

DEPARTMENT OF LAND MANAGEMENT  
CITY AND COUNTY OF HONOLULU

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June 3, 2022

Ms. Mary Alice Evans, Director  
State of Hawaii  
Office of Planning and Sustainable Development  
235 South Beretania Street, 6<sup>th</sup> Floor  
Honolulu, Hawaii 96813

Dear Ms. Evans:

SUBJECT: West Loch Affordable Housing Project, Ewa Beach, Oahu  
TMK: (1) 9-1-122:004  
Final Environmental Assessment and  
Finding of No Significant Impact Transmittal

With this letter, the City and County of Honolulu, Department of Land Management ("DLM") hereby transmits the final environmental assessment (FEA – FONSI) for publication in the next available edition of The Environmental Notice regarding the West Loch Affordable Housing project located at TMK: (1) 9-1- 122: 004 in the Ewa District on the island of Oahu.

We have uploaded an electronic copy of this letter, the publication form, and the FEA-FONSI to your online submittal site.

If you any questions, please contact the planning consultant, Mr. Taeyong Kim of the Environmental Communications, Inc., at (808) 528-4661 or Cameron Lowry, Planner of DLM at (808) 768-4294.

Sincerely,

A handwritten signature in black ink that reads "Scott K. Hayashi". The signature is written in a cursive style with a prominent flourish at the end.

Scott K. Hayashi  
Director

Attachments

**From:** [webmaster@hawaii.gov](mailto:webmaster@hawaii.gov)  
**To:** [DBEDT OPSD Environmental Review Program](#)  
**Subject:** New online submission for The Environmental Notice  
**Date:** Friday, June 3, 2022 3:40:57 PM

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**Action Name**

West Loch Affordable Housing Final Environmental Assessment

**Type of Document/Determination**

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

**HRS §343-5(a) Trigger(s)**

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

**Judicial district**

‘Ewa, O‘ahu

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

(1) 9-1-122: 004

**Action type**

Agency

**Other required permits and approvals**

National Pollutant Discharge Elimination System (NPDES) Permit, Dept. of Health Chapter 201H Approval, Dept. of Planning and Permitting Building Permits, Dept. of Planning and Permitting Certificate of Occupancy, Dept. of Planning and Permitting Construction Dewatering, Permit Dept. of Planning and Permitting Grading and Stockpiling Permits, Dept. of Planning and Permitting Sewer Connection Permit, Dept. of Environmental Services Trenching Permit, Dept. of Planning and Permitting

**Proposing/determining agency**

Department of Land Management

**Agency contact name**

Cameron Lowry

**Agency contact email (for info about the action)**

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**Agency address**

558 South King Street  
Honolulu, Hawaii 96813  
United States  
[Map It](#)

**Was this submittal prepared by a consultant?**

Yes

**Consultant**

Environmental Communications Inc.

**Consultant contact name**

Taeyong Kim

**Consultant contact email**

[environcom1@gmail.com](mailto:environcom1@gmail.com)

**Consultant contact phone**

(808) 528-4661

**Consultant address**

P.O. Box 236097  
Honolulu, Hawaii 96823  
United States  
[Map It](#)

**Action summary**

The proposed project was conceived by the applicant as an affordable rental housing project that would provide much needed housing inventory to the Ewa District for income qualified residents. The City and County of Honolulu Department of Land Management solicited developers for this City and County of Honolulu owned site through a Request for Proposals (RFP) selection process. The project was awarded to Stanford Carr Development LLC and its project development entity Komohale West Loch LLC. The proposed project will consist of 127 affordable units located in seven (7) separate three story buildings configured around a single level central community center. Parking will be located throughout the site at ground level and will offer convenient access to each building.

**Reasons supporting determination**

Please refer to section 7.0 Determination of Significance that explicates why the agency supports a Finding of No Significant Impact.

**Attached documents (signed agency letter & EA/EIS)**

- [2022-6-03-Letter-to-Mary-Alice-re-West-Loch-Affordable-FEA-Transmittal.pdf](#)
- [SCD-West-Loch-FEA-Compiled-v.1B.pdf](#)

**Shapefile**

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

**Action location map**

- [West-Loch-Affordable-Rental-Project-Action-Location-Boundary.zip](#)

**Authorized individual**

Cameron Lowry

**Authorization**

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

submission.

FINAL ENVIRONMENTAL ASSESSMENT

# WEST LOCH AFFORDABLE HOUSING

TMK 9-1-122: 004

EWA, OAHU, HAWAII



THIS DOCUMENT IS PREPARED PURSUANT TO CHAPTER 343, HAWAII REVISED STATUTES

APPROVING AGENCY:  
DEPARTMENT OF LAND MANAGEMENT  
CITY AND COUNTY OF HONOLULU

APPLICANT:  
KOMOHALE WEST LOCH, LLC

JUNE 2022



FINAL ENVIRONMENTAL ASSESSMENT  
**WEST LOCH AFFORDABLE HOUSING**  
TMK 9-1-122: 004  
EWA, OAHU, HAWAII



THIS DOCUMENT IS PREPARED PURSUANT TO CHAPTER 343, HAWAII REVISED STATUTES

APPROVING AGENCY:  
DEPARTMENT OF LAND MANAGEMENT

APPLICANT:  
KOMOHALE WEST LOCH, LLC

PROJECT PLANNING CONSULTANT:  
ENVIRONMENTAL COMMUNICATIONS, INC.

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## APPENDICES

- A *Archaeological Literature Review and Field Inspection for the West Loch Affordable Housing Project, Honouliuli Ahupua‘a, ‘Ewa District, O‘ahu Island TMKs: (1) 9-1-122:041, Honua Consultants*
- B *Cultural Impact Assessment Report for the West Loch Affordable Housing Project, Honouliuli Ahupua‘a, ‘Ewa District, O‘ahu Island TMKs: (1) 9-1-122:004, Honua Consulting*
- C *Draft Transportation Assessment Report for the Proposed West Loch Affordable Housing, Ewa Beach, Oahu, Hawaii, Tax Map Key: 9-9-122:004. The Traffic Management Consultant, Inc.*
- D *91-1666 Renton Road West Loch Affordable Housing – HUD Site Noise Analysis (DLAA#20-044). D.L. Adams Associates*

## ACRONYMS AND ABBREVIATIONS

201H	Chapter 201H, Hawaii Revised Statutes
343	Environmental Law Hawaii Revised Statutes (343 HRS)
AAQS	Ambient Air Quality Standards
AGL	Above Ground Level
ANSI	American National Standards Institute
BLNR	Board of Land and Natural Resources
BMPs	Best Management Practices
BWS	Board of Water Supply
CDUP	Conservation District Use Permit
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CFR	Code of Federal Regulations
City	City and County of Honolulu
CO	Carbon Monoxide
CO <sub>2</sub>	Carbon Dioxide
COC	Contaminant of Concern
COPC	Contaminant of Potential Concern
CT	Census Tract
CWA	Clean Water Act of 1977
CZMA	Coastal Zone Management Act
DA	Department of the Army
dB	Decibel
dBA	Decibels A-Weighted Scale
DBEDT	Dept. of Business, Economic Development and Tourism
DHS	U.S. Department of Homeland Security
DLM	Department of Land Management (City and County of Honolulu)
DLNR	Department of Land and Natural Resources
DNL	Day-night sound level
DOA	Department of Agriculture (State of Hawaii)
DOD	U.S. Department of Defense
DOE	Department of Education (State of Hawaii)
DOH	Department of Health (State of Hawaii)
DOT-A	Department of Transportation, Airports Division (State of Hawaii)
DOT-H	Department of Transportation, Harbors Division (State of Hawaii)
DPP	Department of Planning and Permitting (City and County of Honolulu)
DU	Decision Units
EA	Environmental Assessment
EFH	Essential Fish Habitats
EHE	Environmental Health Evaluation
EHMP	Environmental Hazard Management Plan
EIS	Environmental Impact Statement
EISPN	Environmental Impact Statement Preparation Notice
EMS	Emergency Medical Services (City and County of Honolulu)
EO	Executive Order(s)

EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act of 1973
ESA	Environmental Site Assessment
F	Fahrenheit
FAA	Federal Aviation Administration
FAQ	Frequently Asked Questions
FAR	Federal Aviation Regulations
FEMA	Federal Emergency Management Agency
FHA	Federal Housing Administration
FIRM	Flood Insurance Rate Map(s)
FONSI	Finding of No Significant Impact
FR	Federal Register
FWCA	Fish and Wildlife Coordination Act
GHG	Greenhouse gas
GHGRP	Greenhouse Gas Reporting Program
GWP	Global warming potential
H <sub>2</sub> S	Hydrogen Sulfide
HAR	Hawai'i Administrative Rules
HART	Honolulu Authority for Rapid Transit
HCDA	Hawaii Community Development Authority (State of Hawaii)
HCM	Highway Capacity Manual
HECO	Hawaiian Electric Company
HEER	Hazard Evaluation and Emergency Response Office (State of Hawaii)
HEPA	Hawaii Environmental Policy Act
HFD	Honolulu Fire Department (City and County of Honolulu)
HHFDC	Hawaii Housing Finance and Development Corporation (State of Hawaii)
HIA	Honolulu International Airport
HISC	Hawaii Invasive Species Council
HPD	Honolulu Police Department (City and County of Honolulu)
HRS	Hawaii Revised Statutes
HTCO	Hawaiian Telcom
HUD	U.S. Department of Housing and Urban Development
IBC	International Building Code
IPCC	Intergovernmental Panel on Climate Change
JBPHH	Joint Base Pearl Harbor-Hickam
kV	Kilovolt
LED	Light emitting diode
Leq	Equivalent sound level
LIHTC	State Low Income Housing Tax Credits
LOS	Level of Service
LUC	Land Use Commission (State of Hawaii)
LUO	Land Use Ordinance
MHHW	Mean higher high water
MLLW	Mean lower low water
MS4	Municipal Separate Storm Sewer System
MSL	Mean sea level

MUS	Management Unit Species
NAAQS	National Ambient Air Quality Standards
NAS	National Airspace System
NEC	Network Enterprise Center
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service (National Oceanic and Atmospheric Administration)
NO <sub>2</sub>	Nitrogen Dioxide
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
O <sub>3</sub>	Ozone
OCCL	Office of Conservation and Coastal Lands (State of Hawaii)
OEQC	Office of Environmental Quality Control
OHA	Office of Hawaiian Affairs (State of Hawaii)
OMPO	Oahu Metropolitan Planning Organization
ORMP	Ocean Resources Management Plan (State of Hawaii)
OUI1C	Operating Unit 1C
Pb	Lead
PCB	Polychlorinated biphenyl
PET	Polyethylene terephthalate
PUC	Public Utilities Commission
PVC	Polyvinyl chloride
RFP	Request for Proposals
RHRF	Rental Housing Revolving Fund
ROI	Region of influence
ROW	Right of way
SB	Senate Bill
SHPD	State Historic Preservation Division
SLUC	State Land Use Commission
SMA	Special Management Area
SOEST	School of Ocean and Earth Science and Technology (University of Hawaii)
SO <sub>2</sub>	Sulfur dioxide
SPS	Sewage Pump Station
State	State of Hawaii
SVOC	Semi-volatile organic compounds
SWMP	Storm Water Management Plan
TMDL	Total Maximum Daily Load(s)
TMK	Tax Map Key
UH	University of Hawaii
US	United States
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard

USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	Underground storage tanks
VA	U.S. Department of Veterans Affairs
VOC	Volatile organic compound
VPH	Vehicles per hour
WQC	Water Quality Certification

## SECTION ONE PROJECT SUMMARY

**APPLICANT:** Komohale West Loch, LLC  
1100 Alakea Street, 27th Floor  
Honolulu, Hawaii 96813

**APPROVING AGENCY:** Department of Land Management  
City and County of Honolulu  
558 South King Street  
Honolulu, HI 96813

**AGENT:** Environmental Communications, Inc.  
P.O. Box 236097  
Honolulu, Hawaii 96823

**PROJECT NAME:** West Loch Affordable Housing

**PROJECT LOCATION:** 91-1666 Fort Weaver Road, Ewa Beach, Hawaii  
The project is bounded by Fort Weaver Road to the west, the West Loch Elderly Village to the north, and Renton Road to the east and south.

**TAX MAP KEY:** 9-1-122: 004

**OWNERSHIP:** City and County of Honolulu

**LOT AREA:** 161,346 Square Feet / 3.704 Acres

**ZONING:** The project site is zoned AG-1 Agriculture on the City and County of Honolulu Zoning Map. The site will be developed under Hawaii Revised Statutes Chapter 201H housing rules which do not constrain the project by the underlying zoning designation.

**SPECIAL DISTRICT:** The project is not located in a Special District.

**STATE LAND USE:** Urban

**EXISTING LAND USE:** The project site located on vacant lands located immediately to the south of the West Loch Elderly Village complex and southwest of the Asing Community Park. The property was formerly in agricultural production but has been cleared, leveled

and vacant since the close of agricultural sugar production in the Ewa District.

To the west lay the Kulana Malama medical facility, an R-5 zoning residential subdivision, and commercial buildings along Fort Weaver Road. The areas to the south are similarly cleared and vacant but will soon be subject to residential development

In general, the surrounding areas outside of the project site consist of planned developments with a diverse mix of single-family, low-density and medium density buildings. The overall character is one of a low density urban residential community with a mix of commercial and institutional uses located along the major thoroughfare.

**NATURE OF DEVELOPMENT:**

The proposed project was conceived by the applicant as an affordable rental housing project that would provide much needed housing inventory to the Ewa District for income qualified residents. The City and County of Honolulu Department of Land Management solicited developers for this City and County of Honolulu owned site through a Request for Proposals (RFP) selection process. The project was awarded to Stanford Carr Development LLC and its project development entity Komohale West Loch LLC.

The proposed project will consist of 127 affordable units located in seven (7) separate three story buildings configured around a single level central community center. Parking will be located throughout the site at ground level and will offer convenient access to each building. A single centrally located entry point located off Renton Road will lead to the center of the site while two exist driveways located on either side of the entry will exit on to Renton Road as well.

Units within the complex generally fall into three (3) building configurations. Building Type A is a three story building that contains 4 one-bedroom units, 12 two-bedroom units and 6 three-bedroom units for a total of 22 units per building.

The proposed project will involve the use of Federal HUD 221(d)(4) monies, State Low Income Housing Tax Credits (LIHTC), and Rental Housing Revolving Fund (RHRF) administered by the Hawaii Housing Finance and Development Corporation (HHFDC). Projects using State or County lands or funds must meet the provisions of Chapter 343 of the Hawaii Revised Statutes (HRS). The project will also seek Section 201-H, HRS exemptions for waiver or deferral of development fees and zoning exemptions.

The project will provide critical affordable rental housing inventory within this rapidly growing population center.

- TOTAL PROJECT COST:** Approximately \$23,500,000
- PROJECT SCHEDULE:** The project is anticipated to commence in 2022 and will be completed in 2024.
- PERMITS REQUIRED:**
- National Pollutant Discharge Elimination System (NPDES) Permit  
Dept. of Health
  - Chapter 201H Approval  
Dept. of Planning and Permitting
  - Building Permits  
Dept. of Planning and Permitting
  - Certificate of Occupancy  
Dept. of Planning and Permitting
  - Construction Dewatering Permit  
Dept. of Planning and Permitting
  - Grading and Stockpiling Permits  
Dept. of Planning and Permitting
  - Sewer Connection Permit  
Dept. of Environmental Services
  - Trenching Permit      Dept. of Planning and Permitting

## SECTION TWO PROPOSED PROJECT AND STATEMENT OF OBJECTIVES

### 2.1 PROJECT LOCATION

The project site located on vacant lands located immediately to the south of the West Loch Elderly Village complex and southwest of the Asing Community Park. The property was formerly in agricultural production but has been cleared, leveled and vacant since the close of agricultural sugar production in the Ewa District. The property has a street address of 91-1666 Fort Weaver Road, Ewa Beach, Hawaii. The site is also identified as TMK: 9-1-122: 004, a 3.704 acre site.

To the west lay the Kulana Malama medical facility, an R-5 zoning residential subdivision, and commercial buildings along Fort Weaver Road. The areas to the south are similarly cleared and vacant but will soon be developed as North Park by Gentry Homes. Further north of the West Loch Elderly Village lies the 39 unit West Loch Modular Housing project which is presently under construction.

In general, the surrounding areas outside of the project site consist of planned developments with a diverse mix of single-family, low-density and medium density buildings. The overall character is one of a low density urban residential community with a mix of commercial and institutional used located along the major thoroughfare. Lands in active agricultural use are found in the northwesterly direction and further to the east along the West Loch basin.

The north Ewa area along Fort Weaver Road is a high growth area and the proposed project will add to the diversity of housing types available in the project vicinity.





Figure 3: NW View Towards West Loch Elderly Village

Source: ECI



Figure 4: NE View Towards Renton Road

Source: ECI

## **2.2 PROJECT DESCRIPTION**

### **2.2.1 PROJECT NEED AND PURPOSE OF THIS DOCUMENT**

The primary purpose of the subject project is to develop affordable rental housing in the Ewa District in a manner contextually consistent with the planned development communities already in place or soon to be developed. The proposed project will increase the affordable housing inventory for the City and County of Honolulu in a well suited location on lands available in the City's land inventory.

The proposed project was conceived by the Applicant when a Request for Proposals (RFP) process was offered by the City and County of Honolulu Department of Land Management (DLM). The DLM is responsible for the management of the City's real property interests. The Applicant understands the priority mission of the City and County of Honolulu to provide affordable rental units and therefore prepared the proposed affordable rental project as the optimal use for this valuable City owned asset.

### **2.2.2 PROJECT DESIGN**

The conceptual design of the subject project represents a development cluster similar in character to the low-density townhome style residential developments located to the north and south of the project site. The cluster of structures are served by on-grade parking throughout the site and a central community center building. Separate entry and exit points are located along Renton Road. A total of 127 residential units will be provided.

### **2.2.3 RESIDENTIAL UNITS**

The proposed project will consist of 127 affordable units located in seven (7) separate buildings configured around a central community center. Parking will be located throughout the site at ground level and will offer convenient access to each building. A single centrally located entry point located off Renton Road will lead to the center of the site while two exist driveways located on either side of the entry will exit on to Renton Road as well.

Units within the complex generally fall into three (3) building configurations. Building Type A is a three story building that contains 4 one-bedroom units, 12 two-bedroom units and 6 three-bedroom units for a total of 22 units per building. Building Type B is a three-story building that consists of 4 one-bedroom units per floor and 15 two-bedroom units for a total of 19 units per building. Building Type C is a three-story building that consists of 4 one-bedroom units and 12 two-bedroom units for a total of 16 units per building.

#### **2.2.4 COMMON AREAS**

A Community Center building will be centrally located within the project site. This building will include a large multi-function room, storage space, restrooms and an office. Adjacent to the Community Center will be a Tot Lot and a community garden. Four (4) dedicated parking stalls will front the Community Center building.

#### **2.2.5 PARKING AND VEHICULAR ACCESS**

A total of 127 parking stalls (one per residential unit) will be provided for resident use. These parking stalls, which include 7 accessible stalls and 1 van accessible stall, will be located throughout the project site allowing residents to park adjacent or near the respective residential units.

A central entry way into the site will be located approximately midway along the Renton Road street frontage. Exit driveways will be located on either side of the main entry allowing for convenient and safe vehicular traffic circulation within and outside of the site.

#### **2.2.7 LANDSCAPING**

The project site is located adjacent to the monkey pod lined Renton Road which maintained by the City and County of Honolulu. This visual greenspace provides an open and desirable environment along the western and southern sides of the site. The boundary between the project site and the West Loch Elderly Village is interspersed with eucalyptus trees. The project site will incorporate landscape planting wherever possible and may include native and low water use plantings.

### **2.3 PROJECT OBJECTIVE**

The Applicant is proposing the development of affordable rental housing units in a highly desirable location in the fast growing Ewa District. Demand for housing opportunities is significant and this location, which could be considered an urban infill location is particularly well suited for the creation of new affordable housing. Private developers are creating new ownership opportunities in nearby areas but the need for affordable rental housing remains very strong and the proposed project will significantly increase the inventory required for this market.



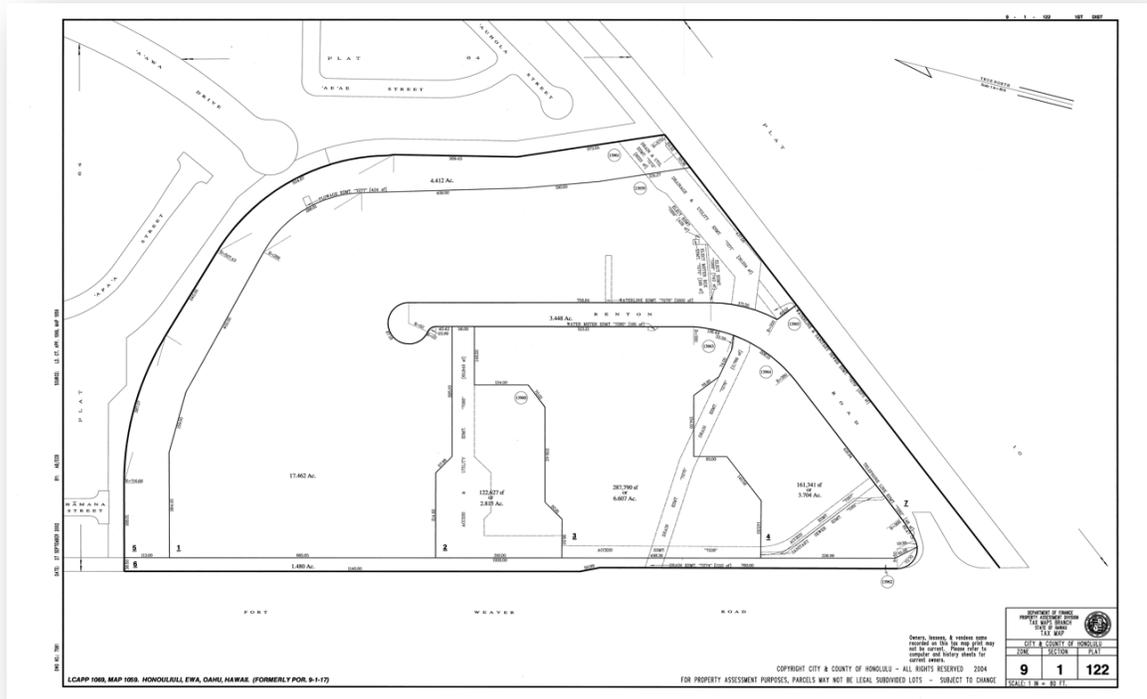


Figure 6: Vicinity Aerial

Source: Google Earth

Figure 7: Tax Map

Source: City and County of Honolulu



This project is consistent with the Blueprint for Affordable Housing to increase rental housing and supportive opportunities for special needs segments of Hawaii’s population. All of the rental units in the project will remain affordable to households earning 100% or below the U.S. Department of Housing and Urban Development (HUD) area median income. The 2020 HUD affordable rental guidelines presently call for maximum allowable income per household as shown below:

<u>Area</u>	<u>\$101,600</u>	<u>Studio</u>	<u>1 Bedroom</u>	<u>2 Bedroom</u>	<u>3 Bedroom</u>	<u>4 Bedroom</u>
<b>HONOLULU COUNTY</b>						
30% of Median		\$661	\$708	\$850	\$982	\$1,095
50% of Median		\$1,102	\$1,181	\$1,417	\$1,636	\$1,826
60% of Median		\$1,323	\$1,417	\$1,701	\$1,964	\$2,192
80% of Median		\$1,764	\$1,890	\$2,268	\$2,619	\$2,922
100% of Median		\$2,205	\$2,362	\$2,835	\$3,273	\$3,652
120% of Median		\$2,646	\$2,835	\$3,402	\$3,928	\$4,383
140% of Median		\$3,087	\$3,307	\$3,969	\$4,583	\$5,113

Source: Hawaii Housing Finance and Development Corporation

## **2.4 FUNDING AND SCHEDULE**

This workforce and affordable rental housing project will employ the use of Federal and State financing mechanisms including HUD Section 221(d)(4) monies, Low-Income Housing Tax Credits as well as Rental Housing Revolving Fund monies. The project total development cost is approximately \$23,500,000.

Upon completion of the Environmental Assessment process, the project will be reviewed and processed through the State 201-H process. The anticipated construction start date is 2023. The project is anticipated to be completed in 2025.



Figure 8: Rendered Site Plan

Source: SCD Development and Alakea Design Group

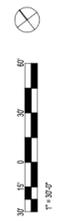
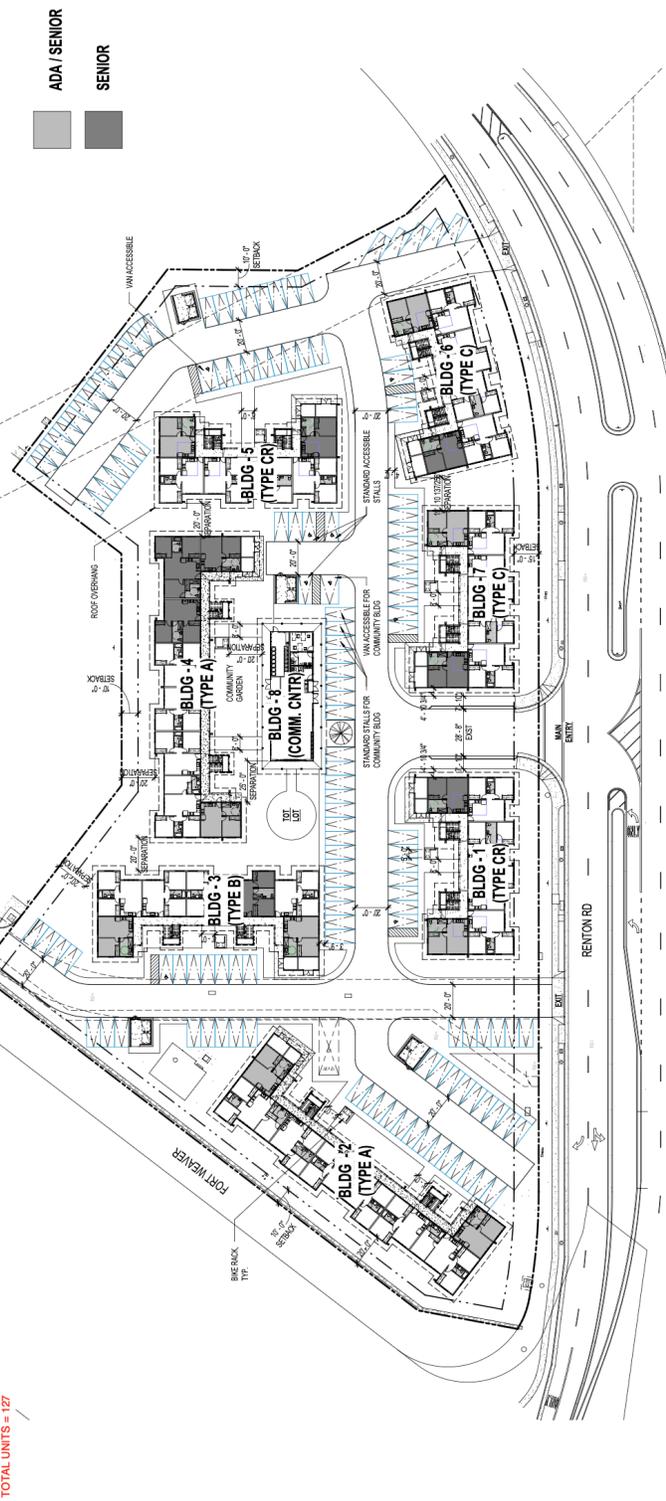
UNIT COUNT PER BLDG TYPE BREAKDOWN				
BLDG A	1-BDRM	2-BDRM	3-BDRM	3-BDRM
2	4	2	0	0
2ND	2	2	5	0
3RD	0	4	5	0
SRD	0	4	5	0
SUB-TOTAL	4	12	15	0
TOTAL UNITS = 22				

TOTAL UNIT COUNT BREAKDOWN				
BLDG	1-BDRM	2-BDRM	3-BDRM	SUBTOTAL
A(2)	4X2	8	12X2	24
B(1)	4X1	4	15X1	15
C(4)	4X4	16	12X4	48
SUB-TOTAL	28	28	87	143
TOTAL UNITS = 127				

ACCESSIBLE AND SENIOR UNIT BREAKDOWN				
BLDG TYPE	QTY	ACCESSIBLE UNITS	SENIOR UNITS	TOTAL UNITS
A	1	0	2	2
A-1	1	3	1	4
B	1	1	2	3
C	2	1(2)	1(2)	4
C-R	2	1(2)	1(2)	4
TOTAL BLDG	7	6	9	17



1 SITE PLAN  
11.24.21

Figure 9: Site Plan

Source: SCD Development



Figure 10: Landscape Plan

Source: SCD Development



Figure 11: Mauka Perspective

Source: SCD Development



Figure 12: Ewa Perspective

Source: SCD Development



Figure 13: Community Building

Source: SCD Development

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## **DESCRIPTION OF ENVIRONMENT, ANTICIPATED IMPACTS AND MITIGATION MEASURES**

### **3.1 ENVIRONMENTAL SETTING**

The project site is located in an area of active low-density residential development. Formerly in uses related to agriculture, the project area has become an important residential community since the development of the nearby West Loch Estates in the 1980's. The general vicinity is characterized as an increasingly urban mix of residential and commercial uses that retain a sense of a suburban community.

The project site parcel consists of flat, cleared lands that is essentially devoid of any buildings or interior plant materials except for a cell phone tower located along Fort Weaver Road. The Fort Weaver Road right-of-way features three large shade trees. The irregularly shaped parcel has street frontages along Fort Weaver Road and Renton Road. No openings for vehicular access exists along the Fort Weaver frontage and a rock wall runs along the entire frontage.

The proposed project immediately adjacent and south of the West Loch Elderly Village complex. Asing Community Park lies to the northeast of the project and the long street frontage on Renton Road is located directly across the ongoing North Park by Gentry residential community.

### **3.2 SURROUNDING USES**

In general, the surrounding areas outside of the project site consist of planned developments with a diverse mix of single-family, low-density and medium density buildings. The overall character is one of a low density urban residential community with a mix of commercial and institutional used located along the major thoroughfare. Lands in active agricultural use are found in the northwesterly direction and further to the east along the West Loch basin. The area north of the project site and west of the West Loch Estates is designed as the Pearl Harbor National Wildlife Refuge.

The north Ewa area along Fort Weaver Road is a high growth area and the proposed project will add to the diversity of housing types available in the project vicinity.

### 3.3 ENVIRONMENTAL CONSIDERATIONS

#### 3.3.1 GEOLOGICAL CHARACTERISTICS

##### Topography

The project site consists of flat urban lands that are presently vacant but were formally in agricultural use. The entire site has been cleared and does not contain any structures other than a rock wall along Fort Weaver Road, a metal fence along the West Loch Elderly Village property line, and a single cellular communications tower located mid-point along the Fort Weaver Road frontage. The surrounding blocks consist of both low-rise and single-story residential structures. The site is located within a rapidly urbanizing environment and the site is essentially devoid of any plant material except for three shade trees along the Fort Weaver Road right-of-way and various grasses and weedy species located within the site. The site does not serve as a habitat for wildlife.

##### Climate

The geography of the Ewa District is typically warm and dry in climate. Prevailing trade winds arrive from the northeast. According to the National Weather Service Honolulu Office, over a period of 30 years, normal monthly high temperatures range from 80 degrees in January to a high of 89 degrees in August for an average of 84 degrees. Normal monthly low temperatures range from a low of 65 degrees in February and a high of 74 degrees in August for a monthly average of 70 degrees. Precipitation typically ranges from 0.44 inches in August to a high of 3.8 inches in December. The annual average rainfall in Honolulu is 70 inches per year.

##### USDA Soil Survey Report and Detailed Land Classification – Island of Oahu

The project site is located on soils classified HxA, Honouliuli clay, 0 to 2 percent slopes. This series consists of soils on coastal plains on the island of Oahu in the Ewa area. This soil type typically occurs in the lowlands along the coastal plains. The representative profile of the soil is dark reddish-brown with clay throughout. The surface layer is about 15 inches thick. Permeability is moderately slow. Runoff is slow and the erosion hazard is no more than slight according to Panel 44 of the *Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii* by the U.S. Department of Agriculture Soil Conservation Service.

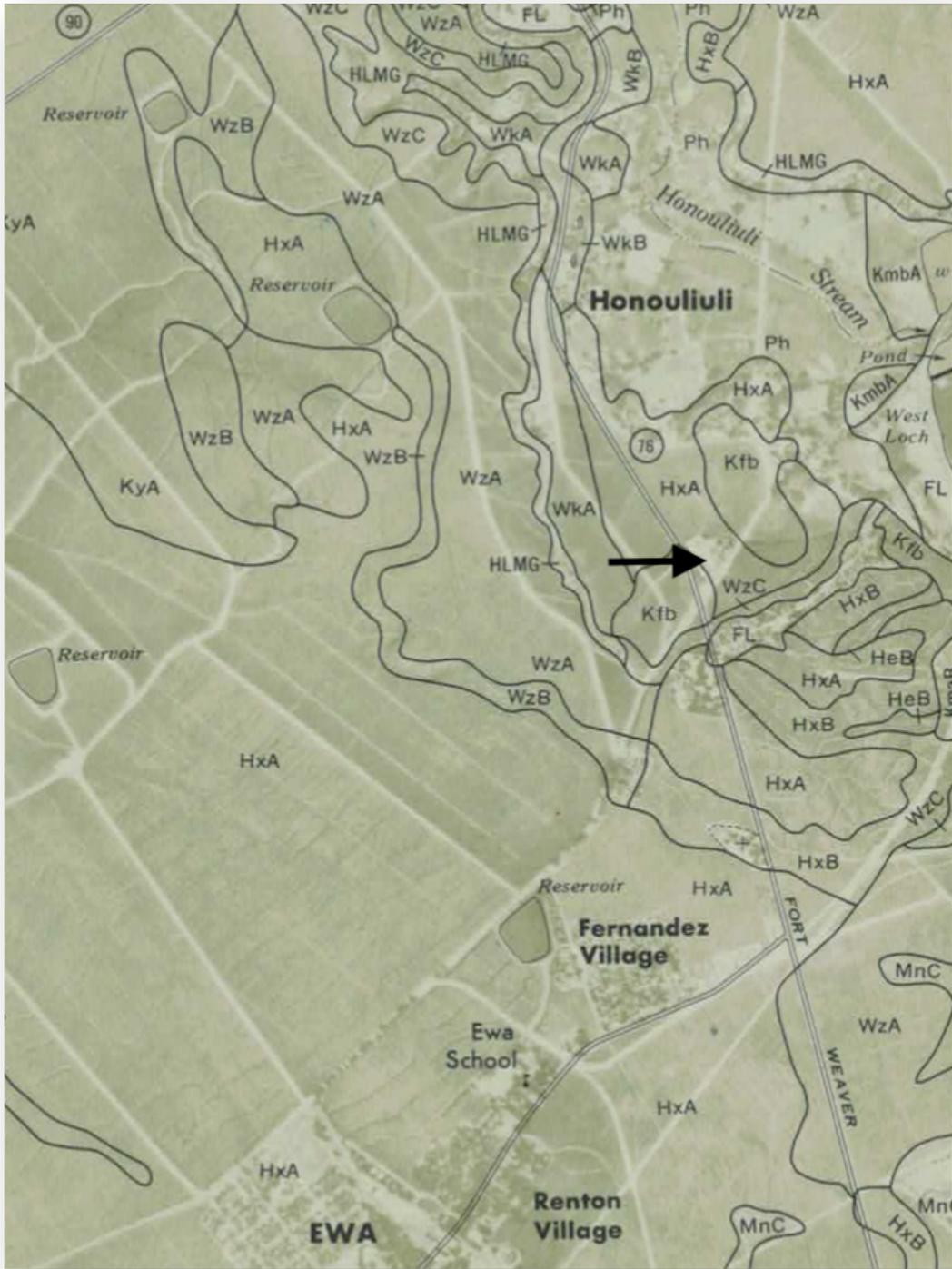


Figure 14: Soil Map Source: Soil Survey, USDA Soil Conservation Service

The project site is classified as B16i on Map No. 207 of the *Detailed Land Classification – Island of Oahu by the University of Hawaii Land Study Bureau*. This rating reflects its former high productivity for sugarcane.

### 3.3.2 WATER RESOURCES

#### Hydrologic Hazards and Resources

According to Panel 150003 C 0310 G of the Federal Emergency Management Agency Flood Insurance Rate Map, the project site is predominantly located in Zone X, an area determined to be outside of the floodplain. The official Flood Hazard Assessment Report follows.

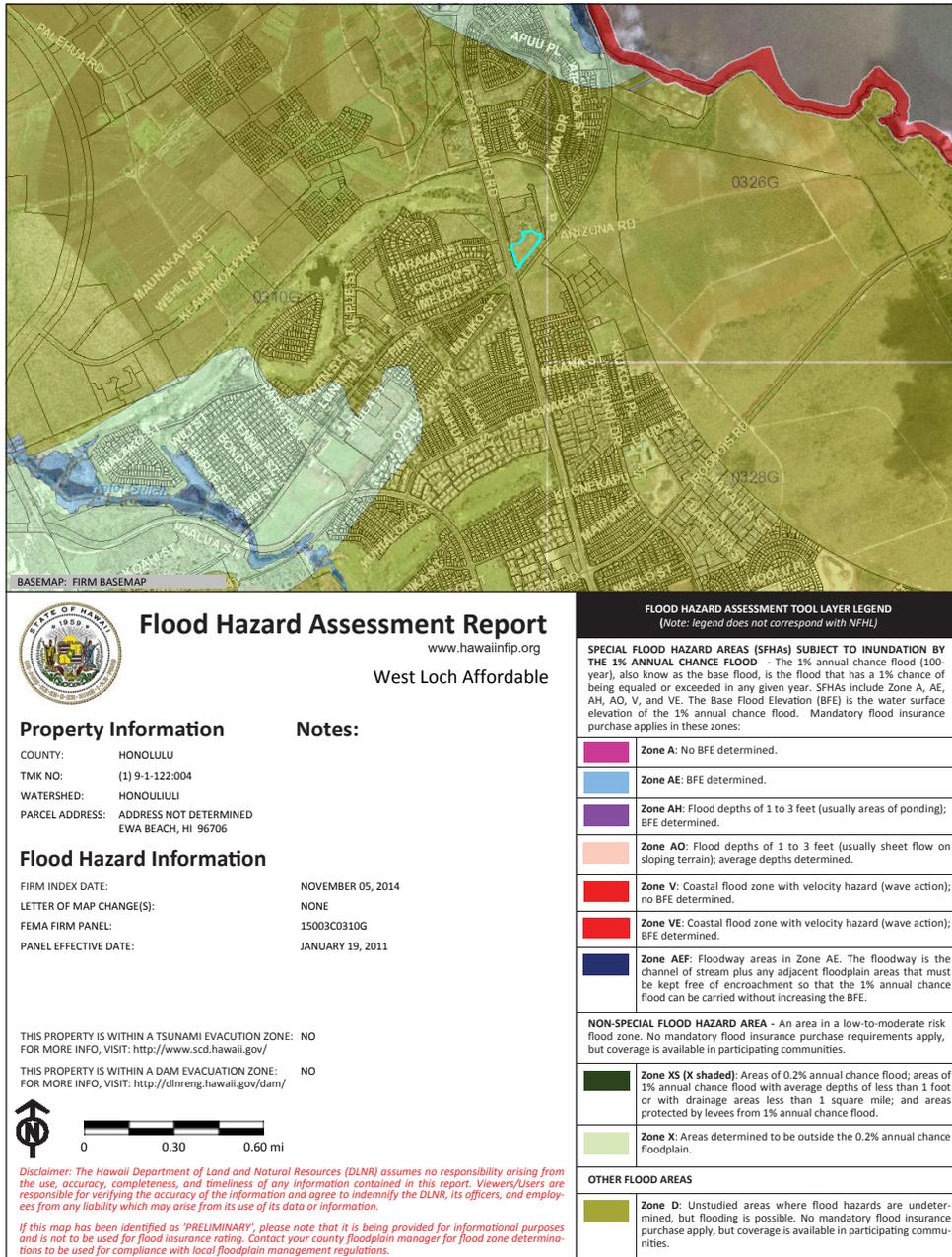


Figure 15: Flood Hazard Map

Source: Department of Land and Natural Resources

## Tsunami Inundation

According to the National Ocean and Atmospheric Administration (NOAA), the project site is located in a safe zone on the Tsunami Hazard Map.

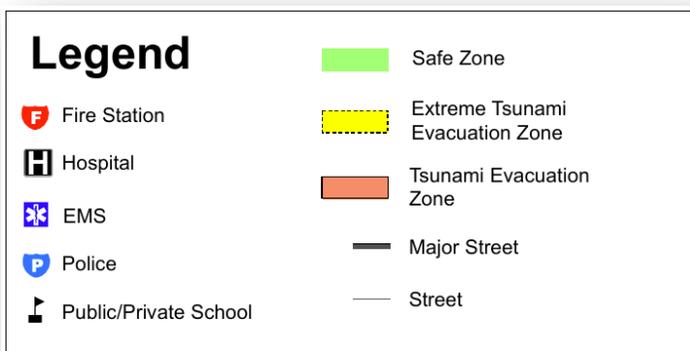


Figure 16: Tsunami Hazard Map

Source: Department of Planning and Permitting

### Special Management Area

The project site is not located within the boundaries of the Special Management Area (SMA) Map.

### Sea Level Rise Vulnerability

According to the *Hawaii Sea Level Rise Vulnerability and Adaption Report* authored by the Department of Land and Natural Resources, State of Hawaii Office of Planning, Terta Tech, the University of Hawaii School of Ocean and Earth Science and Technology, the University Sea Grant Program, and the Pacific Islands Climate Science Center, sea level rise has been historically noted and is projected to increase throughout the remainder of the century. It is now widely accepted that rising sea levels by the year 2100 may reach 3.2 feet above current mean sea level. This is a global phenomenon that must be addressed on a greater policy level. The implications on the proposed project have less impact as the project site is higher than sea level and in fact is not generally not located within a flood zone.

### **3.3.3 HISTORICAL AND ARCHAEOLOGICAL ASSESSMENT**

An archaeological review titled *Archaeological Literature Review and Field Inspection for the West Loch Affordable Housing Project, Honouliuli Ahupua‘a, ‘Ewa District, O‘ahu Island TMKs: (1) 9-1-122:041* was prepared by Honua Consultants in July 2021. The study, which covered the project area, is summarized in this section and included in its entirety as Appendix A along with confirmation from the Department of Land and Natural Resources Historic Preservation Division. A summary of the findings of these studies is provided below.

The objectives of this study were to determine the project area’s land-use history, to identify any historic properties or component features in the project area, to evaluate the proposed project’s potential effect on historic properties, and to make recommendations about mitigation, if applicable. This study is not an archaeological inventory survey (AIS); however, it has been conducted according to standards outlined in Hawai‘i Administrative Rules (HAR) § 13-276 for AIS studies, and is intended to assist with the project’s compliance with Hawai‘i Revised Statutes (HRS) § 6E-8 and consultation with the State Historic Preservation Division (SHPD).

Background research indicates that the project area is situated on the coral plain of ‘Ewa, an area thought to be sparsely inhabited by Hawaiians. The pre-contact (pre-1778) population of ‘Ewa was focused along the coastline with the plains used for resource collection. The numerous sinkholes of the interior karst lands were used for agriculture, burial, and sometimes habitation. Approximately 1 mile

to the north of the project area is an area known as the Honouliuli Taro Lands, an extensive traditional Hawaiian and early historic period lo‘i (pond field) system and habitation area that once comprised much of the lowlands along Honouliuli Stream. Additionally, several former fishponds are located nearby that utilized the shores of the West Loch of Pearl Harbor and Laulaunui Island.

The entirety of the project area was part of LCA 11216, ‘āpana 8 to Mikahela Ke‘ahi-Kuni Kekau‘ōnohi, which consisted of all of the unclaimed lands of Honouliuli Ahupua‘a. In the late 19<sup>th</sup> century, the project area was used for cattle grazing. Later, it was planted with sugar cane around the turn of the 20<sup>th</sup> century with the establishment of the OR&L Railroad in 1889 and the Ewa Plantation Company in 1890. The project area was under cultivation by the Ewa Plantation Company until 1970 and then the Oahu Sugar Company into the 1980s when the property was sold to the City and County of Honolulu. The property was cleared and graded as early as 1993, likely during construction of the West Loch Elderly Villages to the north. Easements were constructed through the project area in 2000 and a cell tower lease facility was built along the western boundary in 2011.

Two previous studies have included the project area or a portion of the project area and include an AIS for the West Loch Estates residential development in 1987 and a historic properties assessment for a cell tower facility in 2009 (Rosendahl 1987 and Macak et al. 2009). No historic properties were documented within the project area during either study. The lack of historic properties was attributed to previous disturbances from historic cattle ranching and subsequent use of the area for commercial sugar cane production.

The archaeological field inspection conducted for the current project consisted of a 100% pedestrian survey of the project area. The entire project area was relatively free of vegetation and has been graded flat. It is bordered on the east, south, and west by streets and sidewalks and on the north by the West Loch Elderly Villages. A road easement and a cell tower lease facility are present in the western portion of the project. A single potential historic property, temporary site designation Honua 1, was documented in south-central portion of the project area and includes an area with several depressions and two possible filled sinkholes recorded as Features A and B.

Sinkholes within the region have been found to contain significant cultural deposits and materials, including human burials, therefore this study recommends further examination of the two filled sinkholes, Features A and B, within the project area. Methodology for investigation of the sinkholes should be discussed with and approved by the State Historic Preservation Division (SHPD). The investigation will likely require the completion of an Archaeological Inventory Survey (AIS) report. The sinkholes should be assessed for cultural modifications, the presence of soil/sediment sufficient for excavation, and the presence of archaeological and paleontological remains. Excavations should be conducted within sinkholes of sufficient size for access and containing sufficient

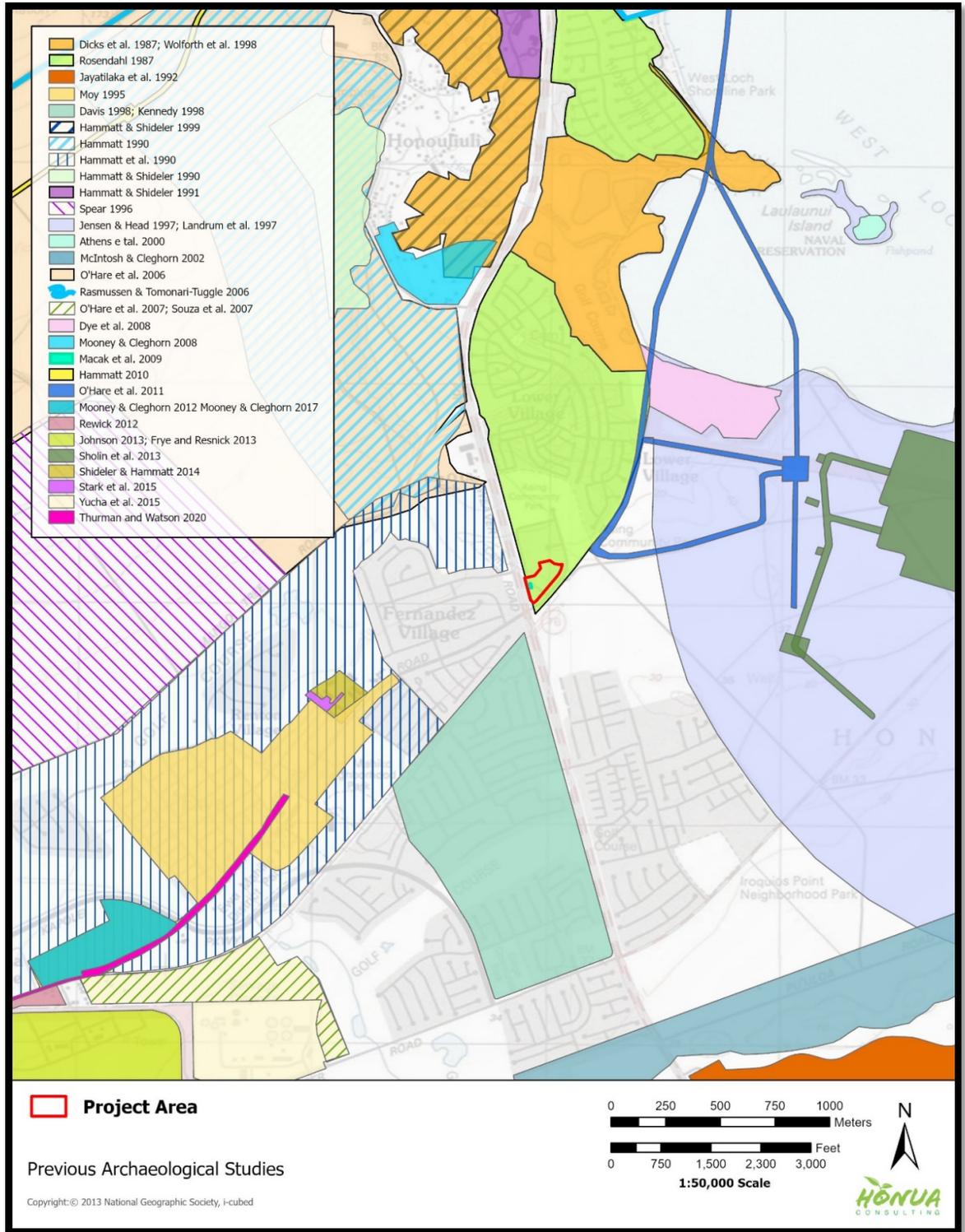


Figure 17. Portion of a 2013 USGS showing previous archaeological studies within a 1.5 mile radius of the project area

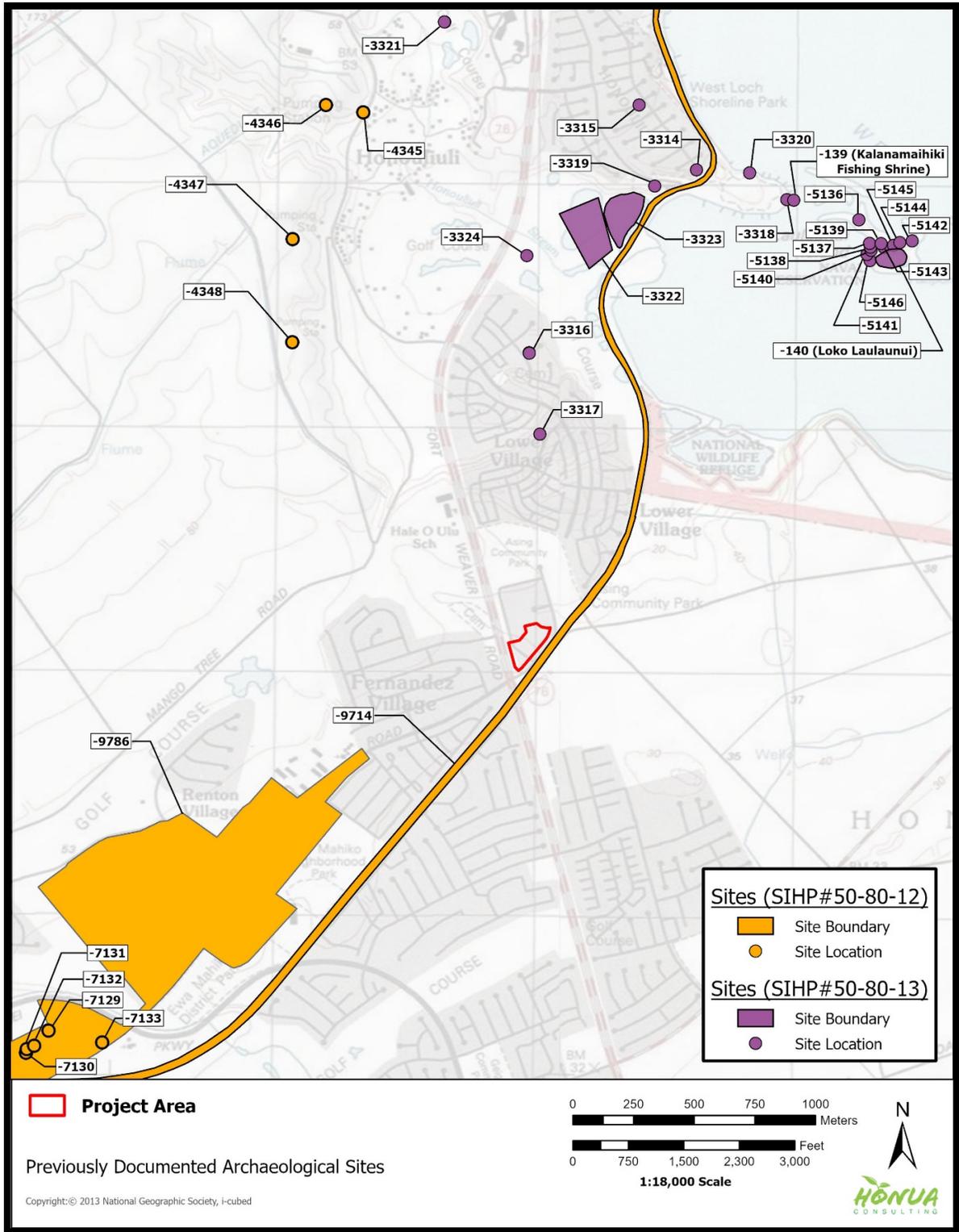


Figure 1. Portion of a 2013 Waipahu USGS showing historic properties within a 1.5 mile radius of the project area

soil/sediment. In the event paleontological remains are recovered, the faunal material should be analyzed by a qualified expert to determine animal species.

Following further investigation of the sinkholes, an archaeological monitoring program is recommended to be carried out in accordance with HAR § 13-279 (Rules for Archaeological Monitoring Studies and Reports). The monitoring program would ensure documentation of any further potential cultural remains or significant deposits that may exist within sinkholes in the project area. The frequency of archaeological monitoring would be determined in coordination with the SHPD.

### **3.3.4 CULTURAL IMPACT ASSESSMENT**

Cultural impacts were assessed in a report titled *Cultural Impact Assessment Report for the West Loch Affordable Housing Project, Honouliuli Ahupua‘a, ‘Ewa District, O‘ahu Island TMKs: (1) 9-1-122:004* was prepared by Honua Consulting in September 2021. The study, which covered the project area, is summarized in this section and included in its entirety as Appendix B. A summary of the findings of these studies is provided below.

Research in preparation of this report consisted of a thorough search of Hawaiian language documents, including but not limited to the Bishop Museum mele index and Bishop Museum archival documents, including the Hawaiian language archival caché. All Hawaiian language documents were reviewed by Hawaiian language experts to search for relevant information to include in the report. Documents considered relevant to this analysis are included herein, and translations are provided when appropriate to the discussion. Summaries of interviews and information on other oral testimonies are also provided herein.

Based on the information gathered and the assessment of the resources conducted, the project is not anticipated to have any adverse impact on cultural resources, traditions, customs, or practices.

Intangible cultural resources refer to those resources without physical form, such as hula or mele. As there are no known or identified cultural practices currently taking place on the property, it is unlikely the proposed project would adversely impact intangible cultural resources on the property or in adjacent areas.

The assessment did not identify any cultural practices currently taking place in the project area.

Adverse cumulative and indirect impacts to cultural resources are often overlooked in CIAs, as they are difficult to assess. Cumulative impacts are

cultural impacts that result from the incremental impacts of an activity when added to past, present, and reasonably foreseeable future actions and activities. Indirect impacts are impacts on cultural resources which are not a direct result of the project, but a secondary or tertiary result of the project.

The land within the Area of Potential Impact (APE) and its immediate vicinity have been extensively developed, so this project is unlikely to result in any adverse impacts. There are no further anticipated cumulative or indirect cultural impacts to the area.

### 3.3.5 TRAFFIC CONDITIONS

A traffic study for the West Loch Affordable Project was conducted by The Traffic Management Consultant, Inc. in July 2021. This study is titled Transportation Assessment Report for the Proposed West Loch Affordable Housing is summarized in this section and included in its entirety as Appendix C.

#### Exiting Conditions

The project site is located on the northeast corner of the intersection of Fort Weaver Road and Renton Road. Site access is proposed at an existing median opening on Renton Road, which is located about 450 feet east of Fort Weaver Road.

The proposed project is located immediately south of the West Loch Elderly Villages. The West Loch Elderly Villages has an existing access easement through the project site to Renton Road, which is located approximately 300 feet east of Fort Weaver Road.

The full build-out and occupancy of the proposed West Loch Affordable Housing Project is expected by mid-2024. For the purpose of this Transportation Assessment Report, the Year 2025 is selected as the first full year of full buildout and occupancy of the West Loch Affordable Housing Project.

The purpose of the traffic study is to assess the transportation impacts resulting from the development of the proposed West Loch Affordable Housing. The report presents the findings and recommendations of the study, the scope of which includes:

1. A description of the proposed project.
2. An evaluation of existing roadway and transportation conditions.
3. The analysis of the future transportation conditions without the proposed project.
4. The development of trip generation characteristics of the proposed project.

5. The identification and analysis of the transportation impacts resulting from the development of the proposed project.
6. The recommendation of improvements, which would mitigate the transportation impacts identified in the traffic study.

Fort Weaver Road is the major north-south collector roadway for Ewa Beach. Fort Weaver Road is a six-lane, divided, State of Hawaii highway. Fort Weaver Road is signalized at its intersection with Renton Road. Fort Weaver Road provides exclusive left- turn and right-turn lanes in both directions at Renton Road.

Renton Road is an east-west collector City & County of Honolulu roadway for Ewa Villages between Kapolei Parkway and Kamokila Boulevard to the west and Fort Weaver Road to the east. Renton Road is a two-way, four-lane divided roadway. Eastbound Renton Road provides exclusive left-turn and right-turn lanes and a shared left-turn/through lane at Fort Weaver Road. Westbound Renton Road provides an exclusive right-turn lane and a shared left-turn/through lane at Fort Weaver Road. Renton Road extends to the east of Fort Weaver Road and terminates at the West Loch Elderly Villages and Asing Community Park.

The project site access is provided at an existing unsignalized Tee-intersection on Renton Road. An exclusive left-turn lane is provided on eastbound Renton Road at the Project Site Access Driveway. Project site access is also provided by an existing driveway easement on Renton Road, between the Project Site Access intersection and Fort Weaver Road.

TheBus stops are located in both directions on Fort Weaver Road at Renton Road. TheBus Routes 42, PH7 Express, 91 Express, W1, 101 Express, and E Country Express provide public transit service to Ewa Beach. TheBus stops also are located on both sides of the west leg of Renton Road. TheBus Route 44 provides public transit service to Ewa Villages.

#### Future Conditions Without the Project

AM peak hour traffic for the northbound and southbound through movements on Fort Weaver Road are expected to operate at LOS “E” and LOS “C”, respectfully, during the AM peak hour of traffic without the proposed project. The other traffic movements at the intersection of Fort Weaver Road and Renton Road are expected to operate at the same Levels of Service as during the existing AM peak hour of traffic.

During the PM peak hour of traffic without the proposed project, the intersection of Fort Weaver Road and Renton Road is expected to operate at the same Levels of Service as during the existing PM peak hour of traffic.

### Future Conditions with the Project

AM peak hour traffic at the intersection of Fort Weaver Road and Renton Road is expected to operate at an overall intersection LOS “E”, during the AM peak hour of traffic with the proposed project. However, the individual traffic movements at the intersection of Fort Weaver Road and Renton Road are expected to operate at the same Levels of Service as during the AM peak hour of traffic without the proposed project. The Project Access Driveway on Renton Road is expected to operate at LOS “A”.

The through movement on northbound Fort Weaver Road is expected to operate at LOS “C”, during the PM peak hour of traffic with the proposed project. The right-turn movement on westbound Renton Road is expected to operate at LOS “B”. The other traffic movements at the intersection are expected to operate at the same Levels of Service as during the PM peak hour of traffic without the proposed project. The Project Access Driveway on Renton Road is expected to operate at LOS “A”.

