h		588			567			266			29	
Approach Delay, s/veh		14.7			13.2			16.3			22.3	
Approach LOS		B			B			B			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	4.2	15.3	4.6	24.9	11.2	8.3	4.4	25.1
Change Period (Y+Rc), s	* 4	* 5.4	* 4	* 5.4	* 4	* 5.4	* 4	* 5.4
Max Green Setting (Gmax), s	* 8	* 21	* 12	* 43	* 18	* 21	* 12	* 43
Max Q Clear Time (g_c+I1), s	2.2	2.8	2.4	16.2	7.5	2.5	2.2	14.1
Green Ext Time (p_c), s	0.0	0.1	0.0	3.3	0.0	0.0	0.0	3.0

Intersection Summary	
HCM 6th Ctrl Delay	14.6
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	44	3	48	84	7	38	15	696	15	9	1065	2
Future Volume (veh/h)	44	3	48	84	7	38	15	696	15	9	1065	2
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	48	3	-1	91	8	1	16	757	16	10	1158	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	244	12	139	233	11	139	172	1201	25	412	1223	2
Arrive On Green	0.09	0.09	0.00	0.09	0.09	0.09	0.01	0.66	0.66	0.01	0.66	0.66
Sat Flow, veh/h	1538	138	1585	1422	125	1585	1781	1825	39	1781	1867	3
Grp Volume(v), veh/h	51	0	-1	99	0	1	16	0	773	10	0	1160
Grp Sat Flow(s),veh/h/ln	1676	0	1585	1547	0	1585	1781	0	1863	1781	0	1870
Q Serve(g_s), s	0.0	0.0	0.0	2.2	0.0	0.0	0.2	0.0	15.5	0.1	0.0	36.1
Cycle Q Clear(g_c), s	1.7	0.0	0.0	3.9	0.0	0.0	0.2	0.0	15.5	0.1	0.0	36.1
Prop In Lane	0.94		1.00	0.92		1.00	1.00		0.02	1.00		0.00
Lane Grp Cap(c), veh/h	256	0	139	244	0	139	172	0	1227	412	0	1225
V/C Ratio(X)	0.20	0.00	-0.01	0.41	0.00	0.01	0.09	0.00	0.63	0.02	0.00	0.95
Avail Cap(c_a), veh/h	577	0	495	568	0	495	741	0	1708	987	0	1714
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	27.4	0.0	0.0	28.3	0.0	26.7	14.2	0.0	6.4	5.6	0.0	10.0
Incr Delay (d2), s/veh	0.1	0.0	0.0	0.4	0.0	0.0	0.1	0.0	0.2	0.0	0.0	7.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	0.0	1.4	0.0	0.0	0.1	0.0	4.3	0.0	0.0	12.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.6	0.0	0.0	28.7	0.0	26.7	14.2	0.0	6.6	5.6	0.0	18.0
LnGrp LOS	C	A	A	C	A	C	B	A	A	A	A	B
Approach Vol, veh/h		50			100			789			1170	
Approach Delay, s/veh		28.1			28.7			6.7			17.9	
Approach LOS		C			C			A			B	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	4.3	48.5		11.2	4.5	48.3		11.2
Change Period (Y+Rc), s	* 4	* 6.3		* 5.6	* 4	* 6.3		* 5.6
Max Green Setting (Gmax), s	* 21	* 59		* 20	* 21	* 59		* 20
Max Q Clear Time (g_c+I1), s	2.1	17.5		3.7	2.2	38.1		5.9
Green Ext Time (p_c), s	0.0	2.0		0.1	0.0	3.9		0.2

Intersection Summary	
HCM 6th Ctrl Delay	14.5
HCM 6th LOS	B

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM Signalized Intersection Capacity Analysis
5: Komohana St & Puainako St (N)

10/21/2022

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	180	423	240	554	994	205
Future Volume (vph)	180	423	240	554	994	205
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.4	4.0	4.0	5.2	5.2	5.2
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	1863	3539	1583
Flt Permitted	0.95	1.00	0.19	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	354	1863	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	196	460	261	602	1080	223
RTOR Reduction (vph)	0	0	0	0	0	73
Lane Group Flow (vph)	196	460	261	602	1080	150
Turn Type	Prot	pt+ov	custom	NA	NA	Perm
Protected Phases	7	1 7	1	2	2	
Permitted Phases		2	1 2	1		2
Actuated Green, G (s)	24.0	105.3	76.9	76.9	64.1	64.1
Effective Green, g (s)	24.0	100.9	76.9	76.9	64.1	64.1
Actuated g/C Ratio	0.21	0.88	0.67	0.67	0.56	0.56
Clearance Time (s)	4.4		4.0	5.2	5.2	5.2
Vehicle Extension (s)	1.5		1.0	1.5	1.5	1.5
Lane Grp Cap (vph)	371	1450	396	1251	1981	886
v/s Ratio Prot	c0.11	0.10	c0.07	0.27	0.31	
v/s Ratio Perm		0.19	c0.37	0.05		0.09
v/c Ratio	0.53	0.32	0.66	0.48	0.55	0.17
Uniform Delay, d1	40.2	1.1	10.3	9.1	16.0	12.3
Progression Factor	1.00	1.00	2.50	0.85	1.00	1.00
Incremental Delay, d2	0.6	0.0	2.1	0.1	0.2	0.0
Delay (s)	40.8	1.2	27.7	7.9	16.1	12.3
Level of Service	D	A	C	A	B	B
Approach Delay (s)	13.0			13.9	15.5	
Approach LOS	B			B	B	

Intersection Summary			
HCM 2000 Control Delay	14.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	114.5	Sum of lost time (s)	18.2
Intersection Capacity Utilization	62.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	1	0	56	2	329	1	452	49	520	877	0
Future Volume (vph)	2	1	0	56	2	329	1	452	49	520	877	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0			7.5		4.7	4.7	
Lane Util. Factor		1.00			1.00			1.00		1.00	1.00	
Frt		1.00			0.89			0.99		1.00	1.00	
Flt Protected		0.97			0.99			1.00		0.95	1.00	
Satd. Flow (prot)		1803			1637			1838		1770	1863	
Flt Permitted		0.74			0.95			1.00		0.29	1.00	
Satd. Flow (perm)		1387			1563			1836		537	1863	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	1	0	61	2	358	1	491	53	565	953	0
RTOR Reduction (vph)	0	0	0	0	155	0	0	3	0	0	0	0
Lane Group Flow (vph)	0	3	0	0	266	0	0	542	0	565	953	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases		3			3			6		5	5 6	
Permitted Phases	3			3			6			5 6		
Actuated Green, G (s)		22.4			22.4			40.9		73.9	78.6	
Effective Green, g (s)		22.4			22.4			40.9		73.9	78.6	
Actuated g/C Ratio		0.20			0.20			0.36		0.65	0.69	
Clearance Time (s)		6.0			6.0			7.5		4.7		
Vehicle Extension (s)		1.5			1.5			1.5		1.0		
Lane Grp Cap (vph)		271			305			655		701	1278	
v/s Ratio Prot										c0.23	c0.51	
v/s Ratio Perm		0.00			c0.17			c0.30		0.29		
v/c Ratio		0.01			0.87			0.83		0.81	0.75	
Uniform Delay, d1		37.1			44.7			33.6		15.4	11.5	
Progression Factor		1.00			1.00			1.00		1.73	0.63	
Incremental Delay, d2		0.0			22.1			8.1		5.8	1.9	
Delay (s)		37.1			66.8			41.6		32.3	9.1	
Level of Service		D			E			D		C	A	
Approach Delay (s)		37.1			66.8			41.6			17.8	
Approach LOS		D			E			D			B	

Intersection Summary			
HCM 2000 Control Delay	31.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	114.5	Sum of lost time (s)	18.2
Intersection Capacity Utilization	111.2%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

APPENDIX F

Draft Noise Impact Report

USGS HVO + PIERC Research Facility

CENSEO AV + Acoustics

June 22, 2022

DRAFT NOISE IMPACT REPORT

USGS HVO+PIERC RESEARCH FACILITY

HILO, HAWAII

June 22, 2022

Prepared For:

HHF Planners

Prepared By:

CENSEO AV+ACOUSTICS

www.CENSEO.design

TABLE OF CONTENTS

1 Executive Summary 1

2 Introduction 1

3 Project Location 1

4 Sound Regulations and Guidelines 2

4.1 Hawaii Department of Health (HDOH) - Community Noise Control Rule 2

4.2 Hawaii Department of Health (HDOH) - Construction Noise Permit and Variance 3

4.3 Federal Highway Administration (FHWA) - Traffic Noise 4

4.4 Hawaii Department of Transportation (HDOT) - Traffic Noise 5

4.5 Environmental Protection Agency (EPA) and Department of Housing and Urban Development (HUD) – Environmental Noise 5

4.6 Various Agencies - Community Noise Response 6

5 Existing Ambient Sound Environment 6

5.1 Sound Measurement Equipment and Procedure 6

5.2 Sound Measurement Locations 7

5.2.2 Measurement Site L1 9

5.2.3 Measurement Site L2 10

5.2.4 Measurement Site S1 11

5.2.5 Measurement Site S2 11

5.3 Sound Measurement Results 11

5.3.1 Long-Term Measurement Results 11

5.3.2 Short-Term Measurement Results 12

6 Traffic Noise Assessment 12

6.1 Predicted Traffic Noise Levels 12

6.2 Traffic Noise Impact 15

7 Project Related Noise Assessment 15

7.1 On-Site Noise Sources 15

7.2 General Construction Noise 15

8 General Noise Mitigation Methods 16

8.1 Traffic Noise Mitigation 16

8.2 Construction Vibration Mitigation 16

8.3 Project Stationary Mechanical Equipment 17
9 References 18

LIST OF FIGURES

Figure 1: Map of Project Site and Surrounding Area 2
Figure 2: Field Measurement Site Map 8
Figure 3: Long-Term Measurement Site L1 9
Figure 4: Long-Term Site L1 Measured Sound Levels 9
Figure 5: Long-Term Measurement Site L2 10
Figure 6: Long-Term Measurement Site L2 Sound Levels 10
Figure 7: Short-Term Measurement Site S2 11
Figure 8: Traffic Noise Analysis Receiver Locations 13

LIST OF TABLES

Table 1: HDOH Property Line Maximum Permissible Noise Limits 3
Table 2: HDOH Community Noise Permit - Construction Hours 3
Table 3: Noise Abatement Criteria (NAC) for Considering Barriers 4
Table 4: Community Response to Changes in Noise Levels 6
Table 5: Summary of Noise Measurement Equipment 7
Table 6: Measurement Location Summary 8
Table 7: Long-Term Measurement Results Summary 11
Table 8: Traffic Count Results Summary 12
Table 9: Traffic Noise Analysis, Calculated AM and PM Peak Hour Traffic Noise 14
Table 10: Traffic Noise Analysis, Predicted Future Increases in Traffic Noise 14
Table 11: Construction Equipment Noise Levels 16

1 Executive Summary

CENSEO AV+Acoustics completed a noise impact study at USGS Hawaii Volcano Observatory (HVO) and Pacific Islands Ecosystems Research Center (PIERC). Primary findings were:

- Existing ambient noise environment: Measured 1-hour L_{eq} ambient sound levels at both long-term measurement locations were between 48 and 51 dBA throughout the day and night, which is typical of a rural environment. The primary noise sources during the ambient noise measurements were environmental noise sources (e.g., birds and wind) and vehicular traffic on Komohana Street.
- Traffic noise: A traffic noise increase of less 1 dB at the adjacent properties and nearby residential neighborhoods was estimated, which is an insubstantial increase. Therefore, a traffic noise impact due to the project is not expected.
- Project noise: The project will incorporate stationary mechanical equipment that is typical for laboratory/office buildings. Noise from this equipment must comply with the HDOH maximum permissible noise limits at the project site property line.
- Construction noise: Construction noise levels at the project site and nearby properties will vary significantly. The actual noise emissions from the construction equipment is a function of the location, number and type of equipment used. The various construction phases may generate noise levels that are substantially louder than the existing noise environment, especially during the initial site preparation phase. Construction activities must occur during permitted hours and will be temporary.

2 Introduction

The USGS Hawaii Volcano Observatory (HVO) and Pacific Islands Ecosystems Research Center (PIERC) project is a proposed research laboratory/office facility located in Hilo, Hawaii. The purpose of this noise impact study is to assess the existing ambient noise environment on the proposed project site, identify potential noise impacts to and from the surrounding area as a result of implementing this project, evaluate future sound levels with respect to state or local noise regulations, and provide conceptual approaches to noise mitigation.

3 Project Location

The proposed USGS Hawaii Volcano Observatory and Pacific Islands Ecosystems Research Center is located in Hilo, Hawaii at the corner of Komohana Street and Nowelo Street. Neighboring facilities include US Pacific Basin Agricultural Research Center to the south, UH Hilo University Research Park and Gemini North Facility to the east, and vacant land to the north and west. The project site is approximately 13 acres and includes the development of research laboratory/office facility, approximately 60,000 gross square feet in size. A map of the project site and the surrounding area is shown in Figure 1.

Figure 1: Map of Project Site and Surrounding Area

4 Sound Regulations and Guidelines

4.1 Hawaii Department of Health (HDOH) - Community Noise Control Rule

Hawaii Administrative Rules, Title 11 – Department of Health, Chapter 46 – Community Noise Control [Reference 1] regulates environmental noise limits within the state of Hawaii. Table 1 summarizes the maximum permissible noise levels for each zoning district. These sound level limits apply to *"stationary noise sources, and equipment related to agriculture, construction, and industrial activities".* The noise regulation further defines stationary sources as *"any mechanical source of noise fixed in or on a station, course, or mode within any premises, including but not limited to mechanical air conditioning units, exhaust systems, generators, compressors, pumps, or other similar equipment".* Therefore, sounds generated by vehicles, hand tools, etc. are not required to satisfy the noise limits shown in Table 1 since these sources do not qualify as a stationary noise source, as defined by the noise regulation.

In mixed zoning areas, the primary land use designation is used for determining the zoning district. The maximum permissible sound levels shall not be exceeded (at or beyond the property line) by more than 10% of the time for any 20-minute period. The maximum permissible sound levels for impulsive sounds can be up to 10 dB above the maximum sound levels in the table above.

For this noise assessment, the project property is considered Class B and adjacent properties are also considered Class B. The applicable maximum noise levels are 60 dBA at project site property lines during daytime hours and 50 dBA at project site property lines nighttime hours.

Table 1: HDOH Property Line Maximum Permissible Noise Limits

Land Use	Day Noise Limit 7am – 10pm	Night Noise Limit 10pm – 7am
Class A – Residential, conservation, preservation, public space, open space, or similar	55 dBA	45 dBA
Class B – Multi-family dwellings, apartment, business, commercial, hotel, resort, or similar	60 dBA	50 dBA
Class C – Agriculture, country, industrial, or similar	70 dBA	70 dBA

4.2 Hawaii Department of Health (HDOH) - Construction Noise Permit and Variance

The Hawaii State Department of Health (HDOH) [Reference 1] grants permits to operate noise sources, such as construction equipment, in excess of the maximum permissible noise limits shown in Table 2. The following factors may be considered in granting a Community Noise Permit for construction activities:

- Noise abatement measures, including the 'best available control technology', may be required to control noise levels from the excessive noise source.
- The activities are temporary, and a construction schedule must be disclosed.
- Noise impacts from nighttime activities must be disclosed.
- The applicant plans to notify the people in the surrounding area of the planned activity.

There are restrictions for construction activities to occur during specific hours with the appropriate community noise permit, as shown in Table 2 below. A Community Noise Permit must be submitted and approved by the State before construction can begin. Loud construction activities outside of normal construction hours require an approved Community Noise Variance.

Table 2: HDOH Community Noise Permit - Construction Hours

Equipment Type	Allowed Hours of Operation
Normal Construction Equipment	Monday - Friday: 7:00 am – 6:00 pm Saturday: 9:00 am – 6:00 pm Sunday & Holidays: No construction activities
Impulsive Construction Equipment: **Pile Drivers, Jackhammers, Hydraulic Hammers, High Pressure Sprayers, Chain Saws, etc.**	9:00 am – 5:30 pm Monday - Friday

4.3 Federal Highway Administration (FHWA) - Traffic Noise

For highway projects, the Federal Highway Administration (FHWA) regulation 23 CFR 772 [Reference 2] contains traffic Noise Abatement Criteria (NAC) for various land use categories. The Land Use Categories and the corresponding NAC, in terms of an hourly equivalent traffic noise level ($L_{eq(h)}$) are summarized in Table 3. A traffic noise impact occurs when the predicted future highway noise levels approach or exceed the NAC (i.e., 1 dB less than the NAC or greater). A traffic noise impact can also occur when predicted future highway traffic noise levels result in a substantial increase over the existing noise environment (i.e., an increase of 5 to 15 dB or greater).

Table 3: Noise Abatement Criteria (NAC) for Considering Barriers

Land Use Category	$L_{eq(h)}$[1] (dBA) (Evaluation Location)	Description of Land Use Category
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B[2]	67 (Exterior)	Residential
C[2]	67 (Exterior)	Active sports areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playground, public meeting rooms, public or non-profit institutional structures, radio studios, recording studios, recreation areas, schools, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D[3]	52 (Interior)	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or non-profit institutional structures, radio studios, recording studios, schools, and television studios.
E	72 (Exterior)	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F	- -	Agricultural, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	- -	Undeveloped lands that are not permitted.

Notes:

1. "L_{eq}" means the equivalent steady-state sound level, which in a stated period of time contains the same acoustic energy as the time-varying sound level during the same period. For purposes of measuring or predicting noise levels, a receptor is assumed to be at ear height, located five feet above ground surface. "$L_{eq}(h)$" means the hourly value of L_{eq}.
2. Includes undeveloped lands permitted for this activity category or publicly-owned recreation lands formally designated in a public agency's Master Plan.

3. Use of interior noise levels shall be limited to situations where a determination has been made that exterior abatement measures will not be feasible and reasonable and after exhausting all outdoor mitigation options.

The USGS project would fall under NAC categories C and D for exterior and interior noise, respectively. While the FHWA criteria are not applicable to this project as it is not a highway project, the "substantial increase" criteria can be used as a guideline for assessing noise impacts due to vehicle noise.

4.4 Hawaii Department of Transportation (HDOT) - Traffic Noise

The Hawaii Department of Transportation (HDOT) [Reference 3] has implemented the requirements of the FHWA's design goals for traffic noise exposure in its noise analysis and abatement policy. According to the policy, a traffic noise impact occurs with the predicted traffic noise level approaches or exceeds the FHWA NAC (i.e., 1 dB less than the NAC or greater). A traffic impact can also occur when the predicted traffic noise level substantially exceeds the existing noise levels (i.e., an increase of 15 dB or greater).

While the subject of this noise evaluation is not a highway project and the FHWA/HDOT criteria are not applicable, the "substantial increase" criteria can be used as a guideline for assessing noise impacts due to vehicle noise.