### Recommendations and Conclusions

The West Loch Elderly Villages access easement through the project site is intended for exit only. However, the field investigation indicated entering traffic also utilized the easement, during the peak hours of traffic. Vehicles entering the easement made a U-turn at the existing median opening on Renton Road, before making a right-turn into the easement driveway. It is recommended that the West Loch Elderly Villages traffic be permitted to access the Project Access Driveway and pass through the parking lot between Renton Road and the West Loch Elderly Villages.

The existing peak hour traffic count data, collected on Fort Weaver Road, has significantly increased over the historical pre-pandemic traffic conditions. The recent growth in peak hour traffic at the intersection of Fort Weaver Road and Renton Road is consistent with historical growth in traffic in Ewa Beach.

TheBus provides adequate public transit service to Ewa Beach to accommodate the proposed West Loch Affordable Housing residents. The proposed project is expected to generate minimal bicycle traffic.

The proposed West Loch Affordable Housing Project is expected to generate less than 60 vehicle trips during the peak hours of traffic. The proposed project is expected to increase the traffic demands at the intersection of Fort Weaver Road and Renton Road by less than one (1) percent, during the AM and PM peak hours of traffic. The Project Access Driveway is expected to operate at LOS “A” during the AM and PM peak hours of traffic. During the peak hours of traffic with the proposed project, the individual traffic movements at the intersection are expected to operate at satisfactory Levels of Service, or at the same Levels of Service as

during the peak hours of traffic without the proposed project. The development of the proposed West Loch Affordable Housing Project is not expected to result in significant vehicular transportation impacts.

Bicycle and pedestrian traffic related impacts have also been determined to be of insignificant impact based on Traffic Impact Assessment conducted for the project. Renton Road is considered a shared use path where bicycle and vehicular traffic will be located along the City and County right-of-way. The project driveways will be designed in consideration of this shared alignment.

### **3.3.6 NOISE ENVIRONMENT**

A noise analysis was conducted by D. L. Adams Associates for the project site in June of 2021. This report entitled, *91-1666 Renton Road West Loch Affordable Housing – HUD Site Noise Analysis (DLAA #20-044)* is summarized below and appended in its entirety in the Appendix D.

#### **Design Criteria**

The noise assessment evaluates the site based on the Site Acceptability Standards of the U.S. Department of House and Urban Development (HUD). The Site Acceptability Standards are given in the Code of Federal Regulations 24 CFR Part 51B. The standards regulate the acceptability of sites for residential buildings with HUD funding. The noise levels are expressed in terms of the Day-Night Average Sound Level (DNL). The DNL is the average sound level over a 24-hour period to which a 10-decibel penalty has been applied to sound levels occurring during the nighttime hours (10:00 PM to 7:00 AM). DNL level in decibels are A-weighted. The HUD Site Acceptability Standards for exterior sound levels are summarized in Table 1 below.

The intent of the 65 DNL outside criteria is to achieve DNL 45 dBA indoors. HUD typically allows upgrades to the building shell to meet an interior DNL of 45 dBA in Normally Unacceptable or Unacceptable areas. This can be accomplished by specifying building facades, windows, and doors with higher sound transmission class (STC) ratings than normal construction. Addressing windows is particularly important, as they are often the weak link in the building facade with respect to noise intrusion.

Category	DNL	Comments
Acceptable	Less than or equal to 65 dBA	No special acoustical design consideration necessary
Normally Unacceptable	Greater than 65 dBA, but less than or equal to 70 dBA	5 dB additional attenuation required through the use of barriers or in design to ensure interior noise levels are acceptable
	Greater than 70 dBA, but less or equal to 75 dBA	10 dB additional attenuation required through the use of barriers or in design to ensure interior noise levels are acceptable
Unacceptable	Greater than 75 dBA	Attenuation measures must be submitted and approved on a case-by-case basis

### HUD Calculations

DLAA analyzed noise levels at five (5) different noise assessment locations (NALs) on the 91-1666 Renton Road development site. Per the HUD Guidelines, DLAA calculated the predicted DNL in the build year (2025) and 10-years beyond the build year (2035) based on the estimated average annual growth rate provided in the Draft TAR.

NAL	DNL Current (2019)	DNL Build Year Predicted (2025)	DNL 10-Year Predicted (2035)
NAL #1	69 L <sub>DN</sub>	69 L <sub>DN</sub>	69 L <sub>DN</sub>
NAL #2	69 L <sub>DN</sub>	69 L <sub>DN</sub>	69 L <sub>DN</sub>
NAL #3	66 L <sub>DN</sub>	66 L <sub>DN</sub>	66 L <sub>DN</sub>
NAL #4	64 L <sub>DN</sub>	65 L <sub>DN</sub>	65 L <sub>DN</sub>
NAL #5	61 L <sub>DN</sub>	61 L <sub>DN</sub>	62 L <sub>DN</sub>

Based on the worst-case results of 69 LDN, the site is considered “Normally Unacceptable”.

### Exterior Shell Review and Recommendations

DLAA has reviewed the necessary composite STC (STCC) rating for the building shell to achieve the HUD required interior 45 LDN criteria. The STCC rating differs slightly from a normal STC rating in that it takes an area that is composed of multiple different assemblies (i.e., windows, exterior walls, or doors) and calculates a weighted average of the assemblies’ STC ratings. The STCC rating of the exterior assemblies were assessed at second and third floor units representing different window and wall combinations for each NAL of the complex exposed to DNL greater than 65 LDN. Only NAL #1, #2 and #3 were assessed for STCC ratings, corresponding to Buildings A1 and B1. Units represented by NAL #4, corresponding to Buildings A2, B2, B3, C1 and C2, are not predicted to have

exposure greater than 65 LDN, therefore STCC analysis is not necessary for these units. Table 3 below summarizes the calculated STCC ratings. Note that all STCC calculations assume minimum STC 30-rated windows, which is typical for windows with a 1” insulating glazing assembly comprised of 1/4” Lite - 1/2” air space – 1/4” Lite.

NAL	Unit Type and Room Analyzed	Calculated STCC	DNL	Result Int. Noise Level
NAL #1	Building A1 3-BR Unit Corner Bedroom (A1_1)	30	69 LDN	39 dBA
	Building A1 3-BR Unit Center Bedroom (A1_2)	31	69 LDN	38 dBA
	Building A1 2-BR Unit Center Bedroom (A1_3)	30	69 LDN	39 dBA
	Building A1 2-BR Unit Living Room (A1_4)	31	69 LDN	38 dBA
NAL #2	Building A1 3-BR Unit Living Room (A1_5)	31	69 LDN	38 dBA
NAL #3	Building B1 1-BR Unit Corner Bedroom (B1_1)	30	66 LDN	36 dBA
	Building B1 2-BR Unit Center Bedroom (B1_2)	30	66 LDN	36 dBA
	Building B1 2-BR Unit Living Room (B1_3)	26	66 LDN	40 dBA

Based on the provided exterior wall assemblies and minimum STC 30-rated windows, each NAL achieves the HUD maximum interior noise level of 45 dBA and is considered “Acceptable”. We recommend selecting window assemblies with minimum STC 30 ratings. If windows with higher STC ratings are selected, expect interior noise levels to decrease.

NAL#5 is an outdoor location, therefore STCC does not apply. However, predicted noise levels at NAL #5 are considered “Acceptable” and no further mitigation is warranted at this time.

### 3.3.7 AIR QUALITY AND HAZARDOUS MATERIALS

The proposed project will have short-term and long-term effect on ambient air quality. During grading and excavation, dust will be generated however fugitive dust is generally controlled by frequent watering and perimeter screening. Best management practices will be used to ensure that dust control during demolition of the existing paving and during construction of the new building are kept to a minimum. These impacts are typical of any new construction project.

### 3.3.8 BIOLOGICAL CHARACTERISTICS

#### Flora

The project lot is presently covered grasses and limited gravel paving. The project site is essentially devoid of any plant material except for grasses and

weedy species located throughout the site a few ornamental trees along the Fort Weaver Road frontage. No rare or endangered species of flora were identified on the site.

### Fauna

The site does not serve as a wildlife habitat although avifauna, feral cats, and rodents may be found on-site.

### **3.3.9 INFRASTRUCTURE AND UTILITIES**

The proposed improvements are readily serviced by existing utilities located in the immediate vicinity. All utilities were previously located underground and will continue to do so for the proposed project.

#### Water

The project will continue to be serviced by the existing water system. The proposed West Loch Affordable Housing development will result in a significant increase in water demand. The new domestic water and fire protection water meters to serve the project are expected as part of the development. Water conservation efforts are likely to be implemented by the project operator upon completion.

#### Stormwater

The site is relatively flat but drains towards Renton Road where a curb and three inlets collect and conveys stormwater. The proposed project will be required to control drainage according to prevailing drainage regulations. All storm water runoff from the proposed improvements will be reviewed for conformance with City and County of Honolulu Ordinance 96-34 regarding peak runoff.

Best Management Practices (BMPs) will be put in to place prior to the start of any construction to ensure that runoff in the storm drain system is treated for minimal impact into State receiving waters. Additionally, Low Impact Design feature will be considered for the project.

#### Wastewater

Approval from City and County of Honolulu Department of Planning and Permitting for municipal sewer system connection to accommodate the proposed project will be required. Sewer mains are located along each street frontage and an appropriate sewage connection system will be designed in consideration of the most effective connection points.

#### Solid Waste

It is expected that private refuse collection service will be used to service the project location. The project operator may implement recycling programs upon project completion.

### Telephone and Electrical Services

Telephone and electrical services are available to the site. Coordination with the local electric and telephone service providers will be expected during the design and construction phases.

#### **3.4.10 PUBLIC FACILITIES**

The Waipahu Fire Station No. 42 provides fire protection service to the project area. The station is located at 94-840 Lumiaina Street. Response time to the site is less than 5 minutes.

Police service is provided by the Honolulu Police Department (HPD) District 8, which is administratively based in Kapolei. This station is located at 1100 Kamokila Boulevard, Police services are provided by patrolling officers and response time to the site is less than 5 minutes.

The nearest hospital providing full medical services is the Queens Medical Center – West Oahu which is located approximately 2 miles from the project site. The address of this facility, which also serves as the base for Emergency Medical Response is 91-2139 Fort Weaver Road, Ewa Beach.

Public and private Schools located near or adjacent to the project site include Pohakea Elementary School, Kaimiloa Elementary Schools, Ewa Beach Elementary School, Ilima Intermediate School, and the private Our Lady of Perpetual Help School. The proposed improvements will not have any impact on these schools but will be an important improvement for athletic activities at the James Campbell High School.

The Department of Education (DOE) is required to provide education for all school-aged children. Discussions with DOE staff stated that for planning purposes, the proposed West Loch Affordable Housing project would generate demand for educational facilities for 27 elementary school aged children, 8 middle school and 13 high school students will result from the development of the subject project. DOE also stated that these ratios are for planning purposes and actual counts may be higher or lower depending on the type of project developed.

Public schools serving the area presently have limited capacity to accommodate the projected student demand however school enrollments in the project area is expected to increase significantly taxing limited Department of Education facilities. Presently, there are no fees or school impact assessments placed on new developments. In the event that school capacity is reached, the developer will be open to discussion with the Department of Education regarding possible solutions.

The project site is located near the active recreational centers of the adjacent Asing Neighborhood Park located immediately the north, Kapapahu Park to the northeast, and Ewa Mahiko District Park to the southwest. Several public and private golf courses are also located within the project vicinity.

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The project is also consistent with the Hawaii State Plan, HRS Chapter 226. While the project does affect the physical environment, the project will not affect the natural beauty and historic resource of Hawaii (12(b)(5) and 12(b)(7)) as the site was formerly in parking lot use within a highly urban environment designated for urban development. The project does provide significant affordable housing and socio-cultural advancement by providing a fully integrated multi-function complex that is supportive of general guidelines on sustainability.

HRS 226-19 elaborates on the State's plan for socio-cultural advancement as it relates to housing. In this regard the Plan states:

(1) Greater opportunities for Hawaii's people to secure reasonably priced, safe, sanitary, and livable homes, located in suitable environments that satisfactorily accommodate the needs and desires of families and individuals, through collaboration and cooperation between government and nonprofit and for-profit developers to ensure that more affordable housing is made available to very low-, low- and moderate-income segments of Hawaii's population, (2) the orderly development of residential areas sensitive to community needs and other land uses, (3) the development and provision of affordable rental housing by the State to meet the housing needs of Hawaii's people.

The project will advance HRS 226-19 by providing much needed affordable rental housing that balances the market housing found in the project vicinity.

Furthermore, HRS 226-55, the State functional plan on housing specifies objectives, policies and implementing actions to realize the States objectives for diverse housing types and the intent of the functional plans to work in coordination with other County and regulatory concerns. As stated earlier, the West Loch Affordable Housing project will expand the diversity of housing found in Ewa area and is clearly supportive of the high demand affordable rental housing market.

The affordable housing provided by the project promotes all of the aforementioned State Plan provision and most significantly addresses HRS 226-106 which elaborates on the priority guidelines on affordable housing which is the primary intent of the subject project. The West Loch Affordable Housing project is not in conflict with any of the State's housing plan objectives.

HRS 226-108 provides the priority principles and guidelines for sustainability. In this regard, the project is generally consistent with all of the principles but is particularly applicable to the subsection (1) Encouraging balanced economic, social, community, and environmental priorities, and (3) Promoting a diversified and dynamic economy. The project will represent a significant component in creating a balanced Ewa district by providing affordable rental housing units within an area that is also rich in market rate housing projects. By creating

affordable workforce housing, the project will support diverse economic opportunity as well as social and community balance.

The project will utilize State of Hawaii DURF funds which requires that the project meet the provisions of § 103-50, Hawaii Revised Statutes as follows:

*All buildings, facilities, and sites shall conform to applicable federal, state, and county accessibility guidelines and standards. Hawaii Revised Statutes §103-50 requires all State of Hawaii or County government buildings, facilities, and sites to be designated and constructed to conform to the Americans with Disabilities Act Accessibility Guidelines, the Federal Fair Housing Amendments Act, and other applicable design standards as adopted and amended by the Disability and Communications Access Board. The law further requires all plans and specifications prepared for the construction of State of Hawaii or County government buildings, facilities, and sites to be reviewed by the Disability and Communication Access Board for conformance to those guidelines and standards.*

#### **4.2 CITY AND COUNTY OF HONOLULU PLANS AND POLICIES**

The City and County of Honolulu General Plan provides the overall vision for the island of Oahu and broadly outlines the objectives and policies shaping future growth. While the proposed action is consistent with the Plan overall, it is particularly pertinent to the Section IV, Housing. It is here where proposed action supports Objective A, to provide decent housing for all the people of Oahu at prices they can afford, and Objective C, to provide the people of Oahu with a choice of living environments which are reasonably close to employment, recreation, and commercial centers and which are adequately served by public utilities. The proposed action will provide affordable rental housing that is located within close proximity to major employment centers as well as having excellent access to public transit options.

The City's Ewa Development Plan 2013 (Ewa DP) development plan guides development in the Ewa District of Oahu. While the project is generally consistent with all aspects of the Ewa DP, particularly relevant to the proposed project is Section 2.2.6 Master Planned Communities. It states that "A network of master planned residential communities will provide a wide variety of housing and accommodate the need for affordable housing." The project is also supportive of Section 2.2.10 Planned Regional Development which addresses the potential supply of housing units of which the proposed will offer significant contribution.



## SECTION FIVE IMPACTS, ALTERNATIVES AND MITIGATION MEASURES

### 5.1 PROBABLE IMPACT ON THE ENVIRONMENT

The proposed project represents a significant change from its current and former uses. The project is consistent with surrounding land uses and the intent of the prevailing Land Use Ordinance through the use of the 201H housing development initiative exemptions. Impacts associated with the proposed project have generally been determined to be negligible. Views will be impacted as a result of the new facility but should be considered in the context that any development of the site would likely impact views as well.

When viewed in the cumulative with the other adjacent projects, impacts to the environment will be slightly more significant. In addition to significantly higher urban density resulting from the build out the project, traffic and noise impacts will rise significantly over the no-action alternative. These cumulative impacts are largely due to the intensive level of activity that are typically associated with residential use however it should be noted that the project will provide exceptionally convenient transportation alternatives.

Positive environmental impacts are expected as a result of the affordable rental residential inventory. The convenience of residing near major employment centers in the Waipahu, Ewa Beach and Kapolei areas and the University of Hawaii West Oahu campus will decrease the need for private cars resulting in decreased traffic volumes and the associated environmental benefits of reduced traffic.

### 5.2 ADVERSE IMPACTS WHICH CANNOT BE AVOIDED

Adverse impacts that cannot be avoided are generally related to short-term construction impacts. These impacts can be minimized by sound construction practices, Best Management Practices (BMPs) adherence to applicable construction regulations as prescribed by the Department of Health, and coordination with applicable County agencies. Primary construction related impacts are discussed in greater detail in the Traffic Study located in Appendix C.

The project is located outside of heavily populated pre-contact habitation sites. Based on the archaeological inventory survey conducted for the site, it is unlikely that historic properties will be encountered within the project area. An archaeological monitoring plan will be developed for the site.

Increases in traffic and air and noise pollution will occur as is expected of any development of this nature.

### **5.3 ALTERNATIVES TO THE PROPOSED ACTION**

No other use alternatives beyond the non-action alternative were considered for this project. Non-action was considered and rejected since no benefit to the community, particularly with regard to the guiding purposes of the City and County of Honolulu for its use of City owned lands, and for the applicant which is a major developer of affordable and market level housing. The applicant's project proposal is consistent with the goals and objectives of the State and City's housing plans to deliver much needed affordable rental housing. Moreover, the addition of affordable rental housing along this corridor creates an exceptional mixed-use development area that is consistent with both State and City objectives when enabled through the 201H process.

Within the scope of proposed improvements, alternative density configurations were considered however an optimal high-rise scheme was selected as the most financially feasible while maintaining an attractive pedestrian scale.

Alternative locations were not considered as the initial RFP process was conducted specifically for this long vacant and severely underutilized site.

### **5.4 MITIGATION MEASURES**

Long-term impacts resulting from the proposed improvements are expected to be minimal or non-existent based upon the subject environmental assessment. Long-term traffic, air and noise impacts are not expected to change significantly after improvements are completed. Short-term construction related noise and air quality impact mitigation measures include general good housekeeping practices and scheduled maintenance to avoid a prolonged construction period. The contractor will be directed to use best management practices (BMP) wherever applicable. Construction materials and equipment will be transported to the project site during non-peak traffic hours. In the event that existing roadways or sidewalks are damaged during construction activities, the roadways and sidewalks will be restored to original or better condition.

### **5.5 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES**

Implementation of the proposed project will result in the irreversible and irretrievable commitment of resources in the use of non-recyclable energy expenditure and labor. Materials used for new construction may have salvage value; however, it is unlikely that such efforts will be cost-effective. The expenditure of these resources is offset by gains in construction-related wages, increased tax base and tertiary spending.

## 6.0 NECESSARY PERMITS AND APPROVALS

Permits and approvals that may be required are contingent upon the actual design of the proposed project. All other permits and approvals are generally ministerial in nature. Permits listed below represent a general list that represents permits and approvals that may be required.

### State Agencies

<u>Permit or Approval</u>	<u>Approving Agency</u>
National Pollutant Discharge Elimination System (NPDES) Permit	Dept. of Health
Chapter 201H Approval	Hawaii Housing Finance and Development Corporation

### County Agencies

<u>Permit or Approval</u>	<u>Approving Agency</u>
Building Permits	Dept. of Planning and Permitting
Certificate of Occupancy	Dept. of Planning and Permitting
Construction Dewatering Permit	Dept. of Planning and Permitting
Grading and Stockpiling Permits	Dept. of Planning and Permitting
Sewer Connection Permit	Dept. of Environmental Services
Trenching Permit	Dept. of Planning and Permitting

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## 7.0. DETERMINATION OF SIGNIFICANCE

As stated in Hawaii Administrative Rules, Title 11, Subchapter 6, Section 11-200.1-13, Significance Criteria: in determining whether an action may have a significant effect on the environment, every phase of a proposed action shall be considered. The expected consequences of an action, both primary and secondary, and the cumulative as well as the short-term and long-term effects must be assessed in determining if an action shall have significant effect on the environment. Each of the significance criteria is listed below and is followed by the means of compliance or conflict (if extant).

- Irrevocable commit a natural, cultural, or historic resource.

The proposed action will occur on an existing developed site and will not impact any topographical resources other than the removal or relocation of some existing trees. Subsurface archaeological artifacts are a possibility but the site has been heavily disturbed and any remnants are unlikely. In the event that any archaeological remains are uncovered during the course of construction, all work will stop and the State Historic Preservation Office will be contacted for appropriate action.

- Curtail the range of beneficial uses of the environment.

The proposed use will result in a significant change from its existing and former uses but represents an appropriate use that will benefit the public and will be environmentally consistent with the surrounding urban area. The proposed project will not curtail beneficial uses of the environment. The proposed project will provide needed housing inventory in Ewa Development Plan area and is considered a highest and best use in the public interest.

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

The proposed action is consistent with the goals and guidelines expressed in Chapter 343, Hawaii Revised Statutes and NEPA. The proposed action is triggered by the use of State funds. The subject Environmental Assessment has been developed in compliance with the Chapter 343.

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

The proposed action will make a positive contribution to the welfare and economy of the State and City by providing desirable and needed affordable rental housing to the State of Hawaii. The facility will also contribute positively to the community through the use of goods and services in the area, through

construction related employment, and through secondary and tertiary spending and taxes. The proposed action will not have any impact on any native cultural practices as the site has been in urban use for over 60 years.

- Have a substantial adverse effect on public health.

The proposed improvements are not expected to have any direct impact on public health but will provide housing for a targeted occupants that may not otherwise have an opportunity for centrally located affordable housing. No recreational resources will be impacted by the project, nor will the project increase any undesirable environmental impacts.

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

The proposed action will increase the population within the community and will increase the demand for public facilities. These impacts are consistent with residential development of this nature and are not considered adverse impacts. The change in population and demand for public facilities will be readily met by existing infrastructure and services.

- Involve a substantial degradation of environmental quality.

The proposed action will not degrade environmental quality. Impacts associated with the project, such as traffic impact and noise quality have been assessed to be minimal. The project is located in a highly urban environment that is expected to be heavily developed in the future. In that respect, the project is consistent with the overall land use of the district.

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

The West Loch Affordable Housing project is very beneficial in offering needed housing in consonance with the intent and overarching plans for the Ewa Development Plan. The site will be appropriately entitled for the proposed activities and through the 201H process and does not serve as a component of a larger development.

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

The proposed action will not affect any rare, threatened or endangered species of flora or fauna, nor is it known to be near or adjacent to any known wildlife sanctuaries.

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

The proposed action will not impact air or water quality. Noise levels will change from those associated with vacant land use to a mixed-use development. The change in noise level is expected to be negligible and will not significantly affect surrounding properties.

Minimal impacts on air quality and noise are anticipated during construction, but will be limited by normal construction practices and Department of Health construction mitigation standards.

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

The project will not have any impact on an environmentally sensitive area.

- Have a substantial adverse effect on scenic vistas and view planes, day or night, identified in County or State plans or studies.

The proposed action will not affect any scenic vistas or view planes as surrounding developments already tower around the proposed project. The project is located in a highly urban environment.

- Require substantial energy consumption or emit substantial greenhouse gases.

The project will increase electrical energy consumption over the existing use. This increase will be consistent with residential use and will be typical of any high-density urban use. The project will include energy conservation measures to the greatest extent practicable. General conservation goals include: meeting State energy conservation goals, using energy saving design practices and technologies, and recycling and using recycled-content products.

It should be noted that Section 11-200-12, Hawaii Administrative Rules states that consideration of previous determinations and accepted statements may be used for a proposed action whenever the information or analysis is pertinent and has logical relevancy and bearing to the proposed action. In the case of the proposed West Loch Affordable Project, the original EIS prepared for the West Loch Estates Master Plan as well as the approvals for the adjacent West Loch Elderly Villages project which is also located on AG-1 land are directly applicable to the proposed project both in terms of their physical adjacencies and impacts as well as their similar use of AG-1 zoned land for the purposes of the development of special affordable housing.

Based on the above stated criteria, the proposed West Loch Affordable Housing project is not expected to have a significant effect on the environment beyond those associated with a master planned community. As such, a Finding of No Significant Impact (FONSI) has been deemed warranted for the project by City and County of Honolulu Department of Land Management.

## **8.0 PARTIES CONSULTED DURING THE PREPARATION OF THE DRAFT ENVIRONMENTAL ASSESSMENT**

### State Agencies

Department of Education

Department of Land and Natural Resources  
Historic Preservation Division

### City and County Agencies

Department of Land Management

Department of Planning and Permitting

Honolulu Fire Department

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**9.0 LIST OF PARTIES CONSULTED DURING THE DRAFT ENVIRONMENTAL ASSESSMENT REVIEW PROCESS**

Agencies with ministerial or specific interests regarding the proposed project were contacted for their comments regarding the proposed project. Parties contacted are listed and the date of their comments are listed below.

	<b>Comment Date</b>
<b>Federal Agencies</b>	
US Environmental Protection Agency Region IX Administrator	
<b>State Agencies</b>	
Department of Business Economic Development & Tourism Energy, Resources & Technology Division	
Department of Education	5/9/2022
Department of Health	
Department of Health Clean Water Branch	
Department of Land and Natural Resources	
Department of Land and Natural Resources State Historic Preservation Officer	
Department of Transportation	5/2/2022
Disability and Communication Access Board	
Office of Environmental Quality Control	
Office of Hawaiian Affairs	
Office of Planning	
University of Hawaii at Manoa Environmental Center	
<b>County Agencies</b>	
Board of Water Supply	
Department of Community and Social Services	
Department of Design and Construction	4/28/2022
Department of Environmental Services	
Department of Facilities Maintenance	
Department of Planning and Permitting	
Department of Parks and Recreation	5/2/2022
Department of Transportation Services	5/2/2022
Fire Department	
Police Department	4/26/2022
<b>Officials and Organizations</b>	
Hawaiian Electric Company	

Kamehameha Schools  
Neighborhood Board



DAVID Y. IGE  
GOVERNOR



KEITH T. HAYASHI  
INTERIM SUPERINTENDENT

**STATE OF HAWAII**  
DEPARTMENT OF EDUCATION  
P.O. BOX 2360  
HONOLULU, HAWAII 96804

OFFICE OF FACILITIES AND OPERATIONS

May 9, 2022

Cameron Lowry  
City and County of Honolulu  
Department of Land Management  
558 South King Street  
Honolulu, Hawaii 96813

Re: Draft Environmental Assessment for the West Loch Affordable Housing Project, Ewa Beach,  
Oahu; TMK: (1)9-1-122:004

Dear Ms. Lowry:

Thank you for your email dated April 8, 2022. The Hawaii State Department of Education (Department) has the following comments on the Draft Environmental Assessment (DEA) for the West Loch Affordable Housing Project (Project).

The information provided in the DEA is accurate. Schools that service the Project are Holomua Elementary, Ilima Intermediate, and Campbell High. Holomua Elementary was designed and operates as a multi-track school. Ilima Intermediate is currently operating below capacity and will continue to operate at this capacity during the next five years. Campbell High is currently operates above capacity and will continue to operate at this capacity over the next five years.

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

Sincerely,

A handwritten signature in black ink, appearing to read "Roy Ikeda".

Roy Ikeda

May 26, 2022

Mr. Roy Ikeda  
Interim Public Works Manager  
Department of Education  
P.O. Box 2360  
Honolulu, HI 96804

Subject: Draft Environmental Assessment, West Loch Affordable Housing Project  
Ewa Beach, Oahu, TMK: (1) 9-1-122: 004

Dear Mr. Ikeda,

We are in receipt of your comments of May 9, 2022 regarding the subject project.

We have reviewed your comments and thank you for your confirmation that the information presented in the DEA is accurate.

Thank you for your comments and participation in the environmental review process. Your comments will be included in the forthcoming Final EA.

Sincerely,

A handwritten signature in black ink, appearing to read 'Taeyong Kim', with a small dot above the 'i'.

Taeyong Kim  
Environmental Communications, Inc.

DAVID Y. IGE  
GOVERNOR



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

JADE T. BUTAY  
DIRECTOR

Deputy Directors  
ROSS M. HIGASHI  
EDUARDO P. MANGLALLAN  
PATRICK H. MCCAIN  
EDWIN H. SNIFFEN

IN REPLY REFER TO:  
DIR 0412  
STP 8.3386

May 2, 2022

VIA EMAIL: [cameron.lowry@honolulu.gov](mailto:cameron.lowry@honolulu.gov)  
[tkim@environcom.com](mailto:tkim@environcom.com)

Mr. Scott K. Hayashi  
Director  
Department of Land Management  
City and County of Honolulu  
558 South King Street  
Honolulu, Hawaii 96813

Attention: Mr. Cameron Lowry

Dear Mr. Hayashi:

Subject: Draft Environmental Assessment (EA)  
West Loch Affordable Housing Project  
Ewa Beach, Oahu, Hawaii  
Tax Map Key: (1) 9-1-122: 004

Thank you for your email submittal on April 8, 2022, requesting the Hawaii Department of Transportation's (HDOT) review and comment on the subject project. HDOT understands Komohale West Loch, LLC is proposing to develop an affordable rental housing project located on 3.7 acres at 91-1666 Fort Weaver Road in Ewa Beach. The project site is on vacant land bounded by Fort Weaver Road (State Route 76) to the west, the West Loch Elderly Village to the north, and Renton Road (County jurisdiction) to the south. The proposed project will include 127 affordable units located in seven (7) separate three-story buildings configured around a community center. A total of 136 parking stalls will be located throughout the site, along with bicycle racks for short-and long-term storage.

HDOT has the following comments:

Airports Division (HDOT-A)

1. The proposed affordable housing project is approximately 2.76 miles from the property boundary of Kalaheo Airport (JRF) and approximately 4.96 miles from the property boundary of Daniel K. Inouye International Airport (HNL). 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](http://files.hawaii.gov/dbedt/op/docs/TAM-FAA-DOT-Airports_08-01-2016.pdf).

2. The project site is approximately 17,231 feet from the end of Runway 22R at JRF. 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 JRF and HNL, the developer and future residents 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, and 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](http://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 proposed affordable housing project shall 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 project landscaping creates a wildlife attractant, the developer shall immediately mitigate the hazard upon notification by the HDOT-A and/or FAA.

#### Highway Division (HDOT-HWY)

1. The following are key findings from the Transportation Assessment Report (TAR), provided in the Draft EA, Appendix C.
  - a. The full occupancy of the site is anticipated in 2025.
  - b. During the existing A.M. and P.M. peak traffic hours, the Fort Weaver Road and Renton Road intersection operates at an overall acceptable Level of Service (LOS) D. Left-turn movements on Fort Weaver Road and left-turn and through movements on Renton Road (both directions) operate at LOS F, which is undesirable.

- c. The development plans for North Park by Gentry included an extension of Keaunui Drive to intersect with Renton Road which is the opposite side of the proposed affordable housing side entry. However, the extension is not included in recent development plans or the traffic projections.
  - d. The estimated A.M. and P.M. peak traffic hour trips generated by the project would be 43 and 56, respectively.
  - e. By 2025, the Fort Weaver Road and Renton Road intersection would operate at an overall LOS D during the P.M. peak traffic hour, with or without the project. The A.M. peak traffic hour LOS would decline from LOS D, without the project, to LOS E with the project (TAR Table 6). This suggests a significant impact related to the project traffic. However, the TAR describes the impact as less than significant based on the 1 percent anticipated increase in traffic volume due to the project. Similar to the existing conditions, specific traffic movements in 2025 would be LOS F, which suggests chronically poor traffic conditions.
2. The TAR and Draft EA should be revised to address the following HDOT-HWY comments regarding potential indirect impacts on Fort Weaver Road:
- a. The Draft EA describes a second exit-only driveway located east of the main entrance. However, the TAR does not include this intersection. The Draft EA suggests the existing primary driveway will be entry-only, and the two other driveways will be exit-only. However, the TAR assumes two-direction traffic at the two driveways assessed. The inconsistencies between the Draft EA and TAR should be resolved.
  - b. Describe and assess the 2025 West Loch Elderly Village traffic impact on the site driveways during peak traffic hours. If the access easement is exit-only for West Loch Elderly Village, will West Loch Village Elderly Village traffic have access to the site's main entrance, the easternmost exit-only driveway, and internal roads?
  - c. Describe the traffic turning movements provided at each driveway.
  - d. Due to the proximity of the exit-only access easement to the Fort Weaver Road and Renton Road intersection and the 2025 LOS decline of D to F with the project, the potential for queuing issues shall be assessed. Consider alternatives to site circulation that would limit the use of the access easement during A.M. peak traffic hours.
3. The HDOT-HWY supports affordable housing, interconnectivity between subdivisions, and the planned provision of bicycle storage. No direct impact on Fort Weaver Road is anticipated. However, consider the following and verify they are not applicable in the Final EA:
- a. Describe pipeline and other utility infrastructure alignments that may be removed or constructed within the Fort Weaver Road Right-of-Way (ROW) to support the project. These actions will require a Land Use and Occupancy Permit approved

Mr. Scott K. Hayashi  
May 2, 2022  
Page 4

STP 8.3386

by the HDOT-HWY, ROW Branch. The applicant shall adhere to HDOT-HWY's Pipeline Policy.

- b. A Permit to Perform Work Upon State Highways is required for any work within the State ROW.
- c. No additional discharge of surface water run-off onto the Fort Weaver Road ROW is permitted. This includes the use of the existing State drainage culverts and channels. All additional stormwater runoff from the project site shall be managed and mitigated onsite.

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](mailto:blayne.h.nikaido@hawaii.gov).

Sincerely,



JADE T. BUTAY  
Director of Transportation

May 27, 2022

Jade T. Butay, Director  
Department of Transportation  
869 Punchbowl Street  
Honolulu, HI 96813-5097

Subject: Draft Environmental Assessment, West Loch Affordable Housing Project  
Ewa Beach, Oahu, TMK: (1) 9-1-122: 004

Dear Mr. Butay,

We are receipt of your comments of May 2, 2022 regarding the subject project. We have reviewed your concerns and offer the following.

Airports Division

1. Thank you for your advisement and reference to the Technical Assistance Memorandum for developments located within 5 miles from Hawaii State Airports. We stand advised regarding this guidance.
1. Thank you for your reference to CFR, Title 14, Part 77.9. We stand advised and would like to note that the proposed project is in low-rise configuration and will not require the need for construction cranes or other high-rise equipment.
2. We stand advised regarding potential noise impacts and other aircraft related impacts. A noise analysis was conducted specifically for this project to address such potential impacts.
3. Thank you for your guidance regarding potential glare and RFI impacts from the use of photovoltaic solar panels (PV). Photovoltaic systems are not part of the project at this time but should a PV system to added to the project, we stand advised regarding these potential impacts to aircraft.
4. No landscaping that would be considered wildlife attractants are proposed for the site. We stand advised regarding the FAA Advisory Circular regarding guidance for appropriate landscaping materials.

Highway Division

1. The DOT's comments regarding the Draft Traffic Assessment Report are well received. Changes have been made to Final Version of the Report which is now included in the Final Environmental Assessment.

2. The Final Environmental Assessment for the project includes a Final Traffic Assessment Report with address the DOT's comments. Specifically, the following are offered.

2.a. As stated above, the Draft Traffic Assessment has been revised and a Final Report is included in the Final Environmental Assessment. The east driveway is now included and addressed in the report and is consistent with the narrative in the FEA.

2.b. The West Loch Elderly Village traffic is expected to continue to exit the existing access easement. Entering West Loch Elderly Village traffic can opt to turn left at the Main Driveway instead of making a U-turn on Renton Road to enter the access easement. The Main Driveway, access easement driveway, and the East Driveway are expected to operate at LOS "A" at Renton Road, during peak hours of traffic.

2.c. As stated in 2.a., project narratives are now consistent by addressing the driveway issue.

2.d. The access easement is located about 275 feet from Fort Weaver Road. According to the traffic analysis, the 95-percentile queues on westbound Renton Road are expected to extend about 70 feet and 175 feet from Fort Weaver Road, during the AM and PM peak hours of traffic, respectively. Therefore, the westbound queue on Renton Road is not expected to back up to the access easement.

3. Thank you for your support of affordable housing projects in Hawaii. We understand and concur with your determination that no impacts to Fort Weaver Road are anticipated. To address your additional comments, we offer the following.

3.a. No utility lines will be affected along Fort Weaver Road. Sewer and stormwater lines are located along Renton Road however it is not anticipated that any work within the Renton Road roadway will be required because connections points already exists on-site.

3.b. In the event that any work is required within the State right-of-way for potable water or other utilities, appropriate permits and approvals for such work will be requested from the Department of Transportation.

3.c. We confirm that no additional discharge of surface waters into the State right-of-way is planned. Stormwaters are conveyed in the easterly direction away from Fort Weaver Road. Municipal storm drain inlets are located along Renton Road where existing drainage inlets will receive any stormwaters that are not retained onsite.

ENVIRONMENTAL COMMUNICATIONS, INC

We appreciate your participation in the environmental review process and will include your comments in the Final Environmental Assessment that will be prepared for the proposed project.

Sincerely,

A handwritten signature in black ink, appearing to read 'Taeyong Kim', with a horizontal flourish extending to the right.

Taeyong Kim  
Environmental Communications, Inc.

DEPARTMENT OF DESIGN AND CONSTRUCTION  
CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 11<sup>TH</sup> FLOOR  
HONOLULU, HAWAII 96813  
Phone: (808) 768-8480 • Fax: (808) 768-4567  
Web site: [www.honolulu.gov](http://www.honolulu.gov)

RICK BLANGIARDI  
MAYOR



ALEX KOZLOV, P.E.  
DIRECTOR

HAKU MILLES, P.E.  
DEPUTY DIRECTOR

April 28, 2022

SENT VIA EMAIL

Mr. Taeyong Kim  
[tkim@environcom.com](mailto:tkim@environcom.com)

Mr. Cameron Lowry  
[Cameron.lowry@honolulu.gov](mailto:Cameron.lowry@honolulu.gov)

Dear Messrs. Kim and Lowry:

Subject: West Loch Affordable Housing Project, Ewa Beach, Oahu  
TMK: (1) 9-1-122:004  
Draft Environmental Assessment Transmittal

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

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

Sincerely,

A handwritten signature in black ink, appearing to read "Alex Kozlov".

*for* Alex Kozlov, P.E.  
Director

AK:km (878041)

May 27, 2022

Mr. Alex Kozlov, P.E.  
Director  
Department of Design and Construction  
650 South King Street, 11<sup>th</sup> Floor  
Honolulu, HI 96813

Subject: Draft Environmental Assessment, West Loch Affordable Housing Project  
Ewa Beach, Oahu, TMK: (1) 9-1-122: 004

Dear Mr. Kozlov,

We are in receipt of your comments of April 28, 2022 regarding the subject project.

We understand that the Department of Design and Construction does not have any comments at this time.

Thank you for your comments and participation in the environmental review process. Your comments will be included in the forthcoming Final EA.

Sincerely,

A handwritten signature in black ink, appearing to read 'Taeyong Kim', with a stylized flourish at the end.

Taeyong Kim  
Environmental Communications, Inc.

**From:** Reid, John A.

**Sent:** Monday, May 2, 2022 8:49 AM

**To:** '[tkim@environcom.com](mailto:tkim@environcom.com)'

**Cc:** Lowry, Cameron

**Subject:** RE: West Loch Affordable Housing Draft Environmental Assessment

Taeyong:

Thank you for the opportunity to review and comment on the Draft Environmental Assessment for the West Loch Affordable Housing project.

The Department of Parks and Recreation has no comment as we understand the project is eligible for and will request exemption from the City's Park Dedication Ordinance pursuant to 201-H.

Aloha,

John Reid, Planner

Department of Parks and Recreation

May 26, 2022

Mr. John Reid  
Planner  
Department of Parks and Recreation  
Via Email

Subject: Draft Environmental Assessment, West Loch Affordable Housing Project  
Ewa Beach, Oahu, TMK: (1) 9-1-122: 004

Dear Mr. Reid,

We are in receipt of your comments on May 2, 2022 regarding the subject project.

We have reviewed your comments and offer the following:

We understand that signs, lights and safety equipment be installed to ensure safety around the construction site. This will be made a requirement for the selected contractor. We also stand advised that the contractor should maintain communications with the Neighborhood Board as a new member of the Ewa Community.

Thank you for your comments and participation in the environmental review process. Your comments will be included in the forthcoming Final EA.

Sincerely,

A handwritten signature in black ink, appearing to read 'Taeyong Kim', with a stylized flourish at the end.

Taeyong Kim  
Environmental Communications, Inc.

DEPARTMENT OF TRANSPORTATION SERVICES  
CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 3RD FLOOR  
HONOLULU, HAWAII 96813  
Phone: (808) 768-8305 • Fax: (808) 768-4730 • web: www.honolulu.gov

RICK BLANGIARDI  
MAYOR



J. ROGER MORTON  
DIRECTOR

JON Y. NOUCHI  
DEPUTY DIRECTOR

TP4/22-879097

May 10, 2022

**MEMORANDUM**

TO: Mr. Scott K. Hayashi, Director  
Department of Land Management

ATTENTION: Cameron Lowry, Planner  
Land Management

FROM: J. Roger Morton, Director  
Department of Transportation Services

SUBJECT: West Loch Affordable Housing Project, Ewa Beach, Oahu  
Tax Map Key: (1) 9-1-122:004  
Draft Environmental Assessment Transmittal

Thank you for the opportunity to provide written comments regarding the subject project. We have the following comments.

1. Transportation Impact Assessment (TIA).
  - i. The applicant shall perform a TIA to examine the vehicle, pedestrian, bicycle, and public transit stress and comfort levels at the nearby intersections and driveways with corresponding improvements to mitigate these impacts by applying Complete Streets principles. The applicant shall discuss the future year growth rate, trip distribution, mode split, and route assignment assumptions used in the TIA.

The TIA should identify an appropriate speed limit for the streets adjacent to the project by analyzing conflict density and activity level, among other contextual factors, to determine the speed limit that will best minimize the risk of a person being killed or seriously injured. The National Association of City Transportation Officials (NACTO) Safe Speed Study methodology is recommended. A Safe Speed Study

Mr. Scott K. Hayashi, Director  
May 9, 2022  
Page 2

should be conducted for the longest relevant segment of a street corridor affected by the project.

The applicant shall submit all native files (e.g., Synchro, Excel, etc.) for the raw multi-modal counts and accompanying analyses to the Regional Planning Branch (RPB) at [dtsplanningdiv@honolulu.gov](mailto:dtsplanningdiv@honolulu.gov). Please refer to the Department of Transportation Services (DTS) TIA Guide for multimodal assessment tools and recommended analyses. The TIA Guide can be found at <http://www4.honolulu.gov/docushare/dsweb/View/Collection-7723>.

- ii. Vehicle Level of Service (LOS). Page 10 of the City and County of Honolulu's TIA Guide requires the use of traffic volumes from the second-highest peak hour traffic counts (for each peak analyzed) when evaluating impacts of a proposed City project, and assume evenly distributed volumes over the analysis hour (i.e., the Peak Hour Factor shall equal 1). The second-hour standard allows for some levels of congestion to occur. This results in decisions that do not prematurely widen roadways for additional automobile capacity. It also requires practitioners to conduct analysis that acknowledges automobile traffic can be at or above capacity for the peak hour and in some cases, there are no practical ways to build roadway improvements that eliminate such congestion without impacting walkability.
- iii. The TIAR shall analyze the City's Planned Street Improvements and assigned roadway/lane configurations. Please refer to the Right-of-Way Widths for Planned Street Improvements Plan and map for data on street types including future bicycle, pedestrian, and transit priority configurations:  
<https://www.honolulu.gov/completestreets/guidance.html>. As of the date of this letter, Renton Road is classified as a "Boulevard" planned to have sidewalks, bike lanes, four travel lanes, no bus service, and no on-street parking.

## 2. Parking.

- i. A discussion regarding off-street parking and site generated parking demand should be added to this report. The project should consider TOD core principals. The January 2017 report, Trip and Parking Generation at Transit-Oriented Developments Number NITC-RR-767, concludes that less parking is required than suggested in the Institute of Transportation Engineers (ITE) Parking Generation Manual for sites

that are dense, mixed use, with low-stress pedestrian environments, and adjacent to a high quality transit stop. We recommend the applicant provide the minimum TOD parking ratio, given that the Project is adjacent to a high quality bus stop on Fort Weaver Road with access to a future rail station.

- ii. Page 27 of the City and County of Honolulu's TIA Guide requires that when proposed parking for the project exceeds the trip generation estimate, the parking generation estimate should be used after adjusting for the time of day distribution for parking demand. This conclusion is supported by research (Millard-Ball A, West J, Rezaei N, Desai G. What do residential lotteries show us about transportation choices? Urban Studies. March 2021. doi:10.1177/0042098021995139), which concludes that parking supply is positively correlated with car ownership and negatively correlated with transit usage.
- iii. Electric Vehicle Parking. Places of accommodation with at least 100 parking spaces available for use by the general public shall have at least one parking space exclusively for electric vehicles and equipped with an electric vehicle charging system located anywhere in the parking structure, as per Hawaii Revised Statutes §291-71.
- iv. Parking Cash-Out Program. The applicant shall investigate the feasibility of implementing a parking cash-out program for employees who are provided free parking to have the option to take the cash value of the space in lieu of the space itself, consistent with TOD principles.
- v. Unbundled Parking. The applicant shall investigate the feasibility of offering residential units with unbundled parking, consistent with TOD principles.

### 3. Complete Streets.

- i. Draft Environmental Assessment (DEA), Section 3.3.5 Traffic Conditions, Pages 39-42. The DEA should include a discussion of pedestrian/bicycle transportation conditions and proposed mitigations.
- ii. Revise the project design to provide pedestrian access connecting to off-site at multiple points, including at the parking areas in the northeast section near Renton Road, and at the vehicular circulation aisle in the northwest section near Fort Weaver Road.

- iii. Pedestrian Improvements. Installation of lighting; pedestrian-oriented green infrastructure, trees, or other greening landscape consistent with the Complete Streets furniture zone; and trash receptacles per the Complete Streets Design Manual, Pedestrian Master Plan, and any applicable streetscape plan.
  - iv. A Priority 1 Shared Use Path project (Project ID 1-33 in the 2019 Oahu Bike Plan) is located on Renton Road fronting the Project site and is currently under construction. Any driveways or improvements shall be designed to minimize the number and size of potential conflict areas between bicyclists and turning vehicles. Additionally, the DEA should acknowledge that the shared-use path will provide major connections to the surrounding areas by foot and bike; and should evaluate a potential pedestrian crossing at Renton Road and the existing private drive to provide pedestrian access to the shared-use path.
  - v. A Priority 1 Bike Lane project (Project ID 1-36 in the 2019 Oahu Bike Plan) is located on Renton Road fronting the Project site. Any driveways or improvements shall be designed to minimize the number and size of potential conflict areas between bicyclists and turning vehicles.
4. Transportation Demand Management (TDM). We suggest the following multi-modal mitigation measures be completed with the project:
- i. Include a description of how the project will promote, encourage, and monitor transit use by its residents.
  - ii. The management entity should inform residents, staff, and visitors of the City's vanpool and car share programs to promote alternate modes of transportation.
  - iii. Investigate feasibility of providing residents and staff with subsidized transit passes.
  - iv. Require the developer, management entity, or owners' association to adopt (i.e., be responsible for litter removal, cleaning and maintenance of bus stop shelter, benches and floor area) anticipated future bus stops on fronting the project site at no cost to the City.
  - v. Require the developer to make a contribution for complete streets improvements as recommended by the TIA.

Mr. Scott K. Hayashi, Director  
May 9, 2022  
Page 5

5. Street Usage Permit. A street usage permit from the DTS should be obtained for any construction-related work that may require the temporary closure of any traffic lane or pedestrian mall on a City street.
6. Neighborhood Impacts. The area representatives, neighborhood board, as well as the area residents, businesses, emergency personnel (fire, ambulance, and police), Oahu Transit Services, Inc. (TheBus and TheHandi-Van), etc., should be kept apprised of the details and status throughout the project and the impacts that the project may have on the adjoining local street area network.
7. Bus Stops. The project site is in the immediate vicinity of bus stops. Please coordinate roadway improvements with DTS – Transportation Mobility Division (TMD). Contact DTS-TMD at [TheBusStop@honolulu.gov](mailto:TheBusStop@honolulu.gov)
8. Disability and Communication Access Board (DCAB). Project plans (vehicular and pedestrian circulation, sidewalks, parking and pedestrian pathways, vehicular ingress/egress, etc.) should be reviewed and approved by DCAB to ensure full compliance with Americans with Disabilities Act requirements.

Should you have any questions, please contact Greg Tsugawa, of my staff, at (808) 768-6683.

sw (Greg Tsugawa)  
\\dtsfp1\dts\TPD\_Review\879097 West Loch Affordable Housing Project DEA\Working Draft Letter\Response Letter - West Loch Affordable Housing Project DEA (879097).docx

May 27, 2022

J. Roger Morton, Director  
Department of Transportation Services  
650 S. King Street, 3<sup>rd</sup> Floor  
Honolulu, HI 96813

Subject: Draft Environmental Assessment, West Loch Affordable Housing Project  
Ewa Beach, Oahu, TMK: (1) 9-1-122: 004

Dear Mr. Morton,

We are receipt of your comments of May 10, 2022 regarding the subject project. We have reviewed your concerns and offer the following.

#### 1. Transportation Impact Assessment (TIA)

- i. Based upon the Institute of Transportation Engineers Trip Generation Manual, the proposed project is expected to generate zero (0) transit trips and zero (0) bicycle trips, during AM and PM peak hours of traffic. Therefore, the subject project is not expected to impact these travel modes.

The transportation study assumptions have been included in the Transportation Assessment Report (TAR).

The existing posted speed limits on Renton Road and Fort Weaver Road are appropriate for their respective roadway classifications.

- ii. The second highest AM and PM peak hour traffic analyses are summarized on Table 6.1.
- iii. The Oahu Bike Plan proposes bicycle lanes along Renton Road. A comprehensive approach should be taken to evaluate Renton Road, including the future extension of Keaunui Drive.

#### 2. Parking

- i. The project's total parking stall count of 136 does exceed the ITE trip generation manual. We would also like to note that this project is not located within a Transit Oriented Development district therefore the NITC-RR-767 is not directly applicable to this project.
- ii. Thank you for your reference to the Millard-Ball, West, Rezeai, Desai study. We would again like to note that the project is not located within a Transit Oriented Development district and multi-modal transportation opportunities are fewer therefore stalls for

vehicles are still desirable until other transportation alternatives become available in this area.

- iii. We also stand advised regarding electric vehicle parking and thank you for your citation. The addition of stalls for EV charging will be developed as the project planning progresses.
- iv. We understand that Parking Cash-Out Programs and Unbundled Parking are valuable TOD principles and would like to note that the project is presently outside of a TOD.

### 3. Complete Streets

- i. Thank you for the information regarding the proposed Complete Streets improvements proposed on Isenberg Street. The Final Environmental Assessment has been revised to include a statement consistent with the Traffic Impact Assessment that the project will not generate any bicycle related traffic.
- ii. Thank you for your comment regarding pedestrian access. Presently we feel that sufficient pedestrian access is available through three access points along Renton Road and an access point located along Fort Weaver Road immediately outside of the western most portion of the site. The internal circulation road accesses the adjacent West Loch Elderly Village complex and also provides convenient access to Fort Weaver Road.
- iii. Pedestrian improvements will be incorporated where practicable and will include safety lighting and landscaping. Thank you for your references which will be taken into consideration as the landscape plan for the project is developed.
- iv. The Final Environmental Assessment will include language that acknowledges the Shared Use Path along Renton Road and the need to design vehicular access points in consideration of this shared pathway.

### 4. Transportation Demand Management Strategies

We stand advised regarding the annual compliance report for transportation demand. Alternative modes of transportation will be promoted for this project where practicable and other incentive programs will be considered. At this stage of planning, these operational considerations are still in development and your suggestions are appreciated. Because these operational considerations have not yet been fully developed, it is difficult to discuss the possible reduction of vehicular trips but we would like to state that the project parking count, particularly for the residential units, was carefully considered to reduce parking counts and at the same time be supportive of the intended occupant's needs. We would note that if this project were market oriented, the parking stall requirements would be far higher.

#### 5. Street Usage Permit

It is understood that a street usage permit will be required from DTS if any construction related work is to occur within the right-of-way or street.

#### 6. Neighborhood Impact

The project team has been in contact with affected parties and through Neighborhood Board presentations. Every effort will be made to ensure that all impacted parties are kept informed regarding the development of the project.

#### 6. Bus Stops

We concur that bus stops are an important part of the overall transportation plan for the project. The Department of Transportation Services Mobility Division will be kept informed of the project plans.

#### 7. Disability and Communications Access Board (DCAB)

It is understood that the project must go through DCAB review. Thank you for your confirmation.

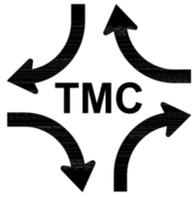
We appreciate your participation in the environmental review process and will include your comments in the Final Environmental Assessment that will be prepared for the proposed project.

Sincerely,

A handwritten signature in black ink, appearing to read 'Taeyong Kim', with a stylized flourish at the end.

Taeyong Kim  
Environmental Communications, Inc.

attachment



## THE TRAFFIC MANAGEMENT CONSULTANT

Randall S. Okaneku, P.E., Principal \* 1188 Bishop Street, Suite 1907 \* Honolulu, Hawaii 96813  
Telephone: (808) 536-0223 \* Facsimile: (808) 537-2985 \* Email: TMCHawaii@aol.com

**TMC Job No. 202008**

May 25, 2022

### **Stanford Carr Development**

1100 Alakea Street, 27<sup>th</sup> Floor  
Honolulu, Hawaii 96813

Attention: Mr. Daniel M. Sandomire

Gentlemen and Ladies:

**Subject: West Loch Affordable Housing**  
**Tax Map Key: 9-1-122:004**

The Traffic Management Consultant (TMC) is pleased to submit this letter report in response to Item No. 1 of the City and County of Honolulu, Department of Transportation Services Memorandum, dated May 10, 2022 (TP4/22-879097), relative to the subject project.

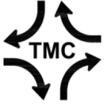
1. Transportation Impact Assessment (TIA)

- i. Based upon the Institute of Transportation Engineers Trip Generation Manual, the proposed project is expected to generate zero (0) transit trips and zero (0) bicycle trips, during AM and PM peak hours of traffic. Therefore, the subject project is not expected to impact these travel modes.

The transportation study assumptions have been included in the Transportation Assessment Report (TAR).

The existing posted speed limits on Renton Road and Fort Weaver Road are appropriate for their respective roadway classifications.

- ii. The second highest AM and PM peak hour traffic analyses are summarized on Table 6.1.
- iii. The Oahu Bike Plan proposes bicycle lanes along Renton Road. A comprehensive approach should be taken to evaluate Renton Road, including the future extension of Keaunui Drive.



If you require clarification on any of the above material or have any other questions, please do not hesitate to call me.

Very truly yours,

**The Traffic Management Consultant**

By

A handwritten signature in blue ink, appearing to read 'Randall S. Okaneku', is written over a light blue rectangular background.

**Randall S. Okaneku, P. E.  
Principal**

Table 6.1. Summary of Capacity Analysis

Intersection	Scenario	MOE	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection	
Fort Weaver Rd & Renton Rd	AM Peak Hour Traffic With Project	vph	480	5	87	12	6	46	92	3,317	14	103	1,275	241	5,678	
		LOS	F	F	C	F	B	B	F	E	A	F	C	A	E	
		d	126.8	129.2	22.1	136.3	12.7	0.40	0.36	139.4	71.8	0.0	152.6	22.5	2.3	64.0
		v/c	0.88	0.90	0.29	0.86	0.40	0.36	0.40	0.74	1.05	0.01	0.86	0.41	0.24	1.05 (Max.)
		vph	441	15	40	19	16	52	50	50	3,298	23	108	922	180	5,164
		LOS	F	F	A	0	F	D	D	F	E	A	F	B	A	E
	2nd Highest AM Peak Hour Traffic With Project	d	129.6	128.2	6.0	0.0	165.2	38.0	139.8	55.4	0.0	135.4	16.1	2.0	55.4	
		v/c	0.87	0.87	0.14	0.00	0.66	0.54	0.60	0.99	0.03	0.78	0.27	0.18	0.99 (Max.)	
		vph	343	37	110	21	23	41	104	104	1,783	51	84	3,035	460	6,092
		LOS	F	F	B	F	F	A	F	F	C	A	F	D	A	D
		d	125.1	124.4	14.9	196.1	9.0	132.1	22.6	132.1	22.6	1.0	139.4	45.9	2.2	43.4
		v/c	0.82	0.82	0.36	0.85	0.36	0.75	0.55	0.75	0.55	0.05	0.72	0.95	0.42	0.95 (Max.)
2nd Highest PM Peak Hour Traffic With Project	vph	373	10	122	16	12	43	121	121	1,702	15	40	2,771	368	5,593	
	LOS	F	F	B	F	F	A	F	F	B	A	F	D	A	D	
	d	125.4	126.7	14.1	150.6	9.2	141.4	17.2	141.4	17.2	0.0	137.9	36.0	2.2	37.0	
	v/c	0.82	0.83	0.38	0.53	0.37	0.80	0.47	0.80	0.47	0.01	0.54	0.83	0.33	0.83 (Max.)	
	EBL–Eastbound Left-Turn/U-Turn Movement	EBT–Eastbound Through Movement	EBR–Eastbound Right-Turn Movement	WBL–Westbound Left-Turn Movement	WBT–Westbound Through Movement	WBR–Westbound Right-Turn Movement	NBL–Northbound Left-Turn Movement	NBT–Northbound Through Movement	NBR–Northbound Right-Turn Movement	SBL–Southbound Left-Turn/U-Turn Movement	SBT–Southbound Through Movement	SBR–Southbound Right-Turn Movement				

**Legend**  
vph – Vehicles Per Hour  
MOE – Measure of Effectiveness  
LOS – Level of Service  
d – Average Delay (seconds/vehicle)  
v/c – Volume-to-Capacity Ratio

POLICE DEPARTMENT  
CITY AND COUNTY OF HONOLULU

801 SOUTH BERETANIA STREET · HONOLULU, HAWAII 96813  
TELEPHONE: (808) 529-3111 · INTERNET: www.honolulu.gov



RICK BLANGIARDI  
MAYOR

RADE K. VANIC  
INTERIM CHIEF

OUR REFERENCE EO-DK

April 26, 2022

SENT VIA EMAIL

Mr. Taeyong Kim  
tkim@environcom.com

Dear Mr. Kim:

This is in response to your email received on April 11, 2022, via the Honolulu Police Department website, regarding the availability of the Draft Environmental Assessment for the West Loch Affordable Housing Project to be located in Ewa Beach.

The Honolulu Police Department (HPD) has reviewed the project plans and recommends that all necessary signs, lights, barricades, and other safety equipment be installed and maintained by the contractor during the construction phase of the project.

The HPD also recommends that the contractor work with the Neighborhood Board, as the rental development is envisioned to accommodate 127 residence units when completed. Due to this being a new community, there may be an increase in calls for services.

If there are any questions, please call Major Gail Beckley of District 8 (Kapolei, Waianae) at (808) 723-8400.

Sincerely,

A handwritten signature in black ink, appearing to read "Darren Chun", with a long horizontal flourish extending to the right.

DARREN CHUN  
Assistant Chief of Police  
Support Services Bureau

cc: Mr. Cameron Lowry  
cameron.lowry@honolulu.gov

May 26, 2022

Mr. Darren Chun  
Assistant Chief of Police  
Police Department  
801 South Beretania Street  
Honolulu, HI 96813

Subject: Draft Environmental Assessment, West Loch Affordable Housing Project  
Ewa Beach, Oahu, TMK: (1) 9-1-122: 004

Dear Assistant Chief Chun,

We are in receipt of your comments on April 26, 2022 regarding the subject project.