4.5 Environmental Protection Agency (EPA) and Department of Housing and Urban Development (HUD) – Environmental Noise

The EPA [Reference 4] has established a goal to reduce exterior noise to protect public health and welfare from the effects of environmental noise. The design goals are stated in terms of day-night sound levels (L_{dn}). The current goal is for noise levels to be less than L_{dn} 65 and the future goal is for noise levels to be less than L_{dn} 55. As a general rule, residential developments in areas where noise levels are L_{dn} 55 or less are considered to have minimal exposure to noise (e.g., rural areas). Developments in areas where noise levels range from L_{dn} 55 to 65 have a moderate exposure to noise (i.e., urban areas that are shielded from high volume streets).

HUD [Reference 5] has developed noise criteria for establishing site acceptability standards for housing projects. These standards are also stated in terms of L_{dn}. The site acceptability standards for exterior sound levels are separated into three categories. An "Acceptable" site for residential development is an area where noise levels are L_{dn} 65 or less. A "Normally Unacceptable" site for residential development is an area where noise levels are L_{dn} 65 to 75. For these sites, noise mitigation can be provided to reduce exterior noise levels to the acceptable category. An "Unacceptable" site for residential development is an area where noise levels are L_{dn} 75 or higher. The main intent of the L_{dn} 65 exterior noise criteria is to achieve 45 dBA indoors. Mitigation for normally unacceptable sites can include sound barrier walls and upgrades to the building façade, windows and exterior doors.

While the USGS project is not a residential development, the EPA and HUD guidelines can be used to ascertain site acceptability based on environmental noise impacts.

4.6 Various Agencies - Community Noise Response

The ability of the average person to perceive increases in noise has been documented by various government agencies, including the Federal Highway Administration (FHWA) [Reference 2] and the International Standards Organization (ISO) [Reference 6]. The ISO has developed a scale, as shown in Table 4, for estimating community response to increases in noise levels. This scale relates changes in noise levels to the subjective response of the community. The scale also allows for a direct estimation of the community's probable response to a predicted change in noise level.

Table 4: Community Response to Changes in Noise Levels

Noise Level Change (dB)	Category	Perception of Sound	Subjective Description
0	None	Imperceptible	No observed reaction
5	Little	Noticeable	Sporadic complaints
10	Medium	2 times (or 1/2) as loud	Widespread complaints
15	Strong	3 times (or 1/3) as loud	Threats of community action
20	Very Strong	4 times (or 1/4) as loud	Vigorous community action

5 Existing Ambient Sound Environment

Long-term ambient noise level measurements were conducted to assess the existing acoustical environment at the project site. Short term measurements were also conducted to quantify vehicular traffic noise from the adjacent roadways. The long-term measurements were conducted continuously from April 15 - 21, 2022 and the short-term measurements were conducted on the morning of April 15, 2022.

5.1 Sound Measurement Equipment and Procedure

At the short-term sound measurement locations, the sound level meter was mounted on a tripod (approximately 5 feet above grade). The microphone was directly connected to the sound level meter and an open-cell polyurethane foam wind screen covered the microphone. At long-term sound measurement locations, the microphone and preamplifier were mounted on a tripod (approximately 5 feet above grade) and connected to the sound level meter with a microphone extension cable. The sound level meter was contained in a weather-resistant equipment case and an open-cell polyurethane foam wind screen covered the microphone. Efforts were made to select sound level measurement locations that were representative of the existing ambient sound environment. All measurements were obtained in free-field conditions. The measurement equipment used for sound level measurements is described in Table 5 below.

Table 5: Summary of Noise Measurement Equipment

Equipment Type	Manufacturer	Model No.	Equipment Quantity
Sound Level Meter	Larson Davis	831	3
Pre-amp	PCB	PRM831	3
Microphone	PCB	377B02	3
Calibrator	Larson Davis	CAL200	2

On April 15, 2022, the day that the equipment was set up, weather conditions were sunny, 75-80 °F, and wind speed in the range of 10-15 mph. less than 5 ft/sec. Mild precipitation was recorded at the start of the measurements and intermittent rainfall occurred throughout the measurement period.

Sound levels were measured as decibels (dB) in 1/3 octave bands and as overall equivalent sound levels. The measurement data was post-processed to provide various sound level metrics, as described below:

- The $L_{eq(1\text{-}HR)}$ is the time-equivalent sound level over a specified time period (t), 1-hour, and is a measure of sound energy.
- The $L_{eq(max)}$ is the maximum sound level which is the highest sound level measured during a single noise event and is commonly used to evaluate a single noise event.
- The L_{90} is the sound level that is less than 90% of the measured sound levels over an hour and is considered to represent the background noise level.
- The L_{dn} describes a receptor's cumulative noise exposure from all events over 24 hours. A 10-dB penalty is applied to nighttime hours (between 10:00 pm and 7:00 am). This metric corresponds well to human annoyance levels and is commonly used for site planning.

5.2 Sound Measurement Locations

A total of two (2) long-term noise measurement locations and two (2) short term noise measurement locations were selected. These noise measurement locations are shown in Figure 2.

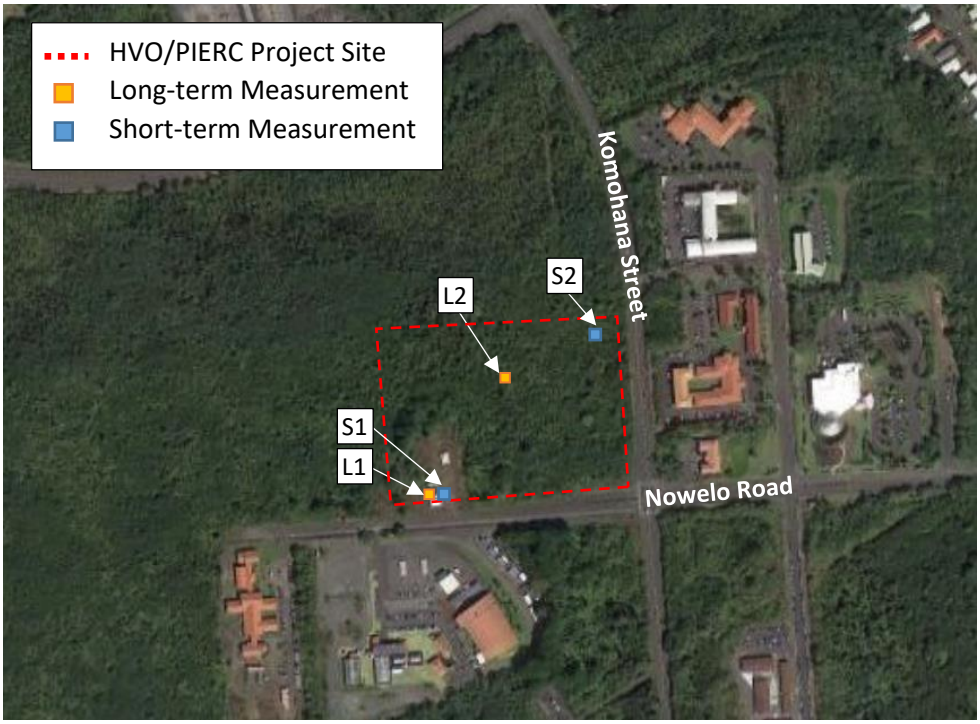


Figure 2: Field Measurement Site Map

The sound level measurement locations, measurement session times, and descriptions of the ambient environments are summarized in Table 6.

Table 6: Measurement Location Summary

ID	Location	Sound Sources	Duration	Start Time
L1	Property line north of Nowelo Road	Primary: Traffic (Nowelo Rd.) Secondary: Nature	6 days	10:00 AM 4/15/22
L2	Center of project site	Primary: Nature Secondary: Distant traffic (Komohana St.)	6 days	10:00 AM 4/15/22
S1	Approx. 10 feet north of Nowelo Road	Primary: Traffic (Nowelo Rd.) Secondary: Nature	20 minutes	11:20 AM 4/15/22
S2	Approx. 10 feet west of Komohana Street	Primary: Traffic (Komohana St.) Secondary: Nature	20 minutes	12:30 PM 4/15/22

5.2.2 Measurement Site L1

Long-term measurement site L1 is on the southern property line of the project area and is approximately 10 feet from Nowelo Road edge-of-pavement, as shown in Figure 3. The noise sources at this location included occasional vehicular traffic on Nowelo Road and environmental sources such as birds. A graphical representation of the one-hour L_{eq} and the L_{90} measurement data is shown in Figure 4.

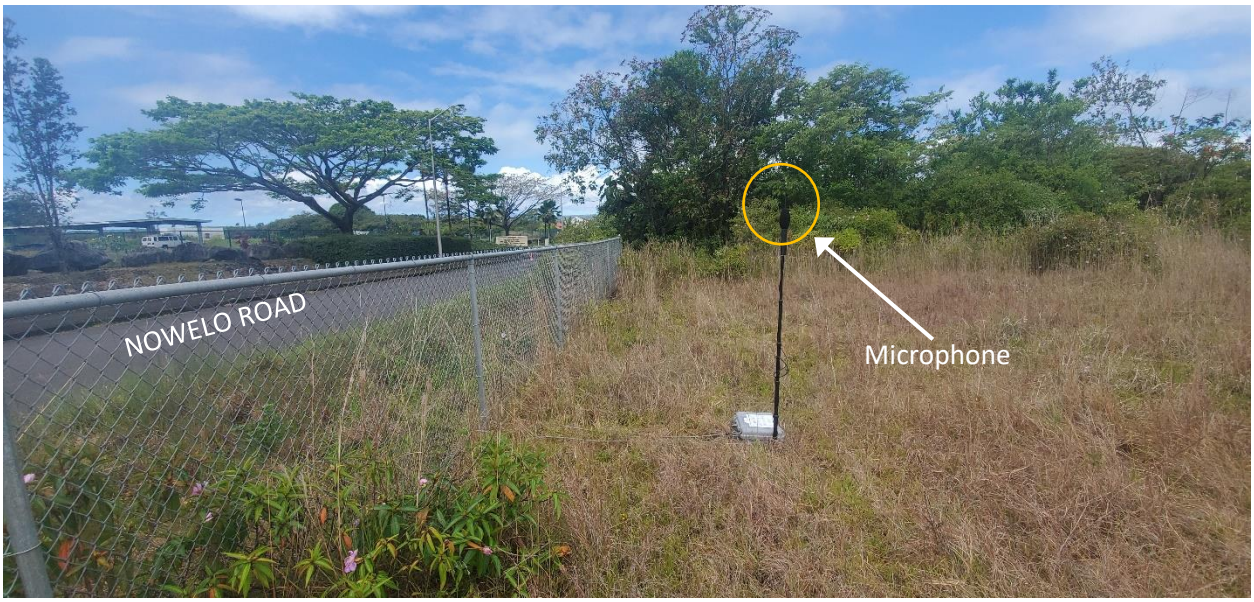


Figure 3: Long-Term Measurement Site L1

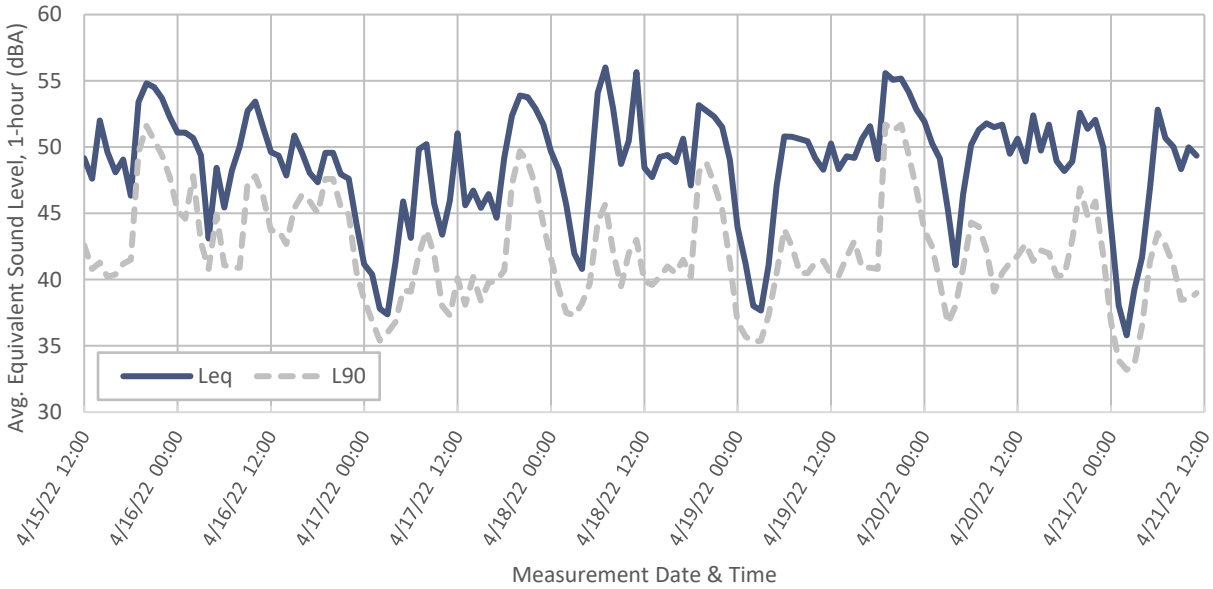


Figure 4: Long-Term Site L1 Measured Sound Levels

5.2.3 Measurement Site L2

Long-term measurement site L2 is at the approximate center of the project property, as shown in Figure 5. The noise sources at this location included environmental sources, such as birds, and traffic noise from Komohana Street was occasionally audible. A graphical representation of the one-hour L_{eq} and the L_{90} measurement data is shown in Figure 6.

Figure 5: Long-Term Measurement Site L2

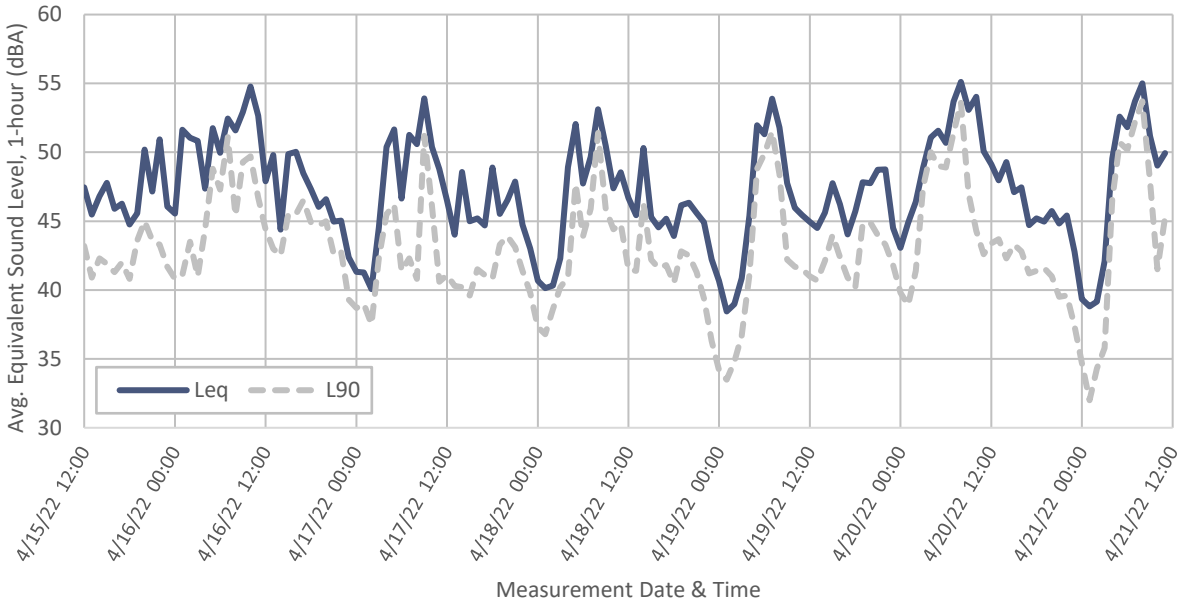


Figure 6: Long-Term Measurement Site L2 Sound Levels

5.2.4 Measurement Site S1

Short-term measurement S1 location is at the same location as long-term measurement site L1, refer to Section 5.2.2 above. This 20-minute measurement session started at 11:20 AM on Friday, April 15, 2022. A 20-minute traffic count was also performed during this measurement period.

5.2.5 Measurement Site S2

Short-term measurement site S2 is approximately 10 feet west of the edge-of-pavement of Komohana Street, as shown below in Figure 7. This 20-minute measurement session started at 12:30 PM on Friday, April 15, 2022. A 20-minute traffic count was also performed during this measurement period.

Figure 7: Short-Term Measurement Site S2

5.3 Sound Measurement Results

5.3.1 Long-Term Measurement Results

Table 7 presents a summary of the measured sound levels at locations L1 and L2. The data is presented in terms of the daytime and nighttime 1-hour equivalent sound level (L_{eq}) and the day-night level (L_{dn}). Graphical representations of the long-term sound level measurements at each location are provided in sections 5.2.2 and 5.2.3 above.

Table 7: Long-Term Measurement Results Summary

Measurement ID	Dist. from Road	Daytime L_{eq}	Nighttime L_{eq}	Day-Night Level L_{dn}
L1	10 ft.	50.9 dBA	48.8 dBA	55.5 dBA
L2	450 ft.	49.3 dBA	47.9 dBA	54.5 dBA

5.3.2 Short-Term Measurement Results

Vehicular traffic noise from Nowelo Road and Komohana Street was the primary noise source for each short-term measurement. Although the total measurement time was less than an hour long, it is representative of sound levels for the entire hour. Short-term measurement results and a summary of the 20-minute traffic counts are shown in Table 8.

Table 8: Traffic Count Results Summary

ID - Road	Distance to EOP	L_{eq}	Speed Limit	North/West Bound		South/East Bound	
				Cars	Medium Trucks[1]	Cars	Medium Trucks[1]
S1 – Nowelo St	10 ft	47.9 dBA	20 mph	4	0	0	0
S2 – Komohana Rd	10 ft	70.9 dBA	45 mph	127	4	160	5

Notes:

1. Heavy trucks, buses, motorcycles, and other heavy vehicles were not observed during the traffic count

6 Traffic Noise Assessment

Traffic noise projections for the existing (Year 2022) and future conditions (Year 2025) were calculated using the FHWA Traffic Noise Model (TNM Ver. 3.1) [Reference 7]. The traffic noise analysis was based on peak hour AM and PM traffic volumes on Nowela Road and Komohana Street, as well as the nearby residential streets of Mohouli Street and Puainako Street. Peak hour traffic volume data was received in the *Traffic Impact Analysis Report* from Austin Tsutsumi [Reference 8] Additional input parameters included speed limit, estimates of traffic mix from on-site observations, and roadway and receiver locations. The short-term measurement data was used to validate the traffic noise model at the measurement locations L1, S1 and S2. Vehicular traffic noise was calculated for eleven (11) receiver locations, including one (1) receiver at the project site and ten (10) noise sensitive receptors located in surrounding areas, as shown in Figure 8.

6.1 Predicted Traffic Noise Levels

Vehicular traffic noise was calculated in terms of an hourly equivalent sound level, L_{eq}, for the peak AM and peak PM traffic hour. The results of the traffic noise analysis for the existing and future year (with and without project) are shown in Table 9 and Table 10.