We have reviewed your comments and offer the following:

We understand that signs, lights and safety equipment should be installed to ensure safety around the construction site. This will be made a requirement for the selected contractor. We also stand advised that the contractor should maintain communications with the Neighborhood Board as a new member of the Ewa Community.

Thank you for your comments and participation in the environmental review process. Your comments will be included in the forthcoming Final EA.

Sincerely,

A handwritten signature in black ink, appearing to read 'Taeyong Kim', with a long horizontal flourish extending to the right.

Taeyong Kim  
Environmental Communications, Inc.

## Appendix A

*Archaeological Literature Review and Field Inspection for the West Loch Affordable Housing  
Project, Honouliuli Ahupua‘a, ‘Ewa District, O‘ahu Island TMKs: (1) 9-1-122:041*

Honua Consultants

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**Archaeological Literature Review and Field Inspection for  
the West Loch Affordable Housing Project,  
Honouliuli Ahupua‘a, ‘Ewa District, O‘ahu Island  
TMKs: [1] 9-1-122:004**



Prepared for



Prepared by

**Nathan J. DiVito, B.A.,  
Fredrick LaChance IV, B.A.,  
Rosanna M. R. Thurman, M.A., and  
Trisha Kehaulani Watson, J.D., Ph.D.**



**Honolulu, Hawai‘i**

**July 2021**

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## Management Summary

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At the request of Stanford Carr Development, LLC, Honua Consulting conducted a Literature Review and Field Inspection (LRFI) in support of the West Loch Affordable Housing Project located in Honouliuli Ahupua‘a, ‘Ewa District, O‘ahu Island, TMK [1] 9-1-122:004. The project area, street address 91-1666 Fort Weaver Road, consists of 3.704 acres (292,026 square feet [sq. ft.] or 27,130 sq. meters [m.]) and is owned by the City and County of Honolulu.

The proposed project plans to construct the West Loch Affordable Housing Project which will consist of 123 rental units divided between seven buildings with an associated community center and community garden. The remainder of the property will be paved for 132 parking stalls and modified for landscaped vegetation and sidewalks. Subsurface excavations will include grading and excavation for foundations and trenching between 1-6 ft below ground surface to connect to existing utilities.

The objectives of this study were to determine the project area’s land-use history, to identify any historic properties or component features in the project area, to evaluate the proposed project’s potential effect on historic properties, and to make recommendations about mitigation, if applicable. This study is not an archaeological inventory survey (AIS); however, it has been conducted according to standards outlined in Hawai‘i Administrative Rules (HAR) § 13-276 for AIS studies, and is intended to assist with the project’s compliance with Hawai‘i Revised Statutes (HRS) § 6E-8 and consultation with the State Historic Preservation Division (SHPD).

Background research indicates that the project area is situated on the coral plain of ‘Ewa, an area thought to be sparsely inhabited by Hawaiians. The pre-contact (pre-1778) population of ‘Ewa was focused along the coastline with the plains used for resource collection. The numerous sinkholes of the interior karst lands were used for agriculture, burial, and sometimes habitation. Approximately 1 mile to the north of the project area is an area known as the Honouliuli Taro Lands, an extensive traditional Hawaiian and early historic period lo‘i (pond field) system and habitation area that once comprised much of the lowlands along Honouliuli Stream. Additionally, several former fishponds are located nearby that utilized the shores of the West Loch of Pearl Harbor and Laulaunui Island.

The entirety of the project area was part of LCA 11216, ‘āpana 8 to Mikahela Ke‘ahi-Kuni Kekau‘ōnohi, which consisted of all of the unclaimed lands of Honouliuli Ahupua‘a. In the late 19<sup>th</sup> century, the project area was used for cattle grazing. Later, it was planted with sugar cane around the turn of the 20<sup>th</sup> century with the establishment of the OR&L Railroad in 1889 and the Ewa Plantation Company in 1890. The project area was under cultivation by the Ewa Plantation Company until 1970 and then the Oahu Sugar Company into the 1980s when the property was sold to the City and County of Honolulu. The property was cleared and graded as early as 1993, likely during construction of the West Loch Elderly Villages to the north. Easements were constructed through the project area in 2000 and a cell tower lease facility was built along the western boundary in 2011.

Two previous studies have included the project area or a portion of the project area and include an AIS for the West Loch Estates residential development in 1987 and a historic properties assessment for a cell tower facility in 2009 (Rosendahl 1987 and Macak et al. 2009). No historic properties were documented within the project area during either study. The lack of historic

properties was attributed to previous disturbances from historic cattle ranching and subsequent use of the area for commercial sugar cane production.

The archaeological field inspection conducted for the current project consisted of a 100% pedestrian survey of the project area. The entire project area was relatively free of vegetation and has been graded flat. It is bordered on the east, south, and west by streets and sidewalks and on the north by the West Loch Elderly Villages. A road easement and a cell tower lease facility are present in the western portion of the project. A single potential historic property, temporary site designation Honua 1, was documented in south-central portion of the project area and includes an area with several depressions and two possible filled sinkholes recorded as Features A and B.

Sinkholes within the region have been found to contain significant cultural deposits and materials, including human burials, therefore this study recommends further examination of the two filled sinkholes, Features A and B, within the project area. Methodology for investigation of the sinkholes should be discussed with and approved by the State Historic Preservation Division (SHPD). The investigation will likely require the completion of an Archaeological Inventory Survey (AIS) report. The sinkholes should be assessed for cultural modifications, the presence of soil/sediment sufficient for excavation, and the presence of archaeological and paleontological remains. Excavations should be conducted within sinkholes of sufficient size for access and containing sufficient soil/sediment. In the event paleontological remains are recovered, the faunal material should be analyzed by a qualified expert to determine animal species.

Following further investigation of the sinkholes, an archaeological monitoring program is recommended to be carried out in accordance with HAR § 13-279 (Rules for Archaeological Monitoring Studies and Reports). The monitoring program would ensure documentation of any further potential cultural remains or significant deposits that may exist within sinkholes in the project area. The frequency of archaeological monitoring would be determined in coordination with the SHPD.

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## Introduction

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### Project Background

At the request of Stanford Carr Development, LLC, Honua Consulting conducted a Literature Review and Field Inspection (LRFI) in support of the West Loch Affordable Housing Project located in Honouliuli Ahupua‘a, ‘Ewa District, O‘ahu Island, TMK [1] 9-1-122:004. The project area consists of 3.704 acres and is owned by the City and County of Honolulu. The project area is shown on a USGS topographic map (Figure 1), an aerial photo (Figure 2), and a TMK (Figure 3). A preliminary site plan for the West Loch Affordable Housing Project is included as Figure 4.

The proposed project plans to construct the West Loch Affordable Housing Project which will consist of 123 rental units divided between seven buildings with an associated community center and community garden. The remainder of the property will be paved for 132 parking stalls and modified for landscaped vegetation and sidewalks. Subsurface excavations will include grading and excavation for foundations and trenching between 1-6 ft below ground surface to connect to existing utilities.

Two previous studies have included the project area or a portion of the project area and include an archaeological inventory survey for the West Loch Estates residential development in 1987 and a historic properties assessment for a cell tower facility in 2009 (Rosendahl 1987 and Macak et al. 2009). No historic properties were documented within the project area during either study. The lack of historic properties was attributed to previous disturbances from historic cattle ranching and subsequent use of the area for commercial sugar cane production.

The objectives of the LRFI were to determine the project area’s land-use history, to identify any historic properties or component features in the project area, to evaluate the proposed project’s potential effect on historic properties, and to make recommendations about mitigation, if applicable.

This study is not an archaeological inventory survey (AIS); however, it has been conducted according to standards outlined in Hawai‘i Administrative Rules (HAR) § 13-276 for AIS studies, and is intended to assist with the project’s compliance with Hawai‘i Revised Statutes (HRS) § 6E-8.

### Environmental Setting

#### Natural Environment

The project area is on the leeward side of O‘ahu in Honouliuli Ahupua‘a of the ‘Ewa District. ‘Ewa is the largest of the six moku (districts) of O‘ahu and encompasses the southwest-central portion of the island. Honouliuli Ahupua‘a extends from the Ko‘olau Mountains to its boundary with Wai‘anae Moku (District) at Nānākuli Ahupua‘a. Rainfall in the project area ranges from 10 centimeter (cm) (4 inches [in.]) in the wetter, winter months to 1.7 cm (0.7 in.) in the dryer, summer months; with a mean annual rainfall of 55 cm (21.6 in.) (Giambelluca et al. 2013). The closest water resources to the project area consist of the coastal lands of the West Loch of Pearl Harbor approximately 1 km (0.65 miles) to the northeast. Elevation in the project area ranges from approximately 40-45 feet [ft.] (12.2-13.7 m) above mean sea level (amsl).

Two soil types are present within the project area and consists of Honouliuli Clay on slopes ranging from 0 to 2 percent (HxA) and 2 to 6 percent (HxB) (Foote et al. 1972) (Figure 5). These soils consist of well-drained soils on coastal plains that developed in alluvium derived from basic igneous material. The topography is nearly level and gently sloping with elevations ranging from 15-125 ft. [4.5-38.1 m] amsl. These soils are typically used for sugar cane, truck crops, orchards, and pasture. Typical vegetation associated with this soil type consists of kiawe (*Prosopis pallida*), koa haole (*Leucaena leucocephala*), fingergrass (*Digitaria* sp.), bristly foxtail (*Setaria verticillata*), and bermudagrass (*Cynodon dactylon*) (Foote et al. 1972:43-44).

## **Built Environment**

The project area is bordered by Renton Road on the the south and east, the West Loch Elderly Villages Apartments in the north, and Fort Weaver Road in the west. A 2 meter high rock wall defines the western boundary of the project area with Fort Weaver Road and a metal fence defines the northern boundary of the project area with the West Loch Elderly Villages. A sidewalk along Renton Road defines the southern and eastern boundary of the project. A fenced Verizon Wireless cell tower lease area consisting of a 60 ft tall mono-palm is located along the the central portion of the western boundary of the project area. A road providing access to the West Loch Elderly Villages runs through the western portion of the project area. Easements include electric running under the West Loch Elderly Villages access road and a sanitary sewer easement running through the eastern portion of the project area. Other utilities in the project area include water, electric and a drain located along Renton Road. The project area has been graded with the northern portion used for parking. The low vegetation in the project area consisted entirely of sparse lawn grass and weeds.

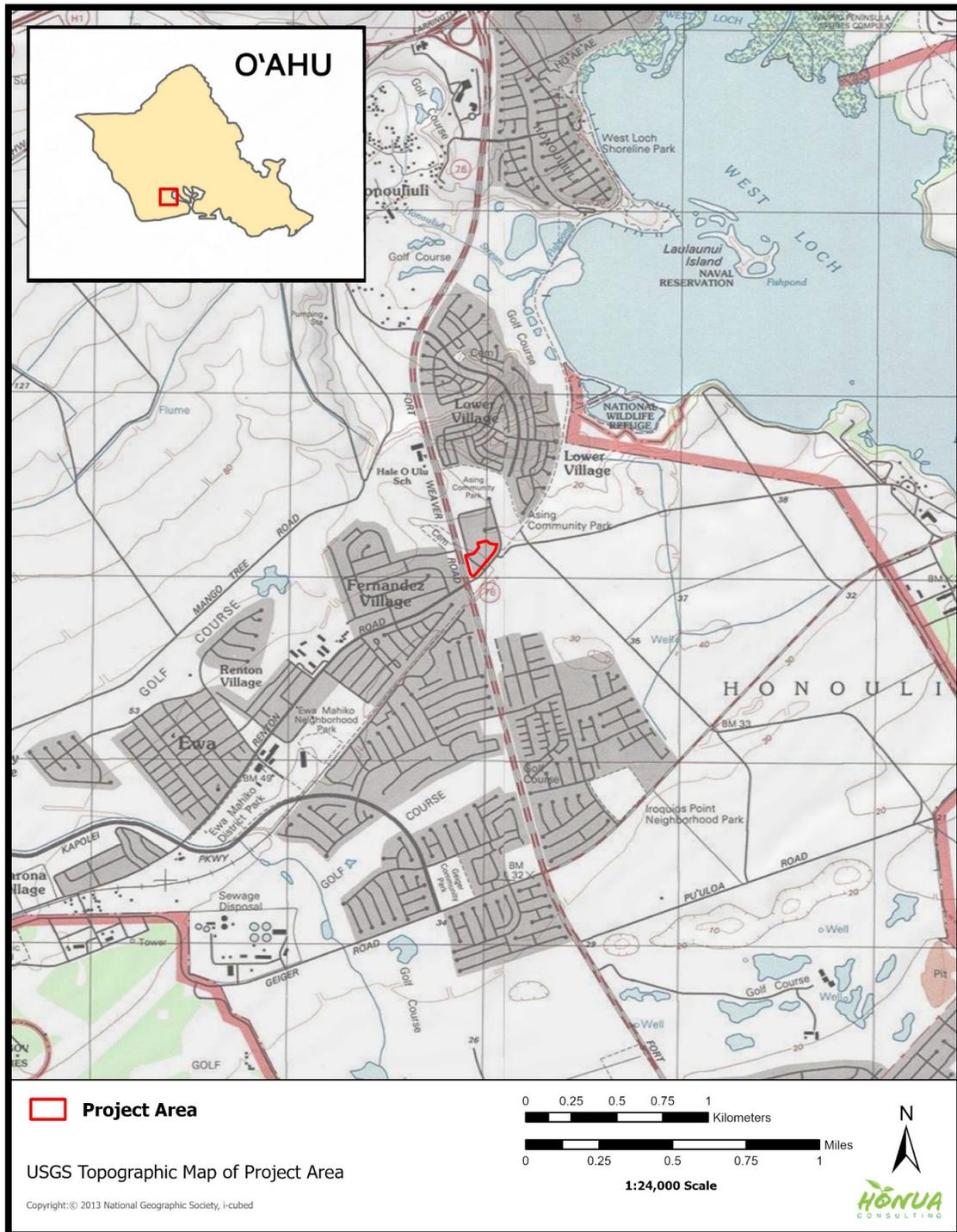


Figure 1. Portion of a 2013 U.S. Geological Survey (USGS) topographic map showing the project area



Figure 2. Aerial photo showing the location of the project area (Source: 2011 U.S. Geological Survey Orthoimagery)

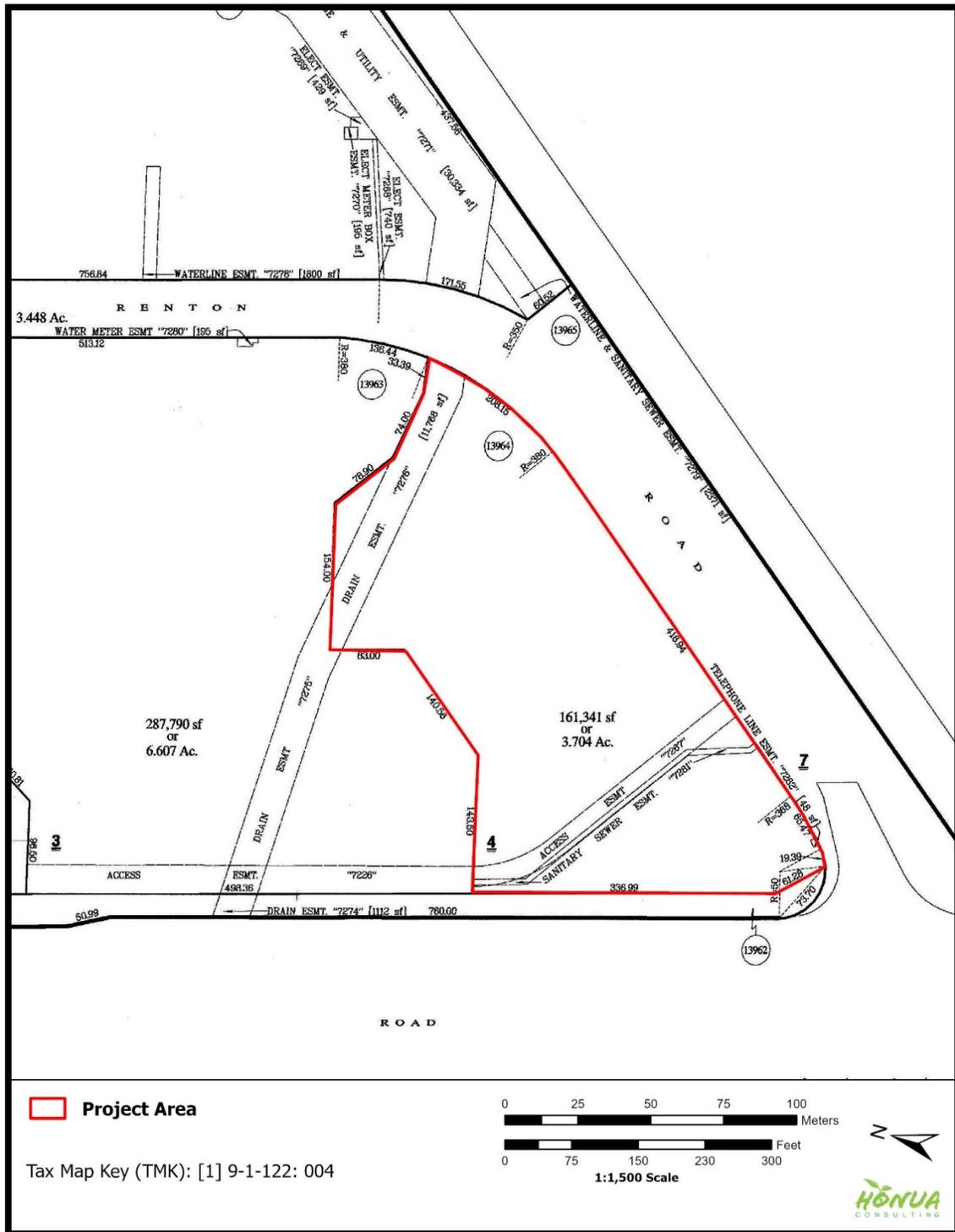


Figure 3. Portion of Tax Map Key (TMK) [1] 9-1-122:004 showing the project area

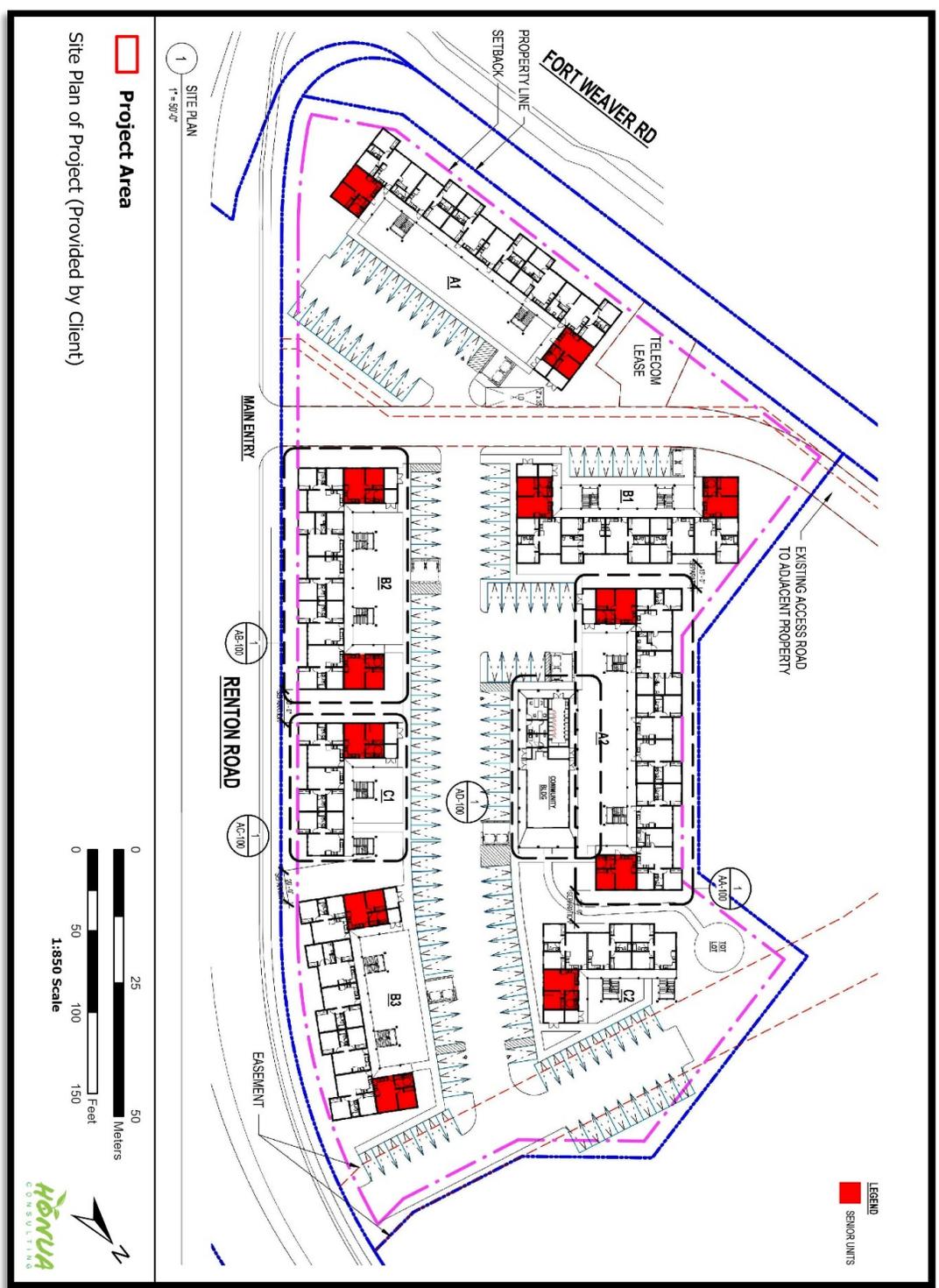


Figure 4. Preliminary construction plan for the West Loch Affordable Housing Project (Provided by Client)

West Loch Affordable Housing Project LRFI

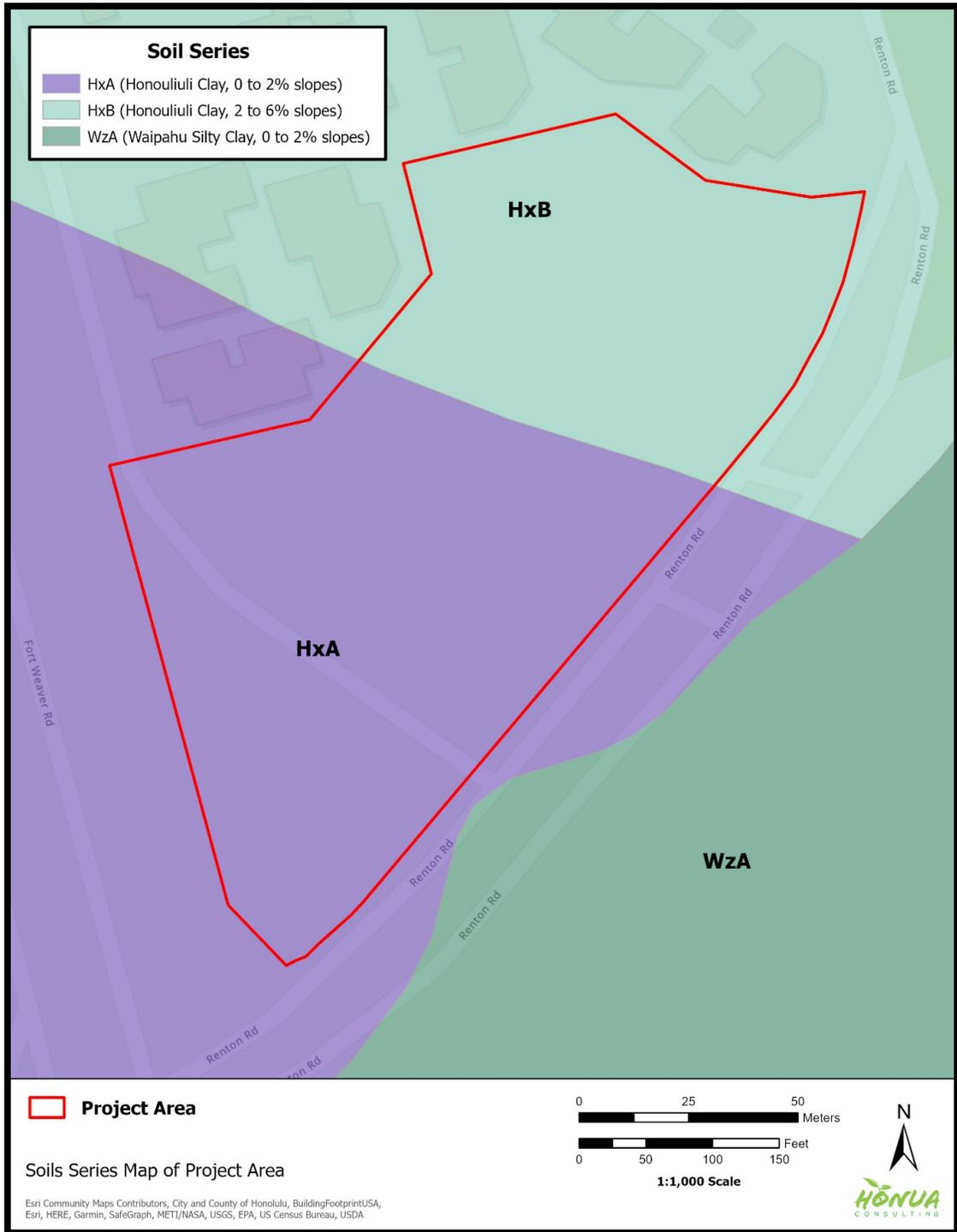


Figure 5. Portion of a 2013 USGS topographic map with soil series overlay showing anticipated soils in the project area (Foote et al. 1972)

## Traditional and Historical Background

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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](http://www.ulukau.com), Soehren 2002-2019), Papakilo Database ([www.papakilodatabase.com](http://www.papakilodatabase.com)), the State Library on-line (<http://www.librarieshawaii.org/Serials/databases.html>), and Waihona ‘Aina Mahele database (<http://www.waihona.com>). Hawaiian terms and place names were translated using the on-line Hawaiian Dictionary (Nā Puke Wehewehe ‘Ōlelo Hawai‘i, [www.wehewehe.com](http://www.wehewehe.com)) and *Place Names of Hawaii* (Pukui et al. 1974). Historic maps were obtained from the State Archives, State of Hawai‘i Land Survey Division website (<http://ags.hawaii.gov/survey/map-search/>), and 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 Pro desktop. 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.

### Traditional Background

Traditionally, ‘Ewa and the districts of Wai‘anae and Waialua were ruled by chiefs and kings of the Maweke-Kumuhonua (Beckwith 1970; Fornander 1996). For a time, the royal center of ‘Ewa was at Lihue in the uplands of Honouliuli. From the 1500s to 1700s, there were several political power shifts including the defeat of the ‘Ewa chief by Peleioholani, a son of Kualī‘i, around 1740 AD. In 1778, Kahahana who was from the ‘Ewa line of chiefs, but who was raised in Kahekili’s Maui court, took control of O‘ahu and ‘Ewa, until King Kamehameha unified the islands around 1810 AD. Following Kamehameha’s conquering of O‘ahu, at least two of his chiefs lived in Pu‘uloa, and later, Liholiho (Kamehameha II) built a house in Pu‘uloa (Kamakau 1961:255).

Background research indicates traditional settlements in Honouliuli were situated near irrigated taro fields located along West Loch and were concentrated around small marshes and wet sinks found throughout an otherwise semi-barren landscape. The wide coastal zone was dependent on mixed marine exploitation and agricultural cultivation. A network of established trails provided routes from the coast around West Loch through the Honouliuli lowlands to Pu‘u o Kapolei, the Wai‘anae coast, and other parts of O‘ahu (‘Ī‘ī 1959). The trail system was a major route joining coastal resources with inland areas.

The history of Hawai‘i is recorded in oral tradition as told through mo‘olelo (traditional stories, legends, mythology) as well as through early historic accounts, historic maps and land records. The following research summarizes myths and place names of the area and describes how the land has been utilized over time.

### Mo‘olelo

Research found a number of site-specific traditions from Honouliuli Ahupua‘a, but much more of the available history is associated with the traditions of neighboring lands of the larger ‘Ewa District—notably with Ke Awalau o Pu‘uloa (The many Bays or Lochs of Pu‘uloa)—and in some

cases connected to events in history across the pae ‘āina (island group). As a result, many of the following citations include other notable places.

Hawaiian mo‘olelo (traditions and historical narratives) share expressions of native beliefs, customs, practices, and history. The Hawaiian landscape is itself storied and each place name is associated with a tradition, ranging from the presence and interactions of the gods with people, to documenting an event or the characteristics of a given place. Unfortunately, today many of these mo‘olelo have been lost. Through the mo‘olelo that have survived the passing of time we are able to glimpse the history of the land and people who have called Honouliuli home.

The narratives are generally organized chronologically by period of time or the events being described, such as when the gods walked the land, touching the lives of the people, or when chiefs engaged in conflicts on the land. In some instances when the mo‘olelo span generations, speaking of the transmission of traditional knowledge and beliefs, the collection of history is linked together. It will be noted that in a number of instances, wahi pana (storied and sacred landscapes) were named in the traditions as a means of commemorating notable events in history.

The project area is located in the ahupua‘a (traditional land division) of Honouliuli (translated as “dark bay”), in the moku (district) of ‘Ewa (“crooked”) (Pukui et al. 1974:28, 51). The translation of Honouliuli as “dark bay” likely refers to the nature of West Loch (west side of Pearl Harbor or Pu‘uloa) (Pukui et al. 1974). Honouliuli Ahupua‘a is the largest and western-most ahupua‘a in ‘Ewa. Honouliuli contains uka (upland), waena (middle), and kahakai (sea/beach) lands, which provided diverse subsistence resources including coastal fishponds, taro planting on the ‘Ewa Plain, and forest resources. The western boundary of the ahupua‘a follows the ridgeline from Palikea (“white cliff”) in the Wai‘anae Mountain Range to the coast at Piliokahe (“clinging to Kahe”) (Pukui et al. 1974:177, 185). The eastern boundary of the ahupua‘a terminates at the West Loch of Pu‘uloa (“long hill”) or Pearl Harbor (Pukui et al. 1974:200-201).

Honouliuli is associated with several traditional stories affiliated with the volcano goddess Pele, her family, and the pig-man, demigod Kamapua‘a. Other legends of the area include the Legend of Lepeamoā the chicken-girl of Pālama (lama wood enclosure), and the Legend of the Wandering Souls.

### **Ka Moolelo o Kamapua‘a (A Tradition of Kamapua‘a)**

S.W. Kahiolo (1861) contributed the tradition of Kamapua‘a to the native newspaper *Ka Hae Hawaii* (the original Hawaiian texts may be viewed in the Hawaiian digital library at [www.ulukau.org](http://www.ulukau.org)). This is the earliest detailed account of Kamapua‘a, a multi-formed deity of traditional significance on O‘ahu and all the major islands of the Hawaiian group. The Hawaiian deity Kamapua‘a is a part of the Lono god-force and possessed many kinolau (body forms), representing both human and various facets of nature. He was born in pig-form to Hina (mother) and Kahiki‘ula (father) at Kaluanui in the Ko‘olau Loa District of O‘ahu.

Excerpts from S.W. Kahiolo’s “He Moolelo no Kamapuaa” in *Ka Hae Hawaii* provide details on places of traditional cultural significance in the ‘Ewa District. This mo‘olelo offers traditions associated with the naming of, or traditional importance and uses of, localities from Honouliuli to Moanalua. Notably, the account shares that place names with the word “wai,” such as Waikele, were gifted by Kamapua‘a to the priestly line of the god Lono. These storied places include, but are not limited to: Waimānalo, Waikele, Waipi‘o, Waiawa, Waimano, Waimalu, Pu‘uokapolei, Keanapua‘a, Pu‘uloa, Moanalua, Waipahu, and Kuolohele.

*Ka Hae Hawaii***He Moolelo no Kamapuaa.****July 10, 1861**

...When the chief Olopana was killed, the island of Oahu became Kamapuaa's. He then fetched his people (who he had hidden) from above Kaliuwaa and brought them down, and they then returned to their lands. The priest (Lonoaiwohi) asked Kamapuaa if he could be given some lands for his own as well. He asked, "Perhaps the water lands might be mine." Kamapuaa agreed. This was something like a riddle that the lands which have the word "water" (wai) in their names would be his, like: Waialua, Waianae, Waimanalo, Waikele, Waipio, Waiawa, Waimano, Waimalu, Waikiki, Waialae, Wailupe, Waimanalo 2, Waihee, Waiahole and etc.

The parents of Kamapuaa, Hina and Kahikiula, thought that this amount of land was too great, and they criticized Kamapuaa for agreeing to it. But his elder siblings and grandmother did not criticize him, agreeing to the priest's request. The remainder of the lands went to Kamapuaa's family...

[Following a journey to Hawaii, where Kamapuaa fought with Pele, he returned to Oahu. Upon arriving at Oahu, Kamapuaa learned that the island was under the rule of another chief, and that his parents had been chased to Kauai, and that his favorite brother Kekeleiaiku had been killed. The following excerpts include accounts describing sites and activities in Ewa.]

**August 7, 1861**

...Kamapuaa walked to Keanapuaa, on the shore at Halawa, and he slept there. When he woke up from his sleep, he urinated in the sea, and that is why the fish of Puuloa have a strong smell to them, so say the uninformed.

From there, he went to Honouliuli and saw his grandmother, Kamauluniho, sitting along the side of a taro pond field. She was looking with desire to the lands below, where some of the men of the king were working and wishing that they would leave even a little bit of taro behind for her to eat. Kamapuaa then went and stood next to her and greeted her. She replied, greeting him, but did not recognize him as her grandson. He then asked her why she was sitting there. She told him, "I am looking to the lowlands, where the men of the chief are working, and wishing that they would leave a little behind so that I may have some food." Kamapuaa then said to his grandmother, "How did you live before?"

She answered, "What is it to you? My grandchildren have died, one in a battle with Pele, another buried, and one on Kauai." This is how she spoke, not understanding that the one before here was her own grandson. Kamapuaa then answered, "I am going to get some food for me." She asked, "Where will you get your food?" He told her, "I will go and perhaps ask for some, and maybe they will give me some of their food."

**August 14, 1861**

Kamapuaa went and said to one of the men who was pulling taro, “Let the two of us pull taro for us.” The man agreed, and the two of them pulled taro, some for the man and some for Kamapuaa. Kamapuaa pulled a large quantity and then carried it up to his grandmother. Because of the large load that he carried, Kamaulaniho suspected that the man was indeed her own grandson, Kamapuaa. She chanted a name song to Kamapuaa and he chanted to her as well. Together, they carried the taro to the house she shared with another old woman, at Puuokapolei. Setting down their bundles of taro, Kamaulaniho placed Kamapuaa on her lap and wept over him. The two were joined by the other old woman and she was introduced to Kamapuaa, who she thought had been lost. Preparations were made for a meal, and Kamapuaa and the old woman went out to her garden to collect sweet potatoes. They then returned to the house and ate...

**August 21-28, 1861**

...Kamapuaa went to Nuuanu and performed a ceremony, bringing his brother, Kekeleiaiku, back to life. He then traveled to Kou where he killed the chiefs and people who had killed his brother and forced his family into their life of despair... Returning from Kou, Kamapuaa met his friend Kuolohele and the two of them walked from Moanalua. They reached Waiawa and continued on to Waipahu. Standing on the edge of the stream there, Kuolohele went to bath in the stream. Kamapuaa noticed that Kuolohele had a large lump (puu) on his back. Picking up a stone, Kamapuaa struck the lump on Kuolohele’s back.

Kuolohele cried out, thinking that he was about to be killed. Kamapuaa reassured him that he was not going to die, but that instead, he would be healed. He then instructed Kuolohele to touch his back. In doing so, Kuolohele found that the lump was gone.

Kamapuaa then picked up the stone and set it on the cliff-side. That stone remains there at this time, and it is a stone which many travelers visit [the stone is named Kuolohele]... Kuolohele and Kamapuaa continued traveling together for a short distance, until Kuolohele reached his destination. Kamapuaa continued to Puuokapolei, where he met with his grandmother and brother. He told them what had transpired, and he then set off for Kauai, to bring his parents back to Oahu... (Kahiolo 1861)

**Ka Moololo o Kalelealuaka (The Tradition of Kalelealuaka)**

The tradition of Kalelealuakā touches on places throughout the Hawaiian Islands. Kalelealuakā and his father, Ka’ōpele, possessed supernatural attributes and their story describes several places in the ‘Ewa District. The tradition was published in *Ka Nupepa Kuokoa* and was submitted by J.W.K. Kaulilinoe between April 9, 1870 and June 4, 1870. The original account offers a richer narrative of places and practices than those cited by Fornander (Vol. IV 1916:464-471) and Beckwith (1970:415-418). There are several wahi pana named in the tradition with descriptions of place and how the names were given.

***Ka Nupepa Kuokoa*****April 9 to April 23, 1870**

Kaopele (k) and Makalani (w) were the parents of Kalelealuaka (k). Kalelealuaka was born on Kauai, the native land of his mother. His father had been born at Waipio, Hawaii, and possessed certain supernatural powers. Kaopele was a great cultivator of the land, and he is credited with the planting of large fields on Hawaii, Maui, Oahu, and Kauai. On Oahu, it was at Kapapakōlea in Moanalua, and at Līhu‘e, in the district of Ewa that Kaopele had cultivated large tracts of land. While Kaopele worked the land with great speed, he was also overcome by a deep sleep that lasted for six months at a time. On many occasions, it was thought that Kaopele had died, and then he would reawaken and resume his tilling of the land. When Makalani became pregnant, Kaopele gave her certain items to identify the child as his own, and shortly before giving birth, Kaopele went to sleep.

**April 30, 1870**

Kalelealuaka was born and grew quickly. When Kaopele woke up from his sleep, he instructed his son in various techniques of fighting, and Kalelealuaka became known as an exceptional warrior, who moved so swiftly, that no one could even see him... One day, when looking out across the ocean, Kalelealuaka saw a land in the distance, and he inquired of Kaopele, “What land is that?” Kaopele told him that it was “Kaena on the island of Oahu. Kalelealuaka then asked, “What is the village that is there beyond the point?” Kaopele answered, telling him that it was “Waianae.” When Kalelealuaka expressed a desire to travel and see that land more closely, Kaopele made a canoe for his son to travel on.

When preparations were being made for Kalelealuaka’s departure, he befriended a youth named Kaluhe, and it was agreed that Kaluhe would travel with Kalelealuaka. When everything was made ready, Kaopele told Kalelealuaka:

Sail until you reach the point outside of the village of Waianae, then travel across the plain to a place where there is a pool of water. That will be the pool of Lualualei. Then you will ascend the pass of Pohakea, from where you will see the flat lands spread out before you. You may also see the expansive cultivated fields of Keahumoa which I planted before coming to Kauai...

**May 7, 1870**

Kalelealuaka and Kaluhe sailed to Oahu and passed the heiau of Kanepuniu and landed on the shore. There Kalelealuaka was met by a group of youth who were surfing. One of the youth inquired about the journey of the two travelers, and one asked if he might accompany Kalelealuaka and his companion. Kalelealuaka agreed, and the group walked across the plain and found the pool of Lualualei. From there, they then ascended the mountain, to the pass at Pohakea, from where they looked out across the broad flat lands of Keahumoa. Descending the slope, they found a large garden planted in bananas that had been planted by Kaopele.

Kalelealuaka then shot his supernatural arrow (pua), and it flew down slope,

passing the plains of Puunahawe and Kekuaolelo, and it landed at Kekuapoai, awaiting Kalelealuaka's arrival. This was at Waipio, above Ewa. The people of the area saw the flight of the arrow, and cried out "Ka pua lele hoi e!" (How the arrow flies!). That is why the place is called "Lele-pua" (Flying-arrow), to this day...

Kalelealuaka stayed in the uplands above Lelepua, at Kahalepoai, and asked his companions to go and fetch the arrow. He also told them to gather some clumps of awa and sedges for straining it. The two companions went and arrived at the edge of the stream called Kaniukulou, where they saw some women bathing. They asked, "Have you perhaps seen our arrow?" The women denied having seen it, hoping that they might keep it for themselves. Because they had found it and greatly admired its beauty. Sensing that they were lying, Kaluhe called out to the arrow, and it leapt from the place at which it had been hidden, into his hands. The women were frightened by this, and fled away.

Kaluhe and his companion left the stream and arrived at a large house with clumps of awa planted all about it. Looking around, they found no one in the house or in the surrounding lands, so they began to gather some of the awa. While picking the awa, they heard a voice call out to them, "Set aside that which you have taken, or I shall return." Startled by this command, they dropped the awa and fled, returning to Kalelealuaka, and describing the house, its surroundings, and events to him. They noted that the house was an excellent one, and only lacked sleeping mats inside.

Kalelealuaka had them gather rolled sleeping mats and kapa and they then traveled to the house. Entering the house, they found that all was in order, and they prepared food, ate, and drank awa, with no other voices calling to them. The next day, Kalelealuaka arose, and he and his companions planted large fields with various crops. The field planted by Kalelealuaka extended from the uplands of Kahalepoai to the lowlands of Puunahawe. When the work was completed they returned to the house and prepared popolo, aheahea, and inamona as their food. These were the only things which presently grew around the house that could be eaten until their own gardens matured. While they were eating, The youth from Oahu, ate with great haste and ferocity, and Kalelealuaka called to him, urging him to eat with patience. Because of this, the youth from Oahu, came to be called "Keinohoomanawanui."

One of the problems in living in the uplands was that there were plenty of plant foods to be had, but there was no fish. One day, while preparing their food, Keinohoomanawanui was making inamona (kukui nut relish). When he struck a broiled kukui nut, the shell flew up and struck him in the eye, blinding him in that eye. Kalelealuaka then took up the task of preparing the food...

### **May 14, 1870**

Kalelealuaka told Keinohoomanawanui, "I will prepare that food which we two desire. Keinohoomanawanui said, "That which I desire are the sweet potatoes of the planted fields below, and the eels of the pond at Hanaloa." Kalelealuaka told Keinohoomanawanui, that "in time, you will have your desire." Now these foods were the property of the king Kakuhihewa, and they were kapu to all but him and his people. Kalelealuaka told Keinohoomanawanui, "Tomorrow, Kakuhihewa and

his people will arrive here in the uplands of Waipio, to gather wood with which to make new houses in the lowlands.

Now while Kalelealuaka and Keinohoomanawanui were discussing these things, Kakuhihewa himself had come to the uplands to gather some of the awa that grew at Kahauone. Seeing the large house in which Kalelealuaka and his companions dwelled, he quietly drew near and overheard the conversation, curious about who these men were. He set a wooden image in the ground near the house to mark the area, and then departed, returning to Puuloa. Kakuhihewa thought about what he had heard, and the bold remarks that they would soon eat the favored eels of Hanaloa. Kakuhihewa spoke of this with his advisors and war leaders, some of whom suggested that a party go to the uplands to kill the impertinent youth.

Instead, Kakuhihewa sent to Waimanalo (Ewa) for his priest, Napuaikamao. Napuaikamao traveled to Koolina where Kakuhihewa was staying, and listened to the words of his chief, describing the youth and their conversation. Napuaikamao thought about their words, and the symbolism of the desire for the eels of Hanaloa, and discerned that one of the youth was the great warrior, Kalelealuaka, of Kauai. Now at this time, Kakuhihewa was at war with a chief named Kualii, the two kings seeking to rule all of Oahu. Napuaikamao told Kakuhihewa, that it was Kalelealuaka who would bring victory to his side, and that he should prepare a house for the youth and allow them to fulfill their desires.

Kakuhihewa agreed, and ordered preparations to be made. He then had his counselor, Maliuhaaino go to the uplands of Waipio and invite Kalelealuaka and his companions to the shore...

### **May 21, 1870**

Maliuhaaino arrived before the youth, and following a discussion, it was agreed that they would meet with Kakuhihewa... Descending to the coast, they passed the plain of Puunahawe. They then passed below Puukuua which is near the mountain ridge, and descended to the shore of Puuloa. Kalelealuaka and his companions were shown the houses and foods that had been prepared for them, and they took up residence at Puuloa...

(During this time, the identity of Kalelealuaka, remained hidden from Kakuhihewa and his people. Because the king had heard Keinohoomanawanui speaking about his desire for the eels of Hanaloa, and because Keinohoomanawanui told people that he had been blinded in one eye by a spear, it was assumed that Keinohoomanawanui was the great warrior that they sought.)

With the passing of several periods of ten days (anahulu), a messenger from the king, Kualii, arrived bearing the message that Kualii challenged Kakuhihewa to a battle on the field at Kanalua [Kauālua], in Moanalua... The warriors met, and a great battle took place in which the champion of Kualii was killed. It was thought that Keinohoomanawanui (mistaken as being Kalelealuaka) had secured the victory for Kakuhihewa... During this battle, Kalelealuaka had stayed behind at Puuloa, and after the battle began, ran secretly with great speed to the battle ground, and killed Kualii's champion...

### **May 28, 1870**

At each of the subsequent battles between the warriors of Kakuhihewa and Kualii, Keinohoomanawanui was credited with, and accepted the honor of having defeated Kualii's champions. Because Kalelealuaka moved so swiftly, no one even saw him enter the battle field. Kalelealuaka had stayed behind at Puuloa, and secretly entered into the battle, killing Kualii's champions, and taking their capes and feather helmets, with which he returned to Puuloa, hiding the items in his house.

### **June 4, 1870**

At the last battle between Kakuhihewa and Kualii's champions, the forces met near Waolani [in Nu'uaniu], and Kalelealuaka killed all of the warriors of Kualii. Great honor was to be bestowed upon Keinohoomanawanui, but Kalelealuaka arrived before the assemblage and claimed the privilege. Kalelealuaka accused Keinohoomanawanui of deception, and challenged him to a fight to prove it. As quickly as the battle began, Keinohoomanawanui was killed, and Kalelealuaka took his head to Malihuhaaino.

Seeing that all of his warriors had been killed, Kualii, thought that his life too was forfeit, but Kalelealuaka invited him to live under Kakuhihewa, to which Kualii agreed. The head of Keinohoomanawanui was taken to Puuloa and then set atop an aa hillock above Kalauao... Kalelealuaka, Kakuhihewa and Kualii, and their people lived out their days in peace... (Kauaililinoe 1870)

## **A Prophecy and the Death of Kahahana**

One significant tradition of O'ahu takes place in the 1780s and includes events on the lands of Honouliuli, Hō'ae'ae, Waikele and Waipi'o in the 'Ewa District. As a part of his plan to take control of O'ahu, Kahekili, then king of the Maui group of islands, tricked Kahahana, his nephew and King of O'ahu, into killing his high priest, Ka'ōpuluhulu. Kahekili had raised Kahahana, and he desired to make O'ahu a part of his kingdom. It was Ka'ōpuluhulu who instructed Kahahana and warned him against certain actions proposed by Kahekili. In January 1862, J.H. Kānepu'u, a frequent contributor of island history to native newspapers, penned one of the earliest native accounts pertaining to the deaths of Ka'ōpuluhulu and his son Kahulupu'e and the prophecy uttered at their deaths.

### ***Ka Hoku o ka Pakipika***

#### **Januari 23, 1862 ('ao'ao 2)**

...Ua hooko mai ke Akua i wanana ma o Kaopuluhulu la, kekahi kaula mana Oahu nei, e haawi mua ana no i ka aina no na mamoa a Sapeta, penei kana olelo i kana keiki, i nui ke aho a make i ke kai, no ke kai ka hoi ua aina, aia la, lilo ka aina ia kai. Mai kai mai no o Kahekili maluna mai o ka waa, a pae

#### **January 23, 1862 (page 2)**

God has fulfilled the prophecy of Kaopuluhulu, one of the powerful prophets of Oahu—giving the land to the descendants of Japheth [cf. Genesis 9:27]—who spoke thus to his son, “Strive to die in the sea, for those of another land shall come from across sea, and the land shall belong to them from

ana i Oahu nei, kaula me Kahahana, a holo o Kahahana i ka nahelehele, lilo ka aina ia kai. Mai kai mai no o Kamehameha, a kaula me Kalanikupule ma Nuuanu nei, a hee o Kalanikupule, lilo ka aina ia kai. Mai kai mai nei no ka haole maluna mai nei o ka moku a noho ana i uka nei, he oluolu wale no ka lakou la hana ana mai i na'lii o kakou, aohe i eha ka ili, lilo no ia lakou la na hooonopono aupuni, na aina, na kuleana ma ka hoolimalima, ma ke kuai, ma ka hoaiie i kahi awelu lole, i ka rama, ia mea ae ia mea ae, ua lilo ia lakou la, o kau no ia o ka hoaa aku ma ka palekai.

across the ocean.” Kahekili came from across the sea on a canoe and landed on Oahu. He then engaged in war with Kahahana, who fled to the forests. Thus the land was taken by the sea. Kamehameha then came from across the sea and engaged in war with Kalanikupule at Nuuanu. Kalanikupule was defeated, and the land was taken by the sea. Then the foreigners came from the across the sea on ships and now reside on the land. Their deeds for our chiefs were kindly, and they took on the work of setting the nations right, the land, the properties and leasing, selling, creating debt for new clothing, rum, this thing and that, it is all theirs now, and built up on the breakwater... [Maly, translator] (Kānepu‘u 1862)

Kamakau (1867) elaborated that about eight years into Kahahana’s reign as king of O‘ahu, Kahekili succeeded in tricking Kahahana into killing Ka‘ōpuluhulu.

Kahahana called for Ka‘ōpuluhulu and his son, Kahuluhu‘e to be brought before him at Wai‘anae. The call was made from Pu‘ukāhea (Hill of calling). Upon the summons, Ka‘ōpuluhulu prayed to his gods and discerned that he and his son would be killed once in the presence of the chief. Arriving at the place now called Nānākuli (ahupua‘a in Wai‘anae District), Ka‘ōpuluhulu called out to Kahahana who looked at him, but made as if he didn’t hear the call (nānā kuli). Ka‘ōpuluhulu then knew for certain that he and his son were to be killed, and he told Kahuluhu‘e:

“I nui ke aho a moe i ke kai! No ke kai ka hoi ua aina!”  
Strive to lie down in the ocean! For our revenge will come from other lands  
across the sea (Kamakau 1867:3).

Kahuluhu‘e ran into the water near Pu‘uohulu where he was killed. Ka‘ōpuluhulu continued his flight across the Honouliuli plain to the shore of Pu‘uloa, where he was then killed (Kamakau 1867). Kamakau also wrote about the last years of Kahahana’s life and his death at the command of Kahekili, placed by some native writers at Hō‘ae‘ae and Waikele:

For two years and six months Ka-hahana and his wife and Ka-hahana’s friend, Alapa‘i, hid in the mountains and were fed and clothed by the commoners, who had compassion upon them. Thus, were the misdeeds of Ka-hahana justly repaid. They were finally betrayed by Ke-ku-manoha’, father of Ka-lani-moku and half brother of Ke-kua-po‘i, Ha‘alo‘u being the mother of both. Their last place of hiding was near Wailele at Waikele in ‘Ewa. Alapa‘i said to Ka-hahana, “Let us kill our wife and then we shall be able to escape.” Ka-hahana was more merciful, perhaps

because he could not endure to lose Ke-kua-po‘i, who was an incomparable beauty. He said, “Why kill our wife who has been so faithful a companion to us while we have dodged death in cold and wet, wandering here in the mountains, in the thickets of Wahiawa, in this ocean of Ka‘ie‘iea? Perhaps she can persuade her kinsmen to help us some day.” Learning that Ke-ku-manoha‘ was at Waikele and Ka-lani-kupule and Koa-lau-kani at Kapapahu [on the Hō‘ae‘ae-Waikele boundary], Ke-kua-po‘i made herself known to her brother, hoping that he would save them all three for her sake. “Where are Ka-hahana and his friend?” asked her brother. “Will you spare us three?” asked the woman. “Why should you die? are we not all chiefs?” he answered; but his words were false; he intended to give up his brother-in-law to Ka-hekili. Alapa‘i urged, “O heavenly one! let us flee. We shall die if we stay here; only Ke-kua-po‘i will be saved.” “If Kekua-po‘i is saved, we shall be also.” “You will not be saved; you are a chief, a ruler by descent.” Then Ke-ku-manoha‘ sent men to Ka-hekili at Waikiki to tell him that Ka-hahana was at Waikele. Ka-hekili ordered him to be killed and brought to Waikiki and he sent double canoes to Halaulani at Waipi‘o in ‘Ewa. Ke-ku-manoha‘ killed Ka-hahana and his friend Alapa‘i, wrapped them in coconut leaves, placed them on the platform of the canoes, and took them to Kahekili at Waikiki... (Kamakau 1961:136-137)

The words of Ka‘ōpuluhulu’s prophecy remained fresh in the minds of elder kama‘āina through time and was often the subject of writings. As noted above in the account of Kānepu‘u (1862), many considered that the priest’s words were fulfilled a short time later with the arrival of Kahekili and his forces on the shores of O‘ahu. This was followed by the arrival of foreigners, Hawaiians’ loss of their land and kingdom, and military control over a larger area of the ‘Ewa District.

In 1900, the native leadership of the Independent Hawaiian party conducted a tour of O‘ahu to advocate for restoration of Queen Lili‘uokalani to the throne. David Kalauokalani, president of Hui Kalai‘āina, spoke to district residents while in Wai‘anae, recalling the power of the prophecy. His talk was described in the *Pacific Commercial Advertiser* (1900). While some facts differ from the earlier account, the connection between events is significant:

Kalauokalani waxes reminiscent in his speech at Waianae and referred to an incident of the early days of Oahu which he said was applicable to the present situation of affairs as far as the natives were concerned with relation to their political status. He referred to the time when Kahahana was chief of the island of Oahu. There was then living in Waianae a famous kahuna named Kaopuluhulu whose son Kahulupue had committed a crime for which he fled the district. When he was being closely pursued the old kahuna called after his son, saying: “My child, bear up until you reach the water, for when you touch the water, then the land shall belong to those who come over the sea.”

The speaker said this prophecy had been fulfilled, and had culminated in the overthrow of the monarchy. He appealed to the people to rectify the evil which the old kahuna had brought upon them (*Pacific Commercial Advertiser* 1900:5).

Native historian Moke Manu wrote further on these events in 1907. Following his defeat at the hands of Kahekili in ca. 1783, Kahahana went into hiding in the ‘Ewa District. In 1785, while

Kahahana was at Honouliuli, Kahekili sent his warriors to kill him and they landed their canoes at Kūpahu at the estuary of Hanapouli. The warriors killed the O‘ahu chief on the plains of Hō‘ae‘ae and brought his body back to Hālaulani at Waipi‘o. From there the body was taken to be offered on a temple in Waikīkī (Thrum 1906:57).

### **The Legend of Lepeamoa**

Lepeamoa, the chicken-girl of Pālama, was the kupua (demigod) daughter of the high chief of Keahua (“the mound”) on Kaua‘i (Beckwith 1970; Pukui et al. 1974:100). Keahua was exiled to a remote mountain called Kawaikini (“the multitudinous water”) (Beckwith 1970; Pukui et al. 1974:98). At Kawaikini, Kauhao (“the scooping”), wife of Keahua and daughter of the chiefess Kapālama of O‘ahu, gave birth to a child in the form of an egg. The egg was wrapped in tapa (bark cloth) and sweet-smelling plants until it hatched into Lepeamoa. Lepeamoa was brought up by her grandparents Kapālama and Honouliuli, which became names of ahupua‘a (Beckwith 1970:429).

### **Pu‘u o Kapolei**

Pu‘u o Kapolei is a hill in Honouliuli where several gods, goddesses, and legendary figures were associated. The hill was the resting place of Hi‘iaka (sister of the volcano goddess Pele) and Lohiau (Pele’s lover), after Hi‘iaka returned from Kaua‘i with Lohiau (Fornander 1998, Vol. V, Part 1:188, note 6). The hill was also the place where chief Nihooleki, originally named Keahaikiaholeha, one of the greatest fisherman in Wai‘anae, took a wife before being killed during a fishing trip (Fornander 1916-1917, Vol. IV, Part 1). Additionally, Pu‘u o Kapolei was the location where Kamapua‘a (pig-god), established his grandmother as queen after conquering most of O‘ahu from King ‘Olopana (Pukui et al. 1974:203; Sterling and Summers 1978:33; Kawaharada 2001). Sterling and Summers (1978:34) state:

Kamapuaa subsequently conquered most of the island of Oahu, and, installing his grandmother [Kamaunuanoho] as queen, took her to Puuokapolei, the lesser of the two hillocks forming the southeastern spur of the Waianae mountain range, and made her establish her court there. This was to compel the people who were to pay tribute to being all the necessities of life from a distance, to show his absolute power over all.

Puuokapolei is some little distance from Sisal, towards Waianae, and is as desolate a spot as could be picked out on the whole island. It is almost equally distant from the sea, from which came the fish supplies; from the taro and potato patches of ‘Ewa, and from the mountain ravines containing the banana and sugar cane plantation.

A very short time ago the foundation of Kamaunuanoho’s house could still be seen at Puuokapolei; also the remains of the stone wall surrounding her home. It has even been said that her grave could then be identified, but since the extension of cane and sisal planting to the base of Puuokapolei, it is possible that the stones may have been removed for wall-making. (Emma Metcalf Nakuina 1904, cited in Sterling and Summers 1978:34)

Pu‘u o Kapolei was often associated with the creation of the seasons. Hawaiian historian Samuel Kamakau was noted in Sterling and Summers as stating the following:

When the sun reached the equator and (began to) move northward, it set right over (the islet of) Ka‘ula and it moved on and set over Kawaihoa; and the Makali‘i season when the sun set (kau) from Ka‘ula to Kawaihoa was called Kau, and the Kau season was also called after the resting place of Kane (Kaulana a Kane). When it set (again) at Kau‘ula and turned south the season was called Ho‘oilo. In the same way, the people of Oahu reckoned from the time when the sun set over Pu‘uokapolei until it set in the hollow of Mahinaona and called this period Kau, and when it move south again from Pu‘uokapolei and it grew cold and the time came when young sprouts started, the season was called from their generation (oilo) the season of Ho‘oilo. There were therefore two seasons, the season of Makali‘i and the season of Ho‘oilo. (Kamakua n.d, cited in Sterling and Summer 1978:34)

Therefore, Pu‘u o Kapolei was an important feature of the Hawaiian landscape. This hill is clearly visible from the current project area.

### **The Legend of the Wandering Souls**

There are three spirit realms (ao) for the spirits of the dead: ao ku ‘Ewa, the realm of the homeless souls; au ‘aumakua, the realm of the ancestral real; and ke ao o Milu, the realm of Milu (the underworld). Ao ku‘Ewa, also known as ao ‘auwana (the realm of the wandering souls), was where a man who has no rightful place in the ‘aumakua (family god) realm will wander. “On the plains of Kaupe‘a, beside Pu‘uloa, wandering souls would go to catch moths and spiders” (Kamakau 1964:49; Sterling and Summers 1978:44). The souls were said to wander the wiliwili grove (*Erythrina sandwicensis*) from Kaupe‘a to Kānehili (Kamakau 1964:47; Sterling and Summers 1978:44). This places the plains of Kaupe‘a between Kānehili, an inhospitable, open kula (pasture) and Pu‘uloa, which is in the general vicinity of the project area.

### **Alahula Pu‘uloa, he Alahela na Ka‘ahupāhau (The Swimming Trails of Pu‘uloa [Pearl Harbor], are the Trails Traveled by Ka‘ahupāhau)**

In 1870, native historian S.M. Kamakau wrote about several practices and beliefs pertaining to manō (sharks) in ancient life. One practice of note in the Pu‘uloa region was the practice of transforming deceased family members into manō as ‘aumakua (family gods/guardians). These family ‘aumākua would help its relatives when in danger on the sea—if a canoe capsized or a man-eating shark was threatening attack. Hawaiians also worked with and tamed manō so that one could ride them like a horse, steering them to where one wished to go (Kamakau 1976). Kupuna Mary Kawena Pukui shared that there were two basic classes of sharks — manō kānaka (sharks with human affiliations) and manō i‘a (wild sharks of the sea, or man eaters). The manō kānaka were revered and cared for, while the manō i‘a were at times hunted and killed following ceremonial observances. The practice of chiefs hunting sharks using the flesh of defeated enemies or sacrificial victims as kūpalu manō (shark fishing chum) and of commoners using rotted fish as kūpalu manō are further described in several historical narratives.

Ke Awalau o Pu‘uloa are famed in traditional and historical accounts of manō. The traditions center around the several deified sharks, foremost of whom is the goddess, Ka‘ahupāhau, then

followed several others, including but not limited to Kahi'ukā, Kūhaimoana, Komoawa, Ka'ehuikimanōpu'uloa, Keli'ikau-o-Ka'ū (Kealiikauaoka'ū) and Mikololou. With the exception of Mikololou, all these shark gods were friendly to people, and dedicated to keeping manō i'a (wild sharks of the sea), man eaters out of the Pu'uloa-'Ewa waters, and protecting people.

Traditions of Ke Awalau o Pu'uloa tell us that one of the most important kōnawai (laws) governing manō was that they would not attack humans. This kōnawai was created by the shark gods themselves. One of the native traditions of Ka'ahupāhau and the killing of the chiefess Papio places the event on the shore of Hō'ae'ae, near a cave which is known by the name Ka-nahuna-o-Papio (The biting of Papio). Kamakau wrote about the establishment of this kōnawai stating that:

Oahu was made a kapu land by this kanawai placed by [the shark gods] Kanehunamoku and Kamohoali'i. But their sister Ka'ahupāhau broke the law and devoured the chiefess Papio. She was taken and "tried" (ho'okolokolo) at Uluka'a [the realm of these gods], but she escaped the punishment of death. It was her woman kahu who paid the penalty of the law because it was her fault—she reviled Papio. The trouble arose over a papahi lei of 'ilima flowers which belonged to Ka'ahupāhau that her kahu was wearing. [The kahu refused to give it to Papio, and] Papio said, "I am going bathing, but when I come back you shall be burned with fire." But Ka'ahupāhau devoured Papio before she could carry out her threat, and she was punished for this. That is how Pu'uloa became a [safe] thoroughfare (alahula). After her confinement ended several years later, Ka'ahupāhau was very weak. She went on a sightseeing trip, got into trouble, and was almost killed. But she received great help from Kupiapia and Laukahi'u, sons of Kūhaimoana, and when their enemies were all slain, the kanawai was firmly established. This law—that no shark must bite or attempt to eat a person in Oahu waters—is well known from Pu'uloa to the Ewas. Anyone who doubts my words must be a malihini there. Only in recent times have sharks been known to bite people in Oahu waters or to have devoured them; it was not so in old times (Kamakau, 1964:73, Pukui, translator).

In addition to the traditions of Ka'ahupāhau, two other accounts center around the nature of sharks in the 'Ewa District and battles that were fought to kill offending sharks. In the early 1820s, members of the Protestant mission station traveled to the 'Ewa District and learned something about the shark gods of Pu'uloa.

Hiram Bingham accompanied King Kamehameha II (Liholiho), the royal family and attendants to 'Ewa in 1823, where they stayed near the shore of Pu'uloa. During the visit, the King and party, along with Bingham, visited the dwelling place of a noted shark god. The name of the god was not recorded in Bingham's journal, though one must infer that it was either the goddess Ka'ahupāhau or her brother, Kahi'ukā. Bingham wrote:

I one day accompanied the King [Liholiho] and others by boat to see the reputed habitation of a Hawaiian deity, on the bank of the lagoon of Ewa. It was a cavern or fissure in a rock, chiefly under water, where, as some then affirmed, a god, once in human form, taking the form of a shark, had his subterraqueous abode. Sharks were regarded by the Hawaiians as gods capable of being influenced by prayers and sacrifices, either to kill those who hate and despise them or to spare those who respect and worship them. It had been held that, when a mother gave her offspring to a shark, the spirit of the child dwelt in it, and the shark becoming an akua, would afterwards recognize and befriend the mother on meeting her, though ready to devour others... (Bingham 1969:177)

Later in January 1825, Elisha Loomis also traveled to ‘Ewa and stayed along the Pu‘uloa shore (Loomis Journals, Jan. 18, 1823, in Westervelt 1937). During his visit, Loomis learned the name of the shark goddess who protected the waters of the Pearl Harbor region and also reported hearing about a war between the good sharks and those who sought to eat human flesh. It will be noted that due to his limited Hawaiian language skills, Loomis apparently transposed she for “he” in his journal.

After supper I conversed with them a long time on the subject of religion... during the conversation one of them mentioned that in former times there dwelt at Puuloa a famous shark named Ahupahau. He had a house in the hole of a rock. He was one their gods. On one occasion a strong shark 3 or 4 fathoms long came into the channel to make war upon the sharks and upon the natives that dwelt there. Ahupahau immediately communicated to the natives information advising them to get a net out and secure him. They took the hint and spread their nets, and in a little time the stranger was captured.

Loomis’s reference to a “war” between an invading shark coincides with the traditions of Ka‘ehu-iki-manō-o-Pu‘uloa (Uaua 1870-1871), Mikololou and Keali‘ikauaoka‘ū (He Moolelo Kaao Hawaii no Keliikau o Kau 1902), in which battles between sharks are fought in order to protect the people of the ‘Ewa region from attacks by manō i‘a.

J.S. Emerson presented a paper titled “The Lesser Hawaiian Gods” before the Hawaiian Historical Society on April 7, 1892. In this report are details of Ka‘ahupāhau, Kahi‘ukā and Mikololou in the history of ‘Ewa and the waters of Pu‘uloa:

One reason for the affection shown to the shark aumakua was the fact that so many of them claimed human parentage, and were related by ties of kinship to their kahus. Such was the case with Kaahupahau and her brother Kahi‘uka, the two famous shark-gods of the Ewa Lagoon on this island. Their birth and childhood differed in no essential features from that of other Hawaiian children up to the time when, leaving the home of their parents, they wandered away one day and mysteriously disappeared. After a fruitless search, their parents were informed that they had been transformed into sharks. As such, they became special objects of worship for the people of the districts of Ewa and Waianae, with whom they maintained pleasant relations, and were henceforth regarded as their friends and benefactors. After a time the man-eating shark, Mikololou, from the coast of the island of Maui, paid them a visit and enjoyed their hospitality until he reproached them for not providing him with his favorite human fleas. This they indignantly refused to give, whereupon, in spite of their protest, he made a raid [page 10] on his own account upon the natives, and secured one or more of their number to satisfy his appetite. Kaahupahau and her brother promptly gave warning to their friends on shore of the character of this monster that had invaded their waters. To ensure his destruction they invited their unsuspecting guest to a feast made in his honor at their favorite resort up the Waipahu river. Here they fed him sumptuously, and at length stupefied him with the unusual amount of awa which they supplied him. While he was in this condition, their friends, who had come in great numbers from the surrounding country, were directed to close up the Waipahu river, which empties into the Ewa Lagoon, with their fish nets, brought for the purpose, while they attacked him in the rear. In his attempt to escape to the open sea he broke through one net after

another, but was finally entangled and secured. His body was then dragged by the victorious people on shore and burned to ashes, but certain got hold of his tongue, and, after eating a portion, dropped the remainder into the river. The spirit of the man-eater revived again, and, as a tongue, now restored and alive, made his way to the coasts of Maui and Hawaii, pleading with the sharks of those waters for vengeance upon the sharks of the Ewa Lagoon. They meantime secured the aid of Kuhaimoana and other notable sharks from the islands of Kaula, Niihau, Kauai, and Oahu. A grand sight it was to the numerous spectators on the shore when these mighty hosts joined in combat and began the great shark-war. It was a contest of gods and heroes whose exploits and deeds of valor have long been the theme of the bards of the Hawaiian Islands... [I]n the first great battle the friends and allies of the cruel man-eater were touted by the superior force of their opponents, which the good Kaahupahau and her brother long continued to enjoy the affectionate worship of their grateful people. It is said that she is now dead, while her brother Kahi'uka still lived in his old cave in the sea, where he was visited from time to time by his faithful kahu, Kimona, now deceased. Sometimes Kimona missed his fish nets, when he was pretty sure to find that Kahi'uka had carried them to a place of safety, to preserve them from destruction by hostile sharks (Emerson 1892:10-11).

### **He Moolelo Kaaō Hawaii no Keliikau o Kau (A Hawaiian Tradition of Keliikau o Kau)**

Keli'ikau-o-Ka'ū was a shark god who traveled to Pu'uloa, 'Ewa from the island of Hawai'i. The tradition appears only in the short-run Hawaiian language newspaper *Home Rula Repubalika* and is incomplete. The following narratives are different in relation to the events and their outcome than those found in more widely reported narratives. There is no specific reference to the source of the account, and only two articles in the series are available. The narratives offer some details on named localities and events that are of significance in the history of Ke Awalau o Pu'uloa.

#### ***Home Rula Repubalika***

#### **He Moolelo Kaaō Hawaii no Keliikau o Kau.**

#### **Ianuali [January] 6, 1902 ('ao'ao [page] 7-8) & Malaki [March] 15, 1902 ('ao'ao 7)**

Summary — A Hawaiian Tradition of Keli'ikau-o-Ka'ū

Keli'ikau-o-Ka'ū was born to his mother as the result of her relationship with the spirit form of Kalani, a king of the sharks. He was a favorite of Kalani, and transformed into a shark, whose body was almost three fathoms long.

At this point in our story, we now look to another mysterious formed shark, and his death at the entrance of Pu'uloa at 'Ewa. His name was Mikololou, it was him who was killed at Pu'uloa, and this is why Keli'ikau-o-Ka'ū went there. The background of this shark, Mikololou is given in the traditions Kāneialehia, and Pāpa'i and Paukūpahu of Puna, Hawai'i. Kāneialehia, protected the lands from Lelewi and Makaokū, near the low islet of Mokuola, and all the way to Makahanaloa of Hilo Palikū. Under the law of Kāneialehia, it was forbidden to kill

any human. Kāneialehia saw swimming past the cliffs, and discerned Mikololou’s nature as an spirit-transformed shark, he also recognized that Mikololou was a man-eater.

Kāneialehia decided to take Mikololou as an attendant, perhaps even as a foster-son, and to teach him how to live under the law of not killing humans...

[We know from various accounts, as cited earlier in this section of the study, that Mikololou departed from Hawai‘i, in the company of other man-eaters, and traveled to Pu‘uloa, where he was eventually killed by Ka‘ahupāhau, Kahi‘ukā and the people of ‘Ewa. Based on other accounts, Mikololou was restored to life, and returned to Hawai‘i, where he enlisted the aid of Keli‘ikau-o-Ka‘ū and other sharks to avenge his treatment by the sharks and people of Pu‘uloa. The issues of the paper with this portion of the tradition are missing, and the account is picked up again on March 15, 1902.]

Keli‘ikau-o-Ka‘ū fought with and killed Ka‘ahupāhau, and it is because of this event, that the famous saying, “Mehameha Pu‘uloa, ua make o Ka‘ahupāhau” (Pu‘uloa is alone, for Ka‘ahupāhau is dead), came about. Keli‘ikau-o-Ka‘ū assumed various body forms he possessed and attacked Ka‘ahupāhau from within, and outside her body. Ka‘ahupāhau went in spirit form to her attendant, Koihala, calling to her, saying that she was dying. Upon her death, Keli‘ikau-o-Ka‘ū called out to Kamoana and Kahi‘ukā, taunting them. He then proceeded to swim through Pu‘uloa, biting and tearing at the native sharks of the region, throwing their bodies up onto the dry land from Kalaekao, Kapua‘ikāula, Keanapua‘a, Kamoku‘ume‘ume, ‘Aiea, Kalauao, Waimalu, Waiau, Waimano, the two lands of Mānana, Waiawa, Hanapōuli, Waipi‘o, Waikele, Hō‘ae‘ae, Honouliuli, Kalaeokahuka, Kanahunaopapio, Kepo‘okala and Pu‘uloa.

Keli‘ikau-o-Ka‘ū destroyed all the sharks of ‘Ewa, and the stench rose upon the land. Thus came about the saying, “Pu‘uloa is alone, for Ka‘ahupāhau is dead.” Upon her death, Ka‘ahupāhau’s body became a coral formation near the place called Papio, and that place is still seen on the side of Honouliuli to this day.

Following the death of Ka‘ahupāhau in this war between the sharks, the shark chiefs of both sides met in council and agreed to no further wars should be fought between them... (He Moolelo Kaa Hawaii no Keliikau o Kau 1902)

It should be noted here, the elder kama‘āina of the ‘Ewa District still claim that Ka‘ahupāhau was seen and cared for during their lifetime.

Noted Hawaiian scholar Mary Kawena Pukui wrote about visits she made to ‘Ewa and the Pu‘uloa region in 1907. She observed that the name “Ka‘ahupāhau” could be translated as “Cloak well cared for;” her place in the history of the land is commemorated in the saying, “Alahula Pu‘uloa he alahela na Ka‘ahupahau, Everywhere in Pu‘uloa is the trail of Ka‘ahupahau” (Pukui 1943:57).

The role of Ka‘ahupāhau as a goddess and guardian in the waters of the Pu‘uloa bays remains alive in the minds of natives in the ‘Ewa District. Her brother Kahi‘ukā (the smiting tail) is also remembered and it is said that with his great tail, Kahi‘ukā was responsible for destroying any foreign sharks “that offended his sister” Ka‘ahupāhau (Pukui 1943:57-58). His cave is reported in several locations, including Drydock No. 1, between Moku‘ume‘ume and Keanapua‘a, and another

in the Waiawa Estuary (Manu 1895). The cave, destroyed in the construction of Drydock No. 1, was once his home.

### **Tradition of the Mullet of Kaihuopalaai**

One of the notable traditions of Ke Awalau o Pu‘uloa is set in Honouliuli and includes descriptions of valuable resources in neighboring ahupua‘a. The tradition was originally published in 1866 under the title “Ka Amaama o Kaihuopalaai” and offers an explanation as to why the famed migration of the ‘anae holo (traveling mullet) around O‘ahu occurs annually. It was published again in the native language newspaper *Nupepa Ka Oiaio* between November 8, 1895 and February 14, 1896 by native historian, Moses Manu under the title “He Moolelo Kaa Hawaii no ka Puihi o Laumeki, ka Mea i Like me ka Ilio Puapualenalena” (The Hawaiian tradition of Pūhi Laumeki [A Deified Eel] and how the ‘Anae-holo Came to Travel around O‘ahu) (Manu 1895). The mo‘olelo (newspaper article) cites numerous wahi pana (legendary places), features of the land, important events, resources, and residents of Honouliuli Ahupua‘a. The narratives include important descriptions of lands fronted by Ke Awalau o Pu‘uloa as the source of the ‘anae holo for fisheries around the island of O‘ahu.

#### ***Nupepa Ka Oiaio***

#### **November 8, 1895**

It is perhaps not unusual for the Hawaiian people to see this type of long fish, an eel, about all the shores and points, and in the rough seas, and shallow reefs and coral beds of the sea. There is not only one type of eel that is written about, but numerous ones that were named, describing their character and the type of skin which they had. In the ancient times of our ancestors, some of the people of old, worshipped eels as Gods, and restrictions were placed upon certain types of eels. There are many traditions pertaining to eels. It is for this fish that the famous saying “An eel of the sea caverns, whose chin sags.”<sup>1</sup>

Indeed, this is the fish that was desired by Keinohoomanawanui, the eels of the fishpond of Hanaloa, when he was living with his friend, Kalelealuaka, above Kahalepoi at Waipio uka, when Kakuhihewa was the king of Oahu. It was necessary for us to speak of the stories above, as we now begin our tradition.

It is said in this account of Laumeki, that his true form was that of an eel. His island was Oahu, the district was Ewa, Honouliuli was the land. Within this land division, in its sheltered bay, there is a place called Kaihuopalaai. It is the place of the anae (mullet), which are known about Honolulu, and asked for by the people, with great desire.

Kaihuopalaai was human by birth, but he was also a kupua [dual-formed being], who was born at Honouliuli. His youngest sister was known by the name of Kaihukuuna. In the days that her body matured and filled out, she and some of her elders left Ewa and went to dwell in the uplands of Laiemaloo, at Koolauloa, where

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<sup>1</sup> An expression that was used to describe a prosperous person (Pukui 1983, #1545).

she met her husband. The place known by the name Kaihukuuna, at Laiemaloo, is the boundary of the lands to which the anae of Honouliuli travel.

At the time that Kaihukuuna was separated from her elder brother and parents, Kaihuopalaai had matured and was well known for his fine features, and his red-hued cheeks. He was known as the favorite of his parents and all the family. There was a young woman, who like Kaihuopalaai, was also favored by her family. Her name was Kaohai, and she lived at the place where the coconut grove which stands at the estuary of Waikele and Waipio. Thus, these two fine children of the land of the fish that quiet voices (Ka ia hamau leo), that is Ewa, were married in the traditional manner.

In their youth, the two lived as husband and wife in peace. And after a time, Kaohai showed signs of carrying a child. This brought great joy to the parents and elders of these two youth. When the time came for Kaohai to give birth, her child was born, a beautiful daughter, who also had the same red-hued nature as her father. While Kaohai was cleaning the child and caring for the afterbirth, she looked carefully at her daughter and saw a deep red-spotted mark that looked like an eel, encircling the infant. Everyone was looking at the mark, contemplating its meaning, and Kaohai was once again taken with birth pains. It was then understood that perhaps there would be a twin born as well. But when the birth occurred, an eel was seen moving about in the blood, on the side of Kaohai's thigh. This greatly frightened the family and attendants, they fled, taking the child who had been born in a human-form, with them. Kaihuopalaai also separated himself from his wife. Kaohai remained with the blood stains upon her, and no one was left to help her.

It was the eel which had been born to her, that helped to clean Kaohai. He worked like a human, and Kaohai looked at the fish child which had been born to her, and she could find no reason to criticize or revile him. Kaohai then called to her husband, Kaihuopalaai, telling not to be afraid, and he returned. They both realized the wondrous nature of this child and cared for him at a good place, in the calm bay of Honouliuli. The named this eel child, Laumeki, and his elder sister, born in human-form, was named Kapapaapuhi. This eel became a cherished child, and was cared for as a God. Laumeki, the one who had been consecrated, asked that the first-born, his sister, also be cared for in the same manner, and a great affection was shared between the children born from the loins of one mother.

### **November 15, 1895**

Thus, it is told in this tradition, that this is the eel Laumeki. It is he who caused the anae to remain at Honouliuli, and why they are known as “Ka anae o Kaihuopalaai” (The mullet of Kaihuopalaai). With the passing of time, the forms of this eel changed. At one time, he was red with spots, like the eel called puhi paka, at other times he was like the laumilo eel.

A while after the birth of Laumeki, another child was born to Kaohai, a son. He was named Mokumeha, and he was given to Wanue, an elder relative of Kaihuopalaai's, to be raised. There are at Honouliuli, Ewa, places named for all of these people. The natives of that land are familiar with these places. For this Wanue,

it is recalled in a song:

The thoughts are set upon the sea at Wanue,  
I am cold in the task done here...

The eel-child Laumeki, followed the fish around in the expanse of the sea, and on the waves of this place. This was a work of love and care, done for his parents and family, that they would have no difficulties. In those days, this eel lived in the sea at a place where a stone islet is seen in the bay of Honouliuli, and he would not eat the fish which passed before him. He did these things for his parents and sister Kapapaapuhi.

Laumeki was very watchful of his family, protecting them from sharks, barracudas, and the long billed marlin of the sea which entered into the sheltered bay of Honouliuli, the land of his birth. Because of his nature, Laumeki did many wondrous things. It was Laumeki who trapped the Puhī lala that had lived out in the sea, in the pond of Hanaloa. This Puhī lala was the one who bragged about his deeds, and when he was trapped his eyes glowed red like the flames of an earthen oven.

It is perhaps worthy here, my readers that we leave Laumeki and speak of Mokumeha and his journey around Oahu. At the time when the sun rested atop the head [describing Mokumeha's maturity], and his fine features developed. He was very distinguished looking. At that time, he determined to travel around the island of Oahu. He asked his parents and guardian permission, and it was agreed that he could make the journey.

Mokumeha departed from Honouliuli and traveled to Waianae, and then went on to Laiemaloo, at Koolauloa, the place where the youngest sister of his father dwelt. She [Kaihukuuna] was pounding kapa with her beater and thinking about her elder brother. She rose and went to the door of her house and saw a youth walking along the trail. Seeing the youth, her thoughts returned once again to her brother Kaihuopalaai and his wife Kaohai. The features of this youth in every way, looked like those of his father, and upon seeing him, tears welled up in Kaihukuuna's eyes. She called to the youth inquiring about his journey, and he responded, answering each of the questions. The moment the youth said the name of his parents, and the land from which he came, Kaihukuuna wept and greeted her nephew in the custom of the people of old.

This greatly startled her husband who was out in the cultivated gardens tending to his crops. He thought that perhaps one of his own family members had arrived at the house. When he reached their house, he saw the strange youth and he quickly went to prepare food for their guest. In no time, everything was prepared, and he then went to his wife asking her to stop her crying, and invite the visitor to eat of the food that had been prepared. He told his wife, "Then, the talking and crying can resume." She agreed and they sat down together and ate, and had a pleasant time talking.

Kaihukuuna then asked Mokumeha about the nature of his trip, and he explained that he was traveling around Oahu on a sight-seeing trip. Kaihukuuna told him, "It

is wonderful that we have met you and can host you here.” She then asked him to consider staying with her and her husband at Laiemaloo, where all of his needs would be met. “We have plenty of food and if you desire a wife, we can arrange that as well.” Mokumeha declined the invitation, explaining his desire to continue the journey and then return to Honouliuli.

### **November 22, 1895**

Now it is true that at this place, Laiemaloo, there was grown great quantities of plant foods, but the one thing that it was lacking was fish. Mokumeha, his aunt, and her husband, Pueo, spoke about this, and it was determined that Pueo should go to Ewa. Mokumeha instructed him to seek out Kaihuopalaai, Kaohai, Kapapaapuhi, and Laumeki, and to ask for fish. He told them that “Laumeki will be able to lead the fish to you here at Laiemaloo.”

Pueo departed for Honouliuli [various sites and features are described along the way]... and he met with Kaihuopalaai. Kaihuopalaai’s love for his sister welled up within him, and it was agreed that fish would be given to her and her family. But rather than sending fish home with Pueo in a calabash—fish which would be quickly consumed, causing Pueo to continually need to make the journey between Laiemaloo and Honouliuli—Kaihuopalaai said that he would “give the fish year round.”

### **November 22, 1895**

When Kaihuopalaai finished speaking, Pueo exclaimed, “This is just what your son said you would do!” Kaihuopalaai and Pueo then went to the house of Kapapaapuhi, who, when she learned that Pueo was her uncle, leapt up and greeted him. They discussed the request for fish, and ate while speaking further. Kaihuopalaai then asked, “Where do you come from?” Pueo answered, “Laiemaloo,” and he described the land to her.

The next day, Kapapaapuhi and Pueo went on a canoe out to the stone islet where Laumeki lived. They took with them food, and as they drew near the stone, the water turned choppy like the water of the stormy winter season. The head of Laumeki rose out of his pit and remained on the surface of the water. Kapapaapuhi offered him the awa and food she had brought with her. This eel was cared for just as a chief was cared for. When he had eaten his food and was satisfied, he rested on the surface. Kapapaapuhi explained to Pueo that he too would need to care for and feed Laumeki, in order to obtain the fish he needed. Kapapaapuhi then called out to Laumeki, “Here is an elder of ours, tomorrow you will go with him and take the fish of our parents with you.”

### **December 6, 1895**

The next day, Pueo rose while it was still dark, and the stars, Aea, Kapawa and Kauopae were still in the heavens. He prepared the foods needed for Laumeki, and prepared the canoes. He and his wife’s family and attendants then went towards Laumeki’s house, where he was resting. When Laumeki saw the canoes coming toward him from Lae o Kahuka, he rose up before them. Together, they passed

Kapakule, the place where the sharks were placed in ancient times as play things of the natives of Puuloa. When the canoes and people aboard reached the place where the waves of Keaalii break, Laumeki cared for them, to ensure that no harm would befall them. This place is right at the entrance of Puuloa.

As the rays of the sun scattered out upon the water's surface, the people on the canoes saw the red-hues upon the water and upon those who paddled the double-hulled canoes. Pueo then saw something reflecting red, beyond the paddlers, and below the water's surface. Pueo realized that it was Laumeki with the anae fish. The anae traveled with Laumeki outside of Kumumau, and past Ahua. They continued on past the Harbor of Kalihi at Kahakaaulana, with the fish being urged on, by the people back at Kalaekao, Puuloa, and Laumeki was at the front, leading the fish at Mamala... They continued on around Kawaihoa, Makapuu, and traveled passed Koolaupoko, and on past Laniloa at Laiemaloo, Koolauloa...

### **December 27, 1895**

...This is how the mullet came to regularly travel between the place called Kaihukuuna at Laiemaloo and Honouliuli at Ewa...

### **January 10 and 17, 1896**

...Mokumeha and Laumeki returned to Honouliuli, and Mokumeha offered a prayer chant to his elder brother:

O eel,  
O Laumeki,  
Who passed before the point,  
Dwelling in the pit,  
Eel of the cavern,  
You of the kauila (body) form,  
That is the form of the Laumilo,  
Your wooden body,  
It is Laumeki.  
Amen, it is freed...

...While Laumeki was resting at Honouliuli, Mokumeha set off once again to visit various locations around the island of Oahu. He bid aloha to his family and walked across the broad plain of Ewa. He arrived at Kapukaki, which is the boundary of the land of the streaked seas, that land in the calm, reddened by the dirt carried upon the wind. This is where Ewa ends and Kona begins... (Manu 1895)

## **He Moolelo Hawaii – No na Aumakua Moo (A History of Hawaii – About the Moo Guardians/Ancstral Gods)**

In this excerpt from “A History of Hawai‘i,” readers learn of the mo‘o (water spirit) goddess, Kānekua‘ana. It was to her that the heiau waihou (heiau specifically for mo‘o spirits) were established along the Pu‘uloa lochs to ensure the abundance of various fisheries, particularly the pipi, nahawele, mahamoe and other bivalve species for which ‘Ewa’s inland fisheries were famed.

Among the kapu (restrictions) of Kānekua‘ana was that fisher-people needed to be very quiet when going to sea to gather the pipi (pearl oysters), momi (pearls) and bivalves. The slightest voice would cause the wind to blow, thus making the pipi and other bivalves sink deep into the sands where they would be difficult to find.

It is because of this kapu associated with Kānekua‘ana that the famous saying of ‘Ewa, “ka i-a hamau leo o Ewa,” came into being.

***Ka Nupepa Kuokoa***

**He Moolelo Hawaii (Mokuna VII.)**

**Mei 20, 1893 (‘ao‘ao 1)**

...Kānekuaana ko Ewa moo kiai, hilinei nui ko Ewa poe kamaaina iaia, mai Halawa a Honouliuli. Ina e pilikia ka ia, hoēu like na kanaka i na waihau e pili ana iaia, a o ka ho-a no ia o ke ahi e hoāia i ka pomaikai o ka aiona. O ka Pipi ka ia kaulana o Ewa. Aole e hala ka mahina eono e ku ai ka lala hau ua piha ka aina i ka Pipi, mai Namakaohalawa a na pali o Honouliuli, mai na kua-pa o ua a na pa akule [Pākule]; mai ka hohonu a ka papa nahawele o kula; mai kaliawa a ka pohaku ona loko a pela aku.

Aia maloko o ka io o ka Pipi momi nani, e like ka nunui me ka onohi ia; he onohinohi keokeo kekahi, ua kapaia he muhee kea; onohinohi ulaula kekahi me anuenuē la, he muhee makoko ia. He liilii a nunui kekahi; a he waiwai kumukuai nui ko ia mea.

O ka Opaehuna a Opaekala kekahi ia; paapu mailoko o ke kai a na loko kua-pa a no loko puuone.

**May 20, 1893 (page 1)**

...Kānekuaana is the moo (water spirit) guardian of Ewa; many of the natives of Ewa, from Halawa to Honouliuli followed (believed) in her. If there was trouble with the fishing, the people dedicated her temple (Waihau) with the lighting of a fire to bring about blessings upon the land. The pipi (pearl oyster) is the famous fish of Ewa. Before six months would pass the hau branches would take hold, and the land would be filled with the pipi, from Nā-maka-o-Hālawā to Honouliuli, from the inland pond walls to the Pā-akule. From the depths to the nahawele reefs and flats. From the channel inlet to the stone-lined ponds, and so forth.

There is within the flesh of the pipi a beautiful pearl, its size is similar to the eyeball of a fish. Some are like the shiny white of an eye, and are called mūhe‘e kea. Others are shiny red, like a rainbow, and are called mūhe‘e mākoko. Some are small and others are larger, and they are highly valued.

The ‘ōpae huna and ‘ōpae kala [types of shrimps] are other fish, that are in the sea, the walled ponds, and dune banked ponds.

O ka nehu pala kekahi ia; piha mai ka nuku o Puuloa a uka o na Ewa, pela me na nuku awalau a pau; no laila ka olelo ia ana:

“He kai puhi nehu puhi lala

Ke kai o Ewa—e.

E noho i ka lai o Ewanui—

A Laakona—a.”

He Mahamoe kekahi ia kaulana, a he Okupe a mau ia e ae no kekahi. A ina i ike ia keia mau ia a pau alaila, eia ka olelo a na pulapula:

“Hoi mai nei ua luahine nei mai na kukulu mai o Kahiki; noho mai la paha a loha i na moomoo ana.”

O lakou no kekahi i hai mai i ke ano o na pae aina o Kahiki a me na aina e ae i ike ole ia... ..O Hauwahine, he kiai ia no na loko o Kawainui a me Kaelepulu. O Laukupu ko Moanalua; he malama lakou i ka pomaika‘i, e pale ana i na pilikia maluna o ke kina a me ka ohana...

The nehu pala is another fish which fills the waters from the entrance of Pu‘uloa to the coastal flats of Ewa. It is the same with all of the lochs (awalau). This is why the saying is told:

“Nehu appear to be blown upon the sea,

causing the water to shine

It is the sea of ‘Ewa,

Dwelling in the calm of great ‘Ewa, of La‘akona”

The mahamoe is another famous fish, and the ‘okupe, another, and there are others. And if all these fish are seen there, here are the words of the natives of the land:

“The old woman (Kānekua‘ana) has returned from the foundations of Kahiki; she dwells here perhaps for the love of her descendants...”

They are the ones spoken of coming from the Kahiki and the other lands which have not been seen... ..Hauwahine is the guardian of the ponds of Kawainui and Kaelepulu. Laukupu is of Moanalua; it is they who tend to the blessings, protecting the lands and people from trouble... (*Ka Nupepa Kuokoa* 1893)

### **He Moolelo Kaa Hawaii no Laukaieie... (A Hawaiian Tradition of Laukaieie...)**

Moses Manu penned several lengthy traditions for the native newspaper *Nupepa Ka Oiaio*, in which he included detailed accounts of a wide range of practices, including those associated with fisheries and deified guardians of the ocean and fresh water fisheries. This account, “He Moolelo Kaa Hawaii no Laukaieie...,” was published between January 5, 1894 and September 13, 1895. The tradition is a rich and complex account with island-wide place name references and details for Honouliuli and the larger ‘Ewa District. The tradition also includes descriptions of fisheries and

aquatic resources, history, and mele, interspersed with accounts from other traditions and references to nineteenth century events. The narratives also include references to the cherished “lei momi” (oyster pearl adornments) made from the sacred pipi (pearl oysters) of Ke Awalau o Pu‘uloa.

The following excerpts of Manu’s account were translated by Maly and include an overview of the mo‘olelo and reference narratives which recount the travels of Makanike‘oe, one of the main figures in the account. During his travels, Makanike‘oe sought out caves and tunnels that served as underground trails. Through the description of his travels, we learn about some of the wahi pana and resources of the lands through which he traveled.

The following accounts, describing places of the ‘Ewa District and neighboring lands, are excerpted from the longer narratives which describe the travels of Laukaieie, her younger brother Makanike‘oe, and their companions. Earlier in the tradition, the lei momi (pearl garlands) of ‘Ewa were described by Laukaieie while she and her companions were at Kā‘ana, Moloka‘i.

#### **March 9, 1894 (page 4)**

Leiomanu (a youth of Kaala, Oahu) gave Kaana of Molokai, and Kawelonaakalailehua, the prized lei momi of Ewa as gifts. The characteristics of these pearls (momi) included those with a fine yellowish tint, others had bumps like diamonds, and some were bluish-yellow. There were many types of pearls, and they were once regularly seen in the sheltered bays of Ewa at Oahu. They came from the Pipi (oysters), and the pearls were found near the edges of the Pipi shell. They were a thing greatly cherished by the chiefs of old and worn in lei (necklaces). This is why it is said:

My fish which quiets the voices,

You mustn’t speak or the wind will blow.

This is the famous thing of Ewa, where the fish quiet the voices, to these new times<sup>2</sup>. This is the type of lei which had been given to the alii of Lehua, the island which snatches the sun...

#### **April 19, 1895 (page 1)**

...Laukaieie and her companions, Hinahelani and Koiahi arrived at Honouliuli and were greeted by the natives of that land. Koiahi, a chiefess from Makua, Waianae, was related to Kahoonani (w), Ulalena (w), and Kauakiowao (k), the alii of Honouliuli. It is for these alii that the chant is sung:

Kahoonani resides upon the plain,

Ulalena is completely surrounded by the Kauakiowao rains...

While they were being hosted at the house of these natives, they saw the beginnings of a red-hued rainbow form near the shore and knew that Kauakiowao, the elder brother of the two beautiful sisters, was crossing the flat lands, drawing near to house. When he arrived, Hinahelani asked

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<sup>2</sup> Tradition has it that the pipi (mother of pearl oysters) were very sensitive to any sounds, and those who were noisy would scare the shellfish into hiding. Thus, when going to catch pipi and other similar oysters, no one spoke (see Pukui 1983, #s 493, 1357 & 1377).

Koiahi to invite Kauakiowao to accompany them on their journey to Kauai... The party departed from the residence at Honouliuli and traveled to Puuokapolei, where they met the young maidens Nawahineokamao and Peekaua, the beauties who dwelt upon the lowlands of Puuloa. These two maidens accompanied the travelers to Waimanalo and Kaiona, for which the song writer of the late chiefess Bernice Pauahi Bishop wrote:

Respond o woman,  
Who travels the plain of Kaiona,  
Pursuing the mirages,  
On the plain covered with ohai blossoms.

Thus, all these beautiful residents of the land of Honouliuli were gathered together, by the famous beauty of Waianae (Koiahi), who is there on the resonating and fine sands of Makua...

#### **April 26, 1895 (page 1)**

...While Laukaieie and her companions were traveling through Waianae, Makanikeoe was following behind. Having landed on the shores of Mamala, he then traveled to Kahakaaulana and the landing at Kalihi. He then looked down along the glistening sands and waters where the mullet are found, outside of Keahua, at the place called Keawakalai. There he saw a crevasse open in the sea. In this place, were sleeping many sharks and turtles, almost as if under the sand. Makanikeoe quickly entered into the cave with the turtles and sharks, to see them more closely. Because of his great speed, they didn't know that he had entered their house. Makanikeoe crawled along one of the crevasses in the sea, and going beneath the land, he exited out at Aliapaakai, at the place called Manawainuikoo. That is the entrance of the sea into that great salt water pond of Moanalua...

Let the author explain here, that this channel was first made when Pele traveled along the islands making craters here and there. This crater is something like the crater of Kauhako, at Kalaupapa, Molokai.

By this little explanation my readers, you may also know that the remaining crater is there above Aliamanu, the hiding cave of the chief Kahahana, his companion, Alapai, and his beautiful wife, Kekuapoi. He (Kahahana) is the one who killed the priest Ka'ōpuluhulu and his son Kahulupue, at Waianae. This is how the famous words of the priest came to be spoken:

Strive for the sea my son,  
for from the sea shall come (others of) another land.

And this cave has been given the name "Pililua" from the time of the death of the chief Kahahana.

Pililua, the two of you shall go to Ewa,  
You are like a canoe,  
Pulled by the rope,  
To the cliff of Kealia,  
At Kamaomao,

There at Kinimakalehua.

After seeing these places, Makanikeoe then went to the top of Leilono, one of the deity of ancient times. There is a pit dug there in which the foul smelling bodies of the dead and the defiled matter of the dead are thrown.

Makanikeoe left that place and went to a place that was covered with something like a rough pahoehoe surface, below the present-day 5 mile marker on the road at Kapukaki. There he saw the spirit of a woman moving swiftly over a portion of the pahoehoe. Makanikeoe recognized that this was a spirit form rather than that of a living woman, and he felt compassion for her. He then saw that there was a deep pit there, filled with the spirits of dead people, swaying back and forth, and crying out, with moaning and wailing. This is the pit which in ancient traditions is called Kaleinaakauhane. The spirits of the dead go there and can only be freed if their aumakua (ancestral family god) fetches them. They might even be returned back to life again...

Now you may be wondering my readers, what was the name of this woman that Makanikeoe took up in his hands. Well the writer will tell you the name of this beautiful young woman of Kaiahamauleo o Ewa-nui-a-Laakona (The fish that quiets the voice of Great-Ewa-of-Laakona), it was Kawailiula. She was a native of two lands of Ewa, Waiau and Waimano. And it is for this woman that Kawailiula, between the 9 and 10 mile markers from Waiau and Manana 2<sup>nd</sup> is named; it is near the present-day court house of Ewa...

At this place, Kaleinaakauhane, hundreds and thousands of spirits have been lost...

### **May 3, 1895 (page 1)**

...Makanikeoe then went to the uplands, atop the cliffs and ridges of Koolau, where he looked down and chanted:

Beautiful is Halawa in the Waahila rains,  
Which visits also, the heights of Aiea,  
The heat and warmth travels across the plain of Kalauao.

It is true, that he then went to Kalauao, where he saw the pool of Kahuawai. He turned to the uplands and saw the source of the water coming out of the earth, near the top of the cliff of Waimalu. The source of this water, from where it flows, cannot be easily seen because it comes out from the ground in an area where there are many deep holes hidden on the side of the cliff of Waimano. It is from one of these pits that the water flows. It is also at one of these places that the body of David Malo<sup>[3]</sup> was laid to rest.

This place, between Waiau and Waimano, called Waipuhia [in Nu‘uanu], is the place of Kawailiula, who was brought back to life at Kaleinaakauhane, at Kapukaki...

Kawailiula invited Makanikeoe to her home where food was prepared, the anae (mullet) from the pond of Weloka and the famous foods of the land. Kawailiula invited Makanikeoe to stay with her, but he declined, explaining that his elder sister and her companions were waiting for him at

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<sup>3</sup> This is not David Malo of Lahaina Luna, but a namesake, who was also a historian and active church member.

Waianae... Kawailiula bid farewell to Makanikeoe and he disappeared from sight, born by the wind, Moaeku of Ewa.

Makanikeoe then traveled to Manana, now the 10 mile marked, and the place where the court house of Ewa stands. This is the place where Oulu, the famous warrior of Kahekili, king of Maui, was surrounded by warriors who thought to take him prisoner. It is there that Oulu fought like the eel Palahuwana, and with great strength and skill, overcame those who fought against him. The place where this fight occurred is called Kaoinaomakaioulu to this day.

Makanikeoe then followed the trail to a place where he saw a large gathering of youth along the trail, at the place called Napohakuhelu. The activity of the children at this place was the shooting of arrows, something that was always done by the youth of those times.

There was among this gathering of youth from Waiawa, a handsome boy named Kanukuokamanu (not to be confused with a place of the same name in Hilo, Hawaii). His place of residence was on the shoreward side of the government road, a place something like a hillock from where one can look to the estuary of Waiawa. It is about at the ten and a half mile point, and the place is known by the name of this youth today.

When Makanikeoe arrived at the place where the youth were playing, he was saddened at seeing the young boy crying. This was because the older children had taken all the arrows, and left none for the younger child to play with. Makanikeoe took the young boy away from the group to a place off to the side. He told the boy "Stop crying and I will give you an arrow of your own. This arrow will fly farther than any of the arrow of your friends." Makanikeoe then gave the boy an arrow like none other he'd seen.

Now Kanukuokamanu was the son of the chief of Waiawa... When he returned to the group of other children who were still playing, he prepared to compete as well. He chanted first to his arrow:

Kaaihlehua flies,

Kainiki flies,

Ahuahu flies...

### **May 10, 1895 (page 1)**

Kanukuokamanu shot his arrow and it flew beyond all the other arrows of the competitors. It flew all the way to "the end of the nose of the pig" at Waimano, and then returned to the youth who had shot it...

Makanikeoe then departed and was lost from sight. Looking seaward, Makanikeoe saw the fin of a shark passing by, in front of a stone in the estuary of Waiawa, on the west side of Kanukuokamanu, next to Piliaumoa. Seeing the shark, Makanikeoe drew nearer and he saw that it was Kahiuka, a native of this estuary. His cave was comfortably situated on the side of the stone. Kahiuka was a good shark, and in his story, he is the guardian of Manana and Waiawa.

The author has met a man at Manana who was known by the name, Kahiuka. He learned the traditions of this shark in his youth, and was taken by this shark for a period of time, and returned again to the land in good health. The man has since died, but his daughter is still alive, and his story is an amazing one.

After seeing the house of this hero of the sea (Kahiuka), Makanikeoe turned and walked along the place where the waters flow from the land at Piliaumoa, Mokaalina, Panaio, Kapuaihalulu, Kapapau, and Manuea. The trail then turned and went to the top of Haupu, where the foundation of the Luakini (Church) of Ewa was later situated. Near there, was a large pond in which awa (milkfish), anae (mullet), and aholehole (*Kuhlia sanvicensis*) fish were found.

Oh readers, let the author explain something here. At the time Luau came from Maui to dwell on Oahu, he arrived at Waiawa, Ewa. He saw some men thatching dried ti leaves on the Luakini (church) that was being built there. Luau asked some people, “Who is the one that is having this important house built?” They answered, “Kanepaiki.” Luau then stated, “The house shall not be finished to its ridge pole before the one who is having it built dies.” The people asked, “Why?” Luau answered, “The house is atop the Heiau (temple) and the Fishpond is below, it is because the waters [life and wealth] are flowing out from this place. (So too shall the life flow out.)” These words of Luau were true, the Luakini of Waiawa was not completed before Kanepaiki died. His body was buried in the uplands of Waimalu.

These were the words of Luau. The one who discerned the nature of the land (kuhikuhi puuone), in the time of the King Kauikeaouli K. III. And his descendants are still living at Kanaio, Honuaula, Maui...

From this place, Makanikeoe then turned and looked to the calm waters of Kuhia Loko and Kuhia Waho. He went to the ponds and saw water bubbling out, and in the pond were many fish of the sea. It was of this pond, that Kane and Kanaloa spoke, while in Kahiki, as heard by the prophet Makuakaumana, who crossed the see and traveled to Hawaii:

The mullet are at Kuhia-loko,  
The seaweed is at Kuhia-waho,  
The salt is at Ninauele,  
The nehu pala are at Muliwai  
The lone coconut tree stands at Hape,  
The taro leaves are at Mokaalika,  
The water is at Kaaimalu,  
The awa is gathered at Kalahikiola.  
Behold the land.

All of these places named by the gods can be seen, extending from the sea of Waiawa, to Halalena at Waiawa uka.

From this place, Makanikeoe then went to a large deep spring which flows from waters beneath Waipio and Waiawa. At a place where the priests discard their offerings. He then came upon another spring at the entrance of the estuary of Waiawa. The trail then turned towards Palea and Pipiloa, where there grew groves of kou and hau in ancient times, and it was the residence of the rulers of Oahu. This is the place where the king of Oahu, Kualii-a-Kauakahiakahoowaha, found his first wife, Kawelaokauhuki, who was of the uplands of Waimano. It is this Kualii who built the long house called Makanaole, on the inland plains of Manana 2<sup>nd</sup>. It is near the place now called Kulanakauhale Momi (Pearl City).

Makanikeoe then traveled to the fishponds of Hanaloa and Eo, the great ponds of Ewa. It is for these ponds that the lines of the song say:

The water of Eo is not fetched,  
It is the sea of Hanaloa the ripples forth.

At this pond, Makanikeoe saw a deep crevasse and inside, there was a giant eel sleeping. The name Hanaloa was given because of the great amount of work that was done by the chief and the people in carrying the stones with which to surround the crevasse and build the pond wall. Thus the pond was built. And it is a famous pond for it is rich with fish, and for the eels which Keinohoomanawanui desired to eat.

From the pond, Makanikeoe then walked to a place where there were several small points of land, near where Papio was bitten and where the sea enters Honouliuli. He noticed how very calm the surface of the water was here, but he also saw that it was agitated in its depths. Looking more closely, he saw in the depths some very large fish, as if guarding the entrance to the harbor. One of these two large fish was like a marlin with a long bill and rows of teeth. The other one was a barracuda whose teeth protruded out of both side of its mouth. These two fish of the bays of Ewa, had ears with which to hear. They leapt in the ocean like flying fish, and are spoken of in some of the traditions of Hawaii.

The marlin is the one, who with his sharp bill, divided the waters that enter into Ewa. Thus, Makanikeoe understood the nature of these fish, and what their work was. They were the guardians of the place. It is true also, that in a short while Makanikeoe saw a procession of many sharks arrive. There was in this group, the famous chiefess, Kaahupahau, of Puuloa, and the messengers of the king shark [Kamohoalii] of Kahoolawe. She was taking them on a tour and to drink the waters of Waipahu and Waiahualele, and to drink the awa from Kahauone, in Waipio uka...

Makanikeoe then turned again to the place where Papio had been bitten as a result of her asking for the ilima [*Sida fallax*] garlands of the old woman, Koihala. This is what the old woman told Papio:

The beautiful girl asks,  
That the garlands of the old woman be given to her.  
Heed my words dirt of the dog, dirt of the pig,  
String your own garland and let it wilt.

Makanikeoe then departed from this place, turning to the plain of Puuloa. He passed many pits in this place where the bones of men have been left. He then followed the trail to the of the breadfruit tree, Leiwalo, at Honouliuli. This is the breadfruit tree of the expert sailor, Kahai (Kauluakahai), so told in his story.

There are also many pits in which were planted sugarcane and bananas, and planting mounds. He also saw manu oo (honey creepers) sipping the nectar of noni blossoms. There were also two ducks that had gone into a pit, and with a great strength, they were trying to push a stone over, to hide the pit. This Makanikeoe knew what the ducks were trying to do. They wanted to hide a spring of water which flowed underground there. It is this spring which in calm times could be heard, but

not found by the people who passed through this area. It was a secret spring, known only to certain native residents of the area, and its name is recorded in the last line of the song:

The o-u is the joyful bird of Kaupea,  
The joyful voiced o-o is of Puuloa,  
Softening the blossoms of the wiliwili,  
Drinking the drops of nectar from the noni,  
The birds drink and pass time,  
The eyes cast about seeking,  
The water of the natives,  
The eyes seek the water of Kaiona.

This hidden spring, known only to the natives, was not hidden to Makanikeoe. From there, Makanikeoe then turned back towards Honouliuli and saw the pit of the native eel, Kapapapuhi, the elder of Laumeki, whose stone-form body is there at the base of Kauiki, Hana, Maui. He was an eel of Oahu who traveled to Hana where he stayed and was turned into stone.

There is also at this place, Kaihuopalaai, where the anae (mullet) begin their journey from Honouliuli to Kaihukuuna at Laiemaloo, Koolauloa.

Seeing this pit, Makanikeoe swiftly ran back to Waipahu, where he looked at the source of the water, where it came out of the earth, and flowed to the estuary of Waikele. Makanikeoe dove into the water to determine its hidden source. He swam underground, and first arrived at Kahuaiki, at Waipio, for which the song is sung:

Return to the coolness of Waipio,  
The cold water of Kahuaiki...

He then dove under and came out on the plain of Puunahawe, that barren and peopless plain. There he saw the source of the water of Kahuaiki. It is near a hidden stone (shaped like a hook pendant) and close to Kekuaolelo, along the trail which ascends straight up to Waipio uka. Makanikeoe then turned and followed the water path, and with great strength, he arrived at Kawaiupuolo, at Waialua. There, he saw the pool of Laniwahine in the famous pond of Ukoa. He then quickly went from Waialua to Kawela, and from there, to Punahoolapa, a deep spring on the plain of Kahuku. There he found the water source that the kapa anvil fell into and was carried to Waipahu, at Ewa. Makanikeoe then crawled along another path and arrived at Punamano, also at Kahuku...

(Makanikeoe continued his journey through the various springs of Oahu, until he rejoined his sister and companions at Waianae. The group then continued on their journey to Kauai...) (Manu 1894-1895)

## Place Names

In ancient times, named localities served a variety of functions, telling people about: (1) places where the gods walked the earth and changed the lives of people for good or worse; (2) heiau or

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other features of ceremonial importance; (3) triangulation points such as ko‘a (ceremonial markers) for fishing grounds and fishing sites; (4) residences and burial sites; (5) areas of planting; (6) water sources; (7) trails and trail side resting places (o‘io‘ina), such as a rock shelter or tree shaded spot; (8) the sources of particular natural resources/resource collections areas, or any number of other features; or (9) notable events which occurred at a given area. Through place names, knowledge of the past and places of significance were handed down across countless generations. Honouliuli and the ‘Ewa Plains have retained many traditional place names. Table 1 lists traditional place names discussed in this report.

Table 1. Place Names in and around Honouliuli Ahupua‘a

Inoa ‘Āina	Description
‘Ewa	Plantation, plantation town, elementary school, and quadrangle west of Pearl Harbor, O‘ahu. <i>Lit.</i> , crooked. Kane and Kanaloa threw a stone to determine district boundaries. The stone was lost but was found later at Pili-o-Kahe. (Pukui et al. 1974:28)
Hō‘ae‘ae	Land section and point, ‘Ewa, ‘Oahu. <i>Lit.</i> , to make soft or fine. A stone called Pōhakupili (clinging rock) is on the edge of the cliff on the boundary of Hō‘ae‘ae and Waikele; it belonged to the gods Kāne and Kanaloa. (Pukui et al. 1974:47)
Honouliuli	Land division, village, forest reserve, and gulch, Wai-pahu, O‘ahu. <i>Lit.</i> , dark bay. (Pukui et al. 1974:51)
Hopeiki & Hopenui	Honouliuli, Waikele and Waipi‘o. ‘Ili lands. Cited in claims of the Māhele.
Kaihuopala‘ai	West Loch, Pearl Harbor, O‘ahu. Pala‘ai was a woman from here who married a Lā‘ie man; she sent her husband from Lā‘ie to fetch mullet from Honouliuli; mullet followed him as far as Kaipapa‘u and then turned back—as they do today. <i>Lit.</i> , the nose of Pala‘ai. (Pukui et al. 1974:68)
Kalaeloa	Old name for Barber’s Point, O‘ahu meaning “the long point” (Pukui et al. 1974:72)
Kalaeokāne	Honouliuli-Waikele. An area disputed between the people of Honouliuli and Waikele. Site of the ancient village, Kupali‘i (Boundary Commission proceedings). The name translates as “the point of Kāne,” and may be suggested to be associated with the tradition of a visit by the gods Kāne and Kanaloa to the region. Cited in the tradition of Maihea.

Inoa 'Āina	Description
Kapuna	A place of kapa makers, lo'i kalo (irrigated terraces of taro [ <i>Colocasia esculenta</i> ]), and houses. The fishery fronting Kapuna belonged to Honouliuli. The people of Kapuna had a way of avoiding the payment of tribute. When the Waikele collector came along, they would claim that they were of Honouliuli; when the Honouliuli collector came along, they would claim they were of Waikele. Their homes were in Waikele, but their fish belonged to Honouliuli ('Ī 1959:32).  Kapuna was a cave in which chiefs of ancient times once lived. Cited in Na Wahi Pana o Ewa (1899). In claims of the Māhele.
Kaupea	A place in the ahupua'a of Honouliuli on the island of O'ahu. (Soehren 2019)
Kaupe'a	Name for the Honouliuli plains meaning "crisscross or interwoven" (Pukui and Elbert 1986:13)
Keanapua'a	Cave near Pearl Harbor, O'ahu. <i>Lit.</i> , the pig's cave (Kamapua'a slept here). (Pukui et al. 194:103)
Ko'olina	A place in the ahupua'a of Honouliuli on the island of O'ahu. (Soehren 2019)
Kupali'i	Honouliuli-Waikele. A village site at Kaleokāne. The area disputed between the people of Honouliuli and Waikele; "...in assessing the ancient tax, putting houses on the line so as to evade both..." (Honouliuli Boundary Commission [1873] proceedings)
Lae o Kāne	A point at Miki (the ocean fishery claimed by Honouliuli). By name, an area of potential religious significance by association with the god Kāne.
Līhu'e	An upland plain and lower mountain region. Waikōloa is a strong wind of Līhu'e that blows from the uplands to the lowlands (cited in the tradition of Ku-a-Pakaa 1901). Mau'unēnē is a light breeze that blows down the slopes of Līhu'e to the lowlands of 'Ewa. Cited in claims of the Māhele for Honouliuli, Hō'ae'ae, Waikele, and Mānana iki, also in Na Wahi Pana o Ewa (1899).
Manawai'elelu	Waikele, Honouliuli, and Hō'ae'ae. Boundary junction zone. A gulch near Poliwai, and site of an ancient hōlua track (Boundary Commission proceedings).
Moanalua	Land division, park, playground, golf course, residential area, shopping center, schools, and stream near Fort Shafter, Honouliuli, said to be named for two encampments (moana lua) at taro patches, where travelers bound for Honolulu from 'Ewa rested. (Pukui et al. 1974:152-153)

Inoa 'Āina	Description
Moku'ume'ume	Old name for Ford Island, Pearl Harbor, O'ahu. Water was brought for melons raised here. <i>Lit.</i> , 'ume game island (famous for this sexual game). (Pukui et al. 1974:156)
Mo'okapu	Honouliuli-Waikele boundary zone. An ancient path which leads into Wai'anae uka. (Honouliuli Boundary Commission 1873)
Pālama	Lama wood enclosure (Pukui et al. 1974:176)
Pau-ku'u-loa "Aole i pau ku'u loa"	Waikele-Honouliuli. A near shore land and fishery (below Hō'ae'ae), fronting Ulemoku (Honouliuli Boundary Commission 1873). The source of naming this place is found in the tradition of Pu'uku'ua. Cited in Na Wahi Pana o Ewa (1899).
Pōhākea	Mountain and pass (2,200 feet elevation), Wai'anae mountains, O'ahu; from here Hi'iaka saw by cloud omens that her lehua groves on Hawai'i had been burned by Pele, and that her friend Hōpoe had been turned to stone; this is where Kauhi brutally murdered his wife, Kahalaopuna, because he thought she had been defiled. Land section and rock off Kualoa; elementary school, 'Ewa Beach, O'ahu. <i>Lit.</i> , white stone (pōhā is short for pōhaku). (Pukui et al. 1974:185)
Pu'uloa	Land section, camp, salt works, station, street, playground, beach park, village, area east of Pearl Harbor, and old name for Peral Harbor, O'ahu; it is said that bread fruit were brought here from Samoa. <i>Lit.</i> , long hill. (Pukui et al. 1974:200-201)
Pu'u o Kapolei	Hill, Honouliuli, O'ahu. The pig-man demigod, Kamapua'a, established his grandmother here as queen after conquering most of O'ahu. (Pukui et al. 1974:203)
Pu'u o Makakilo	Crater, land division, and gulch meaning "observing eyes". (Pukui et al. 1974:140)
Pu'u Pālailai	Gulch and hill meaning "the young lai fish". (Pukui et al. 1974:176)
Pu'uloa	Old name for Pearl Harbor. Land section, camp, village, salt works, area east of Pearl Harbor meaning "long hill". (Pukui et al. 1974:200-201)
Palikea	Peak above Lualualei in the Wai'anae range meaning "white cliff". (Pukui et al. 1974:177)
Piliokahe	Land section on the border of the Wai'anae and 'Ewa districts meaning "clinging to Kahe". (Pukui et al. 1974:185)
Wai'anae	Quadrangle, mountain range, land division, town, valley, school, district, and homesteads, O'ahu. <i>Lit.</i> , mullet water. (Pukui et al. 1974:220)

Inoa ‘Āina	Description
Waimānalo	Land division, road, and gulch, Barber’s Pt. Qd., O‘ahu, and the site of the home of Chief Kākuhihewa, <i>Lit.</i> , potable waters. (Pukui et al. 1974:225)

## Historical Background

Early written accounts of the ‘Ewa Plain describe the area as unpopular. When the English officer of the Royal Navy, Captain George Vancouver, anchored off the coast in 1796, he observed “this tract of land was of some extent but did not seem to be populous, nor to possess any great degree of natural fertility; although we were told that, at a little distance from the sea, the soil is rich, and all necessaries of life are abundantly produced” (cited in Sterling and Summers 1978:36). These early historic accounts suggest the ‘Ewa Plain was not a heavily populated area during the early post-contact time period. The population of Honouliuli ahupua’a was located along the coastline and in the stream valleys and estuaries along the western side of Pearl Harbor. An 1825 Hawaiian Government survey map by Malden shows the project area north of an agricultural area along Honouliuli Stream that came to be known as the Honouliuli Taro Lands (Figure 6).