Figure 8: Traffic Noise Analysis Receiver Locations

Table 9: Traffic Noise Analysis, Calculated AM and PM Peak Hour Traffic Noise

Receiver ID	Calculated Peak Hour Traffic Noise (dBA)					
	Existing 2022 Conditions		Future 2025 No Project		Future 2025 w Project	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
R1	65.4	64.8	65.6	65.2	65.7	65.3
R2	58.2	57.6	59.0	58.5	59.1	59.0
R3	57.5	56.8	58.3	57.8	58.4	58.3
R4	56.8	56.1	57.6	57.1	57.7	57.6
R5	62.8	62.1	63.7	63.0	63.8	63.6
R6	60.7	60.0	61.6	61.0	61.7	61.5
R7	64.5	63.4	65.3	64.9	65.4	65.1
R8	49.0	48.5	49.8	49.7	55.1	55.0
R9	49.1	48.8	50.0	50.0	51.4	51.5
R10	44.5	44.5	45.2	45.4	46.4	46.5
R11	65.9	65.8	66.5	66.6	66.6	66.6

Table 10: Traffic Noise Analysis, Predicted Future Increases in Traffic Noise

Receiver ID	Future 2025 Increase in Peak Hour Traffic Noise (dB)				Traffic Noise Impact?
	Non-Project Traffic		Add'l Increase due to Project		
	AM Peak	PM Peak	AM Peak	PM Peak	
R1	0.2	0.4	0.0	0.1	No
R2	0.8	0.9	0.1	0.5	No
R3	0.8	1.0	0.1	0.5	No
R4	0.8	1.0	0.1	0.5	No
R5	0.9	1.0	0.1	0.5	No
R6	0.9	1.1	0.1	0.4	No
R7	0.9	1.6	0.1	0.1	No
R8	0.8	1.1	5.3	5.4	No
R9	0.8	1.2	1.4	1.5	No
R10	0.6	0.9	1.2	1.2	No
R11	0.6	0.7	0.1	0.1	No

6.2 Traffic Noise Impact

A traffic noise impact can occur if the project traffic volumes result in a substantial noise increase, 5 dB or more. As shown in Table 10, the estimated increase in non-project related traffic growth (i.e., Future Year 2025 minus Existing Year 2022) at all receptor locations is estimated to result in a traffic noise level increase of less than 2 dB, which is an insubstantial increase. The additional increase in future traffic noise due to the project at for both AM and PM peak hour is less than 2 dB all receptor locations except for the project site (R8). This is considered an insubstantial increase which will be barely perceptible to the surrounding community. The project site itself (R8) will experience a traffic noise level increase of 5 dB due to the project generated traffic but this increase is not considered an impact since the site is not currently developed.

7 Project Related Noise Assessment

7.1 On-Site Noise Sources

The HVO/PIERC project will incorporate stationary mechanical equipment that is typical for laboratory/office buildings. Noise from the stationary mechanical equipment must comply with the HDOH [Reference 1] maximum permissible noise limits at the project site property line, as defined in Table 1. The project property is considered Class B and the applicable maximum noise levels are 60 dBA during daytime hours and 50 dBA during nighttime hours. Noise control measures may be required and should be incorporated into the design of the project.

7.2 General Construction Noise

Construction of the HVO/PIERC project will require a permit to allow for the operation of construction equipment that may exceed the HDOH maximum permissible noise limits [Reference 1]. Development of the project will involve excavation, grading, and other typical construction activities. Earthmoving equipment is typically the loudest equipment. Impact equipment such as pile drivers is not anticipated for the project.

Table 11 shows reference noise levels for various types of construction equipment at a distance of 50 ft from the noise source, obtained from the FHWA Construction Noise Handbook [Reference 9]. The equipment contained in Table 12 are the loudest pieces of equipment expected to be used in the construction of this project. Construction noise levels at nearby properties can vary significantly. The actual noise emissions from the construction equipment is a function of the location, number and type of equipment used.

Table 11: Construction Equipment Noise Levels

Equipment	Typical Noise Level 50 ft from Source
Backhoe	80 dBA
Grader	85 dBA
Bulldozer	85 dBA
Paver	89 dBA
Compactor	82 dBA
Excavator	81 dBA
Truck	88 dBA

The various construction phases may generate noise levels that are substantially louder than the existing noise environment, especially during the initial site preparation phase. Construction noises will be audible at the neighboring properties, but the impact will be temporary and short term.

8 General Noise Mitigation Methods

General sound mitigation methods and techniques for attenuating traffic, construction, and project noise are discussed below.

8.1 Traffic Noise Mitigation

Vehicular traffic noise is not expected to impact the project site or the nearest commercial and residential properties. Noise mitigation is not required.

8.2 Construction Vibration Mitigation

Construction noise can be mitigated with proper planning. Although specific noise mitigation may not be required for this project, there are several general factors that could be taken into consideration during construction of the project:

- **Community Noise Permit**
  All construction activities are restricted to the conditions defined in the Construction Noise Permit issued by HDOH [Reference 1]. All work must be done during the construction hours described in the permit, i.e., 7:00 am to 6:00 pm, Monday to Friday and 9:00 am to 6:00 pm on Saturday. Construction work is not permitted on Sundays or holidays.

- **Community Engagement**
  Humans perceive noise and vibration subjectively. Construction and other undesirable noise sources seem more annoying when they are unexpected. A concerted effort should be made to have a dialogue with the surrounding community and set expectations.

- **Work Sequencing**
  Vehicles should be spread out over the project area and not all work close to the property line simultaneously. Particularly noisy tasks should be separated throughout the work schedule when possible.

- **Project Site Layout**
  Noisy stationary equipment, such as generators, should be moved away from noise-sensitive receivers when possible.

- **Mitigation at Source**
  Use low-noise versions of equipment, when possible. Installing mufflers is an effective way to mitigate noise at the source. An equipment maintenance program is necessary as poorly maintained equipment can produce unusually high noise levels.

8.3 Project Stationary Mechanical Equipment

Stationary mechanical equipment on the project site will not generate significant noise complaints if noise control measures are taken into consideration during the design of the project:

- **Distance from Noise Source**
  Locating the exterior stationary mechanical far from the project property lines or siting equipment such that the HVO/PIERC building blocks equipment noise will reduce noise levels to the surrounding properties.

- **Noise Control at Source**
  Equipment enclosures, silencers and acoustical louvers may be required to reduce equipment noise levels at the location of the mechanical equipment.

9 References

1. Department of Health, State of Hawaii, *Community Noise Control*, Chapter 46, Administrative Rules, Title 11, September 23, 1996.

2. Department of Transportation, Federal Highway Administration, *Procedures for Abatement of Highway Traffic Noise,* Title 23, CFR, Chapter 1, Subchapter H, Part 772, 75 FR 39820, July 13, 2010.

3. Department of Transportation, Highways Division, State of Hawaii, *Noise Analysis and Abatement Policy*, December 1, 2011.

4. U.S. Environmental Protection Agency, *Toward a National Strategy for Noise Control,* April 1977.

5. Department of Housing and Urban Development, *Environmental Criteria and Standards,* Title 24, CFR, Part 51, 44 FR 40860, July 12, 1979; Amended by 49 FR 880, January 6, 1984.

6. International Standards Organization, *Noise Assessment with Respect to Community Responses*, November 1969.

7. U.S. Department of Transportation, Federal Highway Administration, *Traffic Noise Model,* Version 3.1, September 2021.

8. Austin, Tsutsumi & Associates, Inc., *Traffic Impact Analysis Report*, USGS Hilo Facility, June 6, 2022.

9. Department of Transportation, Federal Highway Administration, *Construction Noise Handbook*, Chapter 9, Table 9.1, August 2006.

APPENDIX G

Comment Summary and Letters Received During Pre-Assessment Consultation

G Comment Summary and Letters Received During Pre-Assessment Consultation

Table G-1: Pre-Assessment Consultation Comments

Agency/Organization	Contact	Date	Comments
FEDERAL			
U.S. Environmental Protection Agency	Ann McPherson	Ltr dated 4/22/2022	EPA offers following scoping recommendations to USGS to consider when preparing the draft EA (see Detailed Comments): <u>Purpose and Need</u> In DEA, clearly identify the underlying purpose and need to which USGS is responding in proposing the alternatives… Purpose and need should be a clear objective statement of the rationale for the proposed project. Describe the criteria used to determine the minimum project size that would be considered feasible. <u>Range of Alternatives</u> DEA should include a reasonable range of alternative that meet stated purpose and need and are responsive to the issues identified during the scoping process. Include options for avoiding environmental impacts. Alternatives analysis should describe approach used to identify environmentally sensitive areas. Environmental impacts of proposed action and alternatives should be presented in comparative form, defining issues and providing clear basis for choice. <u>Biological Resources</u> DEA should identify all petitioned and listed T&E species and critical habitat. Quantify which maybe directly, indirectly, or cumulatively affected by each alternative. Engage USFWS as early as possible.

Agency/Organization	Contact	Date	Comments
			Invasive Species—EO 13112 mandates that federal agencies whose action may affect status of invasive species use authorities to prevent the introduction, provide for control, and minimize economic, ecological and health impacts of invasive species. DEA should describe how project will meet requirements of EO 13112. <u>Air Quality</u> DEA should provide detailed discussion of ambient air conditions, NAAQS, nonattainment areas, and potential impacts, including cumulative and indirect for each alternative. Analyze mitigation reduce project related greenhouse gas, fugitive dust, and other emissions. <u>Water Resources</u> *Clean Water Act Section 404*—DEA should describe all waters of the US that could be affected. Avoid wetlands/waters of US. *Nonpoint Source Pollution and Low Impact Development*—Identify ways to minimize project footprint and reduce impervious surfaces. LID features should be included in project design. *Clean Water Act Section 303(d*)—DEA should provide info on CWA 303(d) impaired waters in project area. <u>Green Building Certification and Sustainability</u> Recommend utilize LEED standard for green building. USGS should specify in its development contact that developer design and construct facility for LEED certification. EPA encourages the use of construction from mostly recycled or reused materials. DEA discuss how facilities will work to reduce its carbon footprint. Consider Sustainable SITES Initiative voluntary guidelines and rating system. <u>Energy Conservation and Efficiency, Renewable Energy</u>

Agency/Organization	Contact	Date	Comments
			DEA should discuss how facilities can aid in meeting State's goal of 100% renewable energy by 2045. Project should include energy conservation and efficiency measures. Project location conducive to solar energy generation. Shading parking areas reduces evaporative emissions of air pollutants from parked vehicle. Discuss and evaluate solar water heating. <u>Haz Materials/Waste Management</u> DEA should discuss potential direct, indirect and cumulative impacts of waste generation including haz waste from construction and operation activities. Identify projected waste types and volumes, storage, disposal and management. Explain how generation of haz waste would be minimized. DEA should discuss whether any pesticides etc. would be used at project site. <u>NHPA Consultation</u> Describe process and progress of Section 106 consultation between USGS and NHOs. <u>Environmental Justice</u> EO 12898 and MOU on Environmental Justice direct federal agencies to identify and address disproportionately high and adverse effect on minority and low-income populations. DEA should include evaluation of EJ populations within geographic scope of the project area. Describe how proposed action would address potential for disproportionate adverse impacts and approaches used to foster public participation and coordination. (see references for EJ analysis).
U.S. Fish and Wildlife Service, Maui Nui & Hawai'i Island Team, Pacific Islands Fish and Wildlife Office	Melissa Cady, Melissa_cady@fws.gov, (808) 933-6963	Email dated 4/8/2022	USFWS Pacific Island Fish and Wildlife Office has transitioned to use the Information for Planning and Consultation (IPaC) online portal (https://ipac.ecosphere.fws.gov/) for federal action agencies to obtain official species lists.

Agency/Organization	Contact	Date	Comments
			Sent IPaC information
STATE OF HAWAII			
Department of Accounting and General Services	Gayle Takasaki, Planning Branch (808) 586-0584	Ltr dated 4/30/2022	No comments to offer at this time as project does not impact any DAGS projects or existing facilities.
DAGS	Dennis Chen, Planning Branch, dennis.yk.chen@hawaii.gov (808) 586-0491	Ltr dated 4/12/2022	Project does not impact DAGS-projects or existing facilities. No comments to offer at this time.
Department of Hawaiian Homelands	Andrew H. Choy, Planning Program Manager, (808) 620-9481, Andrew.h.choy@hawaii.gov Ref.: PO-22-086	Ltr dated 4/8/2022	Due to lack of proximity to Hawaiian Home Lands, we do not anticipate any impacts to our lands or beneficiaries from the project. Highly encourage all agencies to consult with Hawaiian Homestead community associations and other native Hawaiian organizations when preparing environmental assessments
Department of Health, Disability Communication Access Board (DCAB)	Duane Buote, Facility Access Coordinator, (808) 586-8121, duane.buote@doh.hawaii.gov	Ltr dated 4/19/2022	Because project on state land, covered by §103-50 HRS and will be reviewed with DOJ 2010 ADA Standards for Accessible Design. Required to be submitted to DCAB for formal document review. Because project is a federal facility, it will also have to comply with Architectural Barriers Act (ABA); this is not included in the DCAB review process. Recommend issues in forthcoming design: provide accessible parking stalls and access aisles; accessible route from parking to new building. All employee work areas to be accessible. Beyond DCAB's review process, program access obligations must be met under ADA Title II provisions.
Department of Health, Safe Drinking Water	Michael Miyahira, PE, Supervisor, Engineering Section (808) 586-4258, Michael.miyahira@doh.hawaii.gov	Email dated 4/1/2022	We no longer respond directly to requests for comments on this type of action. Please utilize the DOH-SDWB Standard Comments on the DOH-SDWB website at https://health.hawaii.gov/sdwb (direct link at

Agency/Organization	Contact	Date	Comments
			https://health.hawaii.gov/sdwb/files/2020/11/SDWBstdCmts2020.docx-signed.pdf) regarding your project's responsibilities to maintain drinking water quality and any necessary permitting.
Department of Health, Solid and Hazardous Waste Branch	Solid and Hazardous Waste Branch, (808) 586-4226, shwb@doh.hawaii.gov	Email dated 4/21/2022	SHWB Standard Comments attached
Department of Land and Natural Resources, Land Division	Darlene Nakamura (808) 587-0417, Darlene.k.nakamura@hawaii.gov Engineering-Carty S. Chang	Ltr dated 4/27/2022	Engineering Division Rules and regs of National Flood Insurance Program (NFIP), Title 44 CFR are in effect when development within Special Flood Hazard Area. Contact applicable County NFIP coordinating agency. Division of Forestry and Wildlife State listed Hawaiian hoary bat could potentially occur in area. Time site clearing to avoid disturbance, no disturbance of trees above 15 ft, avoid barbed wire. Artificial light can adversely impact seabirds. Fully shield all lights, avoid nighttime work during fledging season. Hawaiian Goose Nene has potential to occur in vicinity. If any present during construction, all activities within 100 ft should cease; work may continue after bird leaves the area. Hawaiian hawk may occur in vicinity. Recommend surveying area to ensure none present if trees are to be cut. Minimize movement of plant or soil material between worksites such as in fill, which may contain invasive fungal pathogens, vertebrate and invertebrate pests or invasive plant parts. Consult Big Island Invasive Species Committee in planning, design and construction. All equipment, materials and personnel should be cleaned of excess soils and debris to minimize spread of invasive species.

Agency/Organization	Contact	Date	Comments
			To prevent spread of Rapid Ohia Death, if ohia trees will be removed, trimmed or injured, follow noted guidance. Recommend surveys for rare and endangered plants be conducted in all proposed affected areas. Recommend using native plant species for landscaping that are appropriate for the area. Do not plant invasive species. Consult Hawaiʻi Pacific Weed Risk Assessment website. Refer to www.plantpono.org for guidance on selection and evaluation for landscaping plants. Land Division-Hawaiʻi District No comments.
Department of Land and Natural Resources, State Historic Preservation Division	SHPD Intake specialist	Email sent 3/30/2022	SHPD no longer accepts email or hardcopy requests for review. All submissions for SHPD review must be submitted online to Hawaiʻi Cultural Resource Information System (HICRIS) at https://dlnr.hawaii.gov/shpd/
Office of Planning & Sustainable Development	Joshua Hekekia, (808) 587-2845	Ltr dated 4/29/2022	1. CZMA Federal Consistency National CZMA requires fed actions be consistent with approved state coastal programs. May be subject to CZMA fed consistency review. Recommend USGS consult with our office on applicability of CZMA fed consistency. Hawaiʻi Coastal Zone Management (CZM) Program Draft should include discussion of project consistency with policies of Hawaiʻi CZM program, HRS §205A-2, as amended. Disclose impact on CZM objective sand supporting policies as relates to HRS 343 requirements. Stormwater Runoff, Erosion, and Water Resources As DEA is intended to meet both NEPA and Chapter 343 requirements, consider as appropriate to specific action, the affected

Agency/Organization	Contact	Date	Comments
			area (national, regional, local) and its resources; to ensure that nearshore marine resource remain protected, negative effects of stormwater inundation and sediment loading near the proposed project site should be evaluated. Issues that may be examined include area vulnerability to flood and erosion, susceptibility of water resources and nearshore area, intensification of stormwater runoff due to increase of permeable surfaces caused by proposed action. If necessary, mitigation for negative effects in short and long-term should be considered. Include discussion topics on stormwater runoff, erosion controls, and impacts on water resources. 4. State of Hawaii Geological Survey In anticipation of establishment of a State Geological Survey in HI, OPSD recommends that plans for replacement facilities for HVO and PIERC include sharing or co-location of office and other space for State Geological Survey.
Department of Transportation, Highways Division	Blayne Nikaido, HDOT Statewide Transportation Planning Office, (808) 831-7979, Blayne.h.nikaido@hawaii.gov	Ltr dated 4/19/2022	Airports Division (HDOT-A) Project approximately 1.94 mi from boundary of Hilo International Airport (ITO). All projects within 5 mi from Hawaiʻi State airports advised to read Technical Assistance Memorandum for guidance with development and activities that may require further review and permits. Project site approximately 11,306 feet from end of Runway 3 at ITO. FAA regulations requires submittal of FAA Form 7460-1 Notice of Proposed Construction or Alteration pursuant to CFR Title 14, Part 77.9. Due to proximity to ITO, applicant should be aware of potential single event noise from aircraft ops. Also potential for fumes, smoke, vibrations, odors etc. from occasional flight operations. If solar energy PV is installed, be aware PV systems in or near approach path of aircraft can create glint and glare hazard. FAA

Agency/Organization	Contact	Date	Comments
			requires glint and glare analysis for all solar PV systems near airports. Solar PV systems have been known to emit radio frequency interference (RFI) to aviation-dedicated radio signals. Owner of PV system shall be prepared to mitigate any RFI hazard upon notification by HDOT-A and/or FAA. HDOT-A requires that project does not provide landscape and vegetation that will create wildlife attractant which can become a hazard for aircraft operations. If project and landscaping create a wildlife attractant, developer shall be prepared to immediately mitigate hazard upon notification by HDOT-A and/or FAA. <u>Highway Division (HDOT-HWY)</u> Nearest State highway intersection is south of proposed site at Komohana Street (County jurisdiction) and Puainako (State Route 2000). Based on info provided, HDOT-HWY does not anticipate direct adverse impact on State highway. However, DEA traffic impact discussion should include the following: Jurisdiction of roadways in vicinity Location of existing and proposed site access driveways Observations regarding existing traffic conditions during peak traffic hours. Describe bicycle and ped routes and location of transit stops. Project description, including ops and construction activities/duration, hours of operation, estimated number of vehicle trips etc. Any work within State highway ROW to support facility Assessment of project potential direct, secondary and cumulative impact on State roadways If qualitative traffic assessment suggests a potential for adverse impact on State highways, DEA should include a TIAR.

Agency/Organization	Contact	Date	Comments
County of Hawai‘i			
Department of Environmental Management	Solid Waste Division, (808) 961-8270, gene.quiamas@hawaiicounty.gov Wastewater Division, (808) 961-8615, amelia.kajiyama@hawaiicounty.gov	Ltr dated 3/31/2022	Solid Waste Submit Solid Waste Management Plan on or before project advertised for bidding. South Hilo Sanitary Landfill closed in 2019. Construction waste must be disposed at West Hawai‘i Sanitary Landfill. 21 solid waste transfer stations are for residential use only Chapter 20 of Hawai‘i County code recently revised and retitled Integrated Solid Waste Management Wastewater Require connection of existing and/or proposed structures to public sewer in accordance with Section 21-5 of Hawai‘i County code Conduct sewer study in accordance with then applicable wastewater system design standards prior to approval to connect to County sewer system. Provide sewer line or other facility improvements as Director of DEM may reasonably require. Contact Wastewater Div chief for details.
Office of Housing and Community Development	Susan Kunz, Housing administrator, (808) 961-8379	Ltr dtd 3/31/2022	OHCD has no comments or concerns at this time
Planning Department	Kevin Sullivan, (808) 961-8135	Ltr dtd 4/12/2022	2005 County General Plan Policy 2.3(b) “encourages the expansion of the research and development industry by working with and supporting the UH Hilo and…other agencies’ programs that support sustainable economic development…” Select Courses of Action from the GP include: 10.2.4.2.2(d) Support continued expansion of the University system…and encourage continuing education programs. The transfer of State Lands to the University should be actively pursued.

Agency/Organization	Contact	Date	Comments
			10.2.4.2.2(g) Encourage the implementation of existing State and UH plans for the continued development of the "Research and Technology Park" on the campus of UH Hilo. State Land use designation of subject property is Agriculture. …Planning Department recommends that Draft EA address how the mission and operations of both HVO and PIERC at these proposed facilities are 'necessary for agricultural practices', otherwise a special permit may be required for non-agricultural use(s) under HRS 205-6 and HCC Section 25-5-72(c) or (d). County Site Plan Approval (application) will be required regardless.
Department of Water Supply	Ryan Quitoriano, Water Resources & Planning, (808) 961-8070, x256	Ltr dtd 4/21/2022	Existing 12-inch waterline within Nowelo Street fronting project site. Our records do not show existing service lateral at proposed site. Request estimated maximum daily water use calculations for review and approval. Dept. will determine if water available, charges, and improvements required for final approval. Existing 12-inch waterline fronting project adequate to provide required 2,000 gpm for fire protection. Any meters serving project requires installation of reduced pressure type backflow prevention assembly within 5 feet of the meter on private property. Department must inspect and approve installation prior to water service activation.
Other			
R. Scott Keeney, citizen	R. Scott Keeney	Email dtd 4/10/2022	I fully support the move to Hilo. Closer to UH facilities, residential and logistical resources.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

April 22, 2022

Jordan D. Sizemore, REM
USGS Environmental Management Branch
Box 25046 M.S. 205
Denver Federal Center
Denver, CO 80225

Subject: Scoping Comments for the Draft Environmental Assessment for the USGS HVO/PIERC Replacement Facilities, Waiakea, South Hilo, Hawaii

Dear Jordan Sizemore:

The U.S. Environmental Protection Agency has reviewed the U.S. Geological Survey's notice that they intend to prepare a Draft Environmental Assessment for a new facility to support the USGS Hawaii Volcano Observatory (HVO) and Pacific Island Ecosystem Research Center (PIERC). Our review and comments are provided pursuant to the National Environmental Policy Act, Council on Environmental Quality regulations (40 CFR Parts 1500-1508), and our NEPA review authority under Section 309 of the Clean Air Act.

Seismic activity from the 2018 eruption and summit collapse of Kilauea volcano was primarily centered near the Halema'uma'u crater, and significantly damaged buildings in the immediate vicinity on Uēkahuna Bluff, including the USGS HVO facility, prompting HVO to abandon its main building. Since the eruption, staff have been using temporary facilities in Hilo for office, lab, and warehouse functions. The existing PIERC facilities are located in the Hawaii Volcanoes National Park and were not affected by eruption-related damage; however, PIERC has long sought to relocate to Hilo, prompting the USGS to propose a consolidated HVO-PIERC science hub in Hilo. The proposed project will provide replacement facilities for HVO and PIERC, support approximately 103 staff and volunteers, and include office spaces, conference rooms, laboratories, warehouse/storage, and an operations/monitoring center.

The EPA offers the following scoping recommendations to the USGS to consider when preparing the Draft EA. These issues are discussed further in the attached Detailed Comments. The EPA appreciates the opportunity to comment on the preparation of the Draft EA. Once it is released for public review, please provide an electronic copy to me at mcpherson.ann@epa.gov. If you have any questions, please feel free to contact me at (415) 972-3545 or by email.

Sincerely,

Ann McPherson
Environmental Review Branch

Enclosure: EPA's Detailed Comments

U.S. EPA DETAILED COMMENTS ON THE SCOPING NOTICE FOR THE DRAFT ENVIRONMENTAL ASSESSMENT FOR THE USGS HAWAII VOLCANO OBSERVATORY/PACIFIC ISLAND ECOSYSTEM RESEARCH CENTER REPLACEMENT FACILITIES, WAIAKEA, SOUTH HILO, HAWAII COUNTY, HAWAII – APRIL 22, 2022

Purpose and Need

In the Draft Environmental Assessment, clearly identify the underlying purpose and need to which the U.S. Geological Survey is responding in proposing the alternatives (40 CFR 1502.13). The *purpose* of the proposed action is typically the specific objectives of the activity, while the *need* for the proposed action may be to eliminate a broader underlying problem or take advantage of an opportunity. The purpose and need should be a clear, objective statement of the rationale for the proposed project. Describe the criteria used to determine the minimum project size that would be considered feasible.

Range of Alternatives

The Draft EA should include a reasonable range of alternatives that meet the stated purpose and need for the project and that are responsive to the issues identified during the scoping process. A reasonable range of alternatives will include options for avoiding environmental impacts. The alternatives analysis should describe the approach used to identify environmentally sensitive areas and the process used to designate them in terms of sensitivity. A robust range of alternatives will include options for avoiding significant environmental impacts. The environmental impacts of the proposed action and alternatives should be presented in comparative form, thus sharply defining the issues, and providing a clear basis for choice among options by the decision maker and the public (40 CFR 1502.14).

Biological Resources

The Draft EA should identify all petitioned and listed threatened and endangered species and critical habitat that might occur within the project area. We recommend that the USGS quantify which species or critical habitat might be directly, indirectly, or cumulatively affected by each alternative. The U.S. Environmental Protection Agency recommends engaging the U.S. Fish and Wildlife Service as early as possible in the analysis to ensure that the proposed alternatives account for the following:

- Impacts to threatened, endangered, and special-status pieces found in the project area – including impacts from lighting, noise, and vegetation removal;
- Baseline conditions of habitats and populations of covered species;
- Clear description of how avoidance, mitigation, and conservation measures will protect and encourage the recovery of covered species and their habitat in the project area; and
- Monitoring, reporting, and adaptive management efforts to ensure species and habitat conservation effectiveness.

Invasive Species

Executive Order (E.O.) 13112, *Invasive Species* (February 3, 1999) mandates that federal agencies whose actions may affect the status of invasive species use their relevant authorities to prevent the introduction of such species, provide for their control, and minimize the economic, ecological, and human health impacts that invasive species cause. The Draft EA should describe how the project will meet the requirements of E.O. 13112. We recommend including an invasive plant management plan for the monitoring and control noxious weeds.

Air Quality

The Draft EA should provide a detailed discussion of ambient air conditions (baseline or existing conditions), National Ambient Air Quality Standards (NAAQS), nonattainment areas, and potential air

quality impacts of the project, including cumulative and indirect impacts, for each fully evaluated alternative. Emissions of all air pollutants, including greenhouse gases, should be estimated for construction and operations. The Draft EA should analyze reasonable practicable mitigation measures to reduce project-related greenhouse gas, fugitive dust, and other emissions. Typical mitigation measures include design changes to reduce construction and operations emissions, fugitive dust control measures, mobile and stationary source controls, and administrative controls.

Water Resources

Clean Water Act Section 404

The Draft EA should describe all waters of the U.S. that could be affected by the project alternatives and include maps that clearly identify all waters within the project area. Avoidance of any wetlands/waters of the U.S. is strongly recommended. If avoidance is not possible, we recommend early consultation with the U.S. Army Corps of Engineers (Corps) to determine if the proposed project requires a Section 404 permit under the Clean Water Act. If so, it is advisable to ensure that the NEPA alternatives are consistent with the alternatives analysis required under the CWA Section 404 (b)(1) Guidelines. In comparing alternatives, we recommend the discussion include the acreages and channel lengths, habitat types, values, and functions of the waters that would be affected. If water features are found onsite, the project design should make every effort to avoid them. Indirect impacts to these waters from land alteration should be evaluated.

Nonpoint Source Pollution and Low Impact Development

The project applicant should identify ways to minimize the project footprint and reduce impervious surfaces. Runoff from parking areas and roadways should be diverted into stormwater treatment structures such as bioretention areas, infiltration trenches or basins, or filter strips onsite. These and other low-impact development (LID) features should be included in the project design to ensure there is sufficient space allotted during the planning process. For more information see:

- https://www.epa.gov/green-infrastructure;
- https://www.epa.gov/nps/urban-runoff-low-impact-development; and
- https://bmpdatabase.org/.

Clean Water Act Section 303(d)

The CWA requires States to develop a list of impaired waters that do not meet water quality standards, establish priority rankings, and develop action plans called Total Maximum Daily Loads (TMDLs) to improve water quality. The Draft EA should provide information on CWA Section 303(d) impaired waters in the project area.

Green Building Certification and Sustainability

We recommend that the USGS utilize the Leadership in Energy and Environmental Design (LEED) standard for green building. LEED certified buildings save money, improve efficiency, lower carbon emissions, and create healthier places for people. They are a critical part of addressing climate change, enhancing resilience, and supporting more equitable communities. The USGS should specify in its development contracts that the developer design and construct the facility for LEED certification. More information about the LEED green building rating system is available at http://www.usgbc.org/leed. The EPA encourages the use of construction from mostly recycled or reused materials when implementing this project. This would offer an additional opportunity for marketing the HVO/PIERC Replacement Facilities as environment-friendly and as recognized leaders in the green building sector.

We recommend that the Draft EA discuss how the HVO/PIERC Replacement Facilities will work to reduce its carbon footprint. Consider the Sustainable SITES Initiative which provides comprehensive, voluntary guidelines and a rating system to assess the sustainable design, construction, and maintenance of landscapes: https://www.sustainablesites.org/.

Energy Conservation and Efficiency, Renewable Energy

The State of Hawaii has a goal of 100% renewable energy by 2045. The Draft EA should discuss how the facilities can aid in meeting that goal. The project should include energy conservation and energy efficiency measures as best practices and these measures should be built into the project description. In addition, the project location is conducive to solar energy generation, such as rooftop/wall-mounted photovoltaics, and/or PV over parking lots. Shading parking areas also reduces evaporative emissions of air pollutants from parked vehicles. Solar water heating should be discussed and evaluated.

Hazardous Materials/Waste Management

The Draft EA should discuss the potential direct, indirect, and cumulative impacts of waste generation, including hazardous waste, from construction and operation activities. The document should identify projected waste types and volumes and describe their expected storage, disposal, and management. The Draft EA should explain how the generation of hazardous waste would be minimized and identify applicable federal and state hazardous waste requirements. The Draft EA should discuss whether any pesticides, including herbicides or rodenticides, would be used at the project site.

National Historic Preservation Act and Consultation with Native Hawaiian Organizations

Section 106 of the National Historic Preservation Act requires federal agencies to take into account the effects of their undertakings on historic properties and provide the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment on those undertakings. The NHPA requires that, in carrying out the requirements of Section 106, each federal agency must consult with any Native Hawaiian organization that attaches religious and cultural significance to historic properties that may be affected by the agency's undertakings. The ACHP has published a handbook for consultation with Native Hawaiian organizations in the Section 106 review process[1] that may be useful. We recommend the Draft EA describe the process and progress of Section 106 consultation between the USGS and any Native Hawaiian organizations that have shown an interest in the action, issues that were raised, and how those issues are being addressed in the development of the proposed action and alternatives

Environmental Justice

Executive Order 12898 "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" (February 11, 1994) and the "Memorandum of Understanding on Environmental Justice and Executive Order 12898," released on August 4, 2011, direct federal agencies to identify and address disproportionately high and adverse human health or environmental effects on minority and low-income populations, allowing those populations a meaningful opportunity to participate in the decision-making process. CEQ guidance clarifies the terms low-income and minority population, which includes Native Americans, and describes the factors to consider when evaluating disproportionately high and adverse human health effects.

The EPA recommends that the Draft EA include an evaluation of environmental justice populations within the geographic scope of the project area. If such populations exist, describe how the proposed action would address the potential for disproportionate adverse impacts to minority and low-income

[1] Available: https://www.energy.gov/sites/prod/files/2016/02/f30/Native%20Hawaiian%20Consultation%20Handbook.pdf

populations, and the approaches used to foster public participation and coordination with these populations. The EPA recommends the following for development of the EJ analysis:

- Consider *Promising Practices for EJ Methodologies in NEPA Reviews*[2] when developing the EJ section of the Draft EA.
- Include a description of the area of potential impact used for the environmental justice impact analysis and provide the source of demographic information.
- Consider using EPA's Environmental Justice Screening and Mapping Tool EJScreen.[3]
- Disclose whether the project will result in a disproportionate and adverse impact on minority or low-income populations.
- Discuss potential mitigation measures for any anticipated adverse impacts to community members that could result from the project.
- Include opportunities for incorporating public input to promote context sensitive design, especially in minority and low-income communities.
- Document the process used for community involvement and communication, including all measures to specifically involve to low-income and minority communities. Include an analysis of results achieved by reaching out to these populations.
- Identify any specific actions proposed by the USGS to reduce emissions from the project, including use of low or zero-emissions construction equipment, and inclusion of alternative fuel and green technology infrastructure. Include an estimate of the air quality benefits and reduced adverse health effects that would result from each mitigation measure proposed. Identify any specific mitigation measures considered for sensitive populations (e.g., schools, daycare facilities, hospitals, senior centers, etc.).

[2] *See* Promising Practices for EJ Methodologies in NEPA Reviews, May 2016 https://www.epa.gov/sites/production/files/2016-08/documents/nepa_promising_practices_document_2016.pdf
[3] https://ejscreen.epa.gov/mapper/

From:	Cady, Melissa N
To:	Leslie Kurisaki
Cc:	USGS-Hilo-HVO-PIERC; PIFWO_Admin, FW1
Subject:	USGS HVO/PIERC Replacement Facilities
Date:	Friday, April 8, 2022 9:09:50 AM
Attachments:	IPAC information letter and SL instructions_03172022.pdf

[This message was sent from an outside source.]
Hello Jordan,

US Fish and Wildlife Service, Pacific Island Fish and Wildlife Office has transitioned to the use of the Information for Planning and Consultation (IPaC) online portal, https://ipac.ecosphere.fws.gov/, for federal action agencies and non-federal agencies or individuals to obtain official species lists, including threatened and endangered species, designated critical habitat, and avoidance and minimization measures that can be incorporated into your specific project. Obtaining a species list in IPaC is relatively straightforward and takes minimal time to complete. Step by step instructions are included in the accompanying letter. USFWS requests that you please use this portal to develop your official species list and identify appropriate avoidance and minimization measures for the USGS HVO/PIERC Replacement Facilities. I have attached a letter with instructions for using the portal, and I invite you to reach out to me if you have any questions or problems using the portal to meet your project needs.

IPaC: Home

If you have a project that could potentially affect USFWS trust resources, such as migratory birds, species proposed or listed under the Endangered Species Act, inter-jurisdictional fishes, specific marine mammals, wetlands, and National Wildlife Refuge lands, IPaC can help you

ipac.ecosphere.fws.gov

Best Regards,

Melissa Cady
(she/her)
Maui Nui & Hawai‘i Island Team
Pacific Islands Fish and Wildlife Office
U.S. Fish and Wildlife Service
154 Waianuenue Avenue Suite 103
Hilo, Hawai‘i 96720-2452

Office Phone: 808-933-6963
Cell Phone: 808-443-9795
Email: melissa_cady@fws.gov

Mailing Address:
U.S. Fish and Wildlife Service
PO Box 653
Hilo, HI 96721

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

Subject: IPaC generated official species list for the Pacific Islands Fish and Wildlife Office

Dear Action Agency or Applicant:

Beginning March 21, 2022, the Pacific Island Fish and Wildlife Office (PIFWO) will be transitioning to the use of the Information for Planning and Consultation (IPaC) online portal, https://ipac.ecosphere.fws.gov/, for federal action agencies and non-federal agencies or individuals to obtain official species lists, including threatened and endangered species and designated critical habitat in your project area. IPaC has been used by continental USFWS offices to provide official species lists since 2017. Using IPaC expedites the process for species list distribution. Obtaining a species list in IPaC is relatively straightforward and takes minimal time to complete. Step by step instructions are included below.

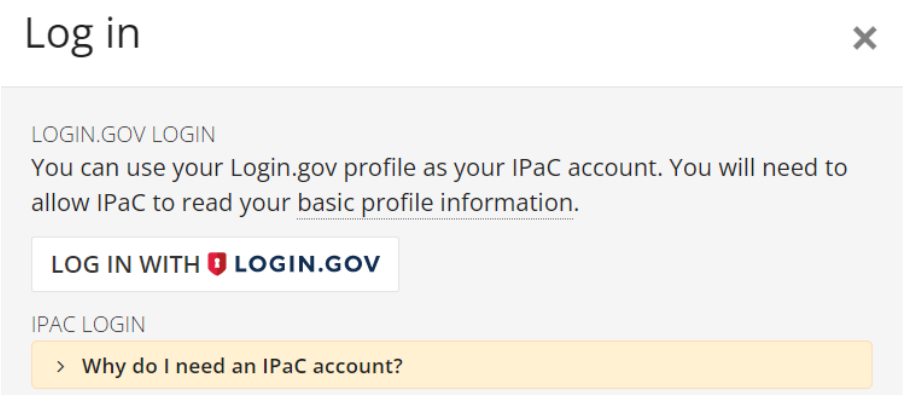
Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of your species list should be verified after 90 days. New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change the species list. Verification can be completed by visiting the IPaC website at regular intervals during project planning and implementation. An updated list may be requested through the IPaC system by completing the same process used to obtain the initial species list.