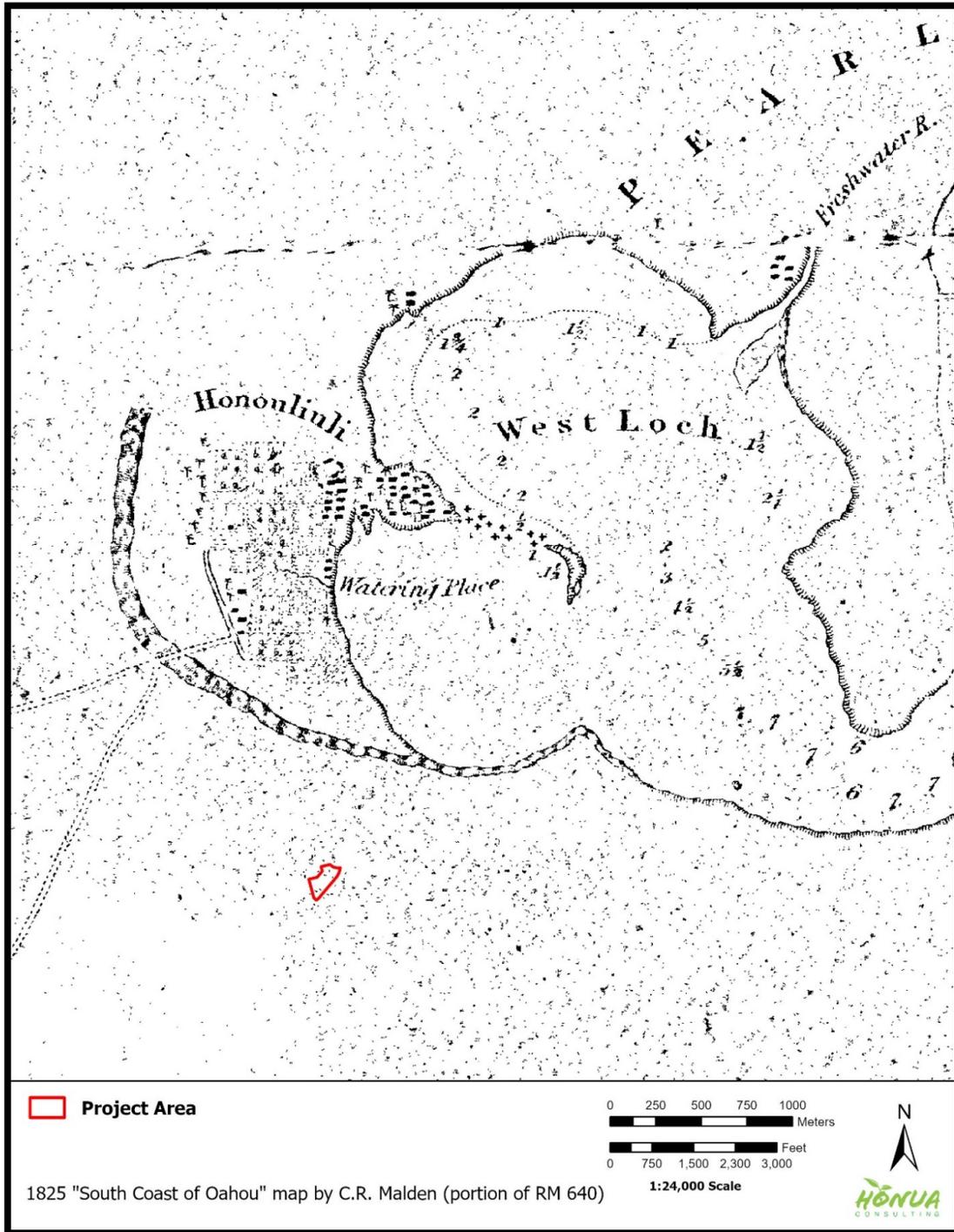


Figure 6. Portion of an 1825 Hawaiian Government survey map of the “South Coast of Oahu” showing the project area (Malden 1825) (Registered Map [RM] 640)

## The Māhele (1847-1855)

In the years between 1847 and 1855, the lands of Hawai‘i were divided under the Māhele. Prior to Western contact, all land in the Hawaiian Islands was held by the chiefs as descendants of the gods—no one owned the land. After Western contact, some foreigners were granted gifts of land for services to Kamehameha I and/or his heirs. With a growing number of foreigners arriving and establishing business interests or in service of the mission stations, many petitioned for fee-simple title to land upon which they lived or worked. In 1848, Kauikeaouli-Kamehameha III agreed to the Māhele ‘Āina, which defined the land interests of the King, some two hundred and fifty-two high-ranking Ali‘i and Konohiki (including several foreigners who had been befriended by members of the Kamehameha line), and the Government. As a result of the Māhele, all lands in the Kingdom of Hawai‘i and associated fisheries 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. The “Enabling” or “Kuleana Act” of the Māhele (December 21, 1849) further defined the frame-work by which *hoā‘āina* (native tenants) could apply for, and be granted fee-simple interest in “Kuleana” lands (cf. Kamakau, 1961:403-403). The Kuleana Act reconfirmed the rights of *hoā‘āina* to: access, subsistence and collection of resources from mountains to the shore, which were necessary to sustain life within their given *ahupua‘a*. Though not specifically stated in this Act, the rights of piscary (to fisheries and fishing) had already been granted and were protected by earlier Kingdom laws.

Land Commission Awards (LCAs) were awarded to natives who actively lived and worked their lands. LCAs can be researched to provide information on how the land was utilized and its contents. Ninety-eight (98) kuleana LCAs were granted in Honouliuli *Ahupua‘a*. The majority of the LCAs were concentrated in areas containing water resources near Pu‘uloa. Land claims included references to *alahahele* (trails), *‘auwai* (irrigation channel), *kahakai* (beach or shoreline), *kihāpai* (garden), *kula* (field), *lo‘i* (irrigated field), various types of ponds and fishponds, and walls and house sites. Resources cultivated and grown on the lands were recorded, including *kalo* (taro, *Colocasia esculenta*), *‘uala* (sweet potato, *Ipomoea batatas*), *‘ulu* (breadfruit tree, *Artocarpus altilis*), *ulu niu* (coconut grove, *Cocos nucifera*), *hala* (*Pandanus tectorius*), *kou* (*Cordia subcordata*), *‘aka‘akai* (bulrushes, *Schoenoplectus lacustris*), and *pa‘akai* (salt) and *kula ālialia* (salt beds).

In January of 1848, LCA 11216 (Royal Patent [RP] 6071), to Mikahela Ke‘ahi-Kuni Kekau‘ōnohi, was awarded and consisted of all unclaimed lands throughout Honouliuli *Ahupua‘a*, including the current project area. Mikahela Ke‘ahi-Kuni Kekau‘ōnohi was the granddaughter of Kamehameha I, niece of Kamehameha III, daughter of Wahinepi‘o (sister of Kalanimoku), and wife of Aaron Kealiiahonui (son of the last sovereign king of Kaua‘i Island). Keka‘ōnohi acquired a total of 43,250 acres from her mother, Wahinepi‘o, who had been awarded Honouliuli *Ahupua‘a* after the unification of O‘ahu by Kamehameha I. Upon the death of her husband Aaron Kealiiahonui, she married Chief Levi Ha‘alelea. After her death in 1851, her properties were transferred to her husband.

## Late 19<sup>th</sup> Century Land Tenure (1863-1889)

In 1863, the owners of the kuleana lands deeded their lands back to Chief Ha‘alelea to pay off debts owed to him (Frierson 1972:12). Upon his death, the deed was transferred over to his surviving wife, Anadelia Amoe. Anadelia Amoe deeded the entire ahupua‘a to John H. Coney. John Coney rented lands to James Dowsett and John Meek in 1871 for cattle ranching. An 1873 map of the west loch of Pearl Harbor by J. Lidgate shows the project area to the southwest of a marshy area later used as a salt works and now known as the Pearl Harbor National Wildlife Refuge, Honouliuli Unit (Figure 7).

In 1877, Coney sold the entire ahupua‘a to John Campbell for approximately \$95,000 (Indices of Awards 1929). Approximately 10,000 acres were converted for cattle ranching and agriculture. By 1879, artesian wells were installed for irrigation. Shortly thereafter, Benjamin Franklin Dillingham developed a partnership with Campbell and W.R. Castle to create the Ewa Plantation Company. By 1889, Campbell also leased several acres to Benjamin Dillingham for the Oahu Railway and Land Company (OR&L).

## Oahu Railway and Land Company (OR&L) (1889-1971)

The OR&L railway was pioneered by Benjamin Franklin Dillingham. Beginning in 1889, the OR&L laid rail throughout the west side of O‘ahu, stretching from Honolulu through the ‘Ewa Plains any beyond. The railroad reached the Ewa Sugar Plantation in 1892, the line reached the Waianae Plantation in 1895, the Waialua Mill in 1898, Kahuku by 1899, and Wahiawa by 1906 (Rewick 2012). A total of 175 miles of track was laid for the railroad, with a tremendous effect on the economic development of O‘ahu and Hawai‘i (Cummins 1974; Knaus 1983). A portion of the OR&L railroad is to the east and southeast running along the coastline of the west loch of Pearl Harbor.

From 1890 to 1892, the Ranch Department of the OR&L constructed plantation flumes and cultivated sisal (*Agave sisalana*). The Hawaiian Fibre Company was established in 1898 and extended within the limits of Naval Air Station Barbers Point (NASBP). To attract more business, Dillingham leased all of his property below 200 feet in elevation to the O‘ahu Sugar Company and William Castle who in turn, sublet to the Ewa Plantation Company for sugar cane cultivation (Frierson 1972:15).

The railroad was initially designed for use as a passenger train and to cart agricultural goods to Honolulu (Hungerford 1963; Treiber 2005). It was constructed adjacent to sugar mills and military bases. During WWII, the U.S. military took over use of the OR&L tracks to transport materials and personnel throughout the island.

Oahu Railway’s finest hour began the minute bombs were dropped on Pearl Harbor. At once it was an important agency in prosecution of the war and operations went on a day-and-night basis. For months locomotives ran with-out lights, then with blackout headlights visible as warnings but given no light for engine crews. Troop trains, workers’ trains, supply trains, ammunition trains—all shuttled constantly until it looked as though traffic saturation would be reached, yet it was not. In the year before war’s outbreak the passenger total had been under a million. In 1942 it exploded to 2,365,601 and in 1943 rose to 2,642,516. (Hungerford 1963:33)

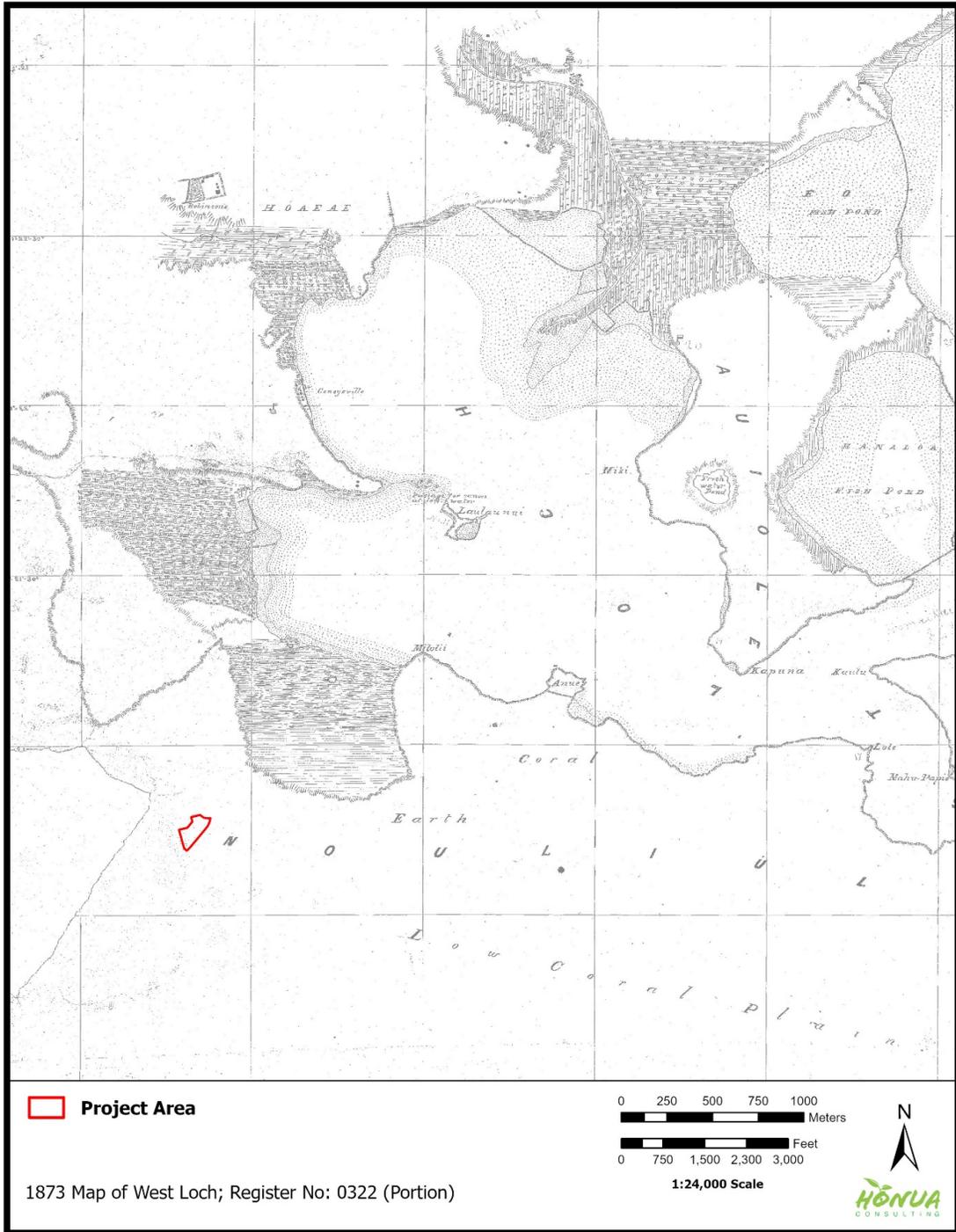


Figure 7. Portion of an 1873 map of West Loch and the Pearl River showing the location of the project area (Lidgate 1873) (RM 322)

In 1943, the OR&L included 26 locomotives, 52 passenger coaches, 6 combination coaches, 1 parlor car, 3 mail cars, 2 gasoline motor cars, and 1,359 freight cars (Hungerford 1963:34). Following the war, there was a decline in passenger use with the popularity of automobiles on the rise and other misfortunes, including a tidal wave which destroyed the tracks along the west coast of O‘ahu. OR&L passenger service ended in 1947, and much of the track was dismantled. However, a large section of the OR&L track and right-of-way was sold to the U.S. Navy, extending 30 miles from the west limits of Pearl Harbor Reservation to a Lualualei ammunition depot (Hungerford 1963). The track was used to transport munitions until 1968 (Trieber 2005).

The OR&L Right-of-Way (ROW) was listed on the State and National Registers in 1975 (SIHP #50-80-12-9714, NR #75000621) (Cummins 1974). The OR&L ROW includes the longest stretch of narrow-gauge railroad track in Hawai‘i, extending 15 miles from West Loch in Honouliuli to the west side of O‘ahu in Nanakuli (Cummins 1974:2; Rewick 2012:3). The ROW is 40 feet wide consisting of a raised roadbed of mixed materials in good condition. The OR&L ROW is located to the south and east of the project area and runs along the eastern shore of west loch.

### **Ewa Plantation Company (1890-1970)**

The Ewa Plantation Company was founded in 1890 and eventually included large tracts of land in Honouliuli Ahupua‘a (Kaukali and Subica 2010). The cultivation of sugar cane required the excavation of Artesian wells to tap underground water supplies as a means to generate more soil deposition. In an effort to create more arable land, ditches were installed from the lower slopes of the mountain ranges to the lowlands (Frierson 1972).

In the early 1900s, the Ewa Plantation Company grew to encompass most of the eastern half of Honouliuli Ahupua‘a, including the current project area. A 1913 U.S. Army map of ‘Ewa indicates the current project area was under commercial sugarcane cultivation as early as 1913 (Figure 8). The Ewa Plantation Company was noted for its output per cultivated acre. The plantation used a Lahaina variety of cane until the early 1900s, when manager and pioneer cane planter, George F. Renton, developed the H-109 variety which increased yields (Kaukali and Subica 2010:50). The Renton family, including George Renton Jr. and James Lewis Renton, managed the mill through the early 1900s.

Growth of the sugar industry introduced more demand for residential development to house the increasing numbers of immigrant workers in the fields. Between the 1890s and 1940s, more than 1,200 residences in eight distinct villages were built to house workers of the Ewa Sugar Plantation. “In the 1890s the plantation built 72 dwellings; in 1910s, 536; in the teens 132; in the 1920s, 285; in the 1930s, 168; and in the 1940s only 35. Today, 275 houses remain” (Moy 1995:5). Only four villages remain, Renton, Tenney, Varona, and Fernandez. “Each village had its own architectural and landscaping character with physical separation formerly by cane field, now open fields” (Ibid). Assigning of housing was described as follows:

For the best workmen, and for those that had the record of the longest residence on the property, Ewa supplied a house with a front veranda, two bedrooms, living room, back screened porch with connected lanai to a detached kitchen and dining room. Each was supplied with a separate washhouse, toilet and bath. As a general rule these houses were given to laborers who had been on the property for over ten years. (Kaukali and Subica 2010:50)

Sugar plantations were commonplace in Hawai‘i during this time period. However, Ewa Plantation Company was known as the Pride of Hawai‘i.

Sugar plantations had a pivotal role in Hawai‘i’s history. They were the main economic engines that fueled Hawaii’s change from subsistence agriculture to a commodity-based system. Sugar plantations ‘were the ruling force behind Hawaii’s economy for over 110 years.’ They altered the landscapes with large areas of sugar can plantings, and by the construction of the mills to process this crop and of the villages to house the workers. The importation of labor for sugar plantations is the main reason for the multi-ethnic make-up of Hawaii’s current population. Ewa Plantation Company’s significance was due to its large size, long period of operation, high number of intact structures, and role as a model plantation in terms of living conditions and benefits to workers. The contrast with the plantations in the southern United States, which evolved from a history of slavery, was emphasized because ‘of the notable strides Ewa Plantation made towards fair and just treatment of its workers.’ The Industrial Center of the Ewa Plantation Company grew around the nucleus of the sugar mill building. Today, even though the mill building is gone, the complex is often called the Ewa Sugar Mill...The history of the buildings in the mill area is complex. The term and the plan for the ‘Industrial Center’ date from 1938. Before that, the arrangement of industrial structures around the mill was decided on a building-by-building basis. (HABS 1933 cited at Library of Congress n.d.)

Buildings of the Ewa Plantation Company mill site were constructed from 1889 through 1995. Initial construction ranged from 1889-1902, with subsequent work in 1956, 1985, and 1995 (Library of Congress n.d.). The mill site included the OR&L Plantation Rail Yard (R.Y.), Pipe and Sheet Metal Shop, a General Office, Machine Shop, a large building including Electrical Supplies, a Cane Conveyer, Roller Mill, Centrifugals, Crystalizers, Settling Tanks, Juice Heaters & Vacuum Pans, Evaporators, Sugar Bagging, Mud Presses and a Fuel Room, a building with Mill Supply Pumps, an Ice Factory, and Soda Water Bottling, as well as a Social Hall, a Church, structures labeled as Warehouses, BLSM & Carpr. Shop, Molasses and Mascuite Tanks, Auto garages, tool sheds, a Cistern, Steam Turbine, Locomotive House, and more. In 1962 Castle and Cooke Ltd. purchased majority control of Ewa Plantation Company stock and in 1970 Ewa Plantation Company merged with the Oahu Sugar Company, centered in Waipahu.

The current project area remained under cultivation and the control of the Ewa Plantation Company up until the merger when it was transferred to the Oahu Sugar Company. The 1927 and 1935 United States Geological Survey (USGS) topographic maps of the area show little change in the project area and vicinity (Figure 9 and Figure 10). A 1939 map of the Ewa Plantation indicates that the project area would have been within Field #56 (Figure 11). A 1943 USGS topographic map of the area also shows little change to the project area and vicinity and shows the Salt Works to the north, now known as the Pearl Harbor Wildlife Refuge Honouliuli Unit, still in production (Figure 12). Lastly, a 1963 USGS shows the growth of Fernandez Village across Fort Weaver Road to the east and no changes to the project area which was still under cultivation at that time (Figure 13).



Figure 8. Portion of a 1913 U.S. Army map of ‘Ewa showing the project area under commercial sugarcane cultivation (US Army 1913)

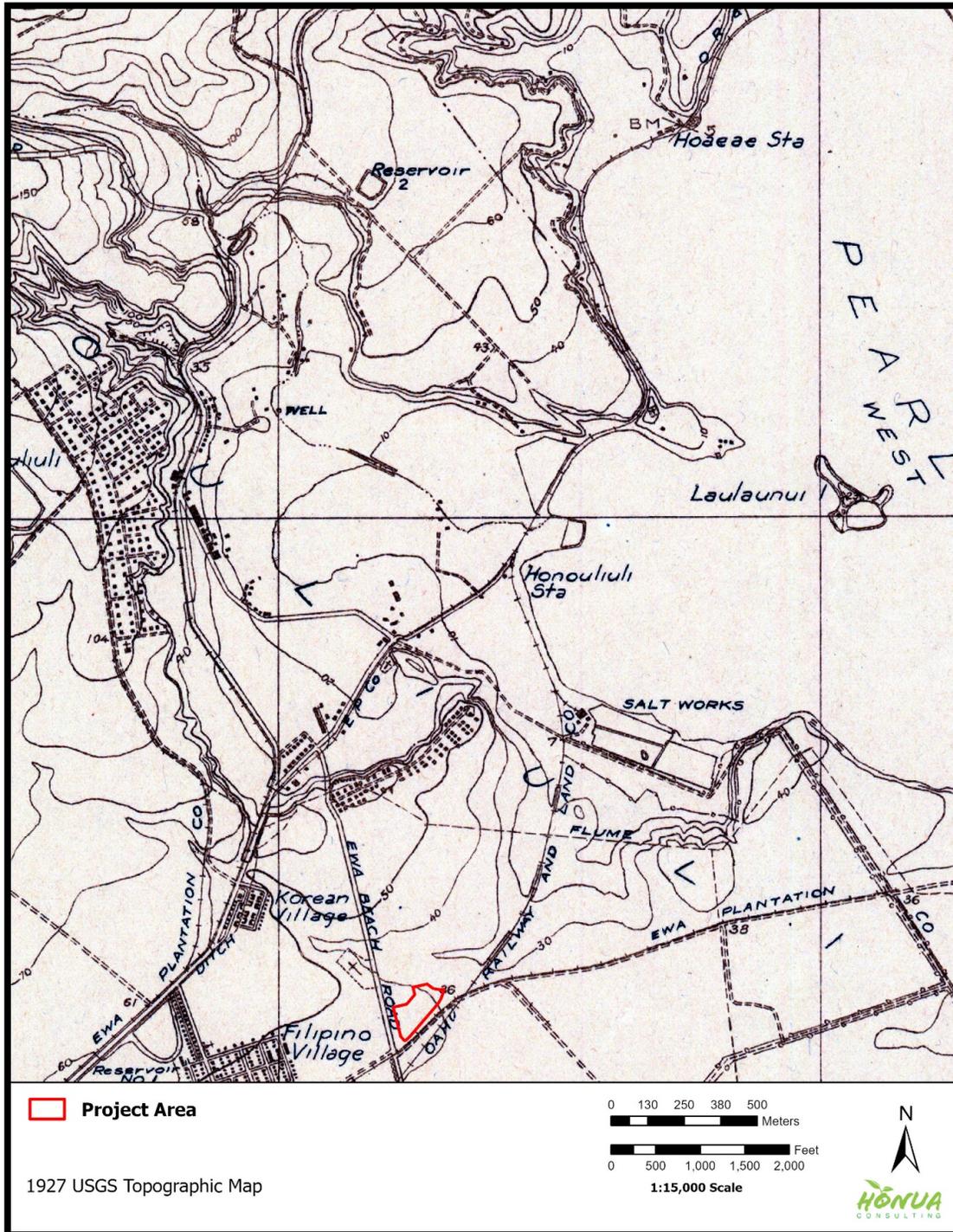


Figure 9. Portion of a 1927 USGS Waipahu quadrangle map showing the project area and OR&L right-of-way to the south (USGS 1927)



Figure 10. Portion of a 1935 USGS Waipahu quadrangle map showing the project area (USGS 1935)

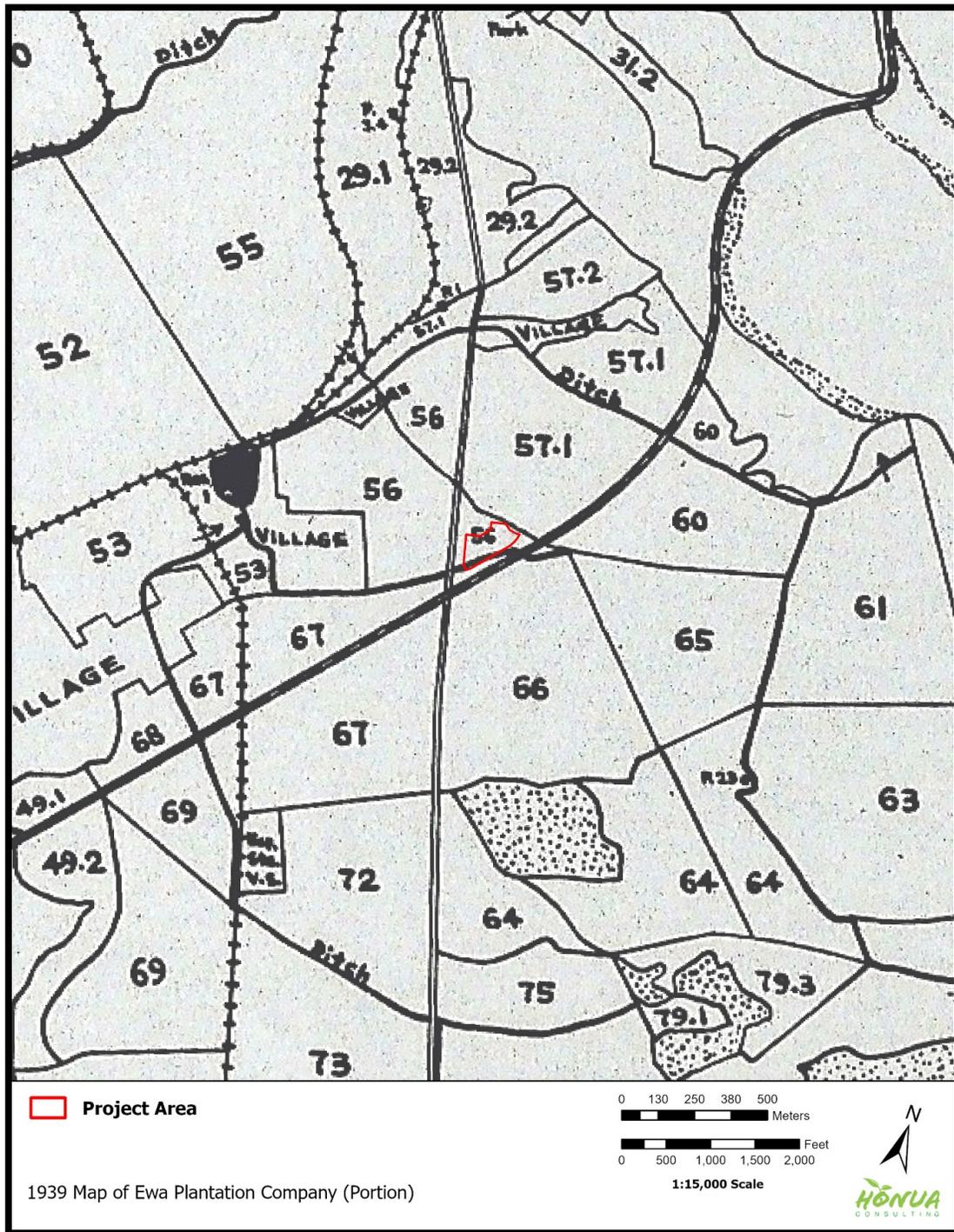


Figure 11. Portion of a 1939 Ewa Plantation map showing the project area within Field #56

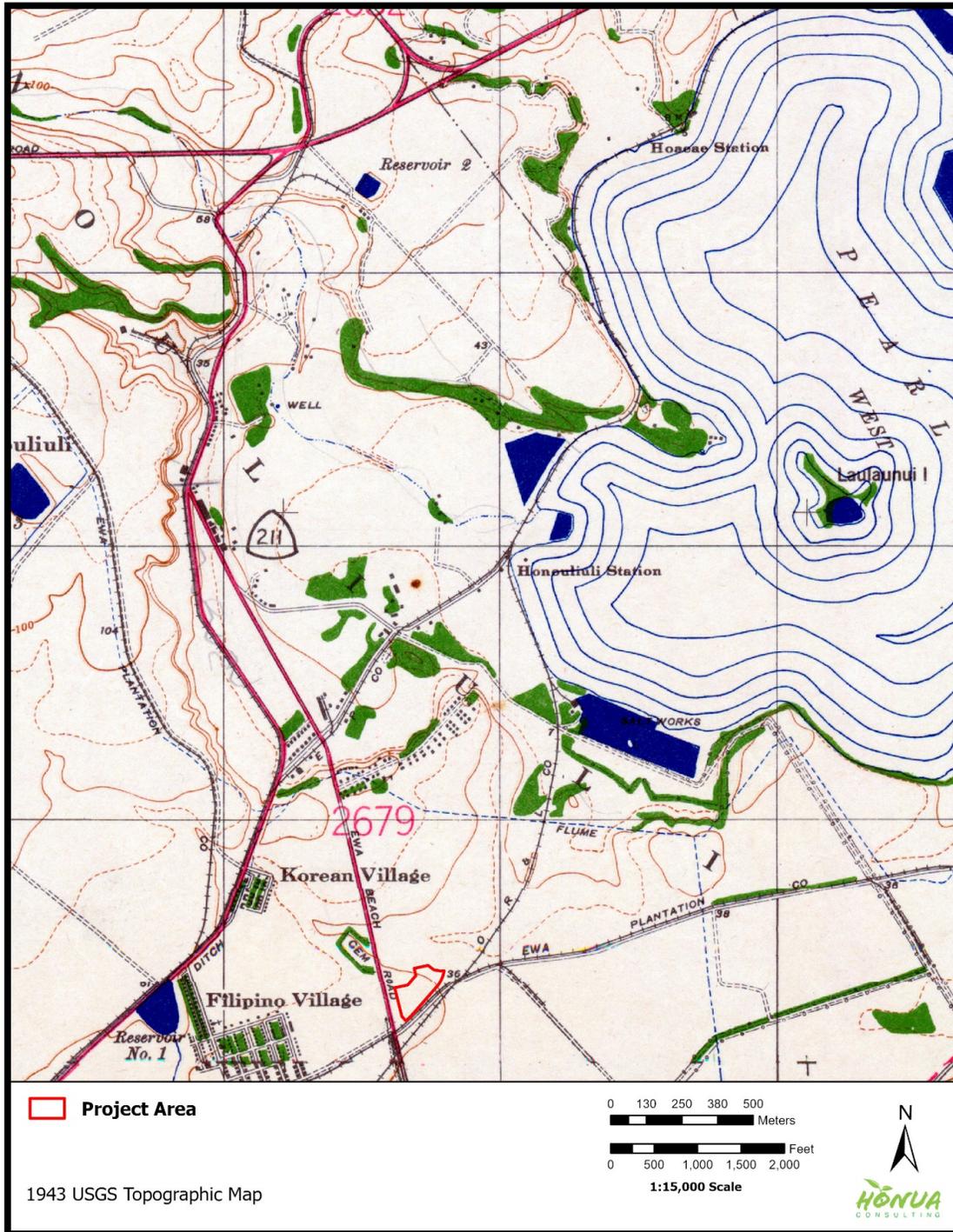


Figure 12. Portion of a 1943 USGS Waipahu quadrangle map showing the project area (USGS 1943)



Figure 13. Portion of a 1962 USGS aerial photograph showing the project area under commercial pineapple cultivation (USGS 1962)

## Oahu Sugar Company (1897-1995)

In 1894, Benjamin F. Dillingham proposed the idea of a 10,000 acre sugar company on O‘ahu. The biggest challenge confronting this ambition was the lack of water available on the Leeward side of O‘ahu. In order to ensure the area had adequate water, testing was conducted and it was determined that the sugar company would be located in the area traditionally known as Auali‘i, (Oahu Sugar Company n.d.).

Oahu Sugar Company (OSC) was established in 1897 and began harvesting sugar cane two years later. The company grew from there, quickly taking over 20 square miles in the area. Most of the land was leased from existing large landowners, including ‘Ī‘i Estate (lands formerly owned by famed Hawaiian historian John Papa ‘Ī‘i), O‘ahu Railway and Land Co. (OR&L), Bishop Estate, Robinson Estates, and Campbell Estates. Many of the landowners, like the Robinson Estates (now known as the Robinson Trust), continue to own lands in modern-day Waipahu. Any lands not leased by OSC were owned by OSC in fee simple (ibid.).

While the name Waipahu already existed as a place name and stream name west of Auali‘i, after OSC began drilling in the area, the name Waipahu, meaning gushing water, grew in usage for the area.

Once OSC was established, it began to steadily bring in plantation workers from around the world. Many of the skilled laborers, known locally as “luna,” which means “above” in Hawaiian, reflecting both the fact that these luna oversaw the plantation laborers and also often rode on horseback, so they would look down on the plantation laborers. Impacted by the lack of unskilled laborers to work in the plantations, OSC also brought in plantation workers from the Philippines, Japan, China, Portugal and Norway to supplement the small number of Native Hawaiian laborers. As was standard operating procedure in the era, each laborer was providing housing, firewood, fuel, and water (Oahu Sugar Company n.d.).

Another important milestone in the evolution of the plantation industry on O‘ahu was the completion in 1906 of the Oahu Rail & Land Company line from Waipahu to Wahiawā. This ensured reliable transport of pineapple and sugar cane from the Wahiawā fields to Honolulu canneries. Eventually, spur lines were extended to outlying fields and workers’ camps.

*The Honolulu Advertiser* (1939) wrote of the importance of the railway to the pineapple industry.

The Oahu Railway was the savior of the Wahiawa pineapple industry in its early days,” declared Harry N. Denison, kamaaina railroad man and now assistant general manager of the Oahu railway. Mr. Denison came here in 1897 and has been with the railroad more than forty years, working up from car repair man.

The cannery, established in 1903, was successfully preserving the fruit, but during the long trip to Honolulu the penetration by the red dust made much of it worthless.

The growers were desperate. It was a railroad or close the doors. Mr. James D. Dole, backed by the Wahiawa colonists, was very aggressive in the struggle to bring the railroad into Wahiawa. Finally in 1905 it was decided to put the railroad through. The actual construction was finished in July 1906 to the gate of Wheeler field; the bridge to Wahiawa was put in the next year.

By 1923, OSC finalized full develop and production of over 11,000 acres of land, realizing Dillingham's dream. Sugar and pineapple plantations worked cooperatively throughout the region. OSC had numerous reservoirs throughout the lands. In 1923, the largest held 12 million gallons, but OSC built an even larger reservoir, which held 41 million gallons of water (*The Honolulu Advertiser* 1923a:4).

The factory was described by *The Honolulu Advertiser* as follows:

Oahu Sugar Company's factory looms up like a medieval castle as one approaches it from the Waipahu railway station. It is a great steel framed corrugated iron building at the edge of a pali overlooking the rice fields and Pearl Harbor, its tall concrete smoke-stack, flanked by a shorter steel one, being a landmark visible for many miles.

Above the mill are the railway storage tracks and sidings with room for 700 cane cars, with a commodious concrete office building to the east, and shops and miscellaneous warehouses to the west. The mill yard is the terminus of the fifty-odd miles of permanent railroads forming a network extending to every field. Seven locomotives varying in size from 12 tons to 30 tons bring the cane to the mill.

The mill plant, on the side towards the office, consists of two trains each comprising a crusher, Searby shredder, and four 3 roller mills. Adjoining it is the mill electric station comprising three stream turbine units with a total generation capacity of 950 kilowatts. This supplies all of the electric power for the motor driven apparatus in the factory and shows, and for lighting the mill and the houses in the main camp (*The Honolulu Advertiser* 1923:10).

During the Japanese attack on Pearl Harbor in December 1941, a mill in Waipahu was shot at by aircrafts in the Imperial Japanese Navy. The attack killed one civilian and injured seven others. Despite this and other effects from the war, the plantation continued to successfully operate.

Figure 14 shows the significant amount of land OSC continued to control into 1950. The area was a thriving center of plantation life for thousands of workers and families. This era continued until OSC was purchased by AmFac, Inc in 1961. AmFac was originally incorporated in Hawaii in 1918 as American Factors, Ltd. as the successor company to H. Hackfield & Company, Ltd., which has been first established in 1849. OSC would continue to operate even after the purchase by AmFac.

From the year of its establishment until 1967, when Henry A. Walker Jr. would take control of the company, AmFac primarily engaged in Hawai'i's sugar plantations. Walker sought to change the company to one that operated a diverse number of businesses, most of them having little to do with Hawaii or the plantation industry (Lehman Brothers Collection n.d.). In 1970 Ewa Plantation Company merged with the Oahu Sugar Company. A 1977 aerial photograph shows the project area under cultivation by the Oahu Sugar Company until at least 1977 (Figure 15) The Oahu Sugar Company continued to operate through the 1980s and ceased operations after the 1995 harvest.

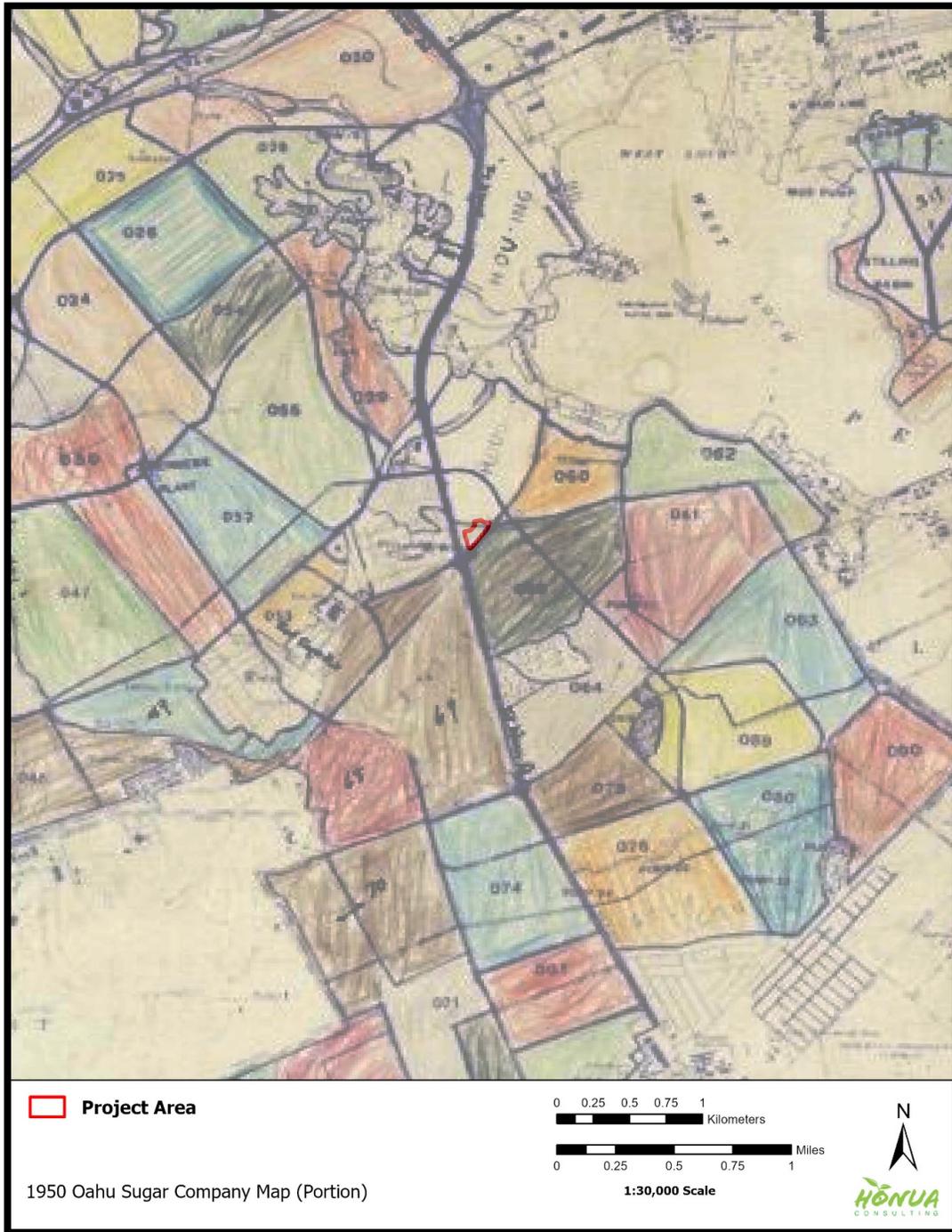


Figure 14. Portion of a 1950 Oahu Sugar Company map showing the extent of sugar operations and the location of the project area



Figure 15. Portion of a 1977 USGS aerial photograph showing the project area and vicinity under commercial pineapple cultivation

## **Brief History of Military Development in ‘Ewa**

In the 1920s, the U.S. Navy leased 206 acres of land on the ‘Ewa Plains from the Campbell Estate and a Honolulu contractor was hired by the Navy to clear the land to build a Mooring Mast and Emergency Landing Field (Ewa Mooring Mast Field or ‘Ewa Field) for dirigibles (Helber Hastert & Fee 2008). This facility was used until the early 1930s and then was dismantled and became part of the ‘Ewa Marine Corps Air Station at Barbers Point (MCAS ‘Ewa) (Tuggle et al. 1997). The airfield formed a large “X” and was nearly finished in 1941 when it was bombed by Japanese invaders, beginning U.S. involvement in WWII.

On December 7, 1941, the MCAS ‘Ewa was one of the first military targets that was bombed by the Japanese in Hawai‘i (Frye and Resnick 2013). Numerous aircraft were destroyed; however, other facilities of MCAS ‘Ewa were largely unharmed (U.S. Navy, BuDocks 1947:139, cited in Helber Hastert & Fee 2008). The Battle of the ‘Ewa Plain includes ‘Ewa Field, Ewa Villages, and ‘Ewa Beach. During and after the battle, military and civilians worked together closely to fight, defend, recover, and rebuild their community (Frye and Resnick 2013:7).

The ‘Ewa Plain Battlefield became a State and National Register site in 2016 (SIHP #50-80-12-5127, NR #16000273). The boundary covers approximately 180 acres, restricted to the lands of the former Ewa Mooring Mast Field, where the most intense air-to-ground assaults on the landscape were conducted and the location of defining features that possess the highest level of integrity. The site includes:

portions of Ewa Field that retain physical features and characteristics dating to 1941. This includes intact portions of the landscape such as airfield/runways, swimming pool, foundations, open fields, and transportation arteries, present during the attack” (Frye and Resnick 2013:7).

A 2,000-foot long spur of the OR&L railway extended to the airfield.

The ‘Ewa Plain Battlefield and contributing resources were divided into three main components: aviation facilities, camp area (north side of airfield), and other resources (Frye and Resnick 2013:13). Existing aviation facilities include runways, a warm-up platform, and parking apron with visible displays of Japanese aircraft gun fire and burning of aircrafts. The camp area included the living quarters, mess halls, latrines, boiler room, recreation areas, offices, swimming pool, fuel tanks, storage facilities, parking lots, roads, landscaped areas, flagpole, and a spur of the OR&L railway (Frye and Resnick 2013:15-18). Existing camp infrastructure includes concrete slab foundations, concrete cradles used to secure fuel tanks, a subsurface fuel tank, a swimming pool with surrounding deck/walkway, a parking lot, a flagpole base, and a berm associated with a spur of the OR&L with railroad ties apparent but tracks removed. Existing infrastructure considered “Other Resources” include a remnant storage building and road networks.

The ‘Ewa Plain Battlefield was determined eligible under Criteria A (associated with events that have made a significant contribution to the broad patterns of Hawai‘i’s history) and D (have yielded or may be likely to yield, information important in history or prehistory) (Frye and Resnick 2013:28).

Between 1921 and 1944, the U.S. Military acquired an additional 3,500 acres of land from the Campbell Estate and constructed the Barbers Point Military Reservation (Battery Barbers Point) as a training area, which consisted of multiple locations including Camp Malakole Military

Reservation (Honouliuli Military Reservation) and Gilbert Military Reservation. Fort Barrette (Kapolei Military Reservation and Battery Hatch) was built on top of Pu‘u o Kapolei as a coastal defense station. Fire control stations were established on top of Pu‘u Makakilo (Fire Control Station A) and Pu‘u Pālailai (Fire Control Station B), as well as Mooring Mast Field, which was an auxiliary airfield for the Marine Corps Air Station and the Naval Air Station at Barbers Point (NASBP) (Tuggle et al. 1997).

After WWII, during the Cold War building period, activities increased at NASBP and it became famous for its Navy patrol squadrons, including Rainbow Fleet and Pineapple Airlines (Helber Hastert & Fee 2008). NASBP was used as the main Pacific Air Station responsible for all Pacific Naval air operations (Tuggle et al. 1997). In 1949, the MCAS ‘Ewa was absorbed into the NASBP and all marine activities moved to Kāne‘ohe.

In 1965, the formal U.S. Coast Guard Air Station Barbers Point was established. Several of the recreational facilities were erected to serve the base’s diverse roles, including a larger airplane parking apron, residential communities, a golf course, and beach cabins along Nimitz Beach (Tuggle et al. 1997). The NASBP base played a role in both Desert Shield and Desert Storm. NASBP reached a maximum size of 3,679 acres before it closed in 1999 (Helber Hastert & Fee 2008). The base is now referred to as the traditional place name, Kalaeloa, and includes only 1,166 acres of land in five noncontiguous areas.

Since the deactivation of NASBP, the State Department of Defense (DOD), Department of Transportation (DOT), Department of Hawaiian Home Lands (DHHL), and the University of Hawai‘i have acquired several acres of land in the area. The airfield was reopened in 1999 as a state regional airport and is now referred to as both Kalaeloa Airport and John Rodgers Field. The airport is used by the U.S. Coast Guard (Air Station Barbers Point), Hawaii Community College Flight Program, Hawai‘i National Guard, and the general aviation community. The airport also serves as the base for HC-130 “Hercules” long-range surveillance aircraft, HH-65 short-range recovery helicopter, search and rescue, and emergency response operations (USCG 2016).

### **Land Division and Modern Development of the Project Area**

In 1934, Land Court Application (LCApp) 1069 subdivided the lands of Honouliuli into Lots A-Y, with the project area being located within a 11,885.67 acre parcel designated Lot E. Between 1939 and 2000 Lot E was subdivided numerous times as portions of LCApp 1069. The maps indicate the project area was included within Lot 47 (172.122 acres) in 1939, Lot 101 (154.904 acres) later that same year, Lot 101-B (154.253 acres) in 1972, and Lot 101-B-1 (143.858 acres) in 1984. In 1989, Lot 101-B-1 was consolidated along with other lots into Lot 5344 (265.968 acres). Lot 5344 was subdivided several times and the project area was included within Lot 5344-A (261.999) in 1990, Lot 6216 (15.00 acres) in 1991, and the current configuration of the project area, Lot 13964 (3.704) in 2000. LCApp maps associated with subdividing the land containing the project area are presented as Appendix B.

The project area was used for sugar cane cultivation from at least 1913 through the 1980s when it was sold to the City and County of Honolulu. A 1993 aerial photograph shows the newly constructed West Loch Elderly Villages Apartments to the north and the project area as a graded dirt lot (Figure 16). Easements consisting of electrical, water, and drainage were built through the project area between that time and the year 2000 and an existing cell tower lease facility was constructed along and within the western boundary of the project area in 2011.



Figure 16. Portion of a NOAA 1993 aerial photograph showing grading of the project area and construction of the West Loch Elderly Villages residential development to the north (NOAA 1993)

## Previous Archaeology

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Although two previous archaeological surveys have included all or a portion of the current project area, no archaeological sites have been documented within it. Previously-documented sites in the vicinity include a subsurface cultural layer and lo'i (irrigated terrace) deposit, as well as a historic cemetery, historic plantation infrastructure including the Oahu Sugar Mill, plantation camps, an irrigation ditch and water control box, and agricultural experiment substation, and the 'Ewa Plain Battlefield. Previously conducted archaeological studies and documented sites within a 1.5 mile radius of the project area are discussed below and shown on Figure 17, Figure 18, and Table 2.

### Previous Surveys of the Project Area

Two previous surveys—described below—concluded that the project area contained no historic properties. The lack of historic properties was attributed to use of the area for commercial sugar cultivation, which was thought to have displaced or destroyed any sites present.

#### Rosendahl 1987

In 1987, PHRI conducted an archaeological reconnaissance survey for Residential Increments I and II of West Loch Estates (Rosendahl 1987). The survey consisted of pedestrian reconnaissance that documented four archaeological sites. They include a surface scatter of marine shell midden recorded as SIHP # 50-80-13-3314, a surface scatter of 19<sup>th</sup> century artifacts recorded as SIHP # 50-80-13-3315, a historic cemetery consisting of at least 5 graves recorded as SIHP # 50-80-13-3316, and an extensive surface scatter of 20<sup>th</sup> century plantation era artifacts recorded as SIHP# 50-80-13-3317. Following the survey, further data collection (data recovery) and preservation “as-is” was recommended for the historic cemetery, SIHP #-3316. The remaining sites were only significant for their information content and no further work was recommended.

#### Macak et al. 2009

In 2009, T.S. Dye and Colleagues, Archaeologists Inc. (T.S. Dye) conducted a historic properties assessment for the Verizon Wireless Fernandez Village cell site located along and within the eastern boundary of the current project area (Macak et al. 2009). No historic properties were documented during the field inspection. The study concluded that the area had been extensively modified for commercial sugar cane cultivation in the past and it was unlikely that any subsurface deposits would be encountered during construction.

### Previous Archaeological Studies in the Vicinity

Numerous archaeological studies have been conducted in the vicinity of the project area, mostly in support of residential developments, a golf course and parks, and military development. The types of traditional Hawaiian sites documented include fishponds, the west loch of Pearl Harbor, a buried pond field system, a ko'a (fishing shrine), a shell midden deposit, buried habitation deposits, and a human burial. The historic site types include plantation and military infrastructure, historic cultural deposits, a historic fishpond, and two possible cemeteries. The results of data recovery and testing studies are interpreted to indicate traditional use of the Honouliuli Stream valley and the coastal resources of West Loch and the 'Ewa Plain as early as 1200 A.D.

## McAllister 1933

In the early 1930s, the Bishop Museum conducted the first systematic island-wide archaeological survey of the island of O‘ahu. McAllister (1933) documented four sites in the vicinity of the project area: Kaaukuu and Pouhala fishponds, the Kalanamaihiki ko‘a, Laulaunui Fishpond, and the West Loch of Pearl harbor. McAllister’s descriptions are below:

**Site 139.** Kalanamaihiki fishing shrine (ko‘a) at Kapapupuhi, Honouliuli.

Near the end of the small tongue of land that juts out opposite of Laulaunui Island in the west loch of Pearl Harbor, are two large rough stones about 2.5 feet in size, with six or seven smooth stones averaging 1 foot in size in a small pile adjoining the larger stones. The entire site is covered with akulikuli (*Batis maritima*) and would not be noticed or considered unusual if the Hawaiians did not know of its former sacredness.

**Site 140.** Fishpond adjoining Laulaunui Island

The pond is possibly Laulaunui fishpond, and named for the island. It is 4 to 5 acres in extent with a wall approximately 900 feet long, 7 feet wide, and 3-5 feet high. There are no outlet gates (makaha).

**Site 141.** Kaihuopalaai, Ewa.

This name is said to apply to the whole West Loch of Pearl Harbor. Each year, beginning in October or November, large shoals of mullet are said to go from Pearl Harbor east to Makapuu Point and then north and west to Laie or Malaekahana, from which point they return to Pearl Harbor over the same route in March or April. This is a favorite story which one comes across frequently about the island, and the oral versions are as diverse as those written. Kaihuopalaai is the pond from which the mullet come.

The site is named for Kaihuopalaai, said to be the daughter of Konikonia and his wife Hinaaimalama. Fornander writes: "... on Oahu, Kaihuopalaai saw a goodly man by the name of Kapapaapuhi who was living at Honouliuli, Ewa; she fell in love with him and they were united, so Kailuopalaai has remained in Ewa to this day.

According to old Hawaiians, there never was a fishpond by this name. In another version, Ihuopalaai is the brother of a woman living in Laie. As the fish were scarce in Laie, this woman sent her husband to Ihuopalaai, who had the mullet follow her husband on his return trip which was made along the shore around Makapuu Point with the mullet following in the water. Makea tells me that Kaihuopalaai’s sister was named Malaekahana. Another story tells of a man who lure the mullet around the island by tossing sweet potatoes into the sea.