We hope this process provides efficiencies to our partners in obtaining a species list. For federal action agencies, it also opens additional IPaC functionality that the PIFWO office is still working on, such as the use of Determination Keys for informal section 7 programmatic consultations. We will let our agency partners know when that functionality becomes available.

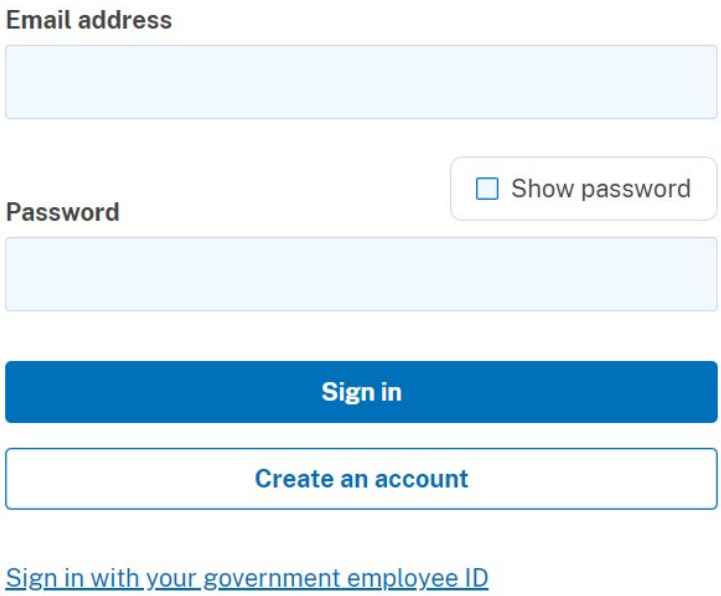
If you have questions about a species list obtained through the IPaC system or need assistance in completing an IPaC species list request, please contact the Service at 808-792-9400 or via email at pifwo_admin@fws.gov. We appreciate your efforts to conserve listed species across the Pacific Islands.

Instructions for Action Agencies and partners to obtain an official species list in IPaC

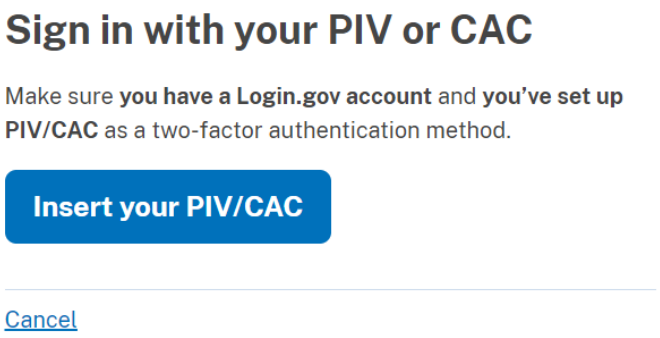
- Navigate to https://ipac.ecosphere.fws.gov/
- You can get an unofficial species list without logging in. However, if you want an official species list you will need to log in first using your Login.gov account. If you don't have an IPaC account, they are easy to create.



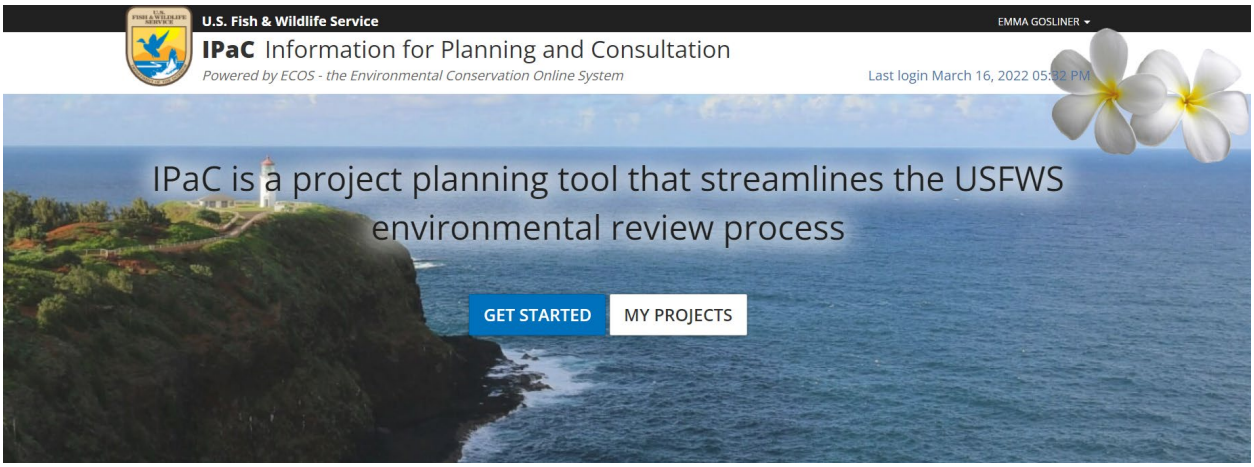
Select Log in with Login.gov and sign in using your email and password.



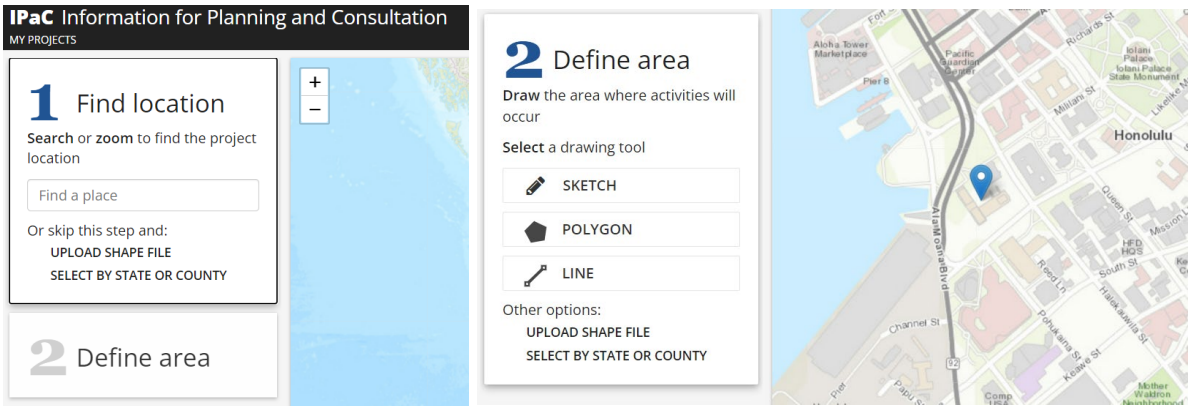
If you have a PIV or CAC card, you can sign in using that method as well.

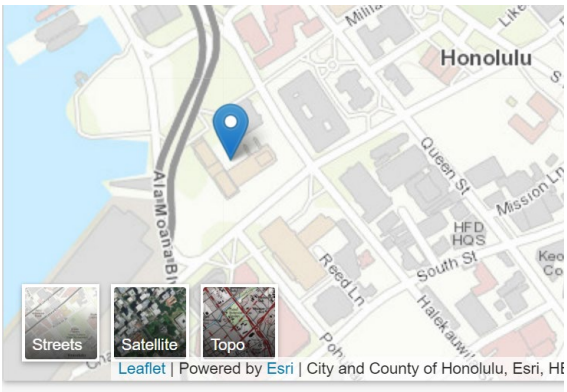


- Once you log in, select "Get Started".

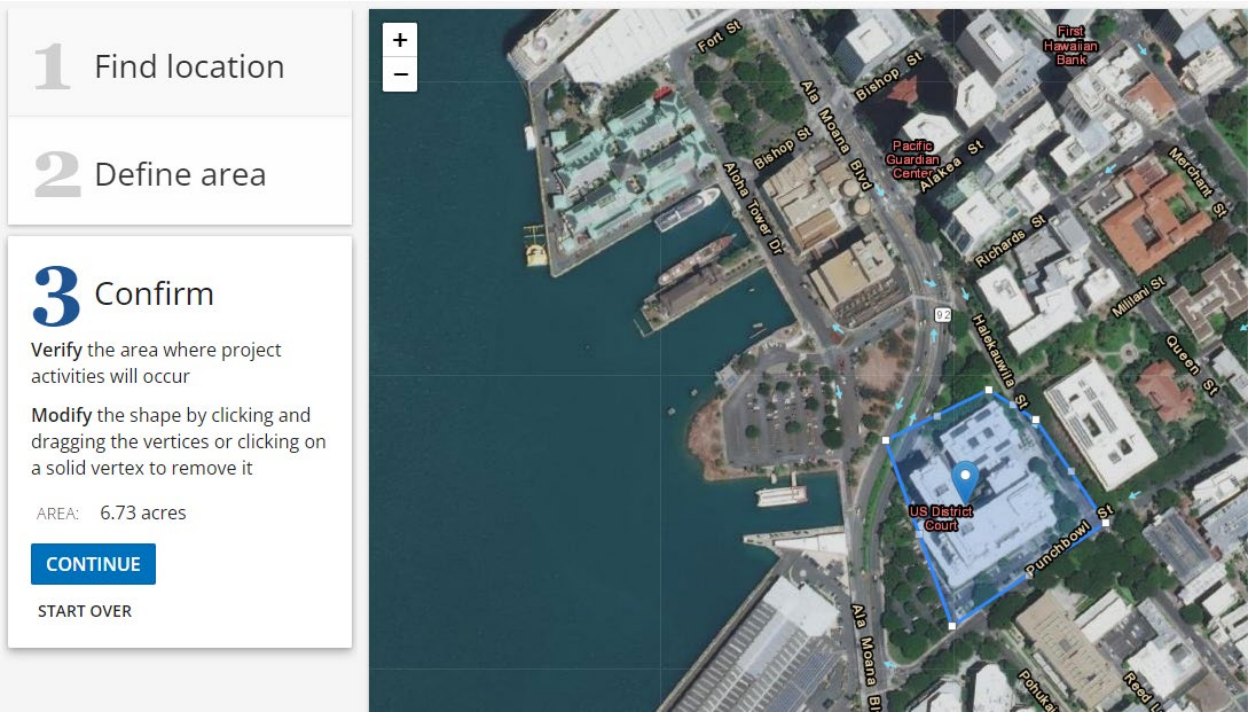


- Define the action area: Identify the location of the proposed action by uploading an existing shapefile or by entering an address or coordinates of the action area. Once identified on the map, you can manually draw the action area using the drawing tools.



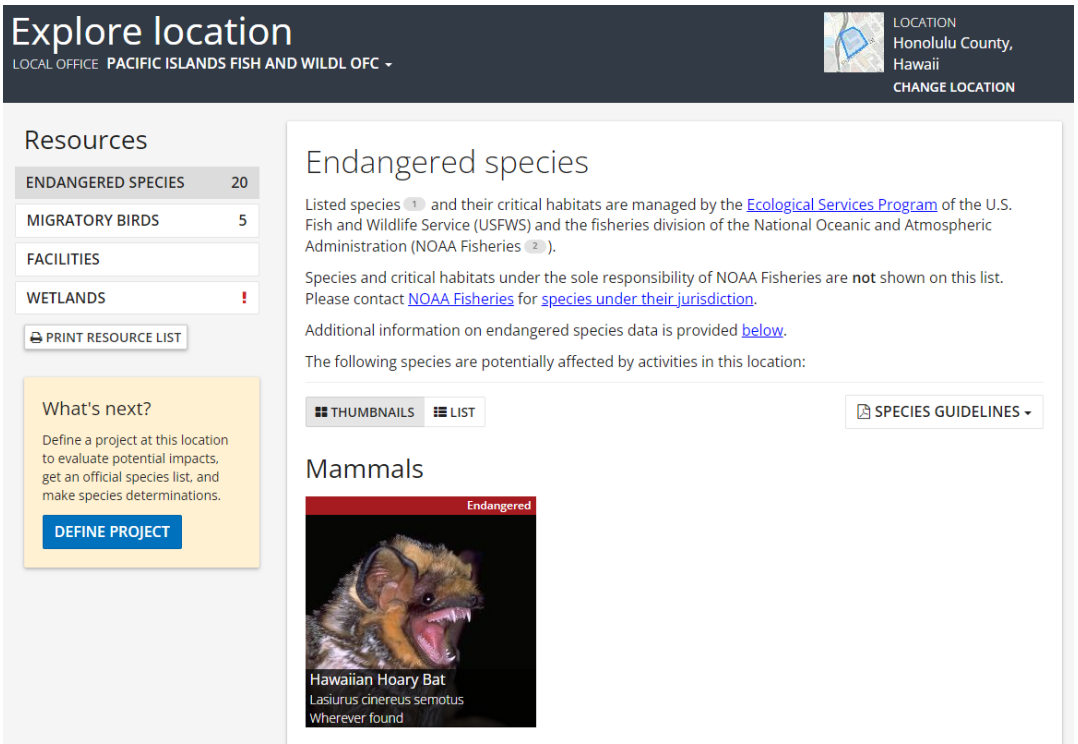


To help identify your action area you can choose between multiple base maps available.

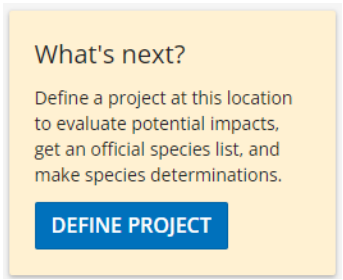


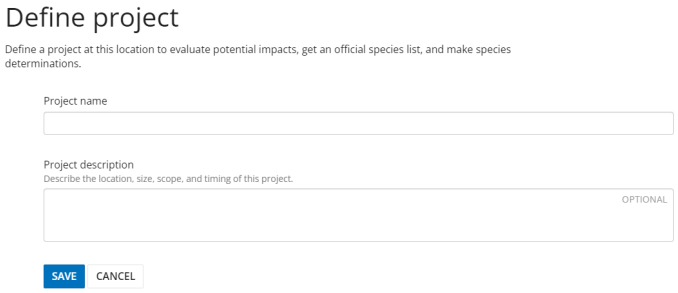
Press continue when you have finished drawing or uploading the action area location.

- The species information on the page that follows is <u>not</u> official. However, it identifies the project County, local Fish and Wildlife Field Office, species covered under NOAA Fisheries as well as Migratory Bird Treaty Act species. The list can be viewed in Thumbnail or List format.



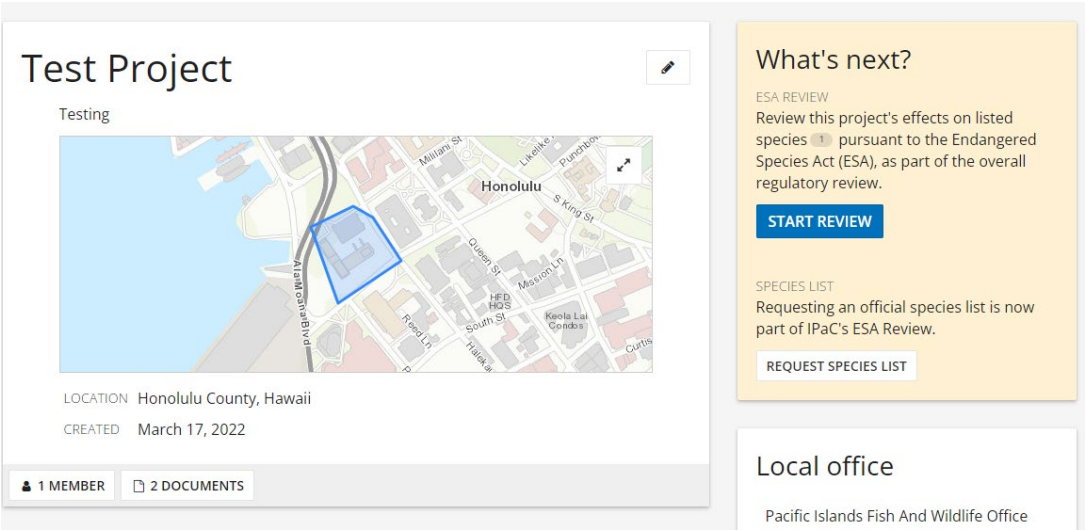
- Continue with the following steps to comply with the requirements of ESA section 7 to obtain an **official species list**.
- Select Define Project



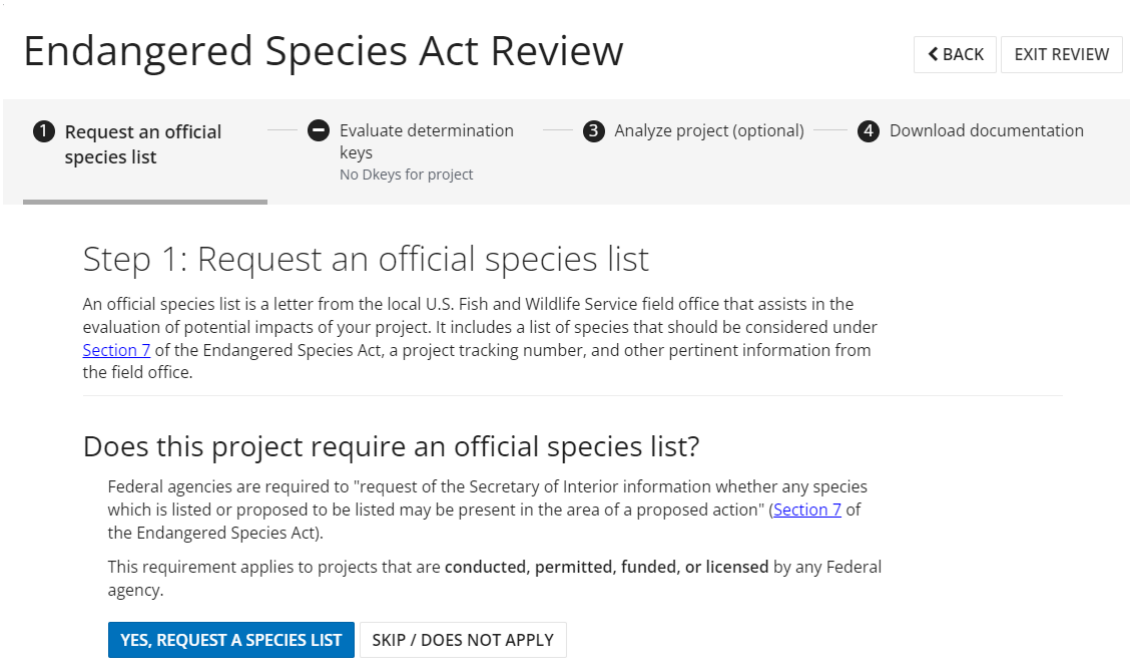


Enter the Project Name and a brief description of the project (a description is not mandatory, but recommended for future coordination with the Service). Click SAVE at bottom of page.