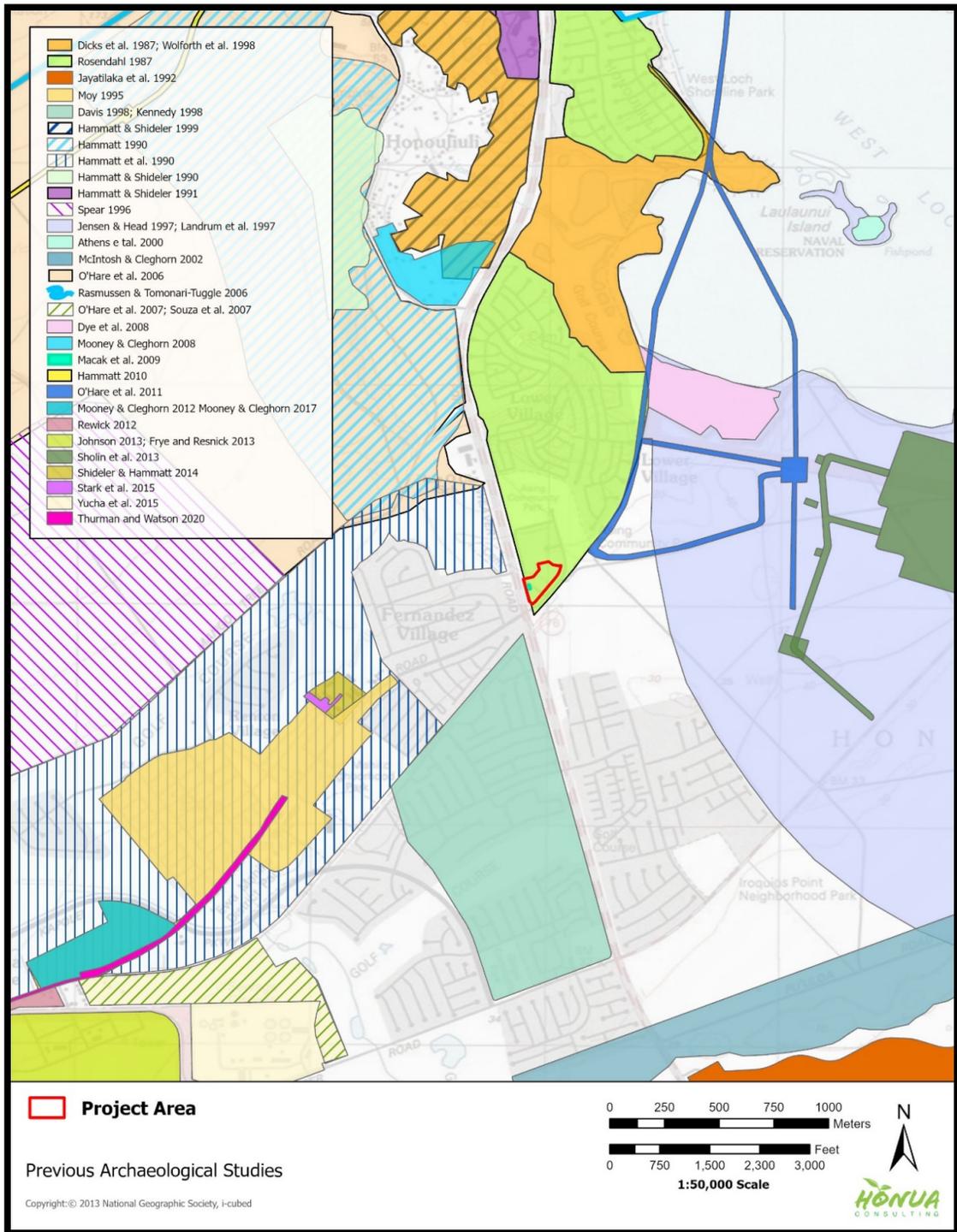


Figure 17. Portion of a 2013 USGS showing previous archaeological studies within a 1.5 mile radius of the project area

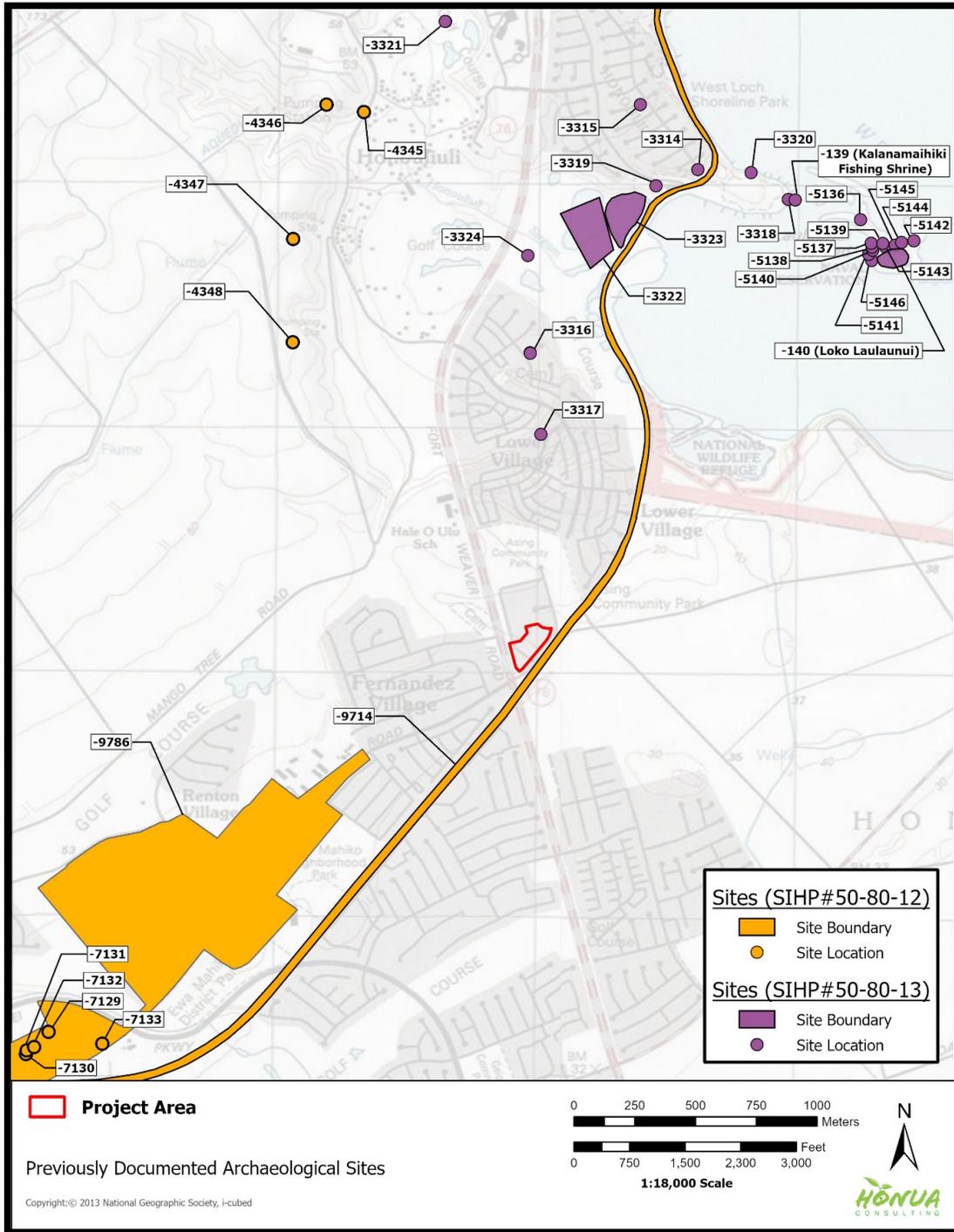


Figure 18. Portion of a 2013 Waipahu USGS showing historic properties within a 1.5 mile radius of the project area

Table 2. Previous Archaeological Studies in the Vicinity of the Project Area

Author(s)	Type of Study	Location	Findings (SIHP #50-80-)
McAllister 1933	Island-Wide Survey	O'ahu	4 sites in vicinity, Kalanamaihiki fishing shrine (Site 139), Laulaunui Fishpond (Site 140), Kaihuopalaai, Ewa (West Loch, Pearl Harbor) (Site 141) and the Ewa Plains (Site 146)
Dicks et al. 1987	Archaeological Reconnaissance Survey	West Loch Estates -Golf Course and Parks	Recorded a surface scatter of 19 <sup>th</sup> century historic artifacts (SIHP # -13-3318), a habitation deposit and possible cemetery recorded as SIHP #50-80-13-3319, two habitation deposits recorded as SIHP #50-80-13-3320 and SIHP #50-80-13-3321, a buried fishpond recorded as SIHP #50-80-13-3322, a historic fishpond recorded as SIHP #50-80-13-3323, and a buried pond field system recorded as SIHP #50-80-13-3324.
Rosendahl 1987	Archaeological Reconnaissance Survey	West Loch Estates – Residential Increments I and II	Recorded four historic properties, a surface scatter of marine shell midden (SIHP #-13-3314), a surface scatter of 19 <sup>th</sup> century artifacts (SIHP #-13-3315), a historic cemetery consisting of at least 5 graves (SIHP #-13-3316), and an extensive surface scatter of 20 <sup>th</sup> century plantation era artifacts (SIHP #-13-3317)
Davis 1988	Archaeological Subsurface Survey	Ewa Gentry	No sites recorded
Kennedy 1988	Archaeological Reconnaissance Report	Ewa Gentry	No sites recorded
Hammatt et al. 1990	Archaeological Reconnaissance Survey	'Ewa Villages	Identified features of 'Ewa Sugar Plantation Villages (SIHP 50-80-12-9786) including Renton Village and mill, Tenney Village, Varona Village, remnants of Mill Village, remnants of Middle Village, remnants of C Village, a plantation cemetery, Reservoir #1, the 'Ewa Depot, a Buddhist temple, and the 'Ewa Japanese School

<b>Author(s)</b>	<b>Type of Study</b>	<b>Location</b>	<b>Findings (SIHP #50-80-)</b>
Hammatt and Shideler 1990	Archaeological Inventory Survey	West Loch Bluffs	Recorded three pipes, (Features A-C of SIHP # -12-4344); a railroad berm, (SIHP # -12-4345); a northern pumping station (SIHP # -12-4346); a central pumping station (SIHP # -12-4347); and a southern pumping station, (SIHP # -12-4348)
Hammatt and Shideler 1991	Archaeological Inventory Survey (AIS)	St. Francis Medical Center West, TMK: [1] 9-1-017:056	No sites recorded
Jayatilaka et al. 1992	Archaeological Inventory Survey	Hawaii Prince Golf Course	No sites recorded
Moy 1995	National Register of Historic Places Registration Form	‘Ewa Villages	‘Ewa Sugar Plantation Villages Historic District (SIHP 50-80-12-9786), public district consisting of 287 contributing resources including 285 domestic and agricultural buildings, 1 processing site, and 1 commercial complex used by plantation workers from 1890 to 1957
Spear 1996	Archaeological Reconnaissance Survey and Assessment	H.F.D.C-East Kapolei Development Project	No sites recorded
Landrum et al. 1997	Cultural Resources Overview Survey	NAVMAG, NAVMAG - Lualualei, NAVMAG – West Loch, and NAVMAG-Waikele	Review of cultural resources on Navy facilities on O‘ahu, no sites recorded in the vicinity of the project area

Author(s)	Type of Study	Location	Findings (SIHP #50-80-)
Jensen and Head 1997	Archaeological Reconnaissance Survey	NAVMAG – West Loch	Recorded 281 historic properties, 11 of which are in the vicinity of the project area, they include a concrete slab, (SIHP # 13-5136); a concrete slab and concrete wall recorded as (SIHP # 13-5137); a concrete slab, (SIHP # 13-5138); a concrete slab and gun emplacement, (SIHP # 13-5139); a concrete slab, (SIHP # 13-5140); a concrete basement (SIHP # 13-5141); a metal structure ,(SIHP # 13-5142); a utility, (SIHP # 13-5143); a metal barge/landing, (SIHP # 13-5144); a wall, (SIHP # 13-5145), and a site complex consisting of concrete paving, a concrete slab, a concrete step, and 2 walls, (SIHP # 13-5146)
Wolforth et al. 1998	Data Recovery	West Loch Estates Residential Increment I, Golf Course, and Shoreline Park	Conducted data recovery excavations at previously recorded sites SIHP #s -3319 (habitation deposit and possible cemetery), -3320 (habitation deposit), and -3321 (habitation deposit), backhoe trenching at SIHP #s -3322 (buried fishpond) and -3324 (extensive pond field system), and archaeological monitoring
Hammatt and Shideler 1999	Archaeological Assessment	St. Francis Medical Center West, TMK: [1] 9- 1-017:017 & 060	No sites recorded
Athens et al. 2000	Paleoenvironmental Coring	Fishponds of Pearl Harbor	Identified fishpond sediments for 8 of the 21 fishponds tested, dating and chronology of fishponds were inconclusive, provides recommendations for future studies
McIntosh and Cleghorn 2002	Archaeological Survey	‘Ewa Gentry Makai, TMK: [1] 9-1-010:007 and 9-1-069:005	No sites recorded

<b>Author(s)</b>	<b>Type of Study</b>	<b>Location</b>	<b>Findings (SIHP #50-80-)</b>
O'Hare et al. 2006	Archaeological Inventory Survey	East Kapolei Project, TMK: [1] 9-1-010:002, 9-1-017:004, 059, 072; 9-1-018:001 & 004; 9-2-001:001	Documented and mapped previously recorded SIHP #s 12-4344 Features A-C (three pipes), 12-4345 (railroad berm), -12-4346 (northern pumping station), 12-4347 (central pumping station), -12-4348 (southern pumping station); Recorded four additional features, Features D through G, of SIHP # 12-4344
Rasmussen and Tuggle 2006	Archaeological Reconnaissance Survey	‘Ewa Junction Drum Filling and Fuel Storage Area, various TMK	No sites recorded
O'Hare et al. 2007, Souza et al. 2007	Archaeological Assessment, Cultural Impact Assessment	‘Ewa Industrial Park	No sites recorded
Dye et al. 2008	Historic Properties Assessment	Pearl Harbor National Wildlife Refuge: Honouliuli Unit	No sites recorded, determined to have a low likelihood of cultural resources
Mooney and Cleghorn 2008	Archaeological Assesement	Two parcels between Fort Weaver Road and Old Fort Weaver Road, TMK: [1] 9-1-017:010 & 041	No sites recorded
Hammatt 2010	AIS	Construction Phase I for the Honolulu High Capacity Transit Corridor Project; TMKs: [1] 9-1, 9-4, 9-6, 9-7 (Various Plats and Parcels)	No sites recorded in the vicinity of the project area
Mooney and Cleghorn 2010	AIS	Varona Village	Recorded five newly-identified structures of ‘Ewa Sugar Plantation Villages Historic District (SIHP # -9786) including historic plantation houses (SIHP #50-80-12-7129 and -7130), house foundations (SIHP #50-80-12-7131 and -7132), and a historic streetlight (SIHP #50-80-12-7133)
O'Hare 2011	Literature Review and Field Inspection	Honouliuli/Waipahu/Pearl City Wastewater Facilities; TMKs: [1] 9-1, 9-4, 9-6, 9-7, 9-8, 9-9 (various plats and parcels)	No sites recorded

<b>Author(s)</b>	<b>Type of Study</b>	<b>Location</b>	<b>Findings (SIHP #50-80-)</b>
Rewick 2012	National Register of Historic Places Registration Form	Hawaiian Railway Society	OR&L ROW and Hawaiian Railway Society's (HRS) 'Ewa Railroad Yard (OR&L Railroad Baseyard) (SIHP #50-80-12-7387)
Johnson 2013, Frye and Resnick 2013	Reconnaissance and Geophysical Survey; State and National Register Nomination	Marine Corps Air Station	'Ewa Plain Battlefield (SIHP #50-80-12-5127, NR #16000273) recorded the foundation of an armory, officers' barracks, and storage building, over 500 ft of charred but intact OR&L railway ties without rails, a swimming pool and adjacent pavement, a subsurface fuel tank, and a subsurface latrine
Sholin et al. 2013	Archaeological Inventory Survey	Army Garrison Hawaii Munitions Storage Complex, Joint Base Pearl Harbor Hickam (JBPHH) West Loch Annex	Recorded a spur of the Ewa Plantation railway as SIHP #50-80-12-7414
Shideler and Hammatt 2014	Archaeological Literature Review and Field Inspection	'Ewa Elementary School, TMK: [1] 9-1-017:002 por. & 037 por. and 9-1-101:999 por.	Within the 'Ewa Sugar Plantation Villages Historic District (SIHP # -9786), no new sites recorded
Stark et al. 2015	Archaeological Assessment	'Ewa Elementary School, TMK" [1] 9-1-017:002	Within the 'Ewa Sugar Plantation Villages Historic District (SIHP # -9786), no new sites recorded
Yucha et al. 2015	Archaeological Assessment	Honouliuli Wastewater Treatment Plant, TMK: [1] 9-1-013:007	No sites recorded
Mooney and Cleghorn 2017	Archaeological Monitoring Report	Varona Village, TMK: [1] 9-1-017:069	Project area consisted of the 45 plantation-era houses of Varona Village, part of the 'Ewa Sugar Plantation Villages Historic District (SIHP # -9786), several historic artifacts such as glass bottles, bottle fragments, rusted metal machine or automotive parts, and residential building materials were observed in disturbed contexts and fill sediments

Author(s)	Type of Study	Location	Findings (SIHP #50-80-)
Thurman et al. 2019 and Thurman and Watson 2020	Literature Review and Field Inspection, Archaeological Monitoring Report	Ewa Villages R-1 Water Main, TMKs: [1] 9-1-016:142, 9-1-017:103, 111, 112, & 113, 9-1-095:163, 9-1-097:103 and 9-1-126:110	Encountered two previously documented sites, 'Ewa Sugar Plantation Villages Historic District (SIHP # -9786) and a historic streetlight (SIHP # -7133) within Varona Village along north side of Renton Road

**Site 146.** Ewa coral plains, throughout which are the remains of many sites. The great extent of old stone walls, particularly near the Puuloa Salt Works, belongs to the ranching period of about 75 years ago. It is probable that the holes and pits in the coral were formerly used by the Hawaiians. Frequently the soil on the floor of the larger pits was used for cultivation, and even today one comes upon bananas and Hawaiian sugar cane still growing in them. They afford shelter and protection, but I doubt if previous to the time of Cook there was ever a large population here.

Vancouver anchored off the entrance to the West Loch in 1793 and made the following observations:

The part of the island opposite us was low, or rather only moderately elevated, forming a level country between the mountains that compose the east [Koolau] and west [Waianae] ends of the island. This tract of land was of some extent, but did not seem to be populous, nor to possess any degree of natural fertility; although we were told that, at a little distance from the sea the soil is rich, and all the necessaries of life are abundantly produced. ...

Mr. Whitbey observed, that the soil in the neighborhood of the harbor appeared of a loose sandy nature; the country low for some distance, and, from the number of houses within the harbour, it should seem to be very populous; but the very few inhabitants who made their appearance were an indication of the contrary.

The following observations of Mathison and Macrae probably pertained more generally to the region around Aiea and Waiau.

The adjoining low country is overflowed both naturally and by artificial means, and is well stocked with taro-plantations, bananas etc. The land belongs to many different proprietors; and on every estate there is a fishpond surrounded by a stone wall, where the fish are strictly preserved for the use of their rightful owners, or tabooed, as the natives express it. One of particularly large dimensions belongs to the King.

The neighborhood of the Pearl River is very extensive, rising backwards with a gentle slope towards the woods, but is without cultivation, except round the outskirts to about half a mile from the water. The country is divided into separate farms or allotments belonging to the chiefs, and enclosed with walls from four to six feet high, made of a mixture of mud and stone.

### **Dicks et al. 1987**

In 1987, Paul H. Rosendahl PhD. Inc. (PHRI) conducted an archaeological reconnaissance survey for the golf course and parks of West Loch Estates (Dicks et al. 1987). The survey consisted of background research and pedestrian reconnaissance of the project area which documented seven archaeological sites. They include a surface scatter of 19<sup>th</sup> century historic artifacts recorded as SIHP #50-80-13-3318, a multi-component habitation deposit and possible cemetery recorded as SIHP #-3319, a multi component habitation deposit recorded as SIHP #-3320, a traditional Hawaiian habitation deposit with a human burial recorded as and SIHP #-3321, a buried fishpond recorded as SIHP #50-80-13-3322, a historic fishpond recorded as SIHP #50-80-13-3323, and a buried pond field system recorded as SIHP #50-80-13-3324. Subsurface testing included the excavation of 98 shovel tests, 176 auger tests, and 81 backhoe trenches throughout the project area. A total 181 artifacts were collected, mostly historic in age, and 21 samples were collected and submitted for radiocarbon dating. The results of the radiocarbon dating were interpreted to indicate use of SIHP #-3319 during the early historic period, use of the lower valley between the mid-1100s and 1600 A.D., use of the upper valley between the 1200s and 1700 A.D. and inconclusive results for use of SIHP #s -3321 and -3323. Following the survey, data recovery excavations guided by a data recovery plan was recommended for SIHP #s -3318, -3320, -3322, and -3324. Data recovery with either preservation “as-is” or proper burial disinterment was recommended for SIHP #s -3319 and -3321 and data recovery and preservation with interpretative development was recommended for SIHP #-3323.

### **Davis 1988**

In 1988, the Department of Anthropology of the Bernice Pauahi Bishop Museum conducted an archaeological inventory survey for the Ewa Gentry residential area (Davis 1988). The survey consisted of a pedestrian survey and subsurface testing of an approximately 1,016 acre area, 900 acres of which had been used extensively for sugarcane cultivation. Trench 3 was the only excavation that contained a notable profile and possible cultural deposit. Charcoal from the deposit returned a radiocarbon date range of 1510-1650 A.D. but was later determined to be natural and not part of a cultural deposit. The lack of archaeological sites or deposits encountered during the project was attributed to use of the area for commercial sugarcane cultivation over many years.

### **Kennedy 1988**

In 1988, Archaeological Consultants of Hawaii produced an archaeological reconnaissance letter report for the Ewa gentry residential area (Kennedy 1988). The study consisted of a pedestrian survey of the area that was conducted prior to the Davis (1988) archaeological inventory survey. The lack of sites documented during the project was attributed to land modifications made during the plantation era in support of commercial sugarcane cultivation.

### **Hammatt and Shideler 1990**

In 1990, Cultural Surveys Hawai‘i (CSH) conducted an archaeological inventory survey of a 546 acre parcel for the West Loch Bluffs project (Hammatt and Shideler 1990). The survey consisted of pedestrian reconnaissance and background research on four historic areas of interest, the Honouliuli Taro Lands, the Kapalani Catholic church, the Ewa Plantation Pipeline Village, and Driver/Stable Villages. The survey documented five archaeological sites which included

plantation infrastructure consisting of three pipes recorded as Features A through C of SIHP # 50-80-12-4344, a railroad berm recorded as SIHP # 50-80-12-4345, a northern pumping station recorded as SIHP # 50-80-12-4346, a central pumping station recorded as SIHP # 50-80-12-4347, and a southern pumping station recorded as SIHP # 50-80-12-4348. Due to the lack of cultural remains found in the four historic areas of interest, they were not assigned SIHP numbers.

### Hammatt et al. 1990

In 1990, CSH conducted an archaeological reconnaissance survey of the ‘Ewa Villages (Hammatt et al. 1990). The study included surface survey of 616 acres. Several features were identified including Renton Village, Tenney Village, Varona Village, remnants of three additional former plantation villages named C Village, Mill Village, and Middle Village (a Korean Village), and other plantation-era infrastructure including a plantation cemetery, ‘Ewa Depot, Buddhist temple, ‘Ewa Japanese School, a reservoir (Reservoir #1), and sugar cane fields (). The study recommended additional study for the remains of a Roundhouse, long store, and community bathhouse (furo). The possibility of intact significant features was noted for Renton, Tenney, and Varona Villages and it was recommended that appurtenances of the OR&L ROW be avoided. No pre-contact traditional Hawaiian features or any other features pre-dating use of the area by the ‘Ewa Plantation were observed. Archaeological monitoring was recommended for any future development of the area.

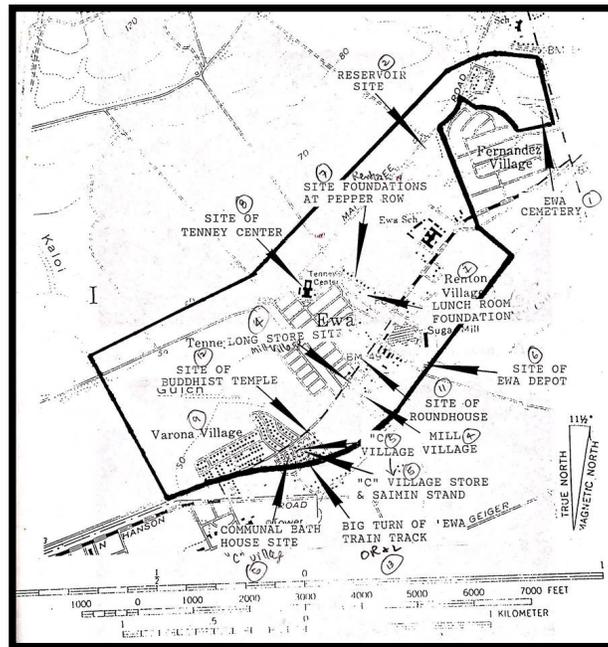


Figure 19. Map Provided within Hammatt et al. (1990:19) showing significant features of their study within Ewa Villages

## **Hammatt and Shideler 1991**

In 1991, CSH conducted an archaeological inventory survey of a 24-acre parcel for the proposed expansion of the Saint Francis Medical Center West (Hammatt and Shideler 1991). The study concluded that the entire project area, which was located on a bluff northeast of the Honouliuli Stream floodplain, had been extensively disturbed. No surface cultural remains were observed, and it was determined that subsurface remains were unlikely (Hammatt and Shideler 1991).

## **Jayatilaka et al. 1992**

In 1992, the Department of Anthropology of the Bernice Pauahi Bishop Museum conducted an archaeological inventory survey with subsurface testing for a 270 acre parcel for the Hawaii Prince Golf Course (Jayatilaka et al. 1992). No archaeological sites or deposits were encountered during the investigation. The lack of sites was attributed to past use of the area for commercial sugarcane cultivation. It was also suggested that the absence of subsurface remains may be due to the area never being inhabited.

## **Moy 1995**

In 1995, the 'Ewa Sugar Plantation Villages (SIHP 50-80-12-9786) were nominated for the National Register of Historic Places (Moy 1995). A public district was designated consisting of 287 contributing historic resources, including 285 domestic and agricultural buildings, one processing site, and one commercial complex utilized by plantation workers from 1890 to 1957. Contributing sites of the 'Ewa Sugar Plantation Villages Historic District includes mill buildings, the plantation management office (1935), the 'Ewa Shopping Basket (1935) or plantation store, the plantation manager's house (1925), three additional managers' houses (1923), single men's quarters (1924), Renton Village (1907-1924) also referred to as "Haole Camp", Tenney Village (1923-26, expanded in late 1930s) also referred to as "Japanese Camp", Varona Village (1933, expanded 1957) also called "Filipino Camp", a Japanese Clubhouse referred to as "J" Club (1935, renovations 1991-1992), the 'Ewa Plantation Cemetery, an Artesian Well Marker (commemorates the first well site established in 1879), and the OR&L Right-of-Way (1889). Additional sites found to contribute to the historic district, but not owned by the City and County of Honolulu, include the 'Ewa Immaculate Conception Catholic Church, Parish Hall & Priest's Home (c. 1926), the 'Ewa Community Church (1937, addition 1956), and the 'Ewa Sotoshuji Church and Social Hall (1949).

## **Spear 1996**

In 1996, Scientific Consultant Services (SCS) conducted an archaeological reconnaissance survey and assessment for the H.F.D.C.-East Kapolei Development Project (Spear 1996). No historic properties were documented, and due to such prolonged sugarcane production in the past, SCS recommended no further archaeological investigation was necessary.

## **Jensen and Head 1997**

In 1994 and 1995, the Department of the Navy conducted an archaeological reconnaissance survey for Naval Magazine Lualualei, NAVMAG-West Loch which consisted of unimproved and out-leased/cultivated lands at West Loch, out-leased/cultivated lands on the Waipi'o peninsula, West Loch Affordable Housing Project LRFI

and the entirety of Laulaunui Island (Jensen and Head 1997). The study consisted of a 25 percent pedestrian survey that documented 281 archaeological sites, 111 of which were interpreted as traditional Hawaiian. The remaining 170 sites were historic in age and primarily represented military construction with a few historic-era ranching and agricultural features. A total of 11 sites were documented in the vicinity of the project area, all of which were located on Laulaunui Island. All of the sites were historic in age and associated with the United States military. The sites include a concrete slab recorded as SIHP #50-80-13-5136, a concrete slab and concrete wall recorded as SIHP #50-80-13-5137, a concrete slab recorded as SIHP #50-80-13-5138, a concrete slab and gun emplacement recorded as SIHP #50-80-13-5139, a concrete slab recorded as SIHP #50-80-13-5140, a concrete basement recorded as SIHP #50-80-13-5141, a metal structure recorded as SIHP #50-80-13-5142, a utility recorded as SIHP #50-80-13-5143, a metal barge/landing recorded as SIHP #50-80-13-5144, a wall recorded as SIHP #50-80-13-5145, and a site complex consisting of concrete paving, a concrete slab, a concrete step, and 2 walls recorded as SIHP #50-80-13-5146. All of the sites were assessed as not significant, and no further work was recommended.

### **Wolforth et al. 1998**

Between 1988 and 1990, PHRI conducted archaeological data recovery excavations for the golf course, shoreline park, and Residential Increment I of West Loch Estates (Wolforth et al. 1998). The sites had been previously recorded during an archaeological reconnaissance survey for the golf course and parks of West Loch Estates (Dicks et al. 1987). Data recovery consisted of excavations at previously recorded sites SIHP #s -3319 (habitation deposit and possible cemetery), -3320 (habitation deposit), and -3321 (habitation deposit), backhoe trenching at SIHP #s -3322 (buried fishpond) and -3324 (extensive pond field system), and archaeological monitoring. A total of 4,288 artifacts were recovered from excavations with 743 being classified as traditional Hawaiian and the remainder classified as historic. The results of the data recovery excavations were interpreted to indicate that the pond fields were used from the 10<sup>th</sup> to 17<sup>th</sup> centuries A.D. They posited that over time the filling of the lower valley with erosional soil changed the environment from being wet with widespread fields to being drier with fields scattered among houses, pastures, and gardens. Following data recovery excavations, no further work was recommended.

### **Hammatt and Shideler 1999**

In 1999, CSH also conducted an archaeological assessment for a second proposed expansion of St. Francis Medical Center West (Hammatt and Shideler 1999). Due to the negative results of the survey, it was termed an archaeological assessment. No cultural materials or deposits of any kind were observed within the project. The study makes mention of a previously-documented subsurface cultural layer, SIHP #50-80-13-3321, located approximately 200 meters (m) to the west of the project area.

### **Athens et al. 2000**

In 1995, International Archaeological Research Institute Inc. (IARII) conducted sediment coring at 21 former fishponds known to exist around Pearl Harbor (Athens et al. 2000). The study identified fishpond sediments for 8 of the former fishponds and attempted to build a dating chronology for each. A single fishpond, Laulaunui Fishpond (SIHP #-140) was the only fishpond tested in the vicinity of the project and two sediment cores were extracted for analysis. Overall, the test results for Laulaunui fishpond and the other ponds tested were inconclusive. This was due

to the mixed environmental origin of the organic material in the sediment samples and the large standard errors encountered during the radiocarbon dating determinations and Bayesian calibration. Therefore, no reliable chronology could be made for the ponds but recommendations were made to guide future paleoenvironmental studies of fishponds.

### **McIntosh and Cleghorn 2002**

In 2002, Pacific Legacy Inc. conducted an archaeological survey for the the 'Ewa Gentry Makai residential development (McIntosh and Cleghorn 2002). Nothing of archaeological note was encountered during the survey and no historic properties were documented. The lack of historic properties was attributed to use of the area for commercial sugar cane production over an almost 100 year period of time.

### **O'Hare et al. 2006**

In 2006, CSH conducted an archaeological inventory survey of approximately 1,600 acres for the East Kapolei Project, which was previously known as the Ho'opili Project (O'Hare et al. 2006). The survey consisted of pedestrian survey and the excavation of 19 backhoe trenches focused in four areas of historic interest, the Honouliuli Taro Lands, the Kapalani Catholic Church, the Pipeline Village, and the Drivers/Stable Village. No new sites were identified during the surface and subsurface survey of the area; this was attributed to cattle ranching and commercial sugar cultivation. The study does provide additional documentation and mapping for five sites previously recorded during an archaeological inventory survey for the West Loch Bluffs project (Hammatt and Shideler 1990). The sites included plantation infrastructure consisting of three pipes recorded as Features A through C of SIHP #-4344, a railroad berm recorded as SIHP #-4345, a northern pumping station recorded as SIHP #-4346, a central pumping station recorded as SIHP #-4347, and a southern pumping station recorded as SIHP #-4348. The only newly documented features recorded during the project consisted of four features documented as Features D through G of SIHP #-4344. The feature groupings included two linear walls along the east bank of Honouliuli Stream (D and E), a stone-faced berm perpendicular to the stream (F), and a concrete ditch and masonry catchment basement on the west bank of Honouliuli Gulch (G). Following the survey, it was recommended that on-call/on-site monitoring be conducted within the four areas of historic interest present within the project area.

### **Rasmussen and Tomomari-Tuggle 2006**

In 2004, archaeological monitoring was conducted along the Waiiau Fuel Pipeline corridor from the HECO Barbers Point Tank Farm to the Waiiau Generating Station (Rasmussen and Tomonari-Tuggle 2006). The portion of pipeline corridor in the vicinity of the project area passed through the upper portion of Loko Pouhala, SIHP # 50-80-09-126, and adjacent to previously recorded SIHP #s -3314, -3319, and 3323, and the OR&L right-of-way, SIHP #50-80-12-9714. No new historic sites were documented during monitoring.

### **O'Hare et al. 2007 and Souza et al. 2007**

In 2007, CSH conducted an archaeological assessment and cultural impact assessment for the 'Ewa Industrial Park (O'Hare et al. 2007 and Souza et al. 2007). Due to the negative results of the survey, it was termed an archaeological assessment. The assessment consisted of a pedestrian survey of approximately 48 acres of land bordered by the OR&L tracks in the north. No historic properties or surface features or artifacts were encountered during the survey. The lack of historic

properties was attributed to agricultural use, bulldozing, and modern use activities which had destroyed or displaced any potential sites or deposits in the project area.

### **Dye et al. 2008**

In 2008 T.S. Dye and Colleagues, Archaeologists Inc., conducted a historic properties assessment for the Pearl Harbor National Wildlife Refuge which consists of the Waiawa, Honouliuli and Kalaehoa units (Dye et al. 2008). The Honouliuli Unit is in the vicinity of the project area and located to the southwest along the south bank of the West Loch of Pearl Harbor. The assessment presents background data and information on previous archaeological research and sites within the refuge and vicinity. The study concluded that cattle ranching and sugar cane cultivation over an over 150 year period had displaced or destroyed much of the cultural resources of the 'Ewa Plain. No sites were identified within the refuge unit, and it was determined to have a low likelihood for cultural resources.

### **Hammatt 2010**

In 2009 and 2010, CSH conducted an archaeological inventory survey for the Honolulu High Capacity Transit Corridor Project, Construction Phase I. No surface cultural resources were observed during the pedestrian survey. Survey and background research helped in determining several areas to be selected for subsurface testing. A Ground Penetrating Radar Survey (GPR) was conducted to determine the viability of GPR in determining stratigraphy and locating cultural deposits within the project area, however the results were inconclusive. A total of 92 test excavations were distributed throughout the project area in areas planned for ground disturbance. During the test excavations, 4 Stratigraphic Zones were identified, one of which (Stratigraphic Zone 3) was identified as an agricultural deposit and was the only cultural resource recorded during the survey. The subsurface cultural deposit was identified as lo'i sediment and designated as SIHP # -7751. The site is located outside the 1.5 mile radius of the current project area at the southern portion of the proposed Waipahu Transit Station, adjacent and south of Farrington Highway. According to radiocarbon testing, the sediment dated as far back as 1,000 years.

### **O'Hare et al. 2011**

In 2010, CSH conducted an archaeological literature review and field inspection for the Honouliuli/Waipahu/Pearl City wastewater facilities project which extended from Hālawā to the wastewater pump station in Honouliuli (O'Hare et al.2011). The lack of historic properties identified during the field inspection was attributed to heavy 20<sup>th</sup> century use of the area. The study indicated that the vicinity of the Waipahu wastewater pump station and much of the project area was close to the water table. However, due to the proximity of Kapakahi Stream and the coastline, initial on-site monitoring was recommended for the project.

### **Mooney and Cleghorn 2012**

In 2010, Pacific Legacy completed an archaeological inventory survey for Varona Village (Mooney and Cleghorn 2010). The project included approximately 22 acres and was located entirely within the 'Ewa Sugar Plantations Historic District (SIHP # -9786). The study recorded five newly-identified structures within Varona Village, including two historic plantation houses recorded as SIHP #s 50-80-12-7129 and -7130, two house foundations recorded as SIHP #s 50-80-12-7131 and -7132, and a historic streetlight recorded as SIHP #50-80-12-7133.

## **Rewick 2012**

In 2012, the OR&L ROW and Hawaiian Railway Society's (HRS) 'Ewa Railroad Yard (OR&L Railroad Baseyard), located adjacent to the south side of the current project area, was nominated to the State Register (SIHP #50-80-12-7387) (Rewick 2012). The HRS 'Ewa Rail Yard contains collections and is a location for research, preservation, conservation, restoration, and maintenance of OR&L engines, boxcars, flatcars, coaches, cane cars, a hand-operated track inspection car, artifacts, and memorabilia. The facility also serves as an operating depot for public train rides. The HRS moved to this location in 1974, the site is not an original location for the OR&L baseyard.

The Railroad Yard includes several train cars that are listed on the State and National Registers, including locomotives #6 ("Kailua", built 1889), #12 (built 1912), and the #64 Dillingham parlor car (built 1924) (Railway Rolling Stock, SIHP #50-80-08-9761 [State Register]) as well as the Waialua Agricultural Company locomotive #6 ("WaCo 6", SIHP #50-80-08-9708, NR #74000719). WaCo 6 is the only locomotive designed and built in Hawai'i and the only fully operational and restored Hawaiian sugar plantation locomotive in the world (Cummins 1974b, HHF 2016).

## **Johnson 2013 and Frye and Resnick 2013**

In 2013, a reconnaissance and geophysical survey at the Marine Corps Air Station ('Ewa Field) was conducted (Johnson 2013). Ground penetrating radar, magnetometry, and metal detection were utilized to identify features at the airfield which were present during the Japanese attack of WWII on December 7, 1941. The study investigated the 'Ewa Plain Battlefield (SIHP #50-80-12-5127, NR #16000273) finding foundations of an armory, officers barracks, a storage building, over 500 ft of charred but intact OR&L railway ties without rails, a swimming pool and adjacent pavement, a subsurface fuel tank, and a subsurface latrine. Several additional features were searched for but not found including evidence of enlisted barracks, a flagpole, water lines, a dispensary, the end of an original coral runway, the mooring mast, a compass rose, a magazine, and an ammunitions dump. The 'Ewa Plain Battlefield was nominated to the State and National Register in 2013 (Frye and Resnick 2013).

## **Sholin et al. 2013**

In 2013, T.S. Dye conducted an archaeological inventory survey for the Army Garrison Hawaii Munitions Storage Complex, located in the West Loch Annex of Joint Base Pearl Harbor Hickam (Sholin et al. 2013). The survey consisted of a pedestrian survey and the excavation of 52 backhoe trenches throughout the project area that contained historic-era fill material over the coral limestone bedrock. A single historic property was encountered during the pedestrian survey and consisted of a spur of the Ewa Plantation railway recorded as SIHP #50-80-12-7414. Due to the lack of integrity for the site, no further work was recommended. The lack of subsurface deposits in the project area was attributed to use of the area for commercial agriculture for many years.

## **Shideler and Hammatt 2014**

In 2014, CSH conducted an archaeological literature review and field inspection for the 'Ewa Elementary School classroom buildings project (Shideler and Hammatt 2014). The project area was located within the 'Ewa Sugar Plantations Historic District (SIHP # -9786). No other historic

properties were observed during the field inspection. CSH stated that encountering burials or cultural deposits during the project would be unlikely.

### **Stark et al. 2015**

In 2015, CSH conducted an archaeological inventory survey for the ‘Ewa Elementary School classroom buildings project (Shideler and Hammatt 2014). Due to the negative results of the survey, it was termed an archaeological assessment. The project is located within the ‘Ewa Sugar Plantations Historic District (SIHP # -9786) and was conducted in preparation for construction of a proposed classroom building. Historic artifacts such as a bent spoon, a broken plate, a bullet, and nails were documented, however the items were noted as not concentrated and not intrinsically associated with any new historic property. CSH stated that no historic properties would be impacted by the project and no further work was necessary.

### **Yucha et al. 2015**

In 2015, CSH conducted an an archaeological inventory survey for the Honouliuli Wastewater Treatment Plant (WWTP) Secondary Treatment and Facilities Project (Yucha et al. 2015). Due to the negative results of the survey, it was termed an archaeological assessment. The assessment consisted of a surface survey of the approximately 100-acre parcel. The OR&L Railroad right-of-way was observed bordering the north side of the property. Only modern wastewater infrastructure and modern agricultural structures were observed. No historic properties were identified within the project area and no further archeological work was recommended.

### **Mooney and Cleghorn 2017**

In 2017, Pacific Legacy Inc. conducted an AMR for sewage system upgrades at Varona Village (Mooney and Cleghorn 2017). The project was located within the ‘Ewa Sugar Plantations Historic District (SIHP # -9786). Varona Village was found to consist of approximately 45 plantation-era houses with associated outbuildings and garden areas. Twenty-eight septic systems were installed, requiring excavations ranging from 2-3 meters (6.6-9.8 feet) in depth. In general, documented stratigraphy consisted of silt loam, clay loam and and coral fill layers, over natural clay soils, and the limestone/coral shelf. Based on provided stratigraphic profiles and descriptions, the upper limit of documented natural clay soils appears to have ranged from 5-48 cm below the surface (cmbs) (0.16-1.6 ft). The upper limit of the documented natural limestone/coral shelf appears to have ranged from 19-135 cmbs (0.6-4.4 ft). Several historic artifacts such as glass bottles and bottle fragments, rusted metal machine or automotive parts, and residential building materials were observed within disturbed contexts or fill sediments. Also observed, were a few sinkholes, however, no traditional Hawaiian features or artifacts were encountered within them. Various historic and modern faunal remains were also observed.

### **Thurman et al. 2019 and Thurman and Watson 2020**

In 2019 Honua Consulting LLC conducted a literature review and field inspection report was completed for Ewa Villages R-1 water main project (Thurman et al. 2019). The study determined the project was within the ‘Ewa Sugar Plantation Villages Historic District (SIHP # -97860) and included a historic streetlight (SIHP # -7133) located within Varona Village adjacent to the north side of Renton Road. Additionally, the study found that the OR&L Right-of-Way (SIHP # -9714, NR #75000621) and OR&L Railroad Baseyard (SIHP # -7387) were located adjacent to the

southern portion of the project area with the ‘Ewa Plain Battlefield (SIHP # -5127, NR #16000273) located approximately 230 feet (70 meters) to the south. It was determined that the proposed project would not affect the integrity of nearby historic properties. A pedestrian survey of the proposed wateline right-of-way documented no new historic properties and no significant cultural materials were identified. The study determined it was highly likely that any pre-contact traditional Hawaiian surface features and/or subsurface cultural deposits that may have existed in the area at one time were destroyed by historic modifications conducted throughout the vicinity.

The study recommended that structures within the ‘Ewa Sugar Plantation Historic District (SIHP # -9786), including the historic streetlight (SIHP # -7133), and adjacent OR&L infrastructure be avoided during construction of the proposed waterline project. It was further recommended that the proposed waterline project proceed under an archaeological monitoring program guided by an approved archaeological monitoring plan (Watson 2020).

## Nearby Historic Properties

A total of 36 historic properties are present within a 1.5 mile radius of the project area (see Figure 18, Table 3). Ten of the sites are assessed as traditional Hawaiian (pre-1778) in age or have traditional Hawaiian site components and include several fishponds, the west loch of Pearl Harbor, a buried pond field system, a ko‘a (fishing shrine), a shell midden deposit, buried habitation deposits, and a human burial. The remaining sites are historic in age and include historic habitation deposits, the ‘Ewa Sugar Plantation Historic District, two possible cemeteries, a fishpond, plantation era infrastructure, military infrastructure, the ‘Ewa Plain Battlefield and the OR&L Railroad.

The first sites in the area were documented by McAllister (1933) during the first systematic survey of the island of O‘ahu in the early 1930s. The sites include Kaaukuu and Pouhala fishponds recorded as SIHP #-126, a ko‘a recorded as SIHP #-139, Laulaunui fishpond recorded as SIHP #-140, and the west loch of Pearl Harbor recorded as SIHP #141.

Several traditional Hawaiian and historic sites were documented during two archaeological inventory surveys for the West Loch Estates golf course and subdivision (Rosendahl 1987 and Dicks et al. 1987). The sites documented during the survey of both residential increments of the subdivision include a surface scatter of marine shell midden recorded as SIHP # -3314, a surface scatter of 19<sup>th</sup> century artifacts recorded as SIHP # -3315, a historic cemetery consisting of at least 5 graves recorded as SIHP # -3316, and an extensive surface scatter of 20<sup>th</sup> century plantation era artifacts recorded as SIHP#-3317 (Rosendahl 1987).

The sites documented during the survey of the golf course and parks included a surface scatter of 19<sup>th</sup> century historic artifacts recorded as SIHP #-3318, a multi-component habitation deposit and possible cemetery recorded as SIHP #-3319, a multi component habitation deposit recorded as SIHP #-3320, a traditional Hawaiian habitation deposit with a human burial recorded as and SIHP #-3321, a buried fishpond recorded as SIHP #-3322, a historic fishpond recorded as SIHP # -3323, and a buried pond field system recorded as SIHP #-3324 (Dicks et al. 1987). The results of the radiocarbon dating were interpreted to indicate use of SIHP #-3319 during the early historic period, use of the lower valley between the mid-1100s and 1600 A.D., use of the upper valley between the 1200s and 1700 A.D. and inconclusive results for use of SIHP #s -3321 and -3323.

Several plantation era sites were documented during an archaeological inventory survey for the West Loch Bluffs project (Hammatt and Shideler 1990). The survey documented five

archaeological sites which included plantation infrastructure consisting of three pipes recorded as Features A through C of SIHP #-4344, a railroad berm recorded as SIHP #-4345, a northern pumping station recorded as SIHP #-4346, a central pumping station recorded as SIHP #-4347, and a southern pumping station recorded as SIHP #-4348. The sites were relocated and mapped during an archaeological inventory survey for the East Kapolei (Ho‘opili) development project in 2006 and four additional feature components of SIHP #-4344 were recorded. They consisted of sugar cane cultivation and irrigation features designated Features D-G.

In 1995, Tenney Village, Varona Village, and Renton Village were placed on the Hawai‘i Register of Historic Places (State Register) as the ‘Ewa Sugar Plantation Villages Historic District or Ewa Villages (SIHP # 50-80-12-9786). The majority of the current project lies within this historic district. It should be noted that although Fernandez Village, located across Fort Weaver Road from the project area, is currently existing and was renovated in the 1970s without guidance and lost much of its integrity, becoming ineligible for the State or National Registers (Moy 1995). Contributing sites of the ‘Ewa Sugar Plantation Villages Historic District includes mill buildings constructed between the 1890s-1950s, the plantation management office (1935), the ‘Ewa Shopping Basket (1935) or plantation store, the plantation manager’s house (1925), three additional managers’ houses (1923), single men’s quarters (1924), Renton Village (1907-1924) also referred to as “Haole Camp”, Tenney Village (1923-26, expanded in late 1930s) also referred to as “Japanese Camp”, Varona Village (1933, expanded 1957) also called “Filipino Camp”, a Japanese Clubhouse referred to as “J” Club (1935, renovations 1991-1992), the ‘Ewa Plantation Cemetery, an Artesian Well Marker (commemorates the first well site established in 1879), and the OR&L Right-of-Way (1889). Additional sites found to contribute to the historic district, but not owned by the City and County of Honolulu, include the ‘Ewa Immaculate Conception Catholic Church, Parish Hall & Priest’s Home (c. 1926), the ‘Ewa Community Church (1937, addition 1956), and the ‘Ewa Sotoshuji Church and Social Hall (1949) (Moy 1995).

Several historic military sites were documented during an archaeological reconnaissance survey for Naval Magazine Lualualei, NAVMAG-West Loch which consisted of unimproved and out-leas/cultivated lands at West Loch, out-leas/cultivated lands on the Waipi‘o peninsula, and the entirety of Lualaunui Island (Jensen and Head 1997). The study documented 11 sites in the vicinity of the current project area, all of which were attributed to the United States military. The sites include a concrete slab recorded as SIHP #-5136, a concrete slab and concrete wall recorded as SIHP #-5137, a concrete slab recorded as SIHP #-5138, a concrete slab and gun emplacement recorded as SIHP #-5139, a concrete slab recorded as SIHP #-5140, a concrete basement recorded as SIHP #-5141, a metal structure recorded as SIHP #-5142, a utility recorded as SIHP #-5143, a metal barge/landing recorded as SIHP #-13-5144, a wall recorded as SIHP #-13-5145, and a site complex consisting of concrete paving, a concrete slab, a concrete step, and 2 walls recorded as SIHP #-5146. All of the sites were assessed as not significant, and no further work was recommended.

In 2010, Pacific Legacy completed an archaeological inventory survey for Varona Village (Mooney and Cleghorn 2010). The project included approximately 22 acres and was located entirely within the ‘Ewa Sugar Plantations Historic District (SIHP # -9786). The study recorded five newly-identified structures within Varona Village, including two historic plantation houses recorded as SIHP #s 50-80-12-7129 and -7130, two house foundations recorded as SIHP #s 50-80-12-7131 and -7132, and a historic streetlight recorded as SIHP #50-80-12-7133.

In 2013, a reconnaissance and geophysical survey at the Marine Corps Air Station (‘Ewa Field) was conducted (Johnson 2013). Ground penetrating radar, magnetometry, and metal detection were utilized to identify features at the airfield which were present during the Japanese attack of WWII on December 7, 1941. The study investigated the ‘Ewa Plain Battlefield (SIHP #50-80-12-5127, NR #16000273) finding foundations of an armory, officers’ barracks, a storage building, over 500 ft of charred but intact OR&L railway ties without rails, a swimming pool and adjacent pavement, a subsurface fuel tank, and a subsurface latrine. Several additional features were searched for but not found including evidence of enlisted barracks, a flagpole, water lines, a dispensary, the end of an original coral runway, the mooring mast, a compass rose, a magazine, and an ammunitions dump. The ‘Ewa Plain Battlefield was nominated to the State and National Register in 2013 (Frye and Resnick 2013).

Lastly, the right-of-way for the OR&L Railroad, documented as SIHP #-9714, runs along the west loch of Pearl Harbor to the east and southeast of the project area. It has been documented in numerous surveys in Waipahu and ‘Ewa and was added to the National Register of Historic Places (NRHP) in 2012 (Rewick 2012).

Table 3. Archaeological Sites Documented within a 1.5 Mile Radius of the Project Area

Reference	SIHP # 50-80-	Site Type	Site Significance	Recommendation	Notes
McAllister 1933	13-139	Ko‘a (fishing shrine)	Unknown	n.a.	Kalanamaihiki fishing shrine (ko‘a) at Kapapahuhi
McAllister 1933, Athens et al. 2000	13-140	Laulaunui fishpond	Unknown	n.a.	Possibly Laulaunui Pond
Rosendahl 1987	13-3314	Shell midden concentration (surface)	Low research, interpretive, and cultural significance	No further work	--
Rosendahl 1987	13-3315	Historic artifact concentration (surface)	Low research, interpretive, and cultural significance	No further work	--
Rosendahl 1987	13-3316	Historic cemetery	Moderate scientific, low interpretive, and high cultural significance	Data recovery and test excavations	At least 5 graves, 3 with names

Reference	SIHP # 50-80-	Site Type	Site Significance	Recommendation	Notes
Rosendahl 1987	13-3317	Historic artifact concentration (surface)	Low research, interpretive, and cultural significance	No further work	Refuse area
Dicks et al. 1987	13-3318	Historic artifact concentration (surface)	Criterion D	No further work	19 <sup>th</sup> century
Dicks et al. 1987, Wolforth et al. 1998	13-3319	Multi-component habitation deposit and possible historic cemetery	Criteria D and E	Data recovery, preservation	--
Dicks et al. 1987, Wolforth et al. 1998	13-3320	Multi-component habitation deposit	Criterion D	Data recovery	--
Wolforth et al. 1998	13-3321	Traditional Hawaiian habitation deposit and human burial	Criteria D and E	Data recovery	--
Wolforth et al. 1998	13-3322	Buried fishpond	Criterion D	Data recovery	--
Dicks et al. 1987, Wolforth et al. 1998	13-3323	Historic fishpond	Criteria C and D	No further work	--
Wolforth et al. 1998	13-3324	Buried pond field system	Criterion D	Data recovery	--
Hammatt and Shideler 1990, O'Hare et al. 2006	12-4345	Ewa Plantation railroad berm	Criteria C and D	Architectural evaluation, preservation	--
Hammatt and Shideler 1990, O'Hare et al. 2006	12-4346	Northern pumping station	Criteria C and D	Architectural evaluation, preservation	--

Reference	SIHP # 50-80-	Site Type	Site Significance	Recommendation	Notes
Hammatt and Shideler 1990, O'Hare et al. 2006	12-4347	Central pumping station	Criteria C and D	Architectural evaluation, preservation	--
Hammatt and Shideler 1990, O'Hare et al. 2006	12-4348	Southern pumping station	Criteria C and D	Architectural evaluation, preservation	--
Johnson 2013, Frye and Resnick 2013	12-5127	'Ewa Plain Battlefield	Criteria A and C	--	'Ewa Mooring Mast Field, Marine Corps Air Station, NR #16000273,
Jensen and Head 1997	13-5136	Concrete Slab	Low research, interpretive, and cultural significance	No further work	U.S Military
Jensen and Head 1997	13-5137	Site complex (2 features)	Low research, interpretive, and cultural significance	No further work	U.S. Military, concrete slab and wall
Jensen and Head 1997	13-5138	Concrete slab	Low research, interpretive, and cultural significance	No further work	U.S. Military
Jensen and Head 1997	13-5139	Site Complex (2 features)	Low research, interpretive, and cultural significance	No further work	U.S. Military, concrete slab and gun emplacement
Jensen and Head 1997	13-5140	Concrete slab	Low research, interpretive, and cultural significance	No further work	U.S. Military
Jensen and Head 1997	13-5141	Concrete basement	Low research, interpretive, and cultural significance	No further work	U.S. Military
Jensen and Head 1997	13-5142	Metal Structure	Low research, interpretive, and cultural significance	No further work	U.S. Military

Reference	SIHP # 50-80-	Site Type	Site Significance	Recommendation	Notes
Jensen and Head 1997	13-5143	Utility	Low research, interpretive, and cultural significance	No further work	U.S. Military
Jensen and Head 1997	13-5144	Metal barge /landing	Low research, interpretive, and cultural significance	No further work	U.S. Military
Jensen and Head 1997	13-5145	Wall	Low research, interpretive, and cultural significance	No further work	U.S. Military
Jensen and Head 1997	13-5146	Site complex (5 features)	Low research, interpretive, and cultural significance	No further work	U.S. Military, concrete paving, concrete slab, concrete step, and 2 walls
Mooney and Cleghorn 2012	12-7129	Historic Plantation House	Criteria a, c, and d	Passive Preservation	Varona Type
Mooney and Cleghorn 2012	12-7130	Historic Plantation House	Criteria a, c, and d	Passive Preservation	Unique construction
Mooney and Cleghorn 2012	12-7131	Concrete Foundation	Criteria d and e	Passive Preservation	Possible outdoor kitchen
Mooney and Cleghorn 2012	12-7132	Concrete Foundation	Criterion d	Passive Preservation	Possible outdoor kitchen
Mooney and Cleghorn 2012	12-7133	Varona Village Historic Street Light	Criterion a, c, and d	Not eligible for listing on the NRHP (Mason Architects 2020)	North side of Renton Road at Varona Village
Rewick 2012	12-9714	OR&L Railroad right-of-way	Criteria a and d	Preservation	Listed on NRHP as #169994
Hammatt et al. 1990	12-9786	‘Ewa Sugar Plantation Historic District	Criteria a and c	--	Tenney Village, Varona Village, and Renton Village,

## Archaeological Field Inspection

Fieldwork was conducted on May 28, 2021, by Nathan J. DiVito, B.A., under the supervision of Rosanna Thurman, M.A. (principal investigator). Fieldwork required approximately 3 person-hours to complete and was conducted under archaeological permit number 21-24, issued to Honua Consulting by the SHPD/DLNR in accordance with HAR § 13-282.

### Methodology

A visual inspection of the ground surface throughout the entire 3.704-acre project area was conducted. Pedestrian survey transects were spaced at approximately 5-meter (m) (16.4 feet [ft.]) intervals (Figure 20). A hand-held Trimble GeoXH (6000 Series) was used to record survey tracks. The Trimble maintained an accuracy ranging between 1 to 3 m (3 to 10 feet). No subsurface excavation was conducted. Existing conditions and potential historic properties were photographed.



Figure 20. Aerial photo showing pedestrian survey tracks

## Survey Results

The project area is relatively flat, which corresponds with historic maps that indicate it was under commercial sugarcane cultivation as early as 1913 and was graded in 1993 (see Figure 8 and Figure 16). It is bordered by Renton Road on the the south and east, the West Loch Elderly Villages Apartments to the north, and Fort Weaver Road to the west (Figure 21 and Figure 22). A modern 2 meter high rock wall defines the western boundary of the project area along Fort Weaver Road and a metal fence defines the northern boundary adjacent to the West Loch Elderly Villages Apartments (Figure 23). A sidewalk along Renton Road defines the southern and eastern boundary. As described below, one potential historic property, designated Honua 1, was identified.

A fenced 500 square foot cell tower lease area consisting of a 60 ft tall mono-palm is located along the the central portion of the western boundary of the project area (Figure 24). An asphalt road providing access to the West Loch Elderly Villages runs northwest/southeast through the western portion of the project area from Renton Road. Easements include electrical running under the West Loch Elderly Villages access road and a drain easement running through the eastern portion of the project area. Other utilities in the project area include water, electrical, irrigation, and a drain located along Renton Road.

Ground visibility in the project area was fair with a sparse cover of low grass and weeds in the western portion of the project area and low grasses and exposed dirt in the eastern portion. A single Eucalyptus tree was present in the project area along the northern boundary. The northern portion of the project area adjacent to the boundary with the West Elderly Villages was used as a parking area and imported mechanically-crushed basalt and coral gravel was present over much of the ground surface there (Figure 25). During the survey, Honua 1 was encountered in the south-central portion of the project area.

### Honua 1

This site consists of a concentration of at least 6 depressions in the ground surface in an approximately 30 by 30 meter area that may represent buried and/or filled sinkholes (Figure 26). The depressions are oblong or irregular in plan and extended to a maximum depth of 30 cmbs. Two of the depressions have been filled with cobble sized concrete fragments and were designated Features A and B (Figure 27 and Figure 28). Feature A measured approximately 80 cm (E-W) by 60 cm (N-S) and Feature B measured approximately 130 cm (N-S) by 80 cm (E-W). It is possible that Features A and B may represent filled sinkholes but may also just be natural depressions that were filled during past grading of the project area and use as a parking lot.



Figure 21. Overview photo of the project area from the southeast corner at Renton Road looking west



Figure 22. Overview photo of the project area from the southwest corner at Renton Road looking north



Figure 23. Overview photo of the rock wall that defines the western boundary of the project area



Figure 24. Overview photo of the cell tower lease facility located along the western boundary of the project area looking west



Figure 25. Overview photo of the northern portion of the project area showing imported basalt and coral gravel fill used for a parking area

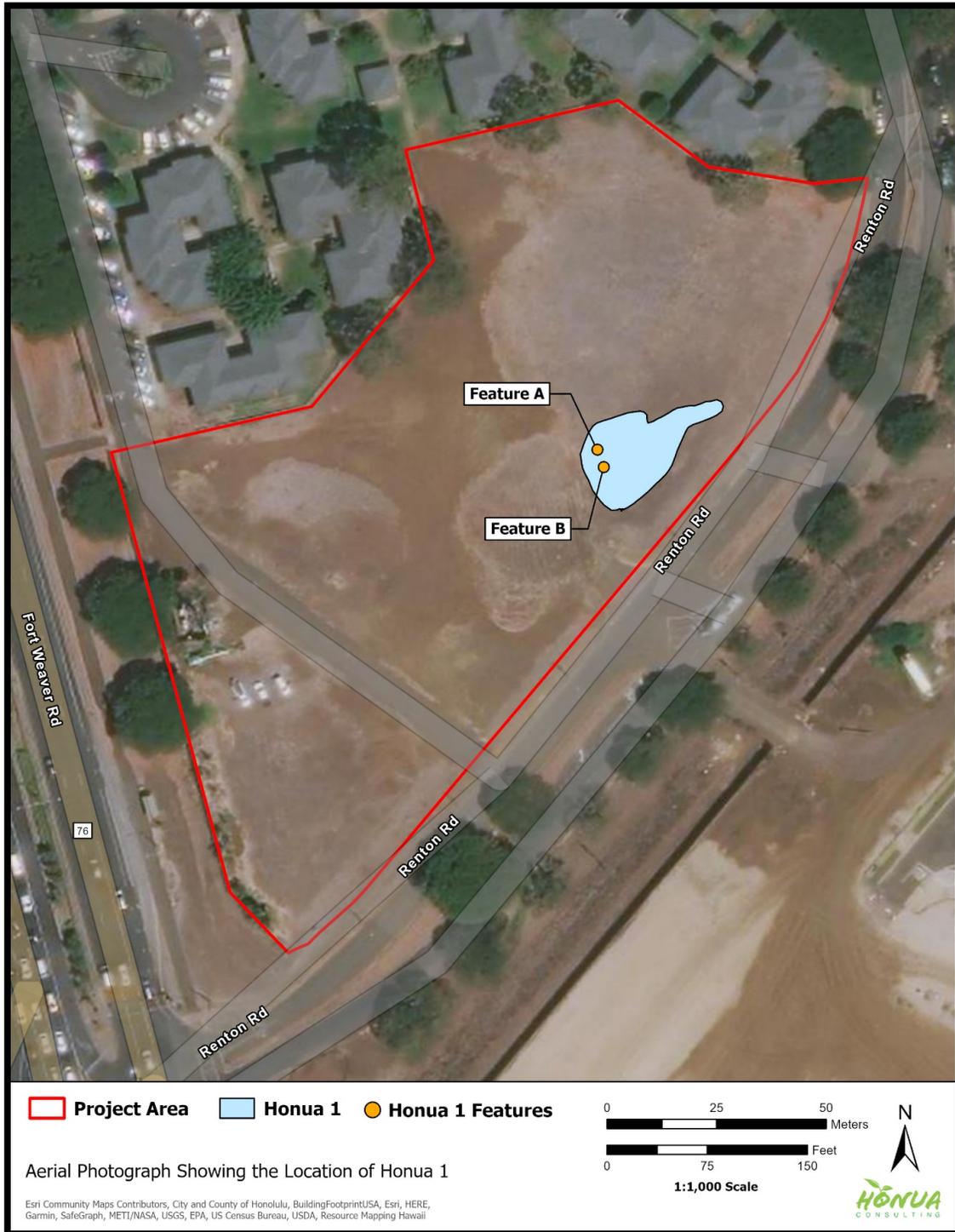


Figure 26. Aerial photograph showing the location of Honua 1, a concentration of possible sinkholes, two of which, Features A and B have been filled in



Figure 27. Photo of a possible filled sinkhole recorded as Honua 1, Feature A, looking northwest



Figure 28. Photo of a possible filled sinkhole recorded as Honua 1, Feature B, looking east

## Summary and Recommendations

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At the request of Stanford Carr Development, LLC, Honua Consulting conducted a Literature Review and Field Inspection (LRFI) in support of the West Loch Affordable Housing Project located in Honouliuli Ahupua‘a, ‘Ewa District, O‘ahu Island, TMK [1] 9-1-122:004. The project area, street address 91-1666 Fort Weaver Road, consists of 3.704 acres and is owned by the City and County of Honolulu.

The objectives of the LRFI were to determine the project area’s land-use history, to identify any historic properties or component features in the project area, to evaluate the proposed project’s potential effect on historic properties, and to make recommendations about mitigation, if applicable. This study is not an archaeological inventory survey (AIS); however, it has been conducted according to standards outlined in Hawai‘i Administrative Rules (HAR) § 13-276 for AIS studies, and is intended to assist with the project’s compliance with Hawai‘i Revised Statutes (HRS) § 6E-8 and consultation with the State Historic Preservation Division (SHPD).

Background research indicates that the project area is situated on the coral plain of ‘Ewa, an area thought to be sparsely inhabited by Hawaiians. The pre-contact (pre-1778) population of ‘Ewa was focused along the coastline with the plains used for resource collection. The numerous sinkholes of the interior karst lands were used for agriculture, burial, and sometimes habitation. Approximately 1 mile to the north of the project area is an area known as the Honouliuli Taro Lands, an extensive traditional Hawaiian and early historic period lo‘i (pond field) system and habitation area that once comprised much of the lowlands along Honouliuli Stream. Additionally, several former fishponds are located nearby that utilized the shores of the West Loch of Pearl Harbor and Laulaunui Island.

The entirety of the project area was part of LCA 11216, ‘āpana 8 to Mikahela Ke‘ahi-Kuni Kekau‘ōnohi which consisted of all of the unclaimed lands of Honouliuli Ahupua‘a. In the late 19<sup>th</sup> century, the project area was used for cattle grazing. Later, it was planted with sugar cane around the turn of the 20<sup>th</sup> century with the establishment of the OR&L Railroad in 1889 and the Ewa Plantation Company in 1890. The project area was under cultivation by the Ewa Plantation Company until 1970 and then the Oahu Sugar Company into the 1980s, when the property was then sold to the City and County of Honolulu. The property was cleared and graded as early as 1993, likely during construction of the West Loch Elderly Villages to the north. Easements were constructed through the project area in 2000 and a cell tower lease facility was built along the western boundary in 2011.

Two previous studies have included the project area or a portion of the project area and include an archaeological inventory survey for the West Loch Estates residential development in 1987 and a historic properties assessment for a cell tower facility in 2009 (Rosendahl 1987 and Macak et al. 2009). No historic properties were documented within the project area during either study. The lack of historic properties was attributed to previous disturbances from historic cattle ranching and subsequent use of the area for commercial sugar cane production.

The archaeological field inspection conducted for the current project consisted of a 100% pedestrian survey of the project area. The entire project area was relatively free of vegetation and has been graded flat. It is bordered on the east, south, and west by streets and sidewalks and on the north by the West Loch Elderly Villages. A road easement and a cell tower lease facility are present in the western portion of the project. A single potential historic property, temporary site

designation Honua 1, was documented in south-central portion of the project area and includes an area with several depressions and two possible filled sinkholes recorded as Features A and B.

Sinkholes within the region have been found to contain significant cultural deposits and materials, including human burials, therefore this study recommends further examination of the two filled sinkholes, Features A and B, within the project area. Methodology for investigation of the sinkholes should be discussed with and approved by the State Historic Preservation Division (SHPD). The investigation will likely require the completion of an Archaeological Inventory Survey (AIS) report. The sinkholes should be assessed for cultural modifications, the presence of soil/sediment sufficient for excavation, and the presence of archaeological and paleontological remains. Excavations should be conducted within sinkholes of sufficient size for access and containing sufficient soil/sediment. In the event paleontological remains are recovered, the faunal material should be analyzed by a qualified expert to determine species.

Following further investigation of the sinkholes, an archaeological monitoring program is recommended to be carried out in accordance with HAR § 13-279 (Rules for Archaeological Monitoring Studies and Reports). The monitoring program would document any potential cultural remains or significant deposits which may exist within sinkholes within the project area. The frequency of archaeological monitoring would be determined in coordination with the SHPD.

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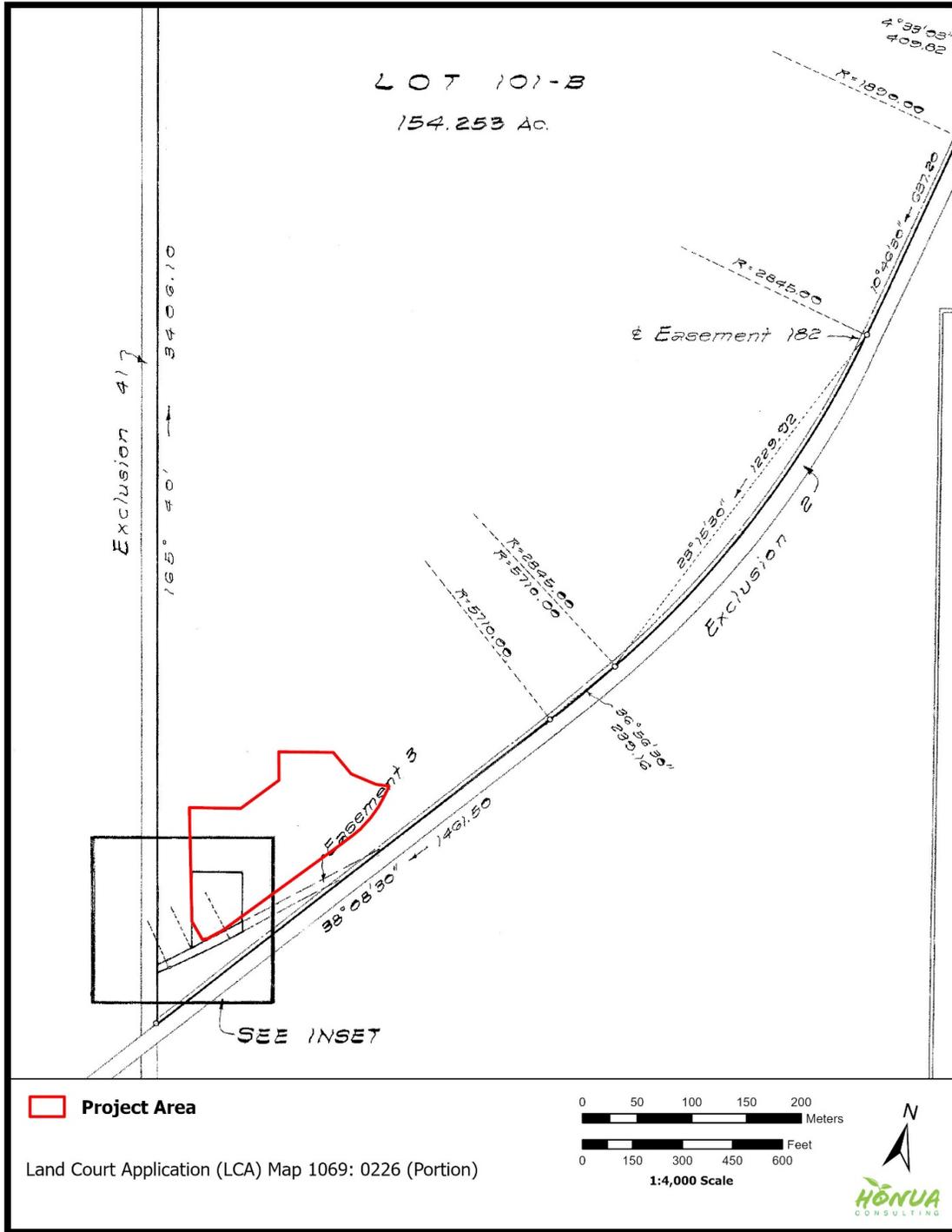
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 Kuleana Aina mai Hawaii a Kauai, Penei hoi:  
 Ke Mikahela Kekauonohi:  
 Inoa i ma Aina Ahupuaa Kāhala Mokuiahi  
 Waiakāhala 2 ma kom. " Kōkai Kauai  
 Kōa-kōa-anii " " "  
 Namahāna " " "  
 Waihoke " Kōhale " "  
 Wainīhi " " "  
 Kōlia " Puna " "  
 Mākae " Kōkai Pōhi Oahu  
 Hōmūliuli " Ewa " "  
 Waimāka, a-o-o, Kōm. " " "  
 Mōkae " - Molokai

Native Register for LCA 11216 to Mikahela Kekauonohi (Native Register, Reel 3, Vol. 4, p. 360)

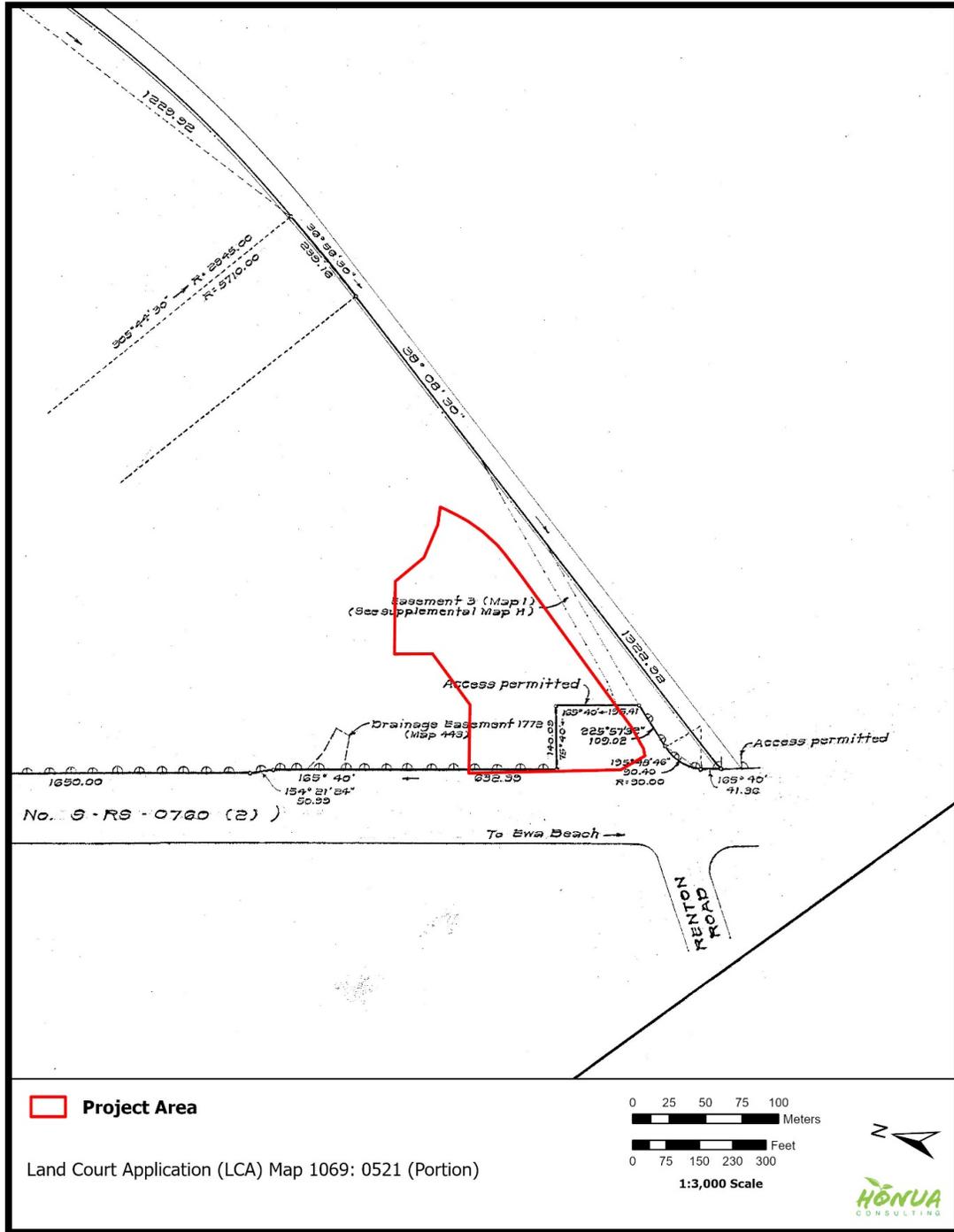
## Appendix B: Land Court Application Map Documentation



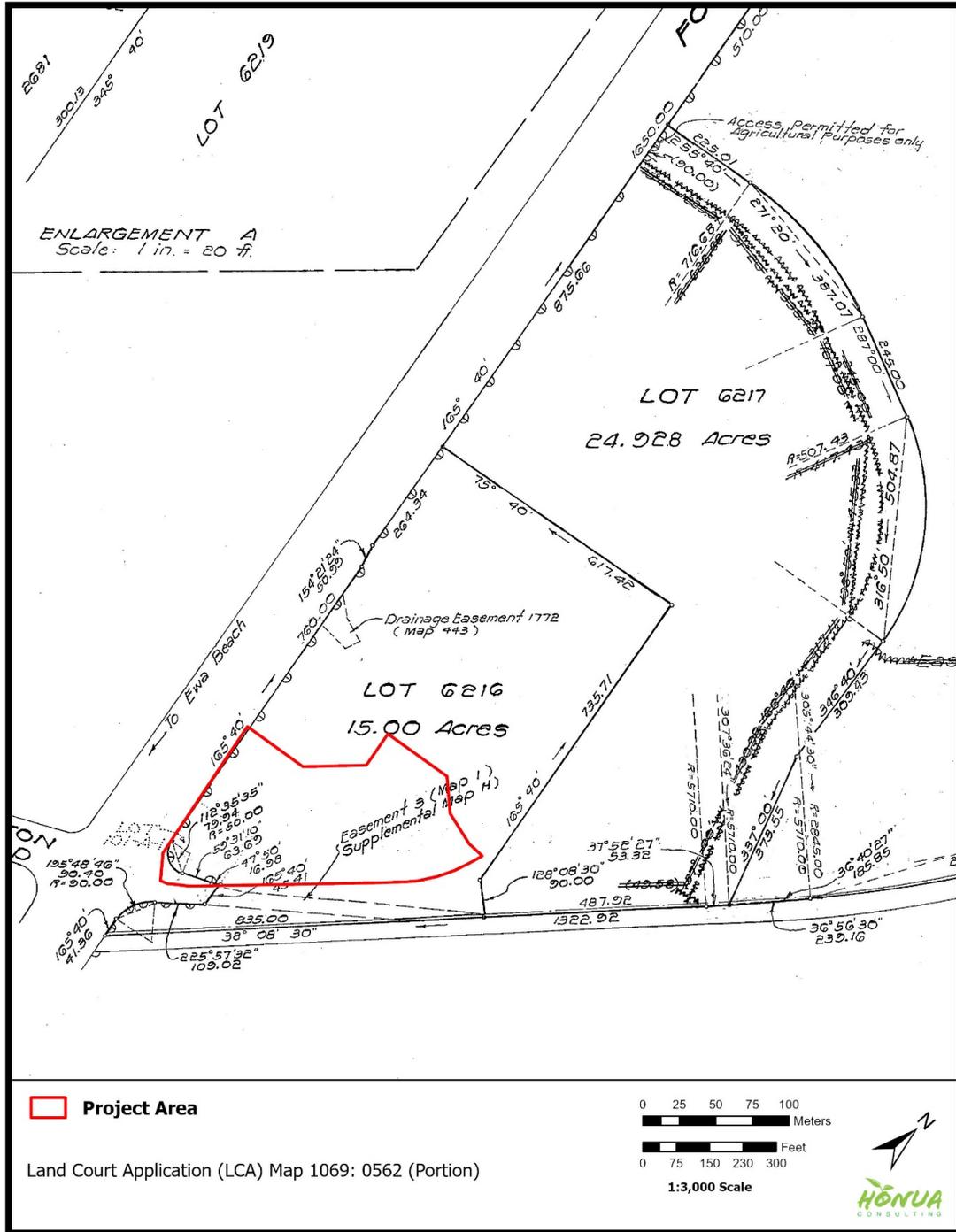
Portion of LCApp 1069 Map 0011 showing the location of the project area within Lot 47 (Mann 1939)



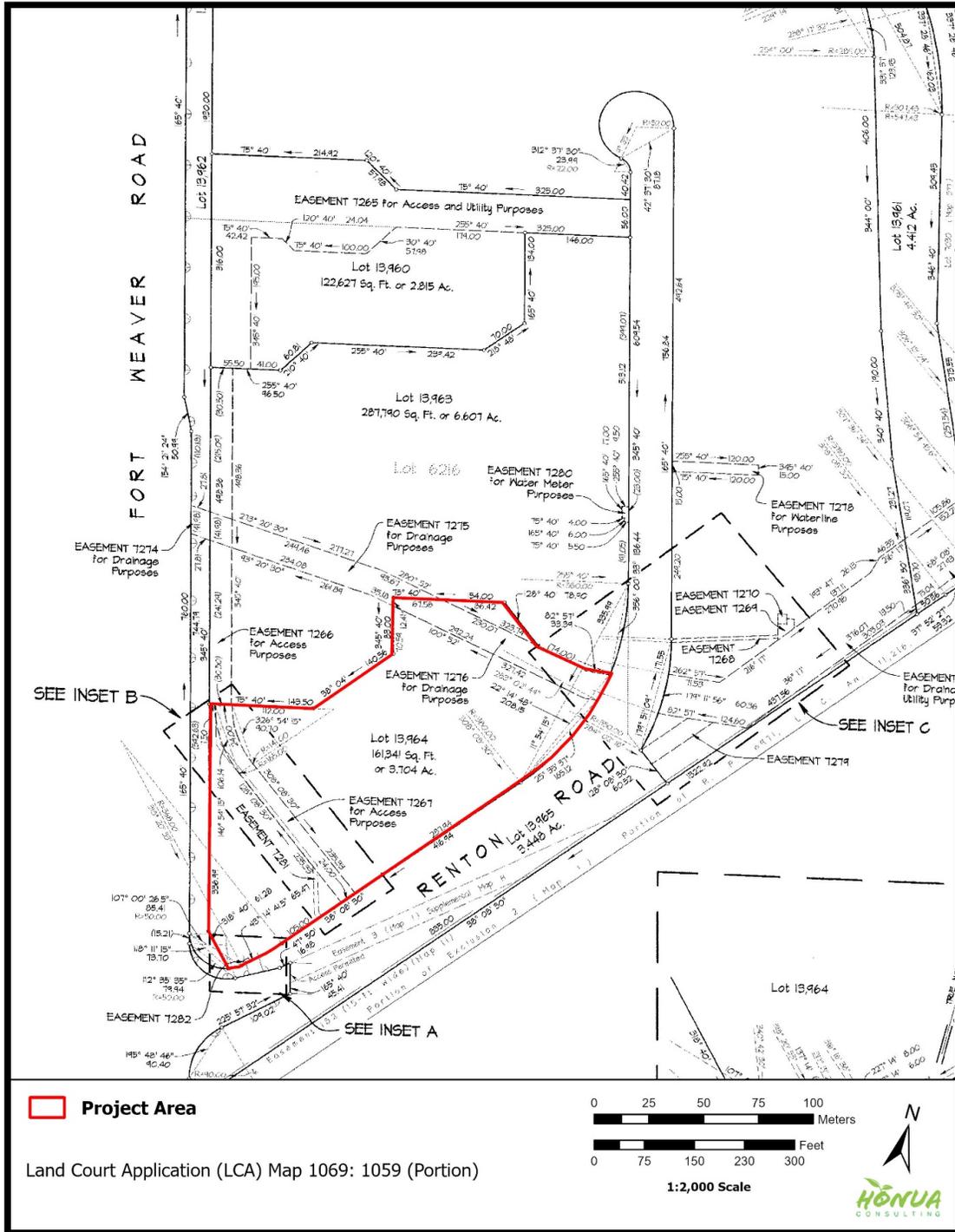
Portion of LCApp 1069 Map 0226 showing the location of the project area within Lot 101-B (Hara 1972)



Portion of LCA App 1069 Map 0521 showing the location of the project area within Lot 5344-A (Figuroa 1990)



Portion of LCA app 1069 Map 0562 showing the location of the project area within Lot 6216 (Figuroa 1990)

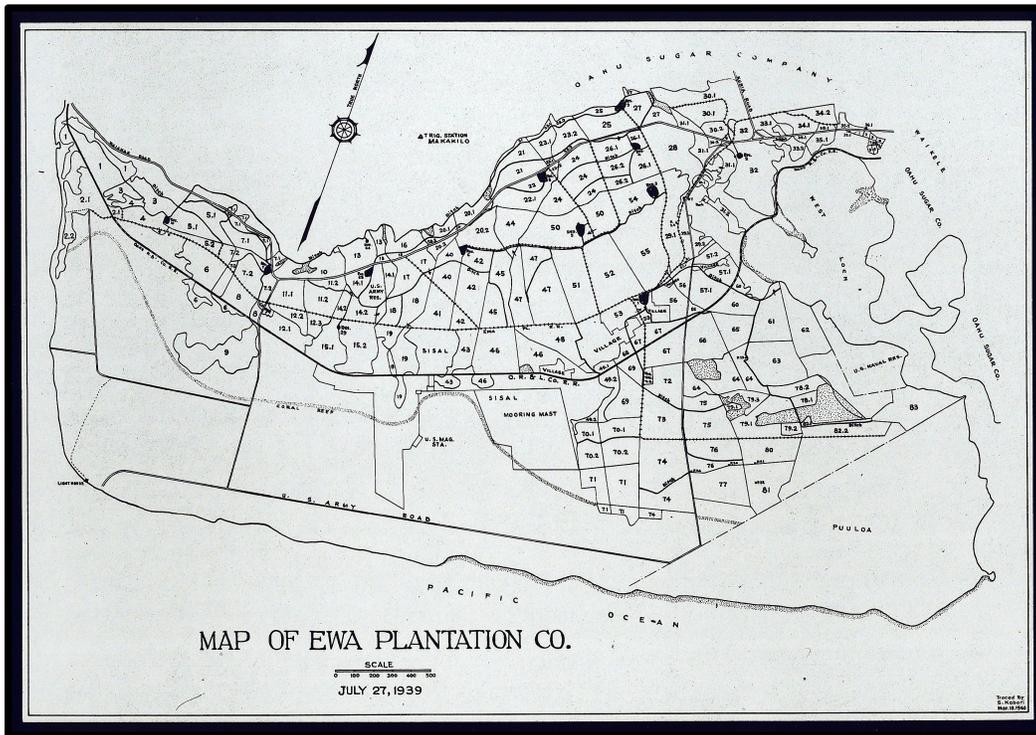


Portion of LCA App 1069 Map 1059 showing the location of the project area within Lot 13964 (Tamamoto 2000)



## Appendix B

*Cultural Impact Assessment Report for the West Loch Affordable Housing Project, Honouliuli  
Ahupua'a, 'Ewa District, O'ahu Island TMKs: (1) 9-1-122:004  
Honua Consulting*



Cultural Impact Assessment Report for the West Loch Affordable Housing Project,  
 Honouliuli Ahupua'a, 'Ewa District, O'ahu Island  
 TMK: [1] 9-1-122:004

Prepared for



Prepared by



September 2021

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### **Note on Hawaiian language usage**

In keeping with other Hawaiian scholars, we do not italicize Hawaiian words. Hawaiian is both the native language of the pae ‘āina of Hawai‘i and an official language of the State of Hawai‘i. 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.

### **Front Cover Credit**

1939 ‘Ewa Plantation Co. Map



## Executive Summary

At the request of Stanford Carr Development, LLC, Honua Consulting conducted a Cultural Impact Assessment in support of the West Loch Affordable Housing Project located in Honouliuli Ahupua'a, 'Ewa District, O'ahu Island, TMK [1] 9-1-122:004. The project area, street address 91-1666 Fort Weaver Road, consists of 3.704 acres (292,026 square feet [sq. ft.] or 27,130 sq. meters [m.]) and is owned by the City and County of Honolulu.

The proposed project plans to construct the West Loch Affordable Housing Project which will consist of 123 rental units divided between seven buildings with an associated community center and community garden. The remainder of the property will be paved for 132 parking stalls and modified for landscaped vegetation and sidewalks. Subsurface excavations will include grading and excavation for foundations and trenching between 1-6 ft below ground surface to connect to existing utilities.

Research in preparation of this report consisted of a thorough search of Hawaiian language documents, including but not limited to the Bishop Museum mele index and Bishop Museum archival documents, including the Hawaiian language archival caché. All Hawaiian language documents were reviewed by Hawaiian language experts to search for relevant information to include in the report. Documents considered relevant to this analysis are included herein, and translations are provided when appropriate to the discussion. Summaries of interviews and information on other oral testimonies are also provided herein.

Based on the information gathered and the assessment of the resources conducted, the project is not anticipated to have any adverse impact on cultural resources, traditions, customs, or practices.

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## Abbreviations and Acronyms

A.B.C.F.M.: American Board of Christian Foreign Missions  
AIS: Archaeological Inventory Survey  
AMR: Archaeological Monitoring Report  
AMSL: Above Mean Sea Level  
APE: Area of Potential Effect  
BMP: Best Management Practice  
CIA: Cultural Impact Assessment  
DFM: City and County of Honolulu Department of Facility Maintenance  
EA: Environmental Assessment  
Fd: Fill Land  
HAR: Hawaii Administrative Rules  
HBWS: Honolulu Board of Water Supply  
HRS: Hawaii Revised Statutes  
HWRF: Honouliuli Water Recycling Facility  
HxA: Honouliuli Clay  
LF: Linear Feet  
MnC: Mamala Stony Silty Clay Loam  
OR&L: O'ahu Railway & Land Company  
PVC: Polyvinyl Chloride  
R-1: Recycled  
R-O: Reverse Osmosis  
ROI: Range of Influence  
ROW: Right of Way  
SIHP: State Inventory of Historic Places  
SLH: Session Laws of Hawai'i  
TMK: Tax Map Key  
USGS: United States Geological Survey  
WkA: Waialua Silty Clay

## I. Project Description

At the request of Stanford Carr Development, LLC, Honua Consulting conducted a Cultural Impact Assessment (CIA) in support of the West Loch Affordable Housing Project located in Honouliuli Ahupua'a, 'Ewa District, O'ahu Island, TMK [1] 9-1-122:004. The project area, street address 91-1666 Fort Weaver Road, consists of 3.704 acres (292,026 square feet [sq. ft.] or 27,130 sq. meters [m.]) and is owned by the City and County of Honolulu.

The proposed project plans to construct the West Loch Affordable Housing Project which will consist of 123 rental units divided between seven buildings with an associated community center and community garden. The remainder of the property will be paved for 132 parking stalls and modified for landscaped vegetation and sidewalks. Subsurface excavations will include grading and excavation for foundations and trenching between 1-6 ft below ground surface to connect to existing utilities.



Figure 1. Location Map of the Project Area



Figure 2. Aerial Photograph of the Project Area

There have been numerous archaeological studies within the current project area. Table 1 provides information that may identify possible historic sites within the project area.

**Table 1. Previous Archaeological Studies in the Vicinity of the Project Area**

Author(s)	Type of Study	Location	Findings
McAllister, 1933	Reconnaissance	Island-Wide	'Ewa Coral Plain (Site 146) (not in Figure 4)
Hammatt and Shideler, 1990	Archaeological Inventory Survey (AIS)	West Loch Bluffs (approx. 5,700 ft / 1 mile north of project area)	5 sites documented, 3 pipe features (SIHP #50-80-12-4344, Features A-C), a stone-faced railroad berm (SIHP #50-80-12-4345), northern pumping station (SIHP #50-80-12-4346), central pumping station (SIHP #50-80-12-4347), and southern pumping station (SIHP #50-80-12-4348)
Hammatt et al., 1990	Reconnaissance Survey	'Ewa Villages ( <b>within project area</b> )	Identified features of 'Ewa Sugar Plantation Villages (SIHP #50-80-12-9786) including Renton Village and mill, Tenney Village, Varona Village, remnants of Mill Village, remnants of Middle Village, remnants of C Village, a plantation cemetery, Reservoir #1, the 'Ewa Depot, a Buddhist temple, and the 'Ewa Japanese School

Author(s)	Type of Study	Location	Findings
Moy, 1995	National Register of Historic Places Registration Form	‘Ewa Villages ( <b>within project area</b> )	‘Ewa Sugar Plantation Villages (SIHP #50-80-12-9786), public district consisting of 287 contributing resources including 285 domestic and agricultural buildings, 1 processing site, and 1 commercial complex used by plantation workers from 1890 to 1957
Spear, 1996	Reconnaissance Survey and Assessment	H.F.D.C-East Kapolei Development Project (approx. 200 ft / 0.04 miles west of project area)	No historic properties documented
Hammatt and Chiogioji, 1997	Reconnaissance Survey	North-South Rd. (approx. 600 ft / 0.1 miles northwest of the project area)	No historic properties documented
O’Hare et al., 2006	AIS	East Kapolei Development Project (approx. 3,000 ft / 0.57 miles northwest of project area)	Five sites previously identified by Hammatt et al. (1990) re-assessed, plantation infrastructure (SIHP #50-80-12-4344, Features A-G), a stone-faced railroad berm (SIHP #50-80-12-4345), northern pumping station (SIHP #50-80-12-4346), central pumping station (SIHP #50-80-12-4347), and southern pumping station (SIHP #50-80-12-4348) were revisited and documented
O’Hare et al., 2007; Souza et al., 2007	Archaeological Assessment; CIA	‘Ewa Industrial Park (approx. 200 ft / 0.04 miles south of project area)	No historic properties documented

Project Description

Author(s)	Type of Study	Location	Findings
Mooney and Cleghorn, 2008	Archaeological Assessment	Two parcel development between Fort Weaver Rd. and Old Fort Weaver Road (approx. 6,500 ft / 1.2 miles northeast of project area)	No historic properties documented
Hammatt, 2010	AIS	Honolulu High-Capacity Transit Corridor Project (approx. 5,000 ft / 0.9 miles north of project area)	Sub-surface lo'i deposit (SIHP #50-80-09-7751) documented near the Waipahu Transit Center
Mooney and Cleghorn, 2010	AIS	Varona Village (adjacent to north side of project area)	Five newly-identified structures of 'Ewa Sugar Plantation Villages (SIHP # -9786), including historic plantation houses (SIHP #50-80-12-7129 and -7130), a house foundation (SIHP #50-80-12-7131 and -7132), and a historic streetlight (SIHP #50-80-12-7133)
Runyon et al., 2010	Archaeological Monitoring Report (AMR)	North-South Rd., Phase IB (approx. 1,500 ft / 0.3 miles north of project area)	No historic properties documented
Mooney and Cleghorn, 2011	Archaeological Assessment	Ka Makana Ali'i (approx. 250 ft / 0.05 miles to west of project area)	No historic properties documented

Project Description

Author(s)	Type of Study	Location	Findings
Runyon et al., 2011	AMR	North-South Road, Phase IC (approx. 11,100 ft / 2.1 miles north of project area)	Burnt trash fill layer (SIHP #50-80-12-7128) with plantation-era artifacts and a previously documented concrete plantation-era water diversion structure containing two sluice gates (SIHP #50-80-14-4664)
Rewick, 2012	National Register of Historic Places Registration Form	Hawaiian Railway Society (adjacent to south side of project area)	OR&L ROW and Hawaiian Railway Society's (HRS) 'Ewa Railroad Yard (OR&L Railroad Baseyard) (SIHP #50-80-12-7387)
Johnson, 2013; Frye and Resnick, 2013	Reconnaissance and Geophysical Survey; State and National Register Nomination	Marine Corps Air Station ('Ewa Field) (230 ft / 0.04 miles to south of project area)	'Ewa Plain Battlefield (SIHP #50-80-12-5127, NR #16000273) finding foundation of an armory, officers' barracks, and storage building, over 500 ft of charred but intact OR&L railway ties without rails, a swimming pool and adjacent pavement, a subsurface fuel tank, and a subsurface latrine
Shideler and Hammatt, 2014	Archaeological Literature Review and Field Inspection	'Ewa Elementary School (560 ft / 0.1 miles northeast of project area)	'Ewa Villages Historic District (SIHP #50-80-12-9786)
Stark et al., 2015	Archaeological Survey and Assessment	'Ewa Elementary School (840 ft / 0.16 miles north of project area)	'Ewa Villages Historic District (SIHP #50-80-12-9786)
Yucha et al., 2015	Archaeological Assessment	Honouliuli Wastewater Treatment Plant (approx. 200 ft / 0.04 miles south of project area)	No historic properties documented

Project Description

Author(s)	Type of Study	Location	Findings
Mooney and Cleghorn, 2017	AMR	Varona Village (adjacent to north side of project area)	45 plantation-era houses of Varona Village, part of the 'Ewa Villages Historic District (SIHP # -9786), several historic artifacts such as glass bottles, bottle fragments, rusted metal machine or automotive parts, and residential building materials were observed in disturbed contexts and fill sediments
Martel and Hammatt, 2018	Archaeological Lit Review and Field Inspection	Kualaka'i Parkway (formerly North-South Rd) (approx. 1,500 ft/ 0.3 miles north of project area)	Remnants of plantation-era infrastructure (SIHP #50-80-12-4664) previously observed within northwest portion of project area (Runyon et al., 2011)

Honua Consulting is also conducting an Archaeological Literature Review and Field Inspection for this project to determine the land-use history of the project area and to identify any potential artifacts, architecture, or cultural deposits present on the ground surface of the property. The report prepared in conjunction with this study provides in-depth analysis of past archaeological studies, while this CIA provides the summary of these studies. The archaeological field inspection consisted of a 100% pedestrian survey of accessible portions of the project area and APE with visual inspection of the ground surface, cut-banks and soil exposures for surface architecture, artifacts and cultural deposits. This pedestrian survey showed that the entire APE has been heavily modified by historic and modern development with no evidence of pre-Contact land use remaining on the surface; no new historic properties nor significant cultural materials were identified within the APE.

## II. Need for a Cultural Impact Assessment

### A. 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 Native Hawaiians and other ethnic groups. To assist decision makers in the protection of cultural resources, Chapter 343, Hawaii Revised Statutes (HRS) and Hawaii 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 Hawai'i (SLH) 2000. Act 50 recognized the importance of protecting Native Hawaiian cultural resources and required that Environmental Impact Statements 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 also 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 cultural impact assessments look at cultural practices and beliefs, which can be associated with a specific location, but also often intangible in nature.

### B. Compliance

The State and its agencies have an obligation to preserve and protect Native Hawaiians'

## Need for a Cultural Impact Assessment

customarily and traditionally exercised rights to the extent feasible.<sup>1</sup> 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 Pa‘akai*, the Hawai‘i 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.
- 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 CIA was prepared under HRS Chapter 343 and Act 50 HSL 2000. The appropriate information concerning Honouliuli ahupua‘a 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 (chants, mele (songs), and/or hula), 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 (places of worship), etc.); culturally significant areas (viewsheds, unmodified

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<sup>1</sup> Article XII, Section 7 of the Hawai‘i State Constitution, *Ka Pa‘akai O Ka ‘Āina v. Land Use Commission*, 94 Haw. 31 [2000](*Ka Pa‘akai*), Act 50 HSL 2000.

## Need for a Cultural Impact Assessment

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.

The EA for which this CIA was written in support will provide 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 EA 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.

Environmental factors potentially influencing the distribution of historic properties will also be evaluated in the EA. The resulting data will be analyzed to develop a general settlement pattern model for the area that helps estimate the likely types and distribution of historic properties. The potential significance and required treatment of expected historic properties will also be summarized. The goal of this work is to develop recommendations to assist with future infrastructure planning that minimizes adverse effects upon historic properties.

The Range of Influence (ROI) 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 EA and Archaeological Literature Review and Field Inspection. It primarily researches and reviews the range of biocultural resources identified through historical documents, traditional knowledge, information found in the Hawaiian language

## Need for a Cultural Impact Assessment

historical caché, and oral histories and knowledge collected from experts and cultural practitioners and experts.

### **C. Methodology**

The approach to developing the CIA is as follows:

- I. 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.
- II. Identify Potential Impacts to Cultural Resources
- III. 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 mitigate and/or reduce any impacts to cultural practices and/or resources.

In ancient times, named localities served a variety of functions, telling people about: (1) places where the gods walked the earth and changed the lives of people for good or worse; (2) heiau or other features of ceremonial importance; (3) triangulation points such as ko'a (ceremonial markers) for fishing grounds and fishing sites; (4) residences and burial sites; (5) areas of planting; (6) water sources; (7) trails and trail side resting places (o'io'ina), such as a rock

shelter or tree shaded spot; (8) the sources of particular natural resources/resource collections areas, or any number of other features; or (9) notable events which occurred at a given area. Through place names, knowledge of the past and places of significance were handed down across countless generations.

The 58 place names that follow below are a sampling of nearly 200 named localities that stand out as being significant indicators of cultural attachment for locations in Honouliuli ahupua‘a (Table 2). Most of the names were identified—and their origins rooted—in ancient traditions; others were recorded through historical accounts such as in claims of the Māhele ‘Āina (Land Division) of 1848 or in other descriptions of land and land use.

**Table 2. Selected Place Names of Honouliuli Ahupua‘a**

Inoa ‘Āina	Description
‘Aihonu	A named locality. Cited with project area claims of the Māhele.
Ha‘alelenui	A land area. Cited with project area claims of the Māhele.
Hale‘au‘au	An upland region between Pu‘uku‘ua and Kānehōa. Cited in the tradition of Hi‘iaka-i-ka-poli-o-Pele.
Hanakāhi (Lae o Halakāhi)	Pu‘uloa/Honouliuli. Site named for a man who resided at this place, and who called upon the unknown gods, making offerings and asking for their blessings in his livelihood as a fisherman. Kāne and Kanaloa heard his prayers and visited him, granting his request because of his faithfulness to them. They built fishponds at Keanapua‘a, Kepo‘okala, and at Kapākule for him. Kapākule, near the shores of Keahi, was the best formed of the ponds and fed Hanakāhi’s family and later generations of ‘Ewa residents for hundreds of years ( <i>Ka Loea Kalaiaina</i> , 1899). The fishery boundary of Hanakāhi (Halakāhi) was disputed with Hālawa.

Inoa 'Āina	Description
Hilo-one	A coastal area famed in mele from the tradition of Hi'iaka-i-ka-poli-o-Pele.
Hoakalei	A coastal spring famed in mele from the tradition of Hi'iaka-i-ka-poli-o-Pele.
Honouliuli	<p>Ahupua'a. In one tradition, Honouliuli is named for a chief of the same name, who was the husband of Kapālama. They were the parents of Lepeamoa and Kaulani, two heroes in ancient tradition.</p> <p>Numerous claims cited in the Māhele, though the awarded claims were generally in the "taro lands" section of Honouliuli (see Register Map No. 630) in a watered area shoreward of the proposed rail alignment corridor. In traditional times, the land area known as Pu'uloa was an 'ili of Honouliuli, though it was sold as a separate land during the time of the Māhele. All native tenant claims made for kuleana at Pu'uloa were given up by the claimants.</p> <p>"Large terrace areas are shown on the U.S. Geological survey map of Oahu (1917) bordering West Loch of Pearl Harbor, the indication being that these are still under cultivation. I am told that taro is still grown here. This is evidently what is referred to as 'Ewa taro lands.' Of the Honouliuli coral plains McAllister (44, site 146) says: '...It is probable that the holes and pits in the coral were formerly used by the Hawaiians. Frequently the soil on the floor of the larger pits was used for cultivation, and even today one comes upon bananas and Hawaiian sugar cane still growing in them'" (Handy, 1940:82).</p>
Hopenui	A land area. Cited with project area claims of the Māhele.

Inoa 'Āina	Description
Kahāhāpū	A named locality. Cited in project area claims of the Māhele.
Kaihuopala'ai	An 'ili and fishery. Cited in claims of the Māhele. This place was famed in ancient times for its 'anae (mullet). Ka'ulu and 'Apoka'a (a husband and wife; also named localities) were the parents of two human children and two supernatural children, Kaihuopala'ai (a son) and Kaihuku'una (a daughter). When Kaihuopala'ai matured, he married Ka'ōhai. To Kaihuopala'ai and Ka'ōhai were born Pūhi Lo Laumeki (a son) and Kapapapūhi (a daughter). Their story is told in the traditions of Ka 'Anae o Kaihuopala'ai and Makanike'oe.
Kalaeokāne	An area disputed between the people of Honouliuli and Waikele. Site of the ancient village, Kupali'i (Boundary Commission testimonies). The name translates as "The point of Kāne," and may be suggested to be associated with the tradition of a visit by the gods Kāne and Kanaloa to the region. Cited in the tradition of Maihea.
Kalo'i	Kalo'i (Kalo'i) is a traditional name used at several areas in Honouliuli Ahupua'a that are all connected by a series of gulches from the uplands near the 2,200 foot elevation to the shore. Following the ethno-historical record, the names Kalo'i, Kalo'i iki, Kalo'i li'ili'i and Kalo'i loa follow from the uplands to the taro land region of Honouliuli, with the latter names being cited in L.C.A. Helu 901, 1570, and 1713.
Kamalua	A land area. Cited with project area claims of the Māhele.

Inoa 'Āina	Description
Kama'oma'o	Honouliuli (see also Nāwahineokama'oma'o). An area on the kula lands within view of Pu'u o Kapolei, and associated with Kaupe'a. Named for a supernatural woman who dwelt in the area. The flat land plains of wandering spirits (also see Kaupe'a). Cited in the tradition of Hi'iaka-i-ka-poli-Pele and in historical narratives.
Kamo'oiki	An 'ili. Cited with project area claims of the Māhele.
Kānehili	Honouliuli/Pu'uloa. An open kula land, noted in tradition for its association with Kaupe'a and as a place of wandering spirits. An inhospitable zone. Cited in the tradition of Hi'iaka-i-ka-poli-o-Pele and in historical narratives.
Kānehoa	A mountain pass, famed in traditional lore and mele. Noted for its growth of kupukupu ferns, and the wind, Waikōloa, which blows from the mountains to the sea. Cited in the traditions of Hi'iaka-i-ka-poli-o-Pele and in historical narratives.
Ka'olina (Ko'olina)	An ancient village site on the western shore, between Lae Loa and Pili o Kahe. Cited in the tradition of Hi'iaka-i-ka-poli-o-Pele and historical narratives.
Kapākule	Pu'uloa-Honouliuli. A fishpond/fish trap on the inner shore of Pu'uloa (across from Hālawa), made by the gods Kāne and Kanaloa for the benefit of Hanakāhi, who faithfully worshipped them. Cited in the tradition of Maihea.
Kapapapūhi (Kapapaapūhi)	Honouliuli-Hō'ae'ae boundary zone. A small point on the shore between these two ahupua'a. Also the name of a fishery for Honouliuli. Kapapaapūhi was named for the daughter of Kaihuopala'ai and Ka'ōhai, whose history is told in the traditions of Mekanike'oe and Pūhi o Laumeki.

Inoa 'Āina	Description
Ka'ulu	Hō'ae'ae-Honouliuli boundary zone. An ancient village site, known as "Coneyville" in historic times—named for John H. Coney, who was married to Ami, sister of Amoe Ha'alelele'a, from who he purchased the ahupua'a of Honouliuli (Boundary Commission testimonies, 1873). Reportedly named for the chief, Ka-'ulu-hua-i-ka-hāpapa (Pukui et al., 1974:93).
Kaupe'a	An area noted as the wandering place of the spirits of the dead, who are seeking their way to another realm. An uninhabited plain with wiliwili ( <i>Erythrina</i> ) trees and 'ōhai ( <i>Sesbania tomentosa</i> ) plants, and associated with Kānehili and Leiolono. From Kaupe'a one may see Leiolono where unclaimed spirits are lost on never ending darkness.
Keahi	Pu'uloa-Honouliuli. An ancient village site named for a beautiful woman who once lived there. For a time, Kamapua'a also lived at Keahi. In the tradition of Kaihuopala'ai, Keahi and Mokuo'eō (an island in the sea fronting Moanalua) were named as companions ( <i>Ka Loea Kalaiaina</i> , 1899; claims of the Māhele).

Inoa 'Āina	Description
Keahumoa	<p>Kula on the inland slopes of 'Ewa, within which is found Kunia, and continuing up to Līhu'e on one side; bounded by Kīpapa on the other side. The area was once extensively cultivated with native crops, planted originally by Ka'ōpele. The fields could be seen when looking makai from the mountain pass at Pōhākea. Cited in the traditions of Hi'iaka-i-ka-poli-o-Pele and Kalelealuakā.</p> <p>There is also situated at Keahumoa, two famous māla 'uala (sweet potato fields) which bear the name, Nāmakaokapā'o. Pūali'i was killed here, later a king of O'ahu and his warriors were also killed here. Cited in the tradition, "Kaa no Namakaokapao" (1918).</p>
Keoneae	A place situated along the old trail between Honouliuli and Wai'anae, on the Pu'uloa side of Pu'uokapolei.
Kohepalaoa	Pu'uloa-Honouliuli. An 'ili and fishpond. Cited in claims of the Māhele and in historic narratives of Pu'uloa.
Kuai'ōpelu	An 'ili. Cited with project area claims of the Māhele.
Kualaka'i	An ancient village site situated on the western shore. Cited in native traditions and claims of the Māhele.
Kumuhau	An 'ili. Cited with project area claims of the Māhele.
Kumumamo	Honouliuli coastal plains. Cited in historical mele.
Kunia	An upland 'ili. Part of the larger Keahumoa plains and site of a battle in the time of Kūali'i.
Kupaka	A former village site in the 'ili of Pu'uloa, situated on the ocean fronting shore of Honouliuli, west of Keahi, and marked on historical maps with a stone wall complex. Cited in historical accounts and oral history interviews.

Inoa 'Āina	Description
Kupali'i	A village site at Kaleokāne. The area disputed between the people of Honouliuli and Waikele; "...in assessing the ancient tax, putting houses on the line so as to evade both..." (Honouliuli Boundary Commission testimonies, 1873).
Lae o Kahuka	Pu'uloa-Honouliuli. A point marked by a large pile of stones along the inner shore of Ke awa lau o Pu'uloa.
Laeloa (Kalaeloa)	A low point of land now known as "Barber's Point." Cited in several traditions and historical accounts.
Līhu'e	An upland plain and lower mountain region. Waikōloa is a strong wind of Līhu'e that blows from the uplands to the lowlands (cited in Nakuina, 1901). Mau'unēnē is a light breeze that blows down the slopes of Līhu'e to the lowlands of 'Ewa ( <i>Ka Loea Kalaiaina</i> , 1899).
Manawai'elelu	Honouliuli, Hō'ae'ae and Waikele boundary junction zone. A gulch near Poliwai and site of an ancient hōlua track (Boundary Commission testimonies).
Mokumeha	Named for a son of Kaihuopala'ai and Ka'ōhai, the brother of Laumeki. Cited in the tradition of Pūhi o Laumeki. Cited in claims of the Māhele.
Mo'okapu	Honouliuli-Waikele boundary zone. An ancient path which leads into Wai'anae uka (Boundary Commission testimonies, 1873).
Nāmakaokapāo'o	An area of māla 'uala situated on the plain of Keahumoa, a short distance below Kīpapa. Named for a youth who once lived nearby. Cited in the tradition, "Kaa no Namakaokapao" (1918).
Nāwahineokama'oma'o	Honouliuli (see also Kama'oma'o). An area on the kula lands named for a companion of Pu'u o Kapolei. Cited in the tradition of Hi'iaka-i-ka-poli-o-Pele.

Inoa 'Āina	Description
Pālā'au	An 'ili. Cited with project area claims of the Māhele.
Papio	An area in the bay fronting Honouliuli where the chiefess of the same name was killed in an act of anger by the shark-goddess, Ka'ahupāhau. Koihala, Ka'ahupāhau's human attendant, was insulted by Papio and asked that she be killed. The site is also referred to as "Kanahunaopapio." The coral body form of Ka'ahupāhau is also found near this site ( <i>Home Rula Repubalika</i> , Mar. 15, 1902).
Pau-ku'u-loa "Aole i pau ku'u loa"	Waikele-Honouliuli. A near shore land and fishery (below Hō'ae'ae), fronting Ulemoku (Boundary Commission testimonies, 1873). The source of naming this place is found in the tradition of Pu'uku'ua ( <i>Ka Loea Kalaiaina</i> , 1899).
Pe'ekāua	Situated on the plain between Pu'uokapolei and Waimānalo. A place famed in the tradition of Hi'iaka's journey across 'Ewa. Pe'ekaua is found on the mauka side of the trail, where there is a large rock standing on the plain. Cited in the tradition of Hi'iaka-i-ka-poli-o-Pele.
Piliokahe	The boundary marker between Honouliuli, 'Ewa, and Nānākuli of the Wai'anae District. The boundary was made during the journey of Kāne and Kanaloa across 'Ewa. During their game of ulu-maika, the boundaries were set by where the stone stopped rolling. Cited in traditions and historical accounts.
Pōhākea	A famed mountain pass over which an ancient trail between Honouliuli and Wai'anae crossed. Noted in several native traditions for its commanding view plane to the lowlands and noted places of the 'Ewa District. One branch of the trail to Pōhākea passed near Pu'uokapolei. Cited in the traditions of Kāne, Kanaloa and Hi'iaka-i-ka-poli-o-Pele.

Inoa 'Āina	Description
Pōhaku Mokomoko	A stone on the shore marking the boundary between Honouliuli and Hō'ae'ae, situated along the side of the government road (Boundary Commission testimonies, 1875).
Pōhakupalahalaha	A "well known rock along the trail" between Honouliuli and Hō'ae'ae (Boundary Commission testimonies, 1873).
Po'ohilo	An 'ili. Named from events following a battle in the Kīpapa-Waikakalaua region, in ca. 1400s, in which the head of Hilo (an invading chief) was placed on a stake at this site and displayed. A named locality cited in project area claims of the Māhele.
Poupouwela	An 'ili, a stream and spring site. One of the lo'i kalo lands of Honouliuli. Cited in historical land records.
Pu'uku'ua	A hill of the inland region of Honouliuli. A place where chiefs once lived and a battle field. It is said that the place named "Pau ku'u loa" originated from a practice of the people here at Pu'uku'ua. Kāne and Kanaloa, tired of working, set aside their work here to return to Kahiki ( <i>Ka Loea Kalaiaina</i> , 1899).
Pu'uloa	This land was traditionally an 'ili of Honouliuli and marked the entrance to Ke awa lau o Pu'uloa (The many bays of Pu'uloa – Pearl Harbor, Pearl River or Wai Momi). The waters of Pu'uloa were protected by the shark goddess Ka'ahupāhau, her brother, Kahi'ukā, and the little shark god Ka'ehu-iki-manō-o-Pu'uloa.

Inoa 'Āina	Description
Pu'u-o-Kapo-lei	<p>This hill was named for the goddess Kapo, an elder sister of Pele. It was also the home of the supernatural grandmother of the demigod, Kamapua'a (Kahiolo, 1861); a storied hill on the plains of Honouliuli (<i>Ka Loea Kalaiaina</i>, 1899).</p> <p>S.M. Kamakau recorded the tradition that Pu'u o Kapolei was used by the people of O'ahu to mark the seasons of the year. When the sun set over the hill, it was Kau (summer). When the sun moved south, setting beyond the hill, it was Ho'oilo (winter) (Kamakau, 1976:14).</p> <p>The old government road passed behind this pu'u. Pu'uku'ua is viewed further inland from this hill. The plains around this region were covered with sugarcane by the late 1890s. A heiau once situated on this hill and a rock shelter were destroyed in the early 1900s (McAllister, 1933:108, Site 138).</p>
Pu'u Pālailai	<p>A hill situated north west of Pu'u o Kapolei. Pālailai is cited in mele recorded in the tradition of Hi'iaka-i-ka-poli-o-Pele.</p>
Waimānalo	<p>An 'ili. This is one of the "wai" (watered lands) granted to priests of the Lono class, by the demigod, Kamapua'a. During the time of Kākuhihewa (King of O'ahu, ca. 1500s), Waimānalo was home of a priest named Nāpuaikama'o. It was this priest who traveled to Ko'olina, where Kākuhihewa was waiting and foretold that Kalelealuakā would gain victory in the battles being brought to O'ahu's shores. Cited in claims of the Māhele.</p>

Inoa 'Āina	Description
Waipōuli	A cave situated about five miles below Nāmakaokapāo'o and the Keahumoa plain. The place where the head of Pūali'i was thrown after he was killed. The cave was used for a time as a shelter to hide Pōka'i, mother of Nāmakaokapāo'o. Cited in the tradition "Kaa no Namakaokapao" (1918).
Wanue	An area near the Kapapapūhi region of the Honouliuli shore line, named for a relative of Kaihuopala'ai (cited in Manu, 1895).

### III. Description of Project Area

The project area is located in the ahupua‘a of Honouliuli within the moku of ‘Ewa. In one tradition, Honouliuli is named for a chief of the same name, who was the husband of Kapālama. They were the parents of Lepeamoa and Kaulani, two heroes in ancient tradition (Westervelt, 1915). In traditional times, the land area known as Pu‘uloa was an ‘ili of Honouliuli, though it was sold as a separate land during the time of the Māhele. All native tenant claims made for kuleana at Pu‘uloa were given up by the claimants.

#### A. Ahupua‘a of Honouliuli: Boundary Commission Description

Following the Māhele ‘Āina, there was a growing movement to fence off the land areas and control access to resources that native tenants had traditionally used. In the 1860s, foreign landowners and business interests petitioned the Crown to have the boundaries of their respective lands, which became the foundation for plantation and ranching interests, settled. In 1862, the King appointed a Commission of Boundaries (the Boundary Commission) and tasked them with collecting traditional knowledge of place, land boundaries, customary practices, and deciding the most equitable boundaries for each ahupua‘a that had been awarded to Ali‘i, Konohiki, and foreigners during the Māhele.

The commission proceedings were conducted under the courts and as formal actions under law. As the commissioners on the various islands undertook their work, the kingdom hired or contracted surveyors to begin the surveys. In 1874, the commissioners were authorized to certify the boundaries for lands brought before them (Alexander, 1891:117-118).

Records from the ‘Ewa District were recorded between 1868 and 1904, with the proceeding from Honouliuli being held between 1873 and 1874. The records include testimonies of elder kama‘āina who were either recipients of kuleana in the Māhele or were the direct descendants of the original fee-simple title holders. The narratives that follow include several types of documentation such as the preliminary requests for establishing the boundaries, letters from the surveyors in the field, excerpts from surveyor’s field books (Register Books),

## Description of Project Area

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the record of testimonies given by native residents of the lands, and the entire record of the Commission in certifying the boundaries of each ahupua'a. The resulting documentation offers descriptions of the land extending from ocean fisheries to the mountain peaks, traditional and customary practices, land use, changes in the landscape witnessed over the informants' lifetime, and various cultural features.

The native witnesses usually spoke in Hawaiian; in some instances, their testimony was translated into English and transcribed as the proceedings occurred. Other testimonies were transcribed in Hawaiian but have now been translated for inclusion in this study.

The Boundary Commission proceedings documented many traditional place names and features along the boundaries of the ahupua'a, with locations extending from the sea (including fishponds and fisheries) to the mountain peaks. These names demonstrate Hawaiian familiarity with the resources, topography, sites and features of the entire ahupua'a. Coulter observed that Hawaiians had place names for all manner of feature, ranging from "outstanding cliffs" to what he described as "trivial land marks" (1931:10). History tells us that named locations were significant in past times: "Names would not have been given to [or remembered if they were] mere worthless pieces of topography" (Handy et al., 1972:412).

In ancient times, named localities signified that a variety of uses and functions occurred, including:

- (1) Triangulation points such as ko'a (land markers for fishing grounds and specific offshore fishing localities);
- (2) Residences; areas of planting;
- (3) Water sources;
- (4) Trails and trail-side resting places (o'io'ina), such as a rock shelter or tree shaded spot;
- (5) Heiau or other features of ceremonial importance;
- (6) May have been the source of a particular natural resource or any number of

Description of Project Area

other features; or

- (7) The names may record a particular event or practice (e.g., use for burials, the making of ko'i or adzes, or designation as a fishery) that occurred in a given area.

Place names called out by witnesses before the commissioners have been compiled and are cited below. A number of the place names remain in use on maps or among some residents, while others are no longer in use. Of particular note are several place names and their associated narratives which document wahi pana (storied or sacred places) on the traditional landscape. The place names cited in the Honouliuli Boundary Proceedings include:

Apokaa	Keahi Pouhala	Mookapu
Auiole Manawahua	Koolina	Nanakuli
Ekahanui Gulch	Kualakai	Panau
Hanohano	Kupalii	Papapuhi (Kapapapuhi)
Homaikaia	Lae o Halakahi	Pili o Kahe (Pili o Kahi)
Hoaeae	Lae o Kahuka	Pohaku Palahalaha
Kahakai	Laeloa	Pookela
Kahapapa	Laeokane (Kalaekane)	Puu Kuuu
Kalanimua	Lihue	Puuloa
Kapuna	Manawaiielelu	Waieli (Kawaieli)
Kauela (Keoneula)	Mauna Kapu	Waikakalaua
Kaulu (Coneyville)	Miki	Waimanalo

**B. Physical Environment**

'Ewa moku consists of 12 ahupua'a, listed from easternmost to westernmost: Hālawa, 'Aiea, Kalauao, Waimalu, Waiau, Waimano, Mānana (Iki and Uka), Wai'awa, Waipi'o, Waikele, Hō'ae'ae, and Honouliuli (Figure 5). The project area was observed to be predominantly comprised of introduced grasses and trees during the pedestrian survey as a result of

Description of Project Area

residential landscaping; the proposed project will have no impact on endangered or native species.

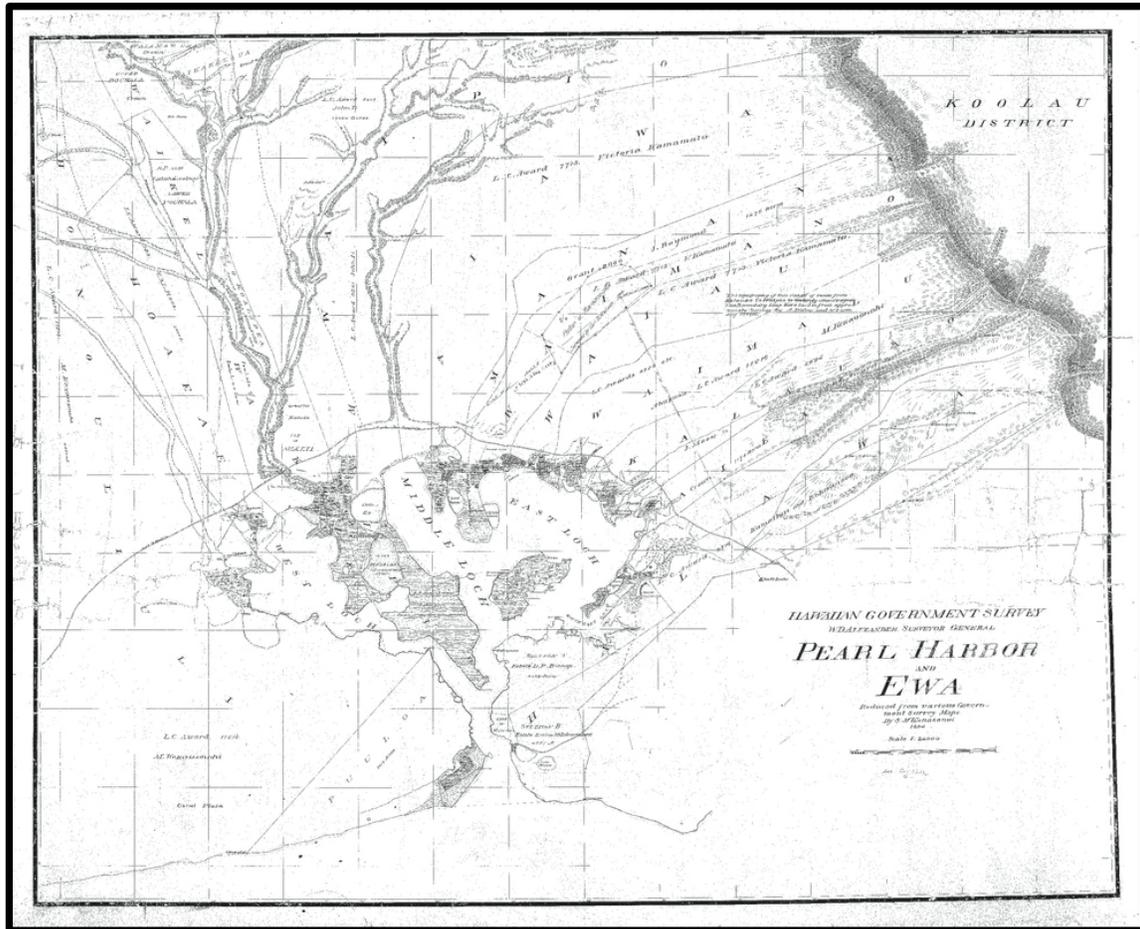


Figure 3. Map of Ahupua‘a in the ‘Ewa Moku (Hawaiian Government Survey, Registered Map No. 1739 by S.M. Kakanui, 1894)

The APE ranges from approximately 40 to 55 feet (12.1 to 16.8 meters) above mean sea level (AMSL) and extends approximately 2 miles north (3,219 meters) from the southern O‘ahu coast. The annual high temperature is 84°F (28.9°C) and the annual low temperature is 67.6°F (19.8°C), with an average temperature of 75.8°F (24.3°C) (U.S. Climate Data, 2019).

## Description of Project Area

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Annual precipitation is low at 17.91 inches (454.9 mm) compared to the state average of 63.7 inches (1,618 mm), with prevailing winds from the northeast at annual average speeds of 15 mph (U.S. Climate Data, 2019).

Soils within, and in proximity to, the project area include Fill Land (Fd), Honouliuli Clay (HxA), 0 to 2% slopes, Mamala Stony Silty Clay Loam (MnC), 0 to 12% slopes, and Waialua Silty Clay (WkA), 0 to 3% slopes (Foote et al., 1972; Figure 6). The soils within the project area are associated with irrigated sugarcane cultivation and have been highly impacted by historic and modern activities.

The soils in the southern portion of the project area is largely comprised of MnC. The Mamala soil series consist of shallow, well-drained soils along the coastal plains which formed from alluvium deposited over coral limestone and consolidated calcareous sand (Foote et al., 1972:93). This soil type has moderate permeability, very slow to medium runoff, and slight to moderate erosion hazard. The Mamala soil series is primarily used for sugarcane, truck crops, orchards, and pasture; natural vegetation includes kiawe (*Prosopis pallida*), koa haole (*Leucaena leucocephala*), bristly foxtail (*Setaria parviflora*), and swollen fingergrass (*Chloris barbata*).

The soils in the northern portion of the project area is largely comprised of HxA. The Honouliuli series consists of deep, well-drained soils on coastal plains which formed in alluvium weathered from basic igneous rocks (Foote et al., 1972:43). The soil type has moderately slow permeability, slow runoff, and no more than slight erosion hazard. The Honouliuli soil series is primarily used for sugarcane, truck crops, orchards, and pasture; natural vegetation includes kiawe, koa haole, fingergrass (*Digitaria* sp.), bristly foxtail, and bermudagrass (*Cynodon dactylon*).

The built environment in the vicinity of the APE includes the O'ahu Railway base yard near the southwestern portion of the APE, a plantation-era residential area with previously documented historic properties (houses, foundations, and a lamp post) immediately northeast of the base

Description of Project Area

yard, Kapolei Parkway and Renton Road Bridge in the central portion of the APE, ‘Ewa Mahiko Park in the eastern portion of the APE, and ‘Ewa Villages subdivision in the northeast.