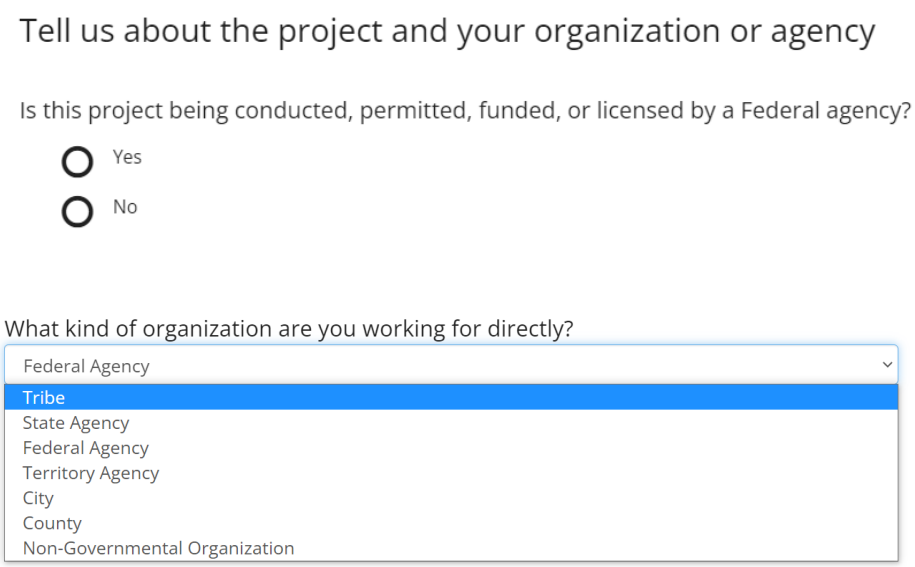
- At the bottom of the What's next box on the right, click Request Species List



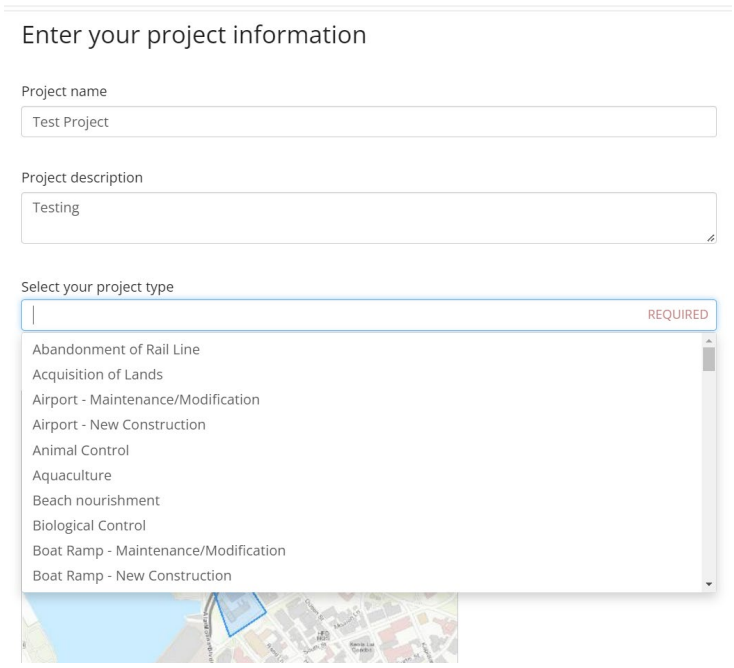
- on the following screen, click Yes, Request Species List



- Fill out the contact information for yourself or your agency. Contractors, state partners, and any other project proponents may request a species list and should be covered using the dropdown menus.



- From the pull-down menu for Classify Type of Project, select the project type that best fits the proposed action.



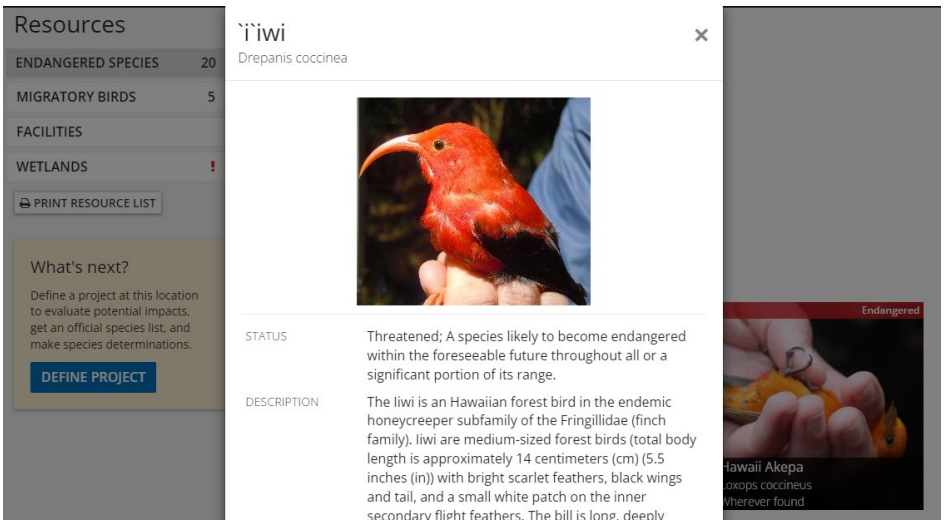
- Once all required sections are filled out, press SUBMIT OFFICIAL SPECIES LIST REQUEST

Location

SUBMIT OFFICIAL SPECIES LIST REQUEST

- An Official Species List should be generated and available for download in a couple of seconds.

- If you need additional information on a species, click on their name that is hot-linked to their species information page. A brief overview of the species' status, description and critical habitat will appear as well as a link to their ECOS species profile.



DAVID Y. IGE
GOVERNOR

CURT T. OTAGURO
COMPTROLLER

AUDREY HIDANO
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P.O. BOX 119, HONOLULU, HAWAII 96810-0119

(P)22.043

MAR 30 2022

Ms. Leslie Kurasaki
HHF Planners
733 Bishop Street, Suite 2590
Honolulu, HI 96813

Dear Ms. Kurasaki

Subject: Draft Environmental Assessment, Pre-Assessment Consultation
USGS HVO/PIERC Replacement Facilities
Waiakea, South Hilo, Island of Hawai'i
TMK: (3) 2-4-001:122 (por)

Thank you for the opportunity to comment on the subject project. We have no comments to offer at this time as the proposed project does not impact any of the Department of Accounting and General Services' projects or existing facilities.

If you have any questions, your staff may call Ms. Gayle Takasaki of the Planning Branch at 586-0584.

Sincerely,

CHRISTINE L. KINIMAKA
Public Works Administrator

GT:mo

DAVID Y. IGE
GOVERNOR

CURT T. OTAGURO
COMPTROLLER

AUDREY HIDANO
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P.O. BOX 119, HONOLULU, HAWAII 96810-0119

(P)22.055

APR 12 2022

Ms. Leslie Kurisaki
HHF Planners
733 Bishop Street, Suite 2590
Honolulu, Hawaii 96813

Dear Ms. Kurisaki:

Subject: United States Geological Survey (USGS)
Hawaii Volcano Observatory (HVO) /
Pacific Island Ecosystems Research Center (PIERC) Replacement Facilities
Draft Environmental Assessment Pre-Assessment Consultation
Waiakea, South Hilo, Island of Hawaii
TMK: (3) 2-4-001:122 (por.)

Thank you for the opportunity to provide comments on the subject project. The project does not impact any of the Department of Accounting and General Services' projects or existing facilities in the Hilo area, and we have no comments to offer at this time.

If you have any questions, your staff may call Mr. Dennis Chen of the Planning Branch at (808) 586-0491 or via e-mail at dennis.yk.chen@hawaii.gov.

Sincerely,

CHRISTINE L. KINIMAKA
Public Works Administrator

DE:mo

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

JOSH GREEN
LT GOVERNOR
STATE OF HAWAII

WILLIAM J. AILA, JR
CHAIRMAN
HAWAIIAN HOMES COMMISSION

TYLER I. GOMES
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P O BOX 1879
HONOLULU, HAWAII 96805

April 8, 2022 Ref.:PO-22-086

Leslie Kuraishi
HHF Planners
USGS-Hilo-HVO-PIERC@hhf.com

Aloha Leslie:

Subject: USGS HVO/PIERC Replacement Facility EA
Draft Environmental Assessment (DEA),
Pre-Assessment Consultation
Waiakea, South Hilo, Hawaii island
TMK: (3) 2-4-001:122 (por)

The Department of Hawaiian Home Lands acknowledges receiving the request for comments on the above-cited project. After reviewing the materials submitted, due to its lack of proximity to Hawaiian Home Lands, we do not anticipate any impacts to our lands or beneficiaries from the project.

However, we highly encourage all agencies to consult with Hawaiian Homestead community associations and other (N)native Hawaiian organizations when preparing environmental assessments in order to better assess potential impacts to cultural and natural resources, access and other rights of Native Hawaiians.

Mahalo for the opportunity to provide comments. If you have any questions, please contact Andrew H. Choy, Planning Program Manager at (808)620-9481 or contact via email at: andrew.h.choy@hawaii.gov.

Me ke aloha,

William J. Ailā, Jr., Chairman
Hawaiian Homes Commission

DISABILITY AND COMMUNICATION ACCESS BOARD

1010 Richards Street, Room 118 • Honolulu, Hawaii 96813
Ph. (808) 586-8121 • Fax (808) 586-8129

April 19, 2022

Mr. Jordan Sizemore
USGS Environmental Management Branch
United States Department of the Interior
U.S. Geological Survey
Denver Federal Center
Denver, Colorado 80225

Regarding: Draft Environmental Assessment Pre-Assessment Consultation for USGS HVO/PIERC Replacement Facilities Project, Waiakea, South Hilo, Hawaii
Tax Map Key (TMK): (3) 2-4-001 (por)

Dear Mr. Sizemore:

The Disability and Communication Access Board (DCAB) would like to thank you for the opportunity to review and comment on the Draft Environmental Assessment Pre-Assessment for USGS HVO/PIERC Replacement Facilities Project. The purpose of this review is to ensure that this project will take into account accessibility design requirements for persons with disabilities.

Because this project is being constructed on State land, it is covered by §103-50, Hawaii Revised Statutes (HRS). The construction of the USGS HVO/PIERC Replacement Facilities Project will be reviewed for compliance with the Department of Justice's (DOJ) 2010 ADA Standards for Accessible Design (2010 Standards) http://www.ada.gov/2010ADAstandards_index.htm. To be consistent with the DOJ's standard, DCAB adopted the 2004 Americans with Disabilities Act Accessibility Guidelines (ADAAG) as of January 1, 2011 and passed interpretive opinions consistent with the 2010 ADA Standards. All new Interpretive Opinions can be viewed or downloaded at http://health.hawaii.gov/dcab/facility-access/interpretive-opinions/.

Because this project is a federal facility, it will also have to comply with the Architectural Barriers Act (ABA), but this is not included in the DCAB review process. If you have any questions regarding your obligations under the ABA, you should contact the U.S. Access Board for guidance.

Projects with construction documents that are covered by §103-50, HRS, are required to be submitted to DCAB for a formal document review.

A preliminary review of the Draft Environmental Assessment Pre-Assessment prepared by the United States Department of Interior, U.S. Geological Survey Division prompts the following issues that we recommend that the department address in their forthcoming project design. Where a new on-site parking facility is being proposed, accessible parking stalls and access aisles shall be provided. An accessible route shall be provided from new accessible parking stalls and access aisles to the proposed new building facilities. The ABA requires that all employee work areas to be accessible.

The above DCAB staff comments address the key issues found in the Draft Environmental Assessment Pre-Assessment Consultation for USGS HVO/PIERC Replacement Facilities Project but does not reflect all the elements required to be accessible. The forthcoming design documents will have to be reviewed to more accurately address all of the accessibility requirements.

Beyond DCAB's review process, program access obligations must be met under the ADA Title II provisions. This obligation may require additional means to provide access, especially where full compliance with the 2010 Standards cannot be achieved.

Should you have any questions, please feel free to contact Duane Buote, Facility Access Coordinator at (808) 586-8121 or duane.buote@doh.hawaii.gov.

Sincerely,

KIRBY L. SHAW
Executive Director

From: Westbrook, Chantyll
To: USDS-Hilo-HVO-PIERC@hhf.com; Leslie Kurisaki
Cc: Miyahira, Michael M; Uehara, Norris N; Corrigan, Joan
Subject: USGS HVO-PIERC Replacement Facility EA
Date: Friday, April 1, 2022 7:23:05 AM

[This message was sent from an outside source.]

Good morning, Jordan D. Sizemore, REM,

The Department of Health (DOH), Safe Drinking Water Branch acknowledges receipt of your letter dated, March 29, 2022, regarding the USGS HVO-PIERC Replacement Facilities, Draft Environmental Assessment Pre-Assessment Consultation, Waiakea, South Hilo, Island of Hawaii, TMK (3) 2-4-001:122 (por).

We no longer respond directly to requests for comments on this type of action.

Please utilize the DOH-SDWB Standard Comments on the DOH-SDWB website at https://health.hawaii.gov/sdwb (direct link at https://health.hawaii.gov/sdwb/files/2020/11/SDWBstdCmts2020.docx-signed.pdf) regarding your project's responsibilities to maintain drinking water quality and any necessary permitting. Thank you for your understanding and cooperation.

If there are any questions, please contact Mr. Michael Miyahira, P.E., Supervisor, of the Engineering Section, at (808) 586-4258 or michael.miyahira@doh.hawaii.gov.

Thank you

Department of Health
Safe Drinking Water Branch
(808)586-4258

From: shwb
To: USGS-Hilo-HVO-PIERC
Subject: EA Pre-Assessment Consultation--USGS HVO-PIERC Replacement Facility
Date: Thursday, April 21, 2022 3:25:17 PM
Attachments: image001.jpg
Early Consult Ltr_DOI USGS_HVO-PIERC.pdf
SHWB STANDARD COMMENTS.pdf

[This message was sent from an outside source.]
Aloha,

Attached is our comments for the EA Pre-Assesment Consultation of USGS HVO-Pierc Facility.

doh

Solid and Hazardous Waste Branch
State of Hawaii | Department of Health
2827 Waimano Home Road, #100, Pearl City, HI 96782
Phone Number: (808) 586-4226 | Fax Number: (808) 586-7509

Solid and Hazardous Waste Branch Standard Comments

November 26, 2018

The Solid and Hazardous Waste Branch administers programs in the areas of:

1) Management of hazardous waste;
2) Management of solid waste; and
3) Regulation of underground storage tanks.

Our general comments on projects are below. For further information about these programs, please contact the Solid and Hazardous Waste Branch at (808) 586-4226. All chapters of the Hawaii Revised Statutes (HRS) are at https://www.capitol.hawaii .gov/hrscurrent/.

Hazardous Waste Program

- The state regulations for hazardous waste and used oil are in chapters 11-260.1 to 11-279.1, Hawaii Administrative Rules (HAR) [http://health.hawaii.go v/shwb/hwrules/]. These rules apply to the identification, handling, transportation, storage and disposal of regulated hazardous waste and used oil. Generators, transporters and treatment, storage, and disposal facilities of hazardous waste and used oil must adhere to these requirements. Violations are subject to penalties under chapter 342J, HRS.

Solid Waste Section

- The Solid Waste Section (SWS) enforces laws and regulations contained in chapters 342H and 3421, HRS, and chapter 11-58.1, HAR, "Solid Waste Management Control" [http://health.hawaii .gov/shwb/solid-waste/].

- The purpose of the rules is to establish minimum standards governing the design, construction, installation, operation, and maintenance of solid waste disposal, recycling, reclamation and transfer systems.

- All facilities that accept solid wastes are required to obtain a solid waste management permit from the SWS. Examples of the types of facilities governed by these regulations include landfills, transfer stations and convenience centers, recycling facilities, composting facilities, and salvage facilities. Medical waste, infectious waste, and foreign waste treatment facilities are also included.

- Generators of solid waste are required to ensure that their wastes are properly delivered to permitted solid waste management facilities. Managers of construction and demolition projects should require their waste contractors to submit disposal receipts and invoices to ensure proper disposal of wastes.

Solid and Hazardous Waste Branch Standard Comments

- Chapter 342G, HRS, encourages the reduction of waste generation, reuse of discarded materials, and the recycling of solid waste. The project developer is highly encouraged to develop a solid waste management plan to ensure proper handling of wastes and divert recyclables from being landfilled. Ideally, the plan would seek to maximize waste diversion and minimize disposal. Such plans should include designated areas to promote the collection of reusable and recyclable materials.

Office of Solid Waste Management

- The Office of Solid Waste Management (OSWM) administers statewide integrated solid waste management planning activities, which apply to the counties, as well as various recycling programs, e.g. the Glass Advance Disposal Fee (ADF) and Deposit Beverage Container (DBC) Programs. Management of the DBC Program is conducted pursuant to chapter 342G, HRS, which contains compliance and enforcement provisions, and chapter 11-282, HAR, "Deposit Beverage Recycling" [http://health.hawaii.gov/hi5/rules-regulations-additional- links/]. OSWM is also responsible for limited enforcement and compliance of solid waste management facilities that operate primarily as certified DBC redemption centers pursuant to chapter 342H, HRS, and chapter 11-58.1, HAR, "Solid Waste Management Control" [http://health.hawaii.gov/shwb/solid-waste/]. Authority for the integrated solid waste management planning and ADF programs is contained in chapter 342G, HRS.

- Glass Advance Disposal Fee Program: Businesses that import glass containers into Hawaii are required to register with the Department of Health and pay a 1.5 cent per container fee. Fee revenue is distributed to the counties for the operation of glass recycling programs.

- Deposit Beverage Container Program: Business that manufacture or import deposit beverage containers into Hawaii are required to register with the Department of Health and pay the five-cent deposit and one cent container fee on each deposit container. Deposits and fees are deposited into a special fund and are used to reimburse DBC redemption center refunds paid to consumers; and to pay handling fees to redemption/recycling companies to process and recycle collected deposit beverage containers; and to pay program administrative costs.

- The Department of Health reimburses and pays an associated handling fee for the redemption of deposit beverage containers (DBC). These transactions are conducted only with certified redemption centers. Certification requires obtaining a solid waste management permit from the SWS (which addresses environmental issues) and a certification from the DBC program (which standardizes the redemption process).

- Chapter 342G, HRS, encourages the reduction of waste generation, reuse of discarded materials, and the recycling of solid waste. Businesses, property managers and developers, and government entities are highly encouraged to develop solid waste management plans to ensure proper handling of wastes and divert recyclables from being landfilled. The project developer is highly encouraged to develop a solid waste management plan to ensure proper handling of wastes and divert recyclables from being landfilled. Ideally, the plan would seek to

maximize waste diversion and minimize disposal. Such plans should include designated areas to promote the collection of reusable and recyclable materials.

- Solid waste management plans seek to maximize waste diversion and minimize disposal. Such plans should include designated areas to promote the collection of reusable and recyclable materials.

Underground Storage Tank Program

- The state's underground storage tank (UST) regulations, found in chapter 11-280.1, HAR [http://health.hawaii.gov/shwb/underg round-storage-tanks/], include specific requirements that UST owners and operators must meet when installing, operating, and permanently closing their UST systems and addressing releases from USTs. Violations are subject to penalties under chapter 11-280.1, HAR, and chapter 342L, HRS.

- A permit is required prior to the installation and operation of a UST. Any new UST system that will be installed must have secondary containment with interstitial monitoring. Refer to subchapters 2, 3, 4, and 12 of chapter 11-280.1, HAR. The installation permit expires 1 year from the date of issuance. The operation permit expires 5 years from the date of issuance.

- §11-280.1-50, HAR, requires owners and operators of USTs or tank systems to notify DOH within twenty-four (24) hours and follow the procedures in§ 11-280.1-52, HAR, if any of the following occur, with specific exceptions found in the rules:
  1) The discovery by any person of evidence of regulated substances which may have been released at the UST site or in the surrounding area (such as the presence of free product or vapors in soils, basements, sewer and utility lines, or nearby surface water);
  2) Unusual UST system operating conditions observed or experienced (such as the erratic behavior of product dispensing equipment, the sudden loss of product from the UST, or an unexplained presence of water in the tank); or
  3) Monitoring results from a release detection method required under §§11-280.1-41 or 11-280 .1-42 indicate a release may have occurred.

- For release response actions, responsible parties and their consultants and contractors should follow the applicable guidance in the Department of Health Hazard Evaluation Emergency (HEER) Office Technical Guidance Manual, HEER Environmental Action Level (EAL) guidance, and other guidance documents on the DOH HEER Office website [http://eha-web.doh.hawaii.gov /eha-cma/Org/HEER/], including those pertaining to Multi-Increment Sampling of soil, low flow groundwater sampling, soil vapor sampling, and Environmental Hazard Evaluations (EHE)/Environmental Hazard Management Plans (EHMP).

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

Apr 27, 2022

HHF Planners
Attn: Ms. Leslie Kurisaki
733 Bishop Street, Suite 2590
Honolulu, Hawaii 96813

via email: USGS-Hilo-HVO-PIERC@hhf.com

Dear Ms. Kurisaki:

SUBJECT: Pre-Assessment Consultation for Draft Environmental Assessment for the Proposed **USGS HVO/PIERC Replacement Facilities** located at Waiakea, South Hilo, Island of Hawaii; TMK: (3) 2-4-001:122 (por.) on behalf of the United States Department of the Interior

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

At this time, enclosed are comments from the (a) Engineering Division, (b) Division of Forestry & Wildlife, and (c) Land Division-Hawaii District on the subject matter. Should you have any questions, please feel free to contact Darlene Nakamura at (808) 587-0417 or email: darlene.k.nakamura@hawaii.gov. Thank you.

Sincerely,

Russell Tsuji

Russell Y. Tsuji
Land Administrator

Enclosures
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

Mar 31, 2022

MEMORANDUM

TO: **DLNR Agencies:**
___Div. of Aquatic Resources
___Div. of Boating & Ocean Recreation
_X_Engineering Division (DLNR.ENGR@hawaii.gov)
_X_Div. of Forestry & Wildlife (rubyrosa.t.terrago@hawaii.gov)
___Div. of State Parks
_X_Commission on Water Resource Management (DLNR.CWRM@hawaii.gov)
___Office of Conservation & Coastal Lands
_X_Land Division – Hawaii District (gordon.c.heit@hawaii.gov)

FROM: Russell Y. Tsuji, Land Administrator *Russell Tsuji*
SUBJECT: Pre-Assessment Consultation for Draft Environmental Assessment for the Proposed **USGS HVO/PIERC Replacement Facilities**
LOCATION: Waiakea, South Hilo, Island of Hawaii; TMK: (3) 2-4-001:122 (por.)
APPLICANT: United States Department of the Interior

Transmitted for your review and comment is information on the above-referenced subject matter. Please submit comments by **April 26, 2022.**

If no response is received by the above date, we will assume your agency has no comments. Should you have any questions about this request, please contact Darlene Nakamura at darlene.k.nakamura@hawaii.gov. Thank you.

BRIEF COMMENTS:

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

Signed: [signature]
Print Name: DAVID G. SMITH,Administrator
Division: Division of Forestry and Wildlife
Date: Apr 24, 2022

Attachments
cc: Central Files

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/Russell Y. Tsuji
Ref: Pre-Assessment Consultation for Draft Environmental Assessment for the Proposed USGS HVO/PIERC Replacement Facilities
Location: Waiakea, South Hilo, Island of Hawaii
TMK(s): (3) 2-4-001:122 (por.)
Applicant: United States Department of the Interior

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). Be advised that 44CFR, Chapter 1, Subchapter B, Part 60 reflects the minimum standards as set forth by the NFIP. Local community flood ordinances may stipulate higher standards that can be more restrictive and would take precedence over the minimum NFIP standards.

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

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

- Oahu: City and County of Honolulu, Department of Planning and Permitting (808) 768-8098.
- Hawaii Island: County of Hawaii, Department of Public Works (808) 961-8327.
- Maui/Molokai/Lanai County of Maui, Department of Planning (808) 270-7139.
- Kauai: County of Kauai, Department of Public Works (808) 241-4849.

Signed: _____
CARTY S. CHANG, CHIEF ENGINEER

Date: Apr 18, 2022

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

Mar 31, 2022

MEMORANDUM

FROM: ~~TO:~~ **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division (DLNR.ENGR@hawaii.gov)
X Div. of Forestry & Wildlife (rubyrosa.t.terrago@hawaii.gov)
__Div. of State Parks
X Commission on Water Resource Management (DLNR.CWRM@hawaii.gov)
__Office of Conservation & Coastal Lands
X Land Division – Hawaii District (gordon.c.heit@hawaii.gov)

TO: ~~FROM:~~ Russell Y. Tsuji, Land Administrator *Russell Tsuji*
SUBJECT: Pre-Assessment Consultation for Draft Environmental Assessment for the Proposed **USGS HVO/PIERC Replacement Facilities**
LOCATION: Waiakea, South Hilo, Island of Hawaii; TMK: (3) 2-4-001:122 (por.)
APPLICANT: United States Department of the Interior

Transmitted for your review and comment is information on the above-referenced subject matter. Please submit comments by **April 26, 2022.**

If no response is received by the above date, we will assume your agency has no comments. Should you have any questions about this request, please contact Darlene Nakamura at darlene.k.nakamura@hawaii.gov. Thank you.

BRIEF COMMENTS:

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

Signed: *CSCh*
Print Name: Carty S. Chang, Chief Engineer
Division: Engineering Division
Date: Apr 18, 2022

Attachments
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET, ROOM 325
HONOLULU, HAWAII 96813

April 22, 2022

Log no. 3606

MEMORANDUM

TO: RUSSELL Y. TSUJI, Land Administrator
Land Division

FROM: DAVID G. SMITH, Administrator
Division of Forestry and Wildlife

SUBJECT: **Division of Forestry and Wildlife Comments for a Pre-Assessment Consultation on a Draft Environmental Assessment (DEA) for the Proposed U.S. Geological Survey (USGS) Hawai'i Volcano Observatory (HVO) and Pacific Islands Ecosystem Research Center (PIERC) Facility on Hawai'i Island**

The Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW) has received your pre-assessment consultation request for a DEA regarding the proposed USGS HVO/PIERC new facility project located in Waiākea, South Hilo, on the island of Hawai'i; TMK: (3) 2-4-001:122 (por). The proposed project consists of developing a 60,000 square feet facility on a 13-acre site that will include office spaces, conference rooms, laboratories, warehouse and storage, and an operation and monitoring center.

The State listed Hawaiian Hoary Bat or 'Ōpe'ape'a (*Lasiurus cinereus semotus*) could potentially occur in the vicinity of the project area and may roost in nearby trees. Any required site clearing should be timed to avoid disturbance to bats during their birthing and pup rearing season (June 1 through September 15). During this period woody plants greater than 15 feet (4.6 meters) tall should not be disturbed, removed, or trimmed. Barbed wire should be avoided for any construction because bat mortalities have been documented as a result of becoming ensnared by this type of fencing during flight.

Artificial lighting can adversely impact seabirds that may pass through the area at night by causing them to become disoriented. This disorientation can result in collision with manmade structures or grounding of birds. For nighttime work that might be required, DOFAW recommends that all lights used be fully shielded to minimize impacts. Nighttime work that requires outdoor lighting should be avoided during the seabird fledging season from September 15 through December 15. This is the period when young seabirds take their maiden voyage to the open sea. For illustrations and guidance related to seabird-friendly light styles that also protect the dark, starry skies of Hawai'i please visit: https://dlnr.hawaii.gov/wildlife/files/2016/03/DOC439.pdf.

The State listed Hawaiian Goose or Nēnē (*Branta sandvicensis*) has the potential to occur in the vicinity of the proposed project site. It is against State law to harm or harass this species. If any

are present during construction activities, then all activities within 100 feet (30 meters) should cease, and the bird should not be approached. Work may continue after the bird leaves the area of its own accord. If a nest is discovered at any point, please contact the Hawai'i Island Branch DOFAW Office at (808) 974-4221.

The State listed Hawaiian Hawk or 'Io (*Buteo solitarius*) may occur in the project vicinity. DOFAW recommends surveying the area to ensure no Hawaiian Hawk nests are present if trees are to be cut. 'Io nests may be present during the breeding season from March to September.

DOFAW recommends minimizing the movement of plant or soil material between worksites, such as in fill. Soil and plant material may contain invasive fungal pathogens (e.g., Rapid 'Ōhi'a Death), vertebrate and invertebrate pests (e.g., Little Fire Ants, Coconut Rhinoceros Beetles), or invasive plant parts that could harm our native species and ecosystems. We recommend consulting the Big Island Invasive Species Committee (BIISC) at (808) 933-3340 in planning, design, and construction of the project to learn of any high-risk invasive species in the area and ways to mitigate spread. All equipment, materials, and personnel should be cleaned of excess soil and debris to minimize the risk of spreading invasive species. Gear that may contain soil, such as work boots and vehicles, should be thoroughly cleaned with water and sprayed with 70% alcohol solution to prevent the spread of Rapid 'Ōhi'a Death and other harmful fungal pathogens.

To prevent the spread of Rapid 'Ōhi'a Death (ROD), if 'ōhi'a trees are present and will be removed, trimmed, or potentially injured DOFAW requests that the information and guidance at the following website be reviewed and followed: https://cms.ctahr.hawaii.edu/rod.

We also recommend that surveys for rare and endangered plants be conducted in all proposed affected areas prior to commencing work due to their potential presence. If any listed species are found, please notify DOFAW at (808) 587-0166.

DOFAW recommends using native plant species for landscaping that are appropriate for the area (i.e. climate conditions are suitable for the plants to thrive, historically occurred there, etc.). Please do not plant invasive species. DOFAW recommends consulting the Hawai'i-Pacific Weed Risk Assessment website to determine the potential invasiveness of plants proposed for use in the project (https://sites.google.com/site/weedriskassessment/home). We recommend that you refer to www.plantpono.org for guidance on selection and evaluation for landscaping plants.

We appreciate your efforts to work with our office for the conservation of our native species. Should the scope of the project change significantly, or should it become apparent that threatened or endangered species may be impacted, please contact our staff as soon as possible. If you have any questions, please contact Paul Radley, Protected Species Habitat Conservation Planning Coordinator at (808) 295-1123 or paul.m.radley@hawaii.gov.

Sincerely,

DAVID G. SMITH
Administrator

4/20/22

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

Mar 31, 2022

MEMORANDUM

TO: **DLNR Agencies:**
___Div. of Aquatic Resources
___Div. of Boating & Ocean Recreation
_X_Engineering Division (DLNR.ENGR@hawaii.gov)
_X_Div. of Forestry & Wildlife (rubyrosa.t.terrago@hawaii.gov)
___Div. of State Parks
_X_Commission on Water Resource Management (DLNR.CWRM@hawaii.gov)
___Office of Conservation & Coastal Lands
_X_Land Division – Hawaii District (gordon.c.heit@hawaii.gov)

FROM: Russell Y. Tsuji, Land Administrator *Russell Tsuji*
SUBJECT: Pre-Assessment Consultation for Draft Environmental Assessment for the Proposed **USGS HVO/PIERC Replacement Facilities**
LOCATION: Waiakea, South Hilo, Island of Hawaii; TMK: (3) 2-4-001:122 (por.)
APPLICANT: United States Department of the Interior

Transmitted for your review and comment is information on the above-referenced subject matter. Please submit comments by **April 26, 2022.**

If no response is received by the above date, we will assume your agency has no comments. Should you have any questions about this request, please contact Darlene Nakamura at darlene.k.nakamura@hawaii.gov. Thank you.

BRIEF COMMENTS:

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

Signed: [signature]
Print Name: GORDON C. HEIT
Division: Land Division
Date: 4/20/22

Attachments
cc: Central Files

From: DLNR.Intake.SHPD
To: USGS-Hilo-HVO-PIERC
Cc: DLNR.Intake.SHPD
Subject: Re: EA Pre-Assessment Consultation--USGS HVO-PIERC Replacement Facility
Date: Wednesday, March 30, 2022 7:36:06 AM

[This message was sent from an outside source.]
Aloha, all submissions for review by the SHPD must be submitted online to the HICRIS or the Hawaii Cultural Resource Information System at https://dlnr.hawaii.gov/shpd/

State Historic Preservation

Aloha from the Hawai'i State Historic Preservation Division. SHPD is comprised of three branches, Architecture, Archaeology, and History & Culture, and together they collectively strive to preserve and protect Hawai'i's historic identity.

dlnr.hawaii.gov

The SHPD no longer accepts email and or hard copy requests for review.
Mahalo,
SHPD Intake Specialist

From: USGS-Hilo-HVO-PIERC <USGS-Hilo-HVO-PIERC@hhf.com>
Sent: Tuesday, March 29, 2022 8:42 AM
To: USGS-Hilo-HVO-PIERC <USGS-Hilo-HVO-PIERC@hhf.com>
Subject: [EXTERNAL] EA Pre-Assessment Consultation--USGS HVO-PIERC Replacement Facility

Aloha,
The U.S. Department of the Interior, U.S. Geological Survey (USGS) is preparing an Environmental Assessment (EA) for a new facility in Hilo, Hawai'i Island, to support the USGS Hawai'i Volcano Observatory (HVO) and Pacific Island Ecosystem Research Center (PIERC).

Attached is a pre-assessment consultation letter with information about the project and instructions on how to provide comment.

Mahalo.

STATE OF HAWAII
OFFICE OF PLANNING
& SUSTAINABLE DEVELOPMENT

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

DAVID Y. IGE
GOVERNOR

MARY ALICE EVANS
DIRECTOR

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

Coastal Zone Management Program

Environmental Review Program

Land Use Commission

Land Use Division

Special Plans Branch

State Transit-Oriented Development

Statewide Geographic Information System

Statewide Sustainability Branch

DTS 202203291042NA

April 29, 2022

Ms. Leslie Kurisaki
Associate
HHF Planners
733 Bishop Street, Suite 2590
Honolulu, Hawai'i 96813

Subject: Pre-Assessment Consultation Draft Environmental Assessment, USGS HVO/PIERC Replacement Facilities
Waiākea, South Hilo, Island of Hawai'i
TMK: (3) 2-4-001: 122 (por)

Thank you for the opportunity to provide comments on your pre-consultation request for the preparation of a Draft Environmental Assessment (Draft EA) for a proposed new facility that will be used to support the US Geological Survey (USGS), Hawai'i Volcano Observatory (HVO) and Pacific Island Ecosystem Research Center (PIERC). The notification request for agency comment was sent via memo dated March 29, 2022.

It is our understanding that USGS is proposing the development of a new facility to be located on a 13-acre site near the University Research Park, University of Hawai'i at Hilo (UH Hilo), and directly across Nowelo Road from the U.S. Pacific Basin Agricultural Research Center.

The proposed project will provide replacement facilities for HVO and PIERC, support approximately 50 staff and volunteers from HVO, as well as 53 staff and volunteers from PIERC. The facility will be approximately 60,000 square feet in size, and will include office spaces, conference rooms, research laboratories, warehouse and storage, and an operations/monitoring center. The project will be beneficial to UH Hilo students and faculty by providing USGS science facilities on campus, increasing student interaction with scientists, and allow for the shared use of an advanced and modern laboratory, along with other high-tech equipment.

The Office of Planning and Sustainable Development (OPSD) has reviewed the transmitted material, and has the following comments to offer:

1. <u>Coastal Zone Management Act (CZMA) Federal Consistency</u>
   The national CZMA requires that federal actions be consistent with

approved state coastal programs enforceable policies. As this is proposed by a federal agency, it may be subject to a CZMA federal consistency review.

OPSD is the lead state agency with the authority to conduct CZMA federal consistency reviews. We recommend that the USGS consult with our office on the applicability of CZMA federal consistency requirements as it pertains to this project.

2. Hawai'i Coastal Zone Management (CZM) Program
The 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" under Hawai'i Revised Statutes (HRS) § 205A-1.

Pursuant to HRS § 205A-4, in implementing the objectives of the CZM program, agencies shall consider ecological, cultural, historic, esthetic, recreational, scenic, open space values, coastal hazards, and economic development. As this project is proposed by the USGS, the Draft should include a discussion on the project's consistency with the policies of the Hawai'i CZM Program, HRS § 205A-2, as amended.

The objectives and supporting policies of the Hawai'i CZM Program serve as the foundation of the enforceable policies of the State of Hawai'i, as listed in HRS § 205A-2. Disclosure of impacts on CZM objectives and supporting policies, as it relates to HRS Chapter 343 requirements, will aid the State in determining impacts to the resources of the coastal zone, and mitigation measures on the subject lands involved for this proposed action.

3. Stormwater Runoff, Erosion, and Water Resources
As the Draft EA is intended to meet both the National Environmental Policy Act and HRS Chapter 343 requirements, pursuant to Title 40, Code of Federal Regulations (CFR) § 1501.3(b)(1) – in considering the potentially affected environment, agencies should consider, as appropriate to the specific action, the affected area (national, regional, or local) and its resources; to ensure that nearshore marine resources remain protected, the negative effects of stormwater inundation and sediment loading near the proposed project site should be evaluated. Issues that may be examined include, but are not limited to, the project area's vulnerability to flood and erosion, potential susceptibility of water resources and the nearshore area, and intensification of stormwater runoff due to the increase of permeable surfaces caused by the development of the proposed action. Pursuant to 40 CFR § 1501.3(b)(2)(i), if necessary, mitigation for the negative effects caused by the proposed action in both the short and long term should be considered. This evaluation should include discussion topics on stormwater runoff, erosion controls, and impacts on water resources.

4. State of Hawai'i Geological Survey[1]
   In anticipation of the establishment of a State Geological Survey in Hawai'i, OPSD recommends that the plans for replacement facilities for HVO and PIERC include sharing or co-location of office and other space for the State Geological Survey. Co-location would foster collaboration and facilitate sharing of resources such as high-tech equipment and a modern laboratory with the State Geological Survey.

If you have any questions, please contact Joshua Hekekia on Environmental Assessment concerns as they relate to this OPSD response letter at (808) 587-2845 or Debra Mendes on CZMA federal consistency at (808) 587-2840.

Sincerely,

Mary Alice Evans

Mary Alice Evans
Director

[1] HCR 102, HD2 was adopted by the Senate and the House of Representatives of the Thirty-First Legislature of the State of Hawai'i, Regular Session of 2021, requesting the Office of Planning [and Sustainable Development], in collaboration with various agencies, to develop a plan to establish a State geological survey in Hawai'i.