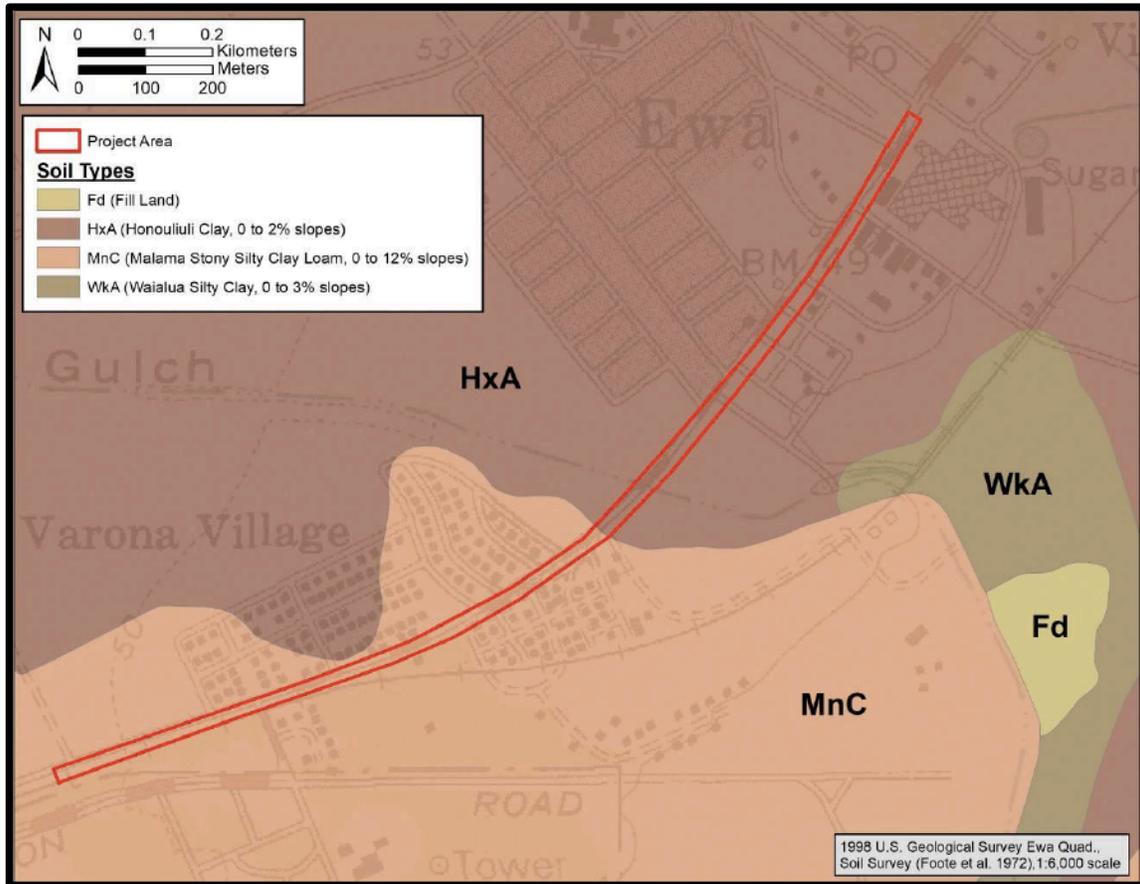


Figure 4. Portion of a 1998 ‘Ewa USGS Topographic Quadrangle Map with Soil Series Overlay showing anticipated soils within the Project Area and APE (Foote et al., 1972)

**C. Biocultural Environment**

To employ the Hawaiian landscape perspective and emphasize the symbiosis of natural and cultural resources, Honua Consulting uses the term ‘biocultural’ to refer to natural and cultural resources, with additional sub-classifications by attributes.

Honua Consulting employs three broad terms that are both well-defined and flexible enough to be used to place traditional cultural areas/properties, naturally occurring non-modified

## Description of Project Area

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features, archaeological features, and other areas of cultural significance within a specific spatial-temporal framework. Hawaiian epistemology categorizes ecological regions much like non-indigenous science categorizes different ecosystems in biomes. Hawaiian ecological regions are referred to as wao (realms). While numerous wao exist, focus is placed on the wao most important to this assessment:

**Wao kānaka:** the region, usually from coast to inland plain (exclusive of inland forests), characterized by permanent human occupation, active resource management, and resource modification. This is observable through the presence of archaeological features indicating permanent occupation, including large concentrations of house lot complexes, religious complexes, and fishponds.

**Wao kele:** the inland forest region, including rain-belt forests, characterized by large-scale subsistence systems, active resource management, and resource modification. This is observable through the presence of agriculture-related archaeological features, fewer heiau than the wao kānaka region, and smaller concentrations of house lots.

**Wao akua:** the distant realm inhabited by the gods and demigods, this area was kapu and the general populous only entered the realm with reverence. Wao akua can include the mountains, mountain tops, and ridges of entire islands and/or regions where clouds settle upon the land (thus at varying elevational zones depending on district and region).

A brief further discussion of environmental zones and traditional Hawaiian land management practices is necessary to understand the tangible and intangible aspects of the Hawaiian landscape. Additionally, it is important to point out once again that in the Hawaiian landscape, all natural and cultural resources are interrelated and culturally significant. Natural unaltered landscape features such as rocky outcrops, cinder cones, intermittent streams, or an open plain can carry as much significance as a planted grove of wauke (*Broussonetia papyrifera*) or a boulder-lined 'auwai (canal).

## Description of Project Area

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Maly presents a narrative of traditional Hawaiian land management strategies and the different environmental zones recorded in *Ka Hoku o Hawaii* (September 21, 1916):

Hawaiian customs and practices demonstrate the belief that all portions of the land and environment are related, like members of an extended family, each environmental zone was named, and their individual attributes were known. Acknowledging the relationship of one environmental zone (wao) to another, is rooted in traditional land management practices and values. Just as place names tell us that areas are of cultural importance, the occurrence of a Hawaiian nomenclature for environmental zones also tells us that there was an intimate relationship between Hawaiians and their environment.

The native tradition of Ka-Miki provides readers with a detailed account of Hawaiian land divisions and environmental zones. While competing in a riddling contest at the court of the chief, Palikū-a-Kīko'oko'o, the hero, Ka-Miki sparred with Pīna'au, the foremost riddler of the district of Hilo Palikū (northern Hilo). The riddles covered topics describing regions from the mountain tips to the depths of the ocean, and descriptions of kalo (taro growth), the ala loa (trail systems), and nā mea lawai'a (fishing practices). As the contest unfolded, it was seen that each of the competitors were well matched. In one of the riddles, Ka-Miki described the various regions of the island of Hawaii, extending from the mountain to the sea. Ka-Miki then told his opponent, that if he could rise to the challenge of answering the riddle, his knowledge could be compared to one who has ascended to the summit of the "mauna o Paliahu" (mountain of Poli'ahu, or Mauna Kea) (in *Ka Hoku o Hawaii*, September 21, 1916).

Through one of the riddles [the] reader learn[s] about the traditional wao or regions of land, districts, and land divisions of the administrators who kept peace upon the land. The environmental zones include:

## Description of Project Area

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1 – Ke kuahiwi; 2 – Ke kualono; 3 – Ke kaumauna; 4 – Ke ku(a)hea; 5 – Ke kaolo; 6 – Ka wao; 7 – Ka wau ma‘u kele; 8 – Ka wao kele; 9 – Ka wao akua; 10 – Ka wao lā‘au; 11 – Ka wao kānaka; 12 – Ka ‘ama‘u; 13 – Ka ‘āpa‘a; 14 – Ka pahe‘e; 15 – Ke kula; 16 – Ka ‘ilima; 17 – Ka pu‘eone; 18 – Ka po‘ina nalu; 19 – Ke kai kohola; 20 – Ke kai ‘ele; 21 – Ke kai uli; 22 – Ke kai pualena; 23 – Kai Pōpolohua-a-Kāne-i-Tahiti.

1 – The mountain; 2 – The region near the mountain top; 3 – The mountain top; 4 – The misty ridge; 5 – The trail ways; 6 – The inland regions; 7 and 8 – The rain belt regions; 9 – The distant area inhabited by gods; 10 – The forested region; 11 – The region of people below; 12 – The place of ‘ama‘u (fern upland agricultural zone); 13 – The arid plains; 14 – The place of wet land planting; 15 – The plain or open country; 16 – The place of ‘ilima growth (a seaward, and generally arid section of the kula; 17 – The dunes; 18 – The place covered by waves (shoreline); 19 – The shallow sea (shoreline reef flats); 20 – The dark sea; 21 – The deep blue-green sea; 22 – The yellow (sun-reflecting sea on the horizon); and 23 – The deep purplish black sea of Kāne at Tahiti (Maly, 2001:3).

The large ‘Ewa moku once encompassed both seaward and high interior plains, the Ko‘olau mountain range’s deep leeward valleys, and the coastal region of the Wai‘anae range, but this area has been since been diminished due to political redivisioning (Handy et al., 1972). Handy and Handy describe the climate and features of ‘Ewa:

The salient feature of ‘Ewa...is its spacious coastal plain, surrounding the deep bays (“lochs”) of Pearl Harbor, which are actually the drowned seaward valleys of ‘Ewa’s main streams, Waikele and Waipi‘o.

...These bays offered the most favorable locality in all the Hawaiian Islands for the building of fishponds and fish traps into which deep-sea fish came on the inflow of tidal waters.

## Description of Project Area

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The lowland, bisected by ample streams, were ideal terrain for the cultivation of irrigated taro. The hinterland consisted of deep valleys running far back into the Ko‘olau range. Between the valleys were ridges, with steep sides, but a very gradual increase of altitude. The lower parts of the valley sides were excellent for the culture of yams and bananas. Farther inland grew the ‘awa for which the area was famous. The length or depth of the valleys and the gradual slope of the ridges made the inhabited lowlands much more distant from the wao, or upland jungle, than was the case on the windward coast. Yet the wao here was more extensive, giving greater opportunity to forage for wild foods in famine time.

The people needed this resource because ‘Ewa, particularly its western part, got very little rain in the summer months when the trade winds dropped their moisture in the interior. Stream water for irrigation, however, was always abundant. In the summer, compared with the windward coast, ‘Ewa was considerably hotter in the daytime, and warmer at night, often rather windless (1972: 469-470).

Based on the descriptions of ‘Ewa’s climate and the various wao in the Hawaiian landscape, it can be determined that the large ‘Ewa moku is not contained to a singular wao. The general vicinity of the project area would be considered “ka pahe‘e” (the place of wet land planting), “ke kula” (the plain or open country), and “ka ‘ilima” (the place of ‘ilima growth). The high volume of kalo cultivation in ‘Ewa supports the “ka pahe‘e” designation; ‘Ewa was famously known for producing the rare and delicious kai variety of kalo, which was described as so delicious that “anyone who married a native of ‘Ewa would come and settle there and would never leave” (Handy et al., 1972:471). The vast coastal plains surrounding the bays of Pearl Harbor support the “ke kula” designation.

## Description of Project Area

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As determined by the Botanical Assessment, there are 'ilima (*Sida fallax*) growing at the western portions of the project area (LeGrande, 2019). Locations of 'ilima growth are known as wao 'ilima, so it can be determined that the project area is in the wao "ka 'ilima." The wao 'ilima is typically a seaward and arid section of the plain, which is the typical climate found in the 'Ewa Villages and its immediate vicinity.

Honouliuli ahupua'a is associated with many mo'olelo (traditions and histories), as the following sections will illustrate. Honouliuli is especially affiliated with Pele, the volcano goddess and Kamapua'a (the pig man demigod). Hi'iakaikapoliopole, Pele's sister and the goddess of medicine in Pele's family, was known to have used 'ilima in some of her healings (Pukui, 1983:272); it is interesting to note that mo'olelo about Hi'iaka are prevalent in Honouliuli ahupua'a, as will be demonstrated in the following section.

#### IV. Existing Resources

##### A. He Māhelehele o Nā Mo'olelo (Excerpts of Traditional Accounts)

The following narratives focus on some of the notable traditions and history of Honouliuli ahupua'a. In following the history of the land from the period of early Hawaiian residency to the modern day, accounts from neighboring ahupua'a, larger regions, and even cross-island are cited as they connect people, storied places, and land use beyond the boundaries of Honouliuli. In Hawaiian mo'olelo are found expressions of native beliefs, customs, practices and history. The Hawaiian landscape itself is storied; each place name is associated with a tradition ranging from the presence and interactions between gods and people, to documenting an event or characteristics of a given place. Unfortunately, today, many of those mo'olelo have been lost. Through the mo'olelo that have survived we are able to glimpse the history of the land and people of Honouliuli ahupua'a (Figure 7).

The narratives are generally organized chronologically by time period or events, such as when the gods walked the land, touching the lives of the people, or when chiefs engaged in conflicts on the land. It will be noted that in a number of instances, wahi pana were named in the traditions as a means of commemorating notable events in history. Underlining is used throughout the texts to identify notable place names or references in the quoted narratives as a means of highlighting history of place.

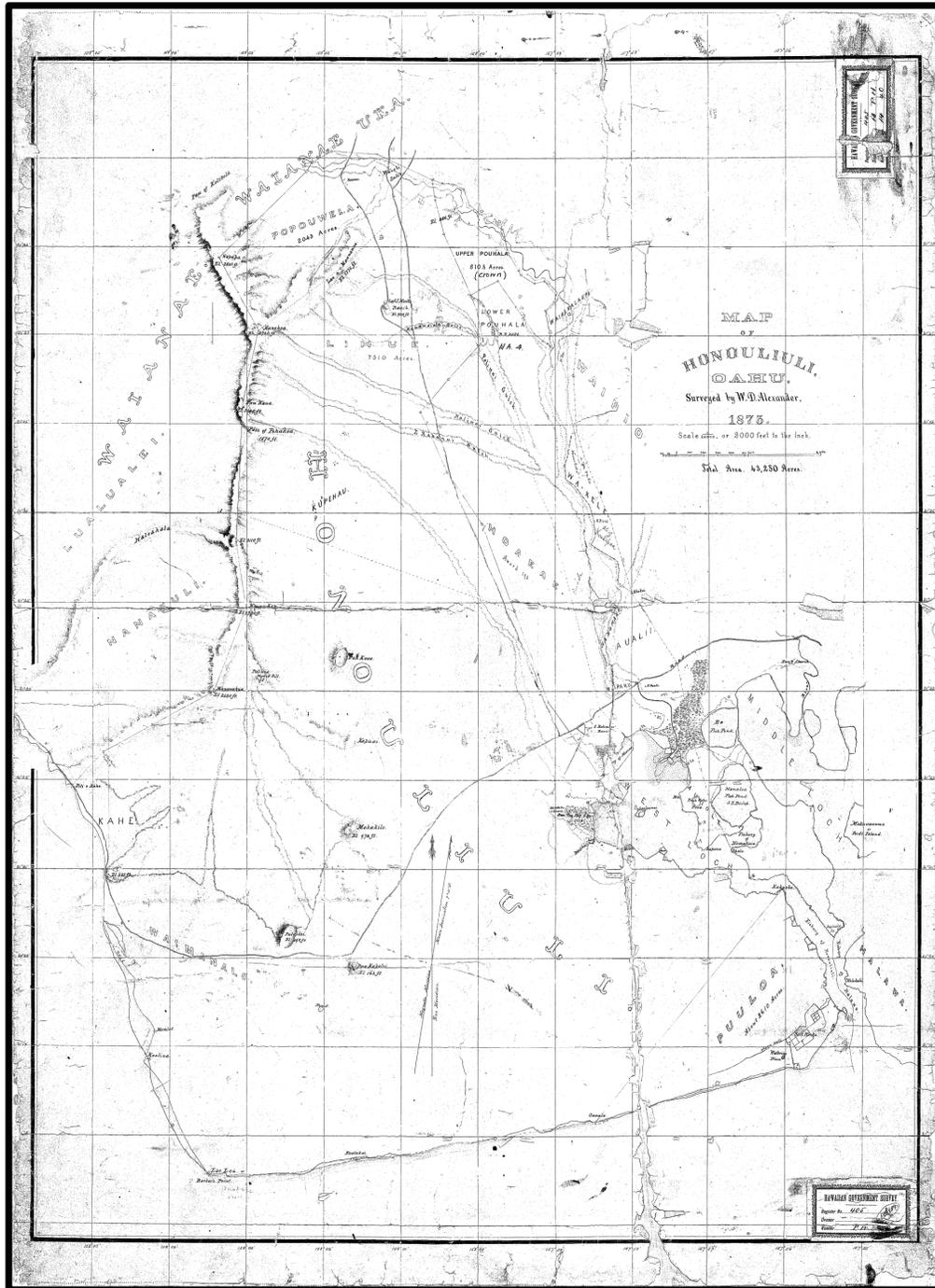


Figure 5. Map of Honouliuli (Hawaiian Government Survey, Registered Map No. 405 by W.D. Alexander, 1873)

## 1. He Wahi Kaao a me Kekahi Mele Pu (A Little Story and Some Chants)

### Traditions of Hi'iaka-i-ka-poli-o-Pele

The epic tradition of the goddess Pele and her youngest sister, Hi'iaka-i-ka-poli-o-Pele (Hi'iaka), spans the entire Hawaiian Archipelago and beyond to Kahiki, the ancestral home of the gods. The tradition is the source of many descriptions of places, place names, beliefs, traditional knowledge and customary practices. As in the account below, "He Wahi Kaao a me kekahi Mele pu" (1860), portions of the tradition were also cited in excerpts to remind people of various facets of knowledge that was recorded in the larger account. Of particular interest in the narratives below are references to Hi'iaka's travels on O'ahu and descriptions of various places in the 'Ewa and Kona districts. There is also an important reference to the goddess "Kiha," a mo'o (water-spirit) whose mana (power) was called upon in the making of chiefs and whose form was a part of the circuit gods who traveled around the island in the Makahiki celebrations. The name Kiha is commemorated in the place name Ka-puka-o-Kiha in Kalauao Ahupua'a.

#### *Ka Hae Hawaii*

#### **He wahi kaao a me kekahi mele pu.**

#### **Iulai 4, 1860 (aoao 60)**

O Lohiau me Kaleiopaoa, he mau kanaka no Kauai, o Haena ko laua wahi noho; Ua launa kino wailua wale o Pele me Lohiau, ua ku a aloha loa o Pele ia Lohiau: no ka nui o kona makemake kena'ku la oia ia Hiiaka e kii ia Lohiauipo i Haena a loa. Eia ka laua Berita, "e kii oe ia Lohiau a loa mai me oe a laa ia'u, Oia ka aoao 1. Eia hoi ka ka aoao elua, e malama oe i kuu aikane ia Hopoe, a hoi mai au;" alaila, hele o Hiiaka i Kauai.

A hiki o Hiiaka me Wahineomao i Haena, ua make o Lohiau, lapaau oia a ola, hoi mai lakou a ekolu o Lohiau, me Wahineomao, a me Hiiaka, a hiki i Oahu, pae o Hiiaka mauka o Waianae, ma ka waa no o Lohiau a me Wahineomao, a hiki i Puuloa. Ia hele ana o Hiiaka mauka, a hiki oia maluna o Pohakea, i

nana'ku ka hana ua make o Hopoe, e ami mai ana i ke kai, alaila hu mai la ke aloha o Hiiaka no ke aikane ana.

A hiki ma Puuloa, kau hou lakou ma ka waa, a hiki i Mamala, halawai me Peleula ma e heenalua ana, hoi lakou i uka i ka hale, hookipa maikai ia po, lealea lakou ia po, he Kilu ka hana ilaila i ike ai o Hiiaka i ka lea o Lohiau.

Haalele ia Honolulu, hiki lakou i Molokai, noho i ke kaha o Palaau, a make i ka make a ka pololi, lohe mai lakou he hale komo ko Olepau ke alii o Maui, manao aku hoi e ola ka pololi ilaila, i ua la nei i komo ai ka hale o Olepau hiki lakou a ekolu ilaila. I ka ike ana mai o Waihinalo ka wahine a Olepau, ua maopopo ia'ku kona ano, he ano pi.

Hoohuli ae la, oia ia Olepau iluna ke alo, hukihuki i ka umiumi. Alaila hapai ae la o Hiiaka i keia mele, a pane aku ia Waihinalo.

Mehameha kanaka ole ka hoi Puuomoeawa-e,  
O Kaupea i ka aina kanaka ole,  
A kulou anei e uwe ana—  
E kala ka uwe he keiki makua ole.

(He mau mele kike ana keia wahi, aole nae i loaia ia'u aka makemake nae o Olepau e ike ia lakou a ekolu aole nae e hiki.) Ua ninau mai o Hiiaka ia Waihinalo i ka wahine a Olepau, la wai Maui?

Hai mai o Waihinalo ia Olepau.  
O Kalani ke'lii Kauhilonohonua,  
O Kamakea kahiko a Kiha,  
O Kiha nui lulu moku,  
O Kaulahea nui o ka lani-e;

## Existing Resources

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Ia Maui--a.

Hai mai o Hiiaka, ua makeia. Haha ae ka oe la! O olo ka pihe i ke aumoe, Owawa ka pihe i ke kakahiaka, o ka haka maia a Olepau, ua pau i ka ai ia e ka wahine. Ua make o Olepau, o Olepau Aloha.

Hoole mai o Waihinalo wahine a Kapoipoi, aole e make kuu alii ia oe, ke hai mai nei na kua wahine oia nei. O Walinuu ma laua o Walimaanoanoa, o Papa o Hoohokukalani, e hoole mai ana, aole e make.

Pane mai o Hiiaka i ka hua o ka make.

Ua make ke lii nona nei moku,  
He puaa kau ko Molokai,--  
He ilio kohekohe Lanai,  
He pale ka aaka o Kahaloa,  
He puoa kai Molokini,  
Huli kaele o na Hono,  
Paiauma wale na aina,  
Oho ki kepakepa na moku,  
Uwe ka wahine, uwe ka hanehane,  
Uwe ka leoleo i ke kula, i ke pili la i Kamaomao,  
Ia kaa kumakena ia o Maui--e;  
Make Olepau, o Olepau aloha.

Pau na mele a laua i paio ai. Iloko o ka Hale komo o Olepau o Kapo, he hoahanau no Hiiaka. Ike oia aole hookipaia kona hoahanau; ku ae la oia a hoi i kona hale, hoolale oia ia Puanui kana kane i mea ai kahu i paha, o Luau. Ua makaukau ka hale o Kapo i na mea ai; (E hoi mai ana o Hiiaka ma a waena o ke Alanui; ua loohia ia o Olepau e ka mai, a aneane e pilikia; Hoounaia ke kanaka e kii ia Hiiaka, me ka puaa pu, hoolohe mai o Hiiaka e alala aku ana ka puaa, ia wa, ua hoaa loa ia ke kanaka me ka puaa, ua ninau ke kanaka ia

Hiiaka, ua hoohokaia: pela ko laua loa ole ana, a hiki lakou ma ka Hale o Kapo, ua makaukau, ua pau i ka ai; a hiki i ke aumoe make iho la o Olepau, nona ka mea i manaoia.)

B. Kalaiohauola. Wailua, Kauai, Iulai 4, 1860.

### **Summary – A Little Story and Some Chants**

Hi'iaka and her companion Wahine'ōma'o traveled to Hā'ena, Kaua'i and returned Lohi'auipo, Pele's mortal lover to life. Hi'iaka, Wahine'ōma'o and Lohi'au then departed from Kaua'i on their journey to the island of Hawai'i where Lohi'au would be reunited with Pele. Arriving at Wai'anae, Hi'iaka went overland, instructing Lohi'au Wahine'ōma'o to continue by canoe, where she would later rejoin them at Pu'uloa.

Hi'iaka walked inland and passed over the summit of Pōhākea, from where she looked to Hawai'i and saw her beloved friend, Hōpoe dancing on the shore. She then descended (across Honouliuli), and arrived at Pu'uloa where she boarded their canoe and traveled on to Māmala and then met with the chiefess Pele'ula (for whom the place in Honolulu is named). They then traveled by canoe on to Moloka'i and then to Maui...

While on Maui, Hi'iaka chanted a mele in which she described certain places where she had traveled. One of the lines returns to the plains of Honouliuli in which she said:

“O Kaupea i ka aina kanaka ole...”  
(Kaupe'a is a land without people...)

## **2. He Moolelo Kaa no Hiiakaikapoliople...**

### **(A Hawaiian Tradition of Hi'iaka who is Held in the Bosom of Pele...)**

Between 1860 and 1928, several important Hawaiian language publications provided

variations in telling of the Pele and Hi'iaka epic tradition. The narratives cited below were published in the Hawaiian newspaper *Ka Hoku o Hawaii* from September 18, 1924 to July 17, 1928 through the partnership of Julia Keonaona, Steven L. Desha Sr., Isaac Kihe, and others. They artfully retold this tradition, embellishing it with descriptions of places and events in history, thus bringing the knowledge of place forward to later generations.

The following excerpts offer important details pertaining to wahi pana, traditional and customary practices and the naming of places visited by Hi'iaka as she traveled into and across lands of the Honouliuli ahupua'a.

***Ka Hoku o Hawaii***

**He Moolelo Kaa no Hiiakaikapoliopole...**

**January 18, 1927 (page 1)**

Seeing the beauty of Ka'ala, Hi'iaka chanted:

Beloved is the dew of Ka'ala,  
That dew which bears the fragrance of the nene grasses,  
[fragrant dew which] Kissed the natives of Pu'uloa,  
One searches far for love...

**January 25, 1927 (page 1)**

...As Hi'iaka and her companions prepared to depart from Pōka'i, she told Lohi'au and Wahine'ōma'ō, that they would travel by canoe, while she would travel for a while over land. They would meet again at Kou [Honolulu], and she instructed them "As you travel, you will arrive at a place where a point juts out into the sea. That will be Laeloa [Barbers Point]; do not land there. Continue your journey forward, and as you continue your journey, you will see a place where the ocean lies calmly within the land. That will be 'Ewa; do not land there. Continue your journey and you will reach a place where the mouth [of the land]

opens to the sea (hamama ana ka waha i ke kai). That is Pu'uloa, do not land there either. That is the entry way to 'Ewa... The travelers then parted and began their journeys.

**February 8, 1927 (page 1)**

Hi'iaka continued to the uplands along the trail which passes through Wai'anae. Now the trail upon which Hi'iaka chose to travel, is the trail which passes through the heights of Pōhākea. Hi'iaka passed along the kula of Mā'ili, and then turned to look at the uplands. She saw the dazzling light of the sun on the uplands of Lualualei and Hi'iaka chanted:

The sun is hot!  
The sun is hot!  
The heat of the sun is on the plain of Lualualei  
The sun chews it up entirely...

Hi'iaka then continued her ascent on the trail in the stifling heat of the sun, and she chanted:

The path is at Waikonene,  
Ascending at Kamoā'ula,  
The heat of the sun is upon the breast,  
'Īlio is born upon the back of Pūhāmalo'o,  
The nāulu winds rage,  
Breaking the stream, but the breast of Pūhāwai is quiet,  
The kaiaulu breeze seems to fight and rebel against the people,  
Striking and causing the noses to rage,  
The mucus flows freely,  
In the hot sun of Lualualei.

From the heights of Pōhākea, Hi'iaka looked to the shores of 'Ewa, where she saw a group of women making their way to the sea. The women were going down to gather pāpa'i [crabs] and limu [seaweeds], and to gather the mahamoe, 'ōkupe [both edible bivalves], and such things as could be obtained along the shore of that land. Hi'iaka then began to chant about those ladies:

The Kehau breeze is there below Wai'ōpua,  
Bearing the fragrance of the kupukupu ferns across the plain,  
The coolness is laid upon the grasses,  
A coolness laid upon the sea of 'Ewa,  
'Ewa is made cold [unfriendly]  
because of the fish which hushes voices,  
Be silent in that breeze.

Hi'iaka saw the women moving ahead to the shoreline, just like the cold Waikoloa wind that blew from the uplands of this place. And this was why Hi'iaka had chanted to them. Hi'iaka then turned towards the canoe on which her companion and the man [Lohi'au] were traveling. They were paddling and were no longer talking, for Hi'iaka had admonished them, warning—

'Ewa is made cold because of the fish  
that hushes voices,  
Be silent!

Now, the famous fish of 'Ewa in those days when the wind blew because of conversations, was the pipi [pearl oyster]. Only when it was very calm could one go to catch the pipi. If anyone spoke while going to get the pipi, the breeze would cause rippling on the water's surface, and the pipi would be hidden from sight.<sup>2</sup>

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<sup>2</sup> It was believed that talking would cause a breeze to blow that would, in turn, frighten the pipi (see Pukui, 1983).

In this way, Hi'iaka had instructed Wahine'ōma'o and Lohi'au to be quiet like the women of 'Ewa who were going fishing. If one spoke, the angry winds would blow and bring misfortune...

**February 15, 1927 (page 1)**

...Turning her gaze towards the island of Hawai'i, she could see the flames of Pele in the lehua forest of Hōpoe, and she chanted out—

Beautiful is Pālaialai, sacred assembly of the woman,  
I set up the drum of the sacred voice,  
The voice of the ocean is what I hear,  
The natives hear it

[The stormy ocean of Waialua, could reportedly be heard in 'Ewa],  
The birds drink the water caught in the noni leaves,  
The billowy clouds pass in the calm,  
The fires of Hawai'i rise above me...

...Hi'iaka then departed Pōhākea, descending to the plain of Keahumoa [in the uplands between Waipi'o and Honouliuli]. It was at this place that she saw several women gathering the blossoms of the ma'o [*Gossypium tomentosum*, an endemic yellow-flowered hibiscus that grows on the dry land plains] with which to string garlands for themselves. She then saw them sit down and begin to string and complete the garlands for themselves, so that they could adorn their necks. These women adorned themselves in the mao garlands and were really quite beautiful. Hi'iaka then felt her own neck, for she was without a lei. Hi'iaka then thought about what to say to the women regarding the garlands with which they had adorned themselves. She then thought within herself, I am going to ask them for a lei that they had been burdened with making. If they have aloha for me, then there is no kindness which they shall not have, but if they deny me, so it will be. Hi'iaka then offered a chant to the women who had

strung their garlands upon the plain which is burned by the sun.

The plain of Keahumoa wears the ma'ō blossoms as its lei  
Adorning the women who string garlands in the wild  
It is like the lehua blossoms of Hōpoe  
Lehua blossoms upon which the sun beats down  
On the nodding koai'a flowers of the cliff  
On the rooftops of the houses at 'Āpuku  
Rising in the presence of the cliff of Pu'uku'ua  
The land is indeed a chief  
Man is indeed a slave  
I am indeed a slave to aloha—love  
It is love which invites us two—come  
I come—

Then one of the women answered her in a kindly manner, “Wait stranger, before you go on your way, here is your lei.” It is true what you have said, “He kauwa ke kanaka na ke aloha, a na ke aloha no e kono, ao ka naue holookoa no ia o ke kino.” (Man is a slave of love or compassion, and it is aloha which beckons to us and moves us to come forth). The woman then moved forward and placed her lei upon Hi'iaka, and the other women did the same as well. The women then saw the true beauty of Hi'iaka and they urged her to join them for a meal at their home on the shore of 'Ewa.

Hi'iaka then spoke to them, “I am not hungry, for your kindness has satisfied me. Here are the words which I share with you—In your dwelling, if one of you should meet with trouble, or if one of the people for whom you have aloha is in need, offer the chant which I offered to you, asking without shame for garlands that you had made. The chant is a prayer for the passing of troubles from you or your loved ones. Now come and kiss me, and I will depart from this long open

plain.”

The women stepped forward to kiss Hi’iaka, and as they rubbed noses each one of them remembered the chant which Hi’iaka offered when she asked for their garlands of ma’o. Thus this chant became a prayer for those women in their days of trouble. Hi’iaka then departed from those women who strung garlands of ma’o on the plain and traveled towards the shore of ‘Ewa, towards Pu’uloa. Turning towards the ocean of Honouliuli, Hi’iaka saw the expanse of Leinono<sup>3</sup> and she said within herself:

Say! I have not forgotten you Leinono, though perhaps you think I am no good because I don’t know you. Therefore, I call to you Leinono with this chant:

Bright eye, the rising sun,  
Companion that travels arm-in-arm with the expanse of ‘Ewa,  
The Amu wind that causes dust to mound up,  
Is the first born of the Moa’e wind,  
A child that is embraced by the ‘Ewa-loa [expanse of Ewa],  
Hail Leinono,  
Our companion.

Finishing her chant, Hi’iaka then turned and saw her companion and Lohi’au paddling their canoe. And her love welled up for her traveling companions. It was also then, that Hi’iaka came to understand that Lohi’au would be killed by Pele when they reached Hawai’i. Hi’iaka then turned and continued her journey along the path that crossed this unpeopled plain. While walking along, she saw two women who were busy stringing garlands of ‘ilima blossoms. The women were sitting alongside the trail upon which Hi’iaka was traveling. Now when

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<sup>3</sup> Leinono, also written as Leilono (Kamakau, 1870b).

these two women saw Hi'iaka, one said to the other, "Say, this is Hi'iaka who is descending along the path, we must depart with haste, lest she kill us."

The two women hastily departed, and reached a stone that was situated along the side of the trail which continued on to Wai'anae. It was at this stone that the two women transformed themselves into their supernatural mo'ō [lizard] forms.

One of the lizards then went and hid in a little space on the stone, and the other went nearby. One mo'ō said to her companion mo'ō...

**February 22, 1927 (page 1)**

..."It is fortunate that we have hidden ourselves at this place, so that we may escape being killed by Hi'iaka." Now from ancient times till recently, the place at which this stone was situated, was called "Pe'e-kāua" [We two hidden]. Now that the road has been made, the stone at which these two mo'ō wahine [lizard women] has been destroyed.

When Hi'iaka saw that these two women had fled and taken their mo'ō forms to hide on the stone along the trail, she chanted out to them:

Greetings to you two women of the plain,  
It is a barren plain in the sun,  
Where the sun bears forcefully down,  
Having gone to hide,  
We two are hidden at Pe'e-kāua,  
Aloha to you two,  
Here I am traveling on.

Hi'iaka then continued walking towards the shore. Hearing Hi'iaka's chant of

affection, these two mo‘o women said to one another, “Say, this is truly remarkable, for we will not die, but have been saved by Hi‘iaka. She has given us her aloha as she descends in the heat of the sun, and so it is that we shall remain upon this plain.”

Descending to the flat lands of Honouliuli, Hi‘iaka then turned and looked at Pu‘uokapolei and Nāwahineokama‘oma‘o who dwelt there in the shelter of the growth of the ‘ōhai [*Sesbania tomentosa*], upon the hill, and where they were comfortably refreshed by the blowing breezes. Hi‘iaka then said, “Pu‘uokapolei and Nāwahineokama‘oma‘o, do not forget me, lest you two go and talk behind my back and without my knowing, so here is my chant of greeting to you:”

Greetings to you two o Pu‘uokapolei and companion  
O Nāwahineokama‘oma‘o  
Set there, and dwelling  
In the shade of the ‘ōhai  
Stringing garlands of kukui in the day,  
Adorning yourselves in the garlands of the ma‘oma‘o  
Kauna‘oa [*Cuscuta sandwichiana*] is the lei of the shores of Ka‘ōlino<sup>4</sup>  
There is joy in traveling.

When Hi‘iaka finished her chant, Pu‘uokapolei said, “Greetings. Love to you, o Hi‘iaka! So it is that you pass by without visiting the two of us. Lo, we have no food with which to host you. Indeed, the eyes roll dizzily with hunger. So you do not visit us two elderly women who have cultivated the barren and desolate plain. We have planted the ‘uala shoots, that have sprouted and grown, and have been dedicated to you, our lord. Thus as you travel by, pull the potatoes and make a fire in the imu, so there will be relief from the hunger. For we have

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<sup>4</sup> Kaolino (the brightness) appears to be a variation of Koolina (interpretively translated as joyous).

no food, we have no fish, and no blanket to keep us warm. We have but one kapa [covering], it is the pilipili'ula [the grass *Chrysopogon aciculatus*]. When it blossoms, we go and gather the grass and plait it into coverings for us. But in the time when the grasses dry, and none is left on the plain, we two are left to live without clothing. The cold breeze blows in the night, the Kehau and Waikōloa, the cold does not remain though, and when the grasses of the land which give us warmth, begin to grow again, our nakedness is covered, and we are a little better off than the flowers of the ma'ō. It is because we are left without our covering of the pilipili'ula grass, that many people have come to say, "Waiho wale iho ka mauu o Kaiona" [Kaiona is left exposed by the grasses; (Nothing is left to the imagination)]. Aloha to you, and aloha be with you in your travels o Hi'iaka-i-ka-poli-o-Pele, our lord.

Hi'iaka then turned and continued her walk in the stifling heat of the sun on the plain of Puuokapolei. Hiiaka saw a mao blossom as she descended, and she picked it in the heat of the sun and chanted out Kona is made dizzy in the long days of Makali'i [in the summer]:

The wiliwili [*Erythrina*] trees sway, then comes the calm,  
The birds of Kānehili endure,  
The sun is exceedingly hot on Pu'uokapolei,  
The ma'ō growth is stunted on the seaward plain,  
The nohu [*Tribulus cistoides*] flowers  
are like a halakea [kapa] covering  
The pua'ula [young kūmū] fish seem  
to flash along the shores of Kaupe'a  
A companion [is the] Nāulu wind,  
It is a traveling companion for me.

When Hi'iaka finished her chant, she continued toward the shore, and looking

to the ocean, she saw the canoe of her friend and Lohi'au, and chanted:

My man on the many harbored sea of Pu'uloa,  
As seen from the plain of Pe'ekāua,  
Let us dwell upon the 'ōhai covered shore,  
Where the noni blossoms are twisted together,  
Descending along Kānehili  
I am winding along

Hi'iaka then turned and looked back to Pu'uku'ua, Kānehoa, and Hale'au'au and said, "Do not forget me Pu'uku'ua mā [and companions]. And so you do not think that I will forget you, here is a chant of endearment for you:"

It is I who travel along the shore of Pu'uloa,  
Where the 'ōhai is at Kaupe'a,  
In the awe-inspiring sun,  
It is seen,  
It has been seen by me,  
At the mountain cliffs,  
Pu'uku'ua at Hale'au'au,  
The sprouting of the kukui growth,  
Dancing in the sun of Kānehoa,  
Love to you my companions.

...Upon finishing her chant, Hi'iaka continued down the trail and arrived at Kualaka'i. At Kualaka'i, the trail took her to a spring of cool water. Looking into the spring, she saw her reflection shining brightly upon the water's surface. Hi'iaka also saw two lehua trees [*Metrosideros polymorpha*] growing on each side of the spring. Now these two lehua trees were completely covered with blossoms. She then picked the lehua blossoms of these two trees and made

garlands for herself.

Hi'iaka fashioned four strands to her lei, she then removed the garlands of ma'o which she had received when descending from Pōhākea, and set them aside.

She then took the garlands which she had made, and adorned herself with them. Hi'iaka then heard the voice calling out from the area of Kānehili:

Hi'iaka is the woman  
Who picked the flowers of Ho'ākalei,  
And with a needle strung and made them into  
four garlands, the sectioned lei of the woman,  
O my younger sibling.  
My younger sibling who came from the place  
where the dusty wind rises from below  
Overturned in the sea of Hilo-one,  
The aloha is for Hilo,  
Love for the lei.

That place, Hilo-one, which is mentioned in the mele, is situated on the northern side of Kualaka'i, towards Kalaeloa. And the name of the spring in which Hi'iaka looked and saw her reflection was Ho'ākalei [reflection of a lei]. It was at this place that Hi'iaka saw the two lehua trees growing, from which she picked the blossoms too make her four garlands.

Hearing the chant, Hi'iaka turned toward where it had come from, and saw her older sister Kapo looking at her. Kapo had arrived at O'ahu from Maui, where she was teaching the practices of the hula. Seeing Kapo, Hi'iaka cried out with affection for her older sister...

**March 1, 1927 (page 1)**

So, it is you o Waialua-iki,  
Of the sun darkened cliff of Uli,  
Liawahine has gone traveling,  
O woman that stands calling from the cliff,  
I am adorned with a lei,  
Yes, I am wearing garlands of the misty-centered lehua blossoms,  
The lehua that grows along the water's edge at Ho'ākalei,  
My lehua of Hilo-one,  
On the shores of Ka'ōlina and Kaupe'a,  
I am adorned.

The reason that Hi'iaka presented this chant to her elder sister Kapo, saying, "kui pua lei, o Hoakalei" [stringing flower garlands of Ho'ākalei] was because in her chant, Kapo had inquired about Hi'iaka's picking the flowers from the spring of Ho'ākalei and making them into four garlands for herself... As it is seen in this mele, Hilo-one is on O'ahu, there at Kualaka'i, near Kalaeloa.

Thus it is understood that through traditions like this, we are given direction in knowing about the names of various places of the ancient people, and which are no longer known in this time... Hi'iaka then continued her journey toward the shore of Pu'uloa, and she thought about the words that she had earlier spoken to Wahine'ōma'o and Lohi'au, and she chanted:

I will not travel to the shore of Kaupe'a,  
To Kaupe'a where the 'ōhai of Kānehili are found,  
I will turn away...

...Hi'iaka then arrived at a place where many people were gathered together, and she overheard them talking about preparations for a journey to Kou, which

is the old name for Honolulu. The people were preparing to go to the court of the chiefess Pele'ula, who was hosting kilu<sup>5</sup> games...

**March 8, 1927 (page 1)**

...Learning of the contest that was to be held at Kou, Hi'iaka had reservations about having Lohi'au stop at the court of the chiefess Pele'ula. So she chanted, calling to Lohi'au, telling him to bring the canoe to shore at Pu'uloa. When Hi'iaka chanted, everyone became quiet, because they were awed by the beauty of her chanting voice. One of the women in the group then called to Hi'iaka, "You are a stranger to us in appearance, but your chant indicates that you are very familiar with this shore, how is that so?" Hi'iaka confirmed that she was indeed a visitor, and yet familiar with the places of this land. She then said, "Ua maikai no kau noi e ke kamaaina maikai, aka, i Kou hoi e hui aku ai na maka" [You have asked a good question, kind native, but, it is at Kou, that all the faces (eyes) shall meet].

Thus it is seen that when Hi'iaka responded to the woman of Pu'uloa, that this famous saying of the people of O'ahu came about, "Hui aku na maka i Kou" [The faces shall meet at Kou]... Now, Lohi'au had heard the chant of Hi'iaka, and he drew the canoe to the shore. When Hi'iaka boarded the canoe, she bid farewell to the people of Pu'uloa and said, "Hui aku o na maka i Kou" [We will meet again].

They then directed their canoe seaward, and went out of opening of Pu'uloa. Hi'iaka turned and looked towards the land where she saw the dwelling places of Kinimakalehua, Leinono, and Keālia. She called out to them, "So you do not forget me, here is a chant for you" —

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<sup>5</sup> Kilu is a Hawaiian game in which a gourd or halved coconut shell is tossed at an opponent's pob (something like horseshoes). The individual who successfully hit the pob that he or she had selected was the winner and could claim a kiss or some other favor from the opponent (see Malo, 1951:216).

Reddish yellow are the rains of Kinimakalehua,  
Leinono is the companion above, and Pu'uloa is shoreward,  
The journey across the expansive sands of 'Ewa has been made arm-in-arm,  
I am at 'Ewa, I greet you o Leinono, We are all companions

In this chant of Hi'iaka, she spoke the famous saying that is the pride of the descendants of 'Ewa; "Ke one kui-lima laula o Ewa" [The sands of 'Ewa, across which everyone joined hand-in-hand]. These words of Hi'iaka are a famous saying of this land to this day. As the canoe continued toward Kou, passing the land of Kalihi, Hi'iaka looked again towards Leinono and Keālia, and she chanted:

Hail to you o Leinono, o Kinimakalehua, o Keālia who is below, aloha,  
Here is the supplication, the offering, of the one who has traveled by.  
It is a voice or song, only a voice—

She then turned forward and the canoe arrived at Nu'uaniu...

### 3. He Moolelo no Kamapuaa (A Tradition of Kamapua'a)

S.W. Kahiolo contributed the tradition of Kamapua'a to the native newspaper *Ka Hae Hawaii* in 1861. This is the earliest detailed account of Kamapua'a, a multi-formed deity of traditional significance on O'ahu and all the major islands of the Hawaiian group. Kamapua'a is a part of the Lono god-force and possessed many kino lau (body forms), representing both human and various facets of nature. He was born in pig-form to Hina (mother) and Kahiki'ula (father) at Kaluanui in the Ko'olau loa district of O'ahu.

Excerpts from Kahiolo's "He Moolelo no Kamapuaa" provide details on places of traditional cultural significance in the 'Ewa District. This mo'olelo offers traditions associated with the naming of, or traditional importance and uses of, localities from Honouliuli to Moanalua.

Waimānalo, Waikele, Waipi'o, Waiawa, Waimano, Waimalu, Pu'uokapolei, Keanapua'a, Pu'uloa, Moanalua, Waipahu, and Kuolohele are named in the following excerpts.

***Ka Hae Hawaii***

**He Moololo no Kamapuaa.**

**July 10, 1861 (page 60)**

...When the chief Olopana was killed, the island of O'ahu became Kamapua'a's. He then fetched his people (who he had hidden) from above Kaliuwa'a and brought them down, and they then returned to their lands. The priest (Lonoawohi) asked Kamapua'a if he could be given some lands for his own as well. He asked, "Perhaps the water lands might be mine." Kamapua'a agreed. This was something like a riddle that the lands which have the word "water" [wai] in their names would be his, like: Waialu, Waiana, Waimanalo, Waikele, Waipio, Waiawa, Waimano, Waimalu, Waikiki, Waialae, Wailupe, Waimanalo 2, Waihe'e, Waiahole and etc.

The parents of Kamapua'a (Hina and Kahiki'ula) thought that this amount of land was too great, and they criticized Kamapua'a for agreeing to it. But his elder siblings and grandmother did not criticize him, agreeing to the priest's request. The remainder of the lands went to Kamapua'a's family...

[Following a journey to Hawai'i, where Kamapua'a fought with Pele, he returned to O'ahu. Upon arriving at O'ahu, Kamapua'a learned that the island was under the rule of another chief, that his parents had been chased to Kaua'i, and that his favorite brother Kekeleiaiku had been killed. The following excerpts include accounts describing sites and activities in 'Ewa.]

**August 7, 1861 (page 76)**

...Kamapua'a walked to Keanapua'a, on the shore at Hālawā, and he slept

there. When he woke up from his sleep, he urinated in the sea, and that is why the fish of Pu'uloa have a strong smell to them, so say the uninformed.

From there, he went to Honouliuli and saw his grandmother, Kamaulaniho, sitting along the side of a taro pond field. She was looking with desire to the lands below, where some of the men of the king were working and wishing that they would leave even a little bit of taro behind for her to eat. Kamapua'a then went and stood next to her and greeted her. She replied, greeting him, but did not recognize him as her grandson. He then asked her why she was sitting there. She told him, "I am looking to the lowlands, where the men of the chief are working, and wishing that they would leave a little behind so that I may have some food." Kamapua'a then said to his grandmother, "How did you live before?"

She answered, "What is it to you? My grandchildren have died, one in a battle with Pele, another buried, and one on Kaua'i." This is how she spoke, not understanding that the one before here was her own grandson. Kamapua'a then answered, "I am going to get some food for me." She asked, "Where will you get your food?" He told her, "I will go and perhaps ask for some, and maybe they will give me some of their food."

**August 14, 1861 (page 80)**

Kamapua'a went and said to one of the men who was pulling taro, "Let the two of us pull taro for us." The man agreed, and the two of them pulled taro, some for the man and some for Kamapua'a. Kamapua'a pulled a large quantity and then carried it up to his grandmother. Because of the large load that he carried, Kamaulaniho suspected that the man was indeed her own grandson, Kamapua'a. She chanted a name song to Kamapua'a and he chanted to her as well. Together, they carried the taro to the house she shared with another old woman, at Pu'uokapolei. Setting down their bundles of taro, Kamaulaniho

placed Kamapua'a on her lap and wept over him. The two were joined by the other old woman and she was introduced to Kamapua'a, who she thought had been lost. Preparations were made for a meal, and Kamapua'a and the old woman went out to her garden to collect sweet potatoes. They then returned to the house and ate...

**August 21, 1861 (page 84) – August 28, 1861 (page 88)**

...Kamapua'a went to Nu'uaniu and performed a ceremony, bringing his brother, Kekeleiaiku, back to life. He then traveled to Kou where he killed the chiefs and people who had killed his brother and forced his family into their lives of despair... Returning from Kou, Kamapua'a met his friend Kuolohele and the two of them walked from Moanalua. They reached Waiawa and continued on to Waipahu. Standing on the edge of the stream there, Kuolohele went to bath in the stream. Kamapua'a noticed that Kuolohele had a large lump [pu'u] on his back. Picking up a stone, Kamapua'a struck the lump on Kuolohele's back.

Kuolohele cried out, thinking that he was about to be killed. Kamapua'a reassured him that he was not going to die, but that instead, he would be healed. He then instructed Kuolohele to touch his back. In doing so, Kuolohele found that the lump was gone.

Kamapua'a then picked up the stone and set it on the cliff-side. That stone remains there at this time, and it is a stone which many travelers visit [the stone is named Kuolohele]... Kuolohele and Kamapua'a continued traveling together for a short distance, until Kuolohele reached his destination. Kamapua'a continued to **Pu'uokapolei**, where he met with his grandmother and brother. He told them what had transpired, and he then set off for Kaua'i, to bring his parents back to O'ahu...

**4. He Kaa no Pikoiaakaalala (The Tradition of Pikoiaaka'alala)**

## Existing Resources

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The tradition of Pīkoi-a-ka-‘alalā (Pīkoi-son-of-the-crow) was printed in the Hawaiian language newspaper *Ka Nupepa Kuokoa* between December 16, 1865 and March 10, 1866 and was contributed by S.M. Kauai.

Pīkoi-a-ka-‘alalā was born to ‘Alalā and Koukou on the island of Kaua‘i and his family were kūpua (beings with supernatural powers and multiple body-forms). Pīkoi-a-ka-‘alalā possessed exceptional sight and excelled in the Hawaiian art of pana pua (shooting with bow and arrow). In the tradition of Pīkoi-a-ka-‘alalā, many localities throughout the islands are named for places where he competed in matches with archers, shooting ‘iole (rats) and manu (birds) from great distances. The tradition is set in the late 1500s when Keawe-nui-a-‘Umi is the king of Hawai‘i Island.

### ***Ka Nupepa Kuokoa***

#### **He Kaa no Pīkoiakaalala.**

#### **December 23, 1865 (page 1)**

[While describing Pīkoiaka‘alalā’s travels around O‘ahu, readers are told]:

...The districts of O‘ahu are thus known... The land from Piliokahe to Kapukakī makes up the district of ‘Ewa...

## **5. Moolelo no Puapualenalena (The Tradition of Puapualenalena)**

Puapualenalena was a supernatural dog who lived during the time of Hakau, the half-brother of Hawai‘i’s ‘Umi-a-Līloa (ca. AD 1525). His primary residence and adventures occurred on Hawai‘i, but he also traveled across the islands. While on O‘ahu, the heights of Pōhākea where the mountain trail descends into Honouliuli were mentioned. From there he traveled to the shore of Pu‘uloa.

### ***Ka Nupepa Kuokoa***

#### **He Kaa no Pīkoiakaalala.**

**February 24, 1866 (page 1)**

...While sailing from Kaua'i, Puapualenalena and his companions reached the Wai'anae coast. Puapualenalena leapt to shore and traveled across the land to Pōhākea from where he looked upon the lands of 'Ewa and Waialua... He then went down to the shore of Pu'uloa where the canoes had landed and joined the travelers to continue the journey to Hawai'i...

**6. Ka Amaama o Kaihuopalaai (Tradition of the Mullet of Kaihuopala'ai)**

One of the famous traditions of Honouliuli centers on the importance of the ahupua'a as the source of the 'anae holo, the annual mullet migration around the island of O'ahu. The tradition was originally published in 1866 under the title "Ka Amaama o Kaihuopalaai" (*Ke Au Okoa*, September 17, 1866, page 3). In 1896 it was published again under the title "He Moololo Kaa no ka Puhi o Laumeki" in a major account that cited numerous locations, resources and residents of the Honouliuli ahupua'a. Both traditions are cited below; the earlier one is provided in the original Hawaiian language as it sets the foundation for the more detailed account of 1896.

***Ke Au Okoa***

**Ka Amaama o Kaihuopalaai.**

**Kepakemapa 17, 1866 (aoao 3)**

Ma ka auina la o ka Poalua o ka pule i hala iho nei, ua olioli makou i ka ike ana'ku i ka lehulehu e hoi ae ana me na puolo anae, he ewalu, a he umi o ka hapawalu. Ua hauoli nui no ko ke kulanakauhale nei i keia mea, ka hoea hou ana mai o ka anae holo, a ua iho nui ka lehulehu e kuai, a o ko makou Hale Pai holookoa nei no hoi kahi i iho pu i ka makeke e kuai ia ai. He wa no aia iloko o ka makahikiki e holo mau ai keia i-a. O Kapapaapuhi ma Ewa, a me Kaipapau ma Koolauloa, oia na wahi i oleloia e kahiko, na wahi hoolulu ia o ua i-a nei, he

anae. O kona home mau nae o Kapapaapuhi.

Eia malalo nei he wahi kaa mai kekahi elemakule mai, e pili ana i ka ano o ke kaapuni ana o ka anae a puni keia mokupuni.

He Kaa no Kaanae.

Aia ma Kapapaapuhi, ma Ewa, kahi i noho ai kekahi ohana nui. Na ka makuakane o keia ohana kekahi kaikamahine maikai, a na makua i aloha nui ai. Ua oi ae paha ke aloha o na makua i keia kaikamahine mamua o na keiki e ae. Ua pii ae ua kaikamahine, a aneane paha he umikumamalima ona mau makahiki, hoohaumia ia iho la oia e kekahi mea. I ka ike ia ana o ke ano hoohaumia ia o ua kaikamahine nei e na makua, ninau aku la na makua ia ia me ke ano e hai mai la hoi ke keiki i ka hua o ka lokomaikai; aohe nae wahi mea a hai mai. Huna eleele loa nohoi ke kaikamahine.

Ninau pinepione aku la na makua e hai mai, aohe wahi mea a hai mai; a no keia mea, kipaku haalele aku la na makua me ka hoohuakao, a i aku i ke kaikamahine, "O hele e imi i kau loaa, a mai manao mai oe he hale!" Ku ae la ua kaikamahine nei o ka hupe o na waimaka, haalele iho la oia i ka ohana.

Hele aku la keia a hiki i Kaipapau, makemake ia mai la keia e kekahi kanaka, no ko ia nei ano wahine ui no hoi paha, a hoao ia ae la laua nei he kane a he wahine, a noho iho la ia he wahine no ka pali hauliuli. O ka hana nui a ua kane nei o ka mahiai i kela makahiki keia makahiki. Oi mahi ai aku ua kanaka nei a piha ka aina i ka ai, ka uala, ka maia, ke ko, a me kela mea keia mea. I ka piha ana o ka aina i kela mea ai keia mea ai, a i kekahi la, olelo mai la ke kane i ka wahine, "Kanu aku nei kaua i ka aina a piha i ka ai, a me kela mea keia mea, a eia la auanei i hea ka inai e pono ai o keia ai!"

Kulou ka wahine ilalo, a pane mai la, “Ua i-a! Ina ke mau la no ke aloha o kuu mau makua ia’u, alaila ka hoi loaa ka inai o ka ai a kua i luhi ai. Hele no ka hoi oe la, a hala mai ke Ahupuaa mea la, o mea ia, a hele aku no oe. Pela no ka hoi oe e hele ai, a hiki oe i ka aina e kapa ia ana la o Ewa, alaila, ninau iho no oe ia Kapapaapuhi. Aia ka hoi ilaila ko’u nui kahi i noho ai. Hele no oe la, a ilaila, kolea iho oe i o’u mau makua; a i ninau mai ia oe i kau huakai ea, alaila, hai aku oe he i-a kau huakai i hiki aku ai ilaila. I haawi ia mai anei oe i ka ia iloko o ka hale, mai lawe anei oe. Olelo aku oe i ka ia iloko o ke kai.” Ae mai la ua kanaka nei.

He anahulu mahope iho, kaapuni iho la ua kanaka nei, e hele ana i ka hale pa leo he makuahonowai. Ninau hele aku la no hoi keia a hiki wale i ua aina hanau nei o ka wahine, a hai ia mai la no hoi keia i ka hale, kahi i noho ai o kona mau makuahonowai. Hele aku la no hoi keia a hiki ilaila, kolea iho la. Uwe mai la ka ohana holookoa, me he mea la o ke kaikamahine okoa no, ua hoi aku. Uwe iho la a pau, hiowai a luana iho la, ninau mai ka makuahonowai kane, “Kau huakai o ka hiki ana mai?” Olelo aku no hoi keia, “I hoouna ia mai nei au i i-a.” “Ae,” wahi a ka makuahonowai; “eia ae no ka i-a la, he umi halau i piha, a hoi [!]awe ia i elima.” Hai aku la no hoi keia, e like me ka olelo a ka wahine, o ka ia iloko o ke kai. Kulou iho’la ka makuahonowai ilalo a pau, olelo mai la, “O ka i-a ia, lawe ia, aia a hoi oe lawe pu me ka ia!”

He mau la mahope mai, hoi mai la ua kanaka nei, a Kapuukolo i Honolulu nei moe, a i ala ae ka hana o ka hiamoe i kakahiaka ae, e kuu mai ana kanaka i ka anae. Manao iho la keia, he i-a no la no ia wahi, noho ilaila ai i-a. Pela aku ana a hiki i ka Luahole i Waikiki. Mai laila aku keia a Maunalua, o ka hana no ka na kanaka o ke kuu i ka i-a. Pela wale a hiki keia i Kaipapau i ke ahiahi o kekahi la, a i ala ae ka hana a ka wahine a nana aku i ke kai e ula mai ana ke kai i ka i-a, a i aku keia i ke kane, “Ai aka i-a au i hele aku nei.” Akahi no keia a hoomanao ae, o ka ia no ka ia e kuu mau ia ana ma na wahi a pau ana e moe

ai.

O keia iho la ka ke kumu i holo ai a puni keia moku, pela la ka olelo a kahiko, aka, pela paha, aole paha, he anoninoni loa ko makou mau manao ma ia mea, e like me ka kahiko e olelo nei.

**7. He Moolelo Kaa Hawaii no ka Puhi o Laumeki (A Tradition of Pūhi Laumeki [A Deified Eel] and how the ‘Anae-holo came to Travel around O‘ahu)**

“He Moolelo Kaa Hawaii no ka Puhi o Laumeki, Ka Mea I Like Me Ka Ilio Puaapualenalena” was published in *Nupepa Ka Oiaio* between November 8, 1895 and February 14, 1896. The mo‘olelo was submitted to the paper by native historian, Moses Manu. The mo‘olelo primarily focuses on wahi pana and features associated with the lands of ‘Ewa, O‘ahu, recounting events associated with the birth and deification of an eel (pūhi) guardian of fisheries and his siblings, among whom was Mokumeha. The narratives include important descriptions of Honouliuli as the source of the ‘anae holo and fisheries around the island of O‘ahu. The following installments are summaries, not direct translations of these primary resource documents.

***Nupepa Ka Oiaio***

**November 8, 1895 (page 4)**

...It is perhaps not unusual for the Hawaiian people to see this type of long fish, an eel, about all the shores and points, and in the rough seas, and shallow reefs and coral beds of the sea. There is not only one type of eel that is written about, but numerous ones that were named, describing their character and the type of skin which they had. In the ancient times of our ancestors, some of the people of old, worshipped eels as Gods, and restrictions were placed upon certain types of eels. There are many traditions pertaining to eels. It is for this

fish that the famous saying “An eel of the sea caverns, whose chin sags.”<sup>6</sup>

Indeed, this is the fish that was desired by Keinoho‘omanawanui, the eels of the fishpond of Hanaloa, when he was living with his friend, Kalelealuaka, above Kahalepō‘ai at Waipi‘o uka, when Kākuhihewa was the king of O‘ahu. It was necessary for us to speak of the stories above, as we now begin our tradition.

It is said in this account of Laumeki, that his true form was that of an eel. His island was O‘ahu, the district was ‘Ewa, Honouliuli was the land. Within this land division, in its sheltered bay, there is a place called Kaihuopalaai. It is the place of the ‘anae, which are known about Honolulu, and asked for by the people, with great desire.

Kaihuopala‘ai was human by birth, but