DAVID Y. IGE
GOVERNOR

JADE T. BUTAY
DIRECTOR

Deputy Directors
ROSS M. HIGASHI
EDUARDO P. MANGLALLAN
PATRICK H. MCCAIN
EDWIN H. SNIFFEN

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

IN REPLY REFER TO:
DIR 0355
STP 8.3378

April 19, 2022

VIA EMAIL: USGS-Hilo-HVO-PIERC@hhf.com

Ms. Leslie Kurisaki
HHF Planners
Pacific Guardian Center, Makai Tower
733 Bishop Street, Suite 2590
Honolulu, Hawaii 96813

Dear Ms. Kurisaki:

Subject: Early Consultation for Draft Environmental Assessment (EA)
USGS HVO/PIERC Replacement Facility
Waiakea, South Hilo, Hawaii Island, Hawaii
Tax Map Key: (3) 2-4-001:122 (por)

Thank you for your letter dated March 29, 2022, requesting the State of Hawaii Department of Transportation's (HDOT) review and comment on the subject project. HDOT understands the United States Department of the Interior, United States Geological Survey (USGS) is proposing to build a new facility to replace the existing USGS Hawaii Volcano Observatory (HVO) and Pacific Island Ecosystem Research Center (PIERC). The proposed site will be near the University of Hawaii at Hilo campus, on a 13-acre property located at the intersection of Komohana Street and Nowelo Street, across from the U.S. Pacific Basin Agricultural Research Center. The facility will be approximately 60,000 sq. ft. and includes office spaces, conference rooms, laboratories, a warehouse, storage, and an operations/monitoring center.

HDOT has the following comments:

Airports Division (HDOT-A)

1. The proposed USGS HVO and PIERC Replacement Facilities are approximately 1.94 miles from the property boundary of Hilo International Airport (ITO). All projects within 5 miles from Hawaii State airports are advised to read the Technical Assistance Memorandum (TAM) for guidance with development and activities that may require further review and permits. The TAM can be viewed at this link: http://files.hawaii.gov/dbedt/op/docs/TAM-FAA-DOT-Airports_08-01-2016.pdf.

2. The project site is approximately 11,306 feet from the end of Runway 3 at ITO. Federal Aviation Administration (FAA) regulation requires the submittal of FAA Form 7460-1 Notice of Proposed Construction or Alteration pursuant to the Code of Federal

Regulations, Title 14, Part 77.9, if the construction or alteration is within 20,000 feet of a public use or military airport which exceeds a 100:1 surface from any point on the runway of each airport with its longest runway more than 3,200 feet. Construction equipment and staging area heights, including heights of temporary construction cranes, shall be included in the submittal. The form and criteria for submittal can be found at the following website: https://oeaaa.faa.gov/oeaaa/external/portal.jsp.

3. Due to the project's proximity to ITO, the applicant should be aware of potential single event noise from aircraft operations. There is also a potential for fumes, smoke, vibrations, odors, etc., resulting from occasional aircraft flight operations over or near the project. These incidences may increase or decrease over time and are dependent on airport operations.

4. If a solar energy photovoltaic (PV) system is going to be installed, be aware that PV systems located in or near the approach path of aircrafts can create a hazardous condition for pilots due to possible glint and glare reflected from the PV panel array. If glint or glare from the PV array creates a hazardous condition for pilots, the owner of the PV system shall be prepared to immediately mitigate the hazard upon notification by the HDOT-A and/or FAA.

   The FAA requires a glint and glare analysis for all solar energy PV systems near airports. The www.sandia.gov/glare website has information and guidance with the preparation of a glint and glare analysis. A separate FAA Form 7460-1 will be necessary for the solar energy PV system. After the FAA determination of the Form 7460-1 glint and glare analysis, a copy shall be provided to the HDOT-A by the owner of the solar energy PV system.

   Solar energy PV systems have also been known to emit radio frequency interference (RFI) to aviation-dedicated radio signals, thereby disrupting the reliability of air-to ground communications. Again, the owner of the solar energy PV system shall be prepared to immediately mitigate the RFI hazard upon notification by the HDOT-A and/or FAA.

5. The HDOT-A requires that the proposed project does not provide landscape and vegetation that will create a wildlife attractant, which can potentially become a hazard to aircraft operations. Please review the FAA Advisory Circular 150/5200-33C, Hazardous Wildlife Attractants On Or Near Airports for guidance. If the proposed project and landscaping create a wildlife attractant, the developer shall be prepared to immediately mitigate the hazard upon notification by the HDOT-A and/or FAA.

Highway Division (HDOT-HWY)

The nearest State highway intersection is south of the proposed site at Komohana Street (County jurisdiction) and Puainako Street (State Route 2000). Based on the information provided, the

HDOT-HWY does not anticipate a direct adverse impact on State highways, however, the Draft EA traffic impact discussion should include the following:

a. Jurisdiction of roadways in the vicinity.

b. Location of existing and proposed site access driveways.

c. Observations regarding existing traffic conditions during peak traffic hours in the vicinity of the site, including the Komohana Street and Puainako Street intersection. Describe bicycle and pedestrian routes and the location of transit stops in the area.

d. Project description, including operations and construction activities/duration, hours of operation, the estimated number of vehicle trips to/from the site during peak traffic hours, and design features that promote employee and visitor use of alternative forms of transportation.

e. Describe any work (e.g., utilities) within the State highway right-of-way to support the facility.

f. Assessment of the project's potential direct, secondary, and cumulative impact on State roadways.

If the qualitative traffic assessment suggests a potential for adverse impact on State highways, the Draft EA should include a Traffic Impact Assessment Report prepared by a licensed Professional Engineer.

If there are any questions, please contact Mr. Blayne Nikaido of the HDOT Statewide Transportation Planning Office at (808) 831-7979 or via email at blayne.h.nikaido@hawaii.gov.

Sincerely,

JADE T. BUTAY
Director of Transportation

Mitchell D. Roth
Mayor

Lee Lord
Managing Director

Ramzi I. Mansour
Director

Brenda Iokepa-Moses
Deputy Director

County of Hawai'i

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

345 Kekūanāo'a Street, Suite 41 · Hilo, Hawai'i 96720 · cohdem@hawaiicounty.gov
Ph: (808) 961-8083 · Fax: (808) 961-8086

March 31, 2022

HHF Planners
USGS-Hilo-HVO-PIERC@hhf.com
via email

SUBJECT: USGS HVO/PIERC Replacement Facilities
Draft Environmental Assessment Pre-Assessment Consultation
Waiakea, South Hilo, Island of Hawai'i
TMK (3) 2-4-001:122 (por)

Dear Consultant,

The Department of Environmental Management, County of Hawai'i (DEM), has received your request for comments and recommendations for the USGS HVO/PIERC Replacement Facilities Draft Environmental Assessment Pre-Assessment Consultation dated March 29, 2022. After review of the documents provided, DEM has the following comments and recommendations:

Solid Waste:

- Submit a Solid Waste Management Plan (SWMP). SWMP shall be submitted on or before the project is advertised for bidding.
- South Hilo Sanitary Landfill closed permanently in 2019. Construction waste is not allowed at the East Hawaii Reload Station and must be disposed at the West Hawai'i Sanitary Landfill. Refer to DEM Admin Rules effective March 14, 2022.
- The 21 Solid Waste Transfer Stations are for residential use only. Commercial operations, State and Federal agencies, religious entities and non-profit organizations shall not use the transfer stations. Refer to DEM Admin Rules effective March 14, 2022.
- Chapter 20 of the Hawai'i County Code was recently revised and retitled Integrated Solid Waste Management.

Wastewater:

- Require connection of existing and/or proposed structures to the public sewer in accordance with Section 21-5 of the Hawai'i County Code.

- Conduct a sewer study in accordance with the then applicable wastewater system design standards prior to approval to connect to the County sewer system. Provide such sewer line or other facility improvements as the Director of DEM may reasonably require, which the sewer study may indicate are advisable for mitigation of impacts of the proposed project. Contact Wastewater Division Chief for details.

Thank you for the opportunity to provide comment. For specific questions regarding these recommendations, contact the Solid Waste Division at (808) 961-8270, gene.quiamas@hawaiicounty.gov, or the Wastewater Division at (808) 961-8615, amelia.kajiyama@hawaiicounty.gov.

Sincerely,

Brenda D. Wong-Moss

Ramzi Mansour, Director
Department of Environmental Management
County of Hawai'i

Mitchell D. Roth
Mayor

Lee E. Lord
Managing Director

Ramzi I. Mansour
Director

Brenda D. Iokepa-Moses
Deputy Director

County of Hawai'i

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
345 Kekūanāo'a Street, Suite 41 · Hilo, Hawai'i 96720
Ph: (808) 961-8083 · Fax: (808) 961-8086
Email: cohdem@hawaiicounty.gov

January 29, 2021

SOLID WASTE MANAGEMENT PLAN
Guidelines

INTENT AND PURPOSE

This is to establish guidelines for reviewing Solid Waste Management Plans, for which special conditions are placed on developments. The Solid Waste Management Plan will be used to: (1) promote and implement recycling and recycling programs, (2) predict the waste generated by the proposed development to anticipate the loading on County Solid Waste Management Facilities, and (3) predict the additional vehicular traffic being generated because of waste and recycling transfers. A State of Hawai'i licensed engineer shall prepare a suitable Solid Waste Management Plan for review by the Department of Environmental Management.

REPORT

The Solid Waste Management Plan will contain the following:

1. Description of the project and the potential waste it may be generating: i.e. analysis of anticipated waste volume and composition. This includes waste generated during the construction and operational or maintenance phases. Waste types shall include (but not be limited to):
    A. Organics (including food waste and green wastes);
    B. Construction and Demolition materials;
    C. Paper (including cardboard);
    D. Metal (including ferrous and non-ferrous metals).
    E. Plastic;
    F. Special (including ash, sludge, treated medical waste, bulky items, tires);
    G. Hazardous (including paint, vehicle fluids, oil, batteries); and
    H. Glass.

2. Indicate onsite source separation by waste type; i.e. source separation bins for glass, metal, plastic, cardboard, aluminum, etc. Provide ample and equal space for rubbish and recycling.

3. Identification and location of the proposed waste reduction, waste re-use, recycling facility or disposal site and associated transportation methods for the various components of the development's waste management system, including the number of vehicle movements and associated routes that will be used to transport the waste and recycled materials.

4. The report will include identification of any impacts to County-operated waste management facilities, and the appropriate mitigation measures that will be implemented by the development to minimize these impacts.

5. Analysis will be based on the highest potential use or zoning of the development.

REQUIREMENTS AND CONDITIONS

1. A Solid Waste Management Plan will be prepared for all commercial developments, as defined under the policies of the Department of Environmental Management, Solid Waste Division.

2. The Department of Environmental Management will require the developer to provide or resolve all recommendations and mitigation measures as outlined in the solid waste management plan; besides any conditions placed on the applicant herein.

3. A State of Hawai'i licensed engineer will draft and certify in writing the Solid Waste Management Plan as complying with applicable Federal, State and County of Hawai'i Solid Waste Laws, Regulations, and Administrative Rules.

Should you require additional information, please contact Greg Goodale, Solid Waste Division Chief, at (808) 961-8515.

CONCUR:

Ramzi I. Mansour
DIRECTOR

Mitchell D. Roth
Mayor

Lee E. Lord
Managing Director

Robert H. Command
Deputy Managing Director

Susan K. Kunz
Housing Administrator

Harry M. Yada
Assistant Housing Administrator

County of Hawai'i
Office of Housing and Community Development
1990 Kino'ole Street, Suite 102 • Hilo, Hawai'i 96720 • (808) 961-8379 • Fax (808) 961-8685
Existing Housing: (808) 959-4642 • Fax (808) 959-9308
Kona: (808) 323-4300 • Fax (808) 323-4301

March 31, 2022

Jordan D. Sizemore, REM
USGS Environmental Management Branch
U.S. Geological Survey
Box 25046 M.S. 205
Denver Federal Center
Denver, Colorado 80225

SUBJECT: **USGS HVO/PIERC Replacement Facilities**
Draft Environmental Assessment Pre-Assessment Consultation
Waiakea, South Hilo, Island of Hawai'i
TMK (3) 2-4-001:122 (por)

We support the activities of the USGS Hawai'i Volcano Observatory and the Pacific Island Ecosystem Research Center and support the plan for a new facility in Hilo, Hawai'i.

The Office of Housing and Community Development has no comments or concerns on the proposed facility and location at this time. Thank you for the opportunity to comment.

Should you have any further questions, feel free to contact our office at (808) 961-8379.

Susan K. Kunz
Housing Administrator

2212askk

EQUAL HOUSING OPPORTUNITY

Mitchell D. Roth
Mayor

Lee E. Lord
Managing Director

West Hawai'i Office
74-5044 Ane Keohokālole Hwy
Kailua-Kona, Hawai'i 96740
Phone (808) 323-4770
Fax (808) 327-3563

County of Hawai'i
PLANNING DEPARTMENT

Zendo Kern
Director

Jeffrey W. Darrow
Deputy Director

East Hawai'i Office
101 Pauahi Street, Suite 3
Hilo, Hawai'i 96720
Phone (808) 961-8288
Fax (808) 961-8742

April 12, 2022

Jordan D. Sizemore, REM
USGS Environmental Management Branch
Box 25046 M.S. 205
Denver Federal Center
Denver, CO 80225

Dear Mr. Sizemore:

SUBJECT: Early Consultation for Draft Environmental Assessment (DEA) (PL-INT-2022-001872)
Landowner: State of Hawai'i
Project: New Facility for USGS Hawai'i Volcano Observatory (HVO) and Pacific Island Ecosystem Research Center (PIERC)
Location: (3) 2-4-001:122 (por); South Hilo District, Island of Hawai'i

Thank you for including us in early consultation for this Draft Environmental Assessment. The proposed new facility would be located on a 13-acre site near the north corner of the intersection of Komohana Street and Nowelo Road and would provide replacement facilities for HVO and PIERC, supporting approximately 50 staff and volunteers from HVO and 53 staff and volunteers from PIERC. The facility would be approximately 60,000 square feet in size, and would include office spaces, conference rooms, laboratories, warehouse and storage, and an operations/ monitoring center. We understand the project site is part of a larger parcel of land that was granted to the University of Hawai'i by Executive Order No. 3814, dated April 11, 2000, "for the University of Hawai'i and its allied purposes[.]"

The 2005 County of Hawai'i General Plan, Policy 2.3(b), "encourages the expansion of the research and development industry by working with and supporting the University of Hawai'i at Hilo and … other agencies' programs that support sustainable economic development in the County of Hawai'i." Further, select Courses of Action from the General Plan[1], include:

- 10.2.4.2.2(d). Support the continued expansion of the University system and the University of Hawai'i at Hilo and Hawai'i Community College campus and encourage the continuing education programs throughout the community. The transfer of State lands to the University should be actively pursued.

[1] 10.2.4.2.2 Courses of Action

- 10.2.4.2.2(g). Encourage the implementation of existing State and University of Hawai'i plans for the continued development of the "Research and Technology Park" on the campus of the University of Hawai'i at Hilo.

The State Land Use designation of the subject property is Agriculture. Hawai'i Revised Statutes (H.R.S.), Section 205-4.5 allows for "public institutions and buildings that are necessary for agricultural practices" to be permitted uses in Agriculture State Land Use districts[2]. The Land Use Pattern Allocation Guide (LUPAG) Map from the 2005 General Plan designation is University (UU)[3]. The County Zoning of the property is A-1a. The A (agricultural) zoning district, provides for agricultural and very low density agriculturally-based residential use, encompassing rural areas of good to marginal agricultural and grazing land, forest land, game habitats, and areas where urbanization is not found to be appropriate[4].

In furtherance of H.R.S. Chapter 205, "Public uses and structures which are necessary for agricultural practices" may be permitted 'by right'[5] in County Zoning A. Further, "Public uses, structures and buildings and community buildings are permitted uses in any district, provided that the director has issued plan approval for such use"[6]. Additionally, "buildings and uses accessory" (to permitted uses), are also permissible in the A district[7].

For these reasons, the Planning Department recommends that the Draft Environmental Assessment address how the mission and operations of both HVO and PIERC at these proposed facilities are 'necessary for agricultural practices'; otherwise, a special permit may be required for non-agricultural use(s) under H.R.S. §205-6 and Hawai'i County Code (HCC) Section 25-5-72 (c) or (d). County Site Plan Approval (application) will be required regardless.

We look forward to reviewing the Draft Environmental Assessment when available. If you have any questions regarding this correspondence, please contact Kevin Sullivan of this office at (808) 961-8135 or via email at kevin.sullivan@hawaiicounty.gov.

Sincerely,

Zendo Kern
Zendo Kern (Apr 12, 2022 12:52 HST)

ZENDO KERN
Planning Director

KS:cc
\\coh01\planning\public\wpwin60\CH343\2022\4.12.2022_PL-INT-2022-001872_DEA_precons_HVO_PIERC_Sizemore.docx

---

[2] H.R.S. §205-4.5(a)(5)
[3] "Public university, including ancillary public uses, residential, and support(ive) commercial uses".
[4] HCC Sec. 25-5-70. Purpose and Applicability
[5] HCC 25-5-72(a)(18)
[6] HCC Section 25-4-11. Power lines, utility substations, public buildings.
[7] HCC Sec. 25-5-72(e)

DEPARTMENT OF WATER SUPPLY • COUNTY OF HAWAI'I
345 KEKŪANAŌ'A STREET, SUITE 20 • HILO, HAWAI'I 96720
TELEPHONE (808) 961-8050 • FAX (808) 961-8657

April 21, 2022

Mr. Jordan D. Sizemore
USGS Environmental Management Branch
P.O. Box 25046 M.S. 205
Denver Federal Center
Denver, CO 80225

Dear Mr. Sizemore:

Subject: Pre-Environmental Assessment Consultation for USGS HVO/PIERC Replacement Facilities
Waiākea, South Hilo, Island of Hawai'i
Tax Map Key (3) 2-4-001:122 portion

This is in response to your Pre-Environmental Assessment Consultation letter dated March 29, 2022.

Please be informed that there is an existing 12-inch waterline within Nowelo Street fronting the proposed project site. Please be informed that our records do not show that there is an existing service lateral installed at the proposed project site.

The Department requests estimated maximum daily water usage calculations, prepared by a professional engineer, licensed in the State of Hawai'i, for review and approval. After review of the calculations, the Department will determine if additional water is available, the water commitment deposit amount, facilities charges due, and any water system improvements required for final approval.

The existing 12-inch waterline fronting the project site is adequate to provide the required 2,000-gallons per minute flow for fire protection, as per the Department's Water System Standards.

Please also be informed that any meter(s) serving the proposed project will require the installation of a reduced pressure type backflow prevention assembly within five feet of the meter on private property. The Department must inspect and approve the installation before water service can be activated.

Should there be any questions, please contact Mr. Ryan Quitoriano of our Water Resources and Planning Branch at (808) 961-8070, extension 256.

Sincerely yours,

for Keith K. Okamoto, P.E.
Manager-Chief Engineer

RQ:dmj

copy – DWS Cross Connection Section

From: R. Scott Keeney
To: USGS-Hilo-HVO-PIERC
Subject: I support the move to Hilo
Date: Sunday, April 10, 2022 1:02:22 PM

[This message was sent from an outside source.]

I fully support the move to Hilo.
Closer to UH facilities, residential and logistical resources.
Thank You,
R, Scott Keeney
94-1569 Kaulua Circle 68
Naalehu, HI
96772

512-983-4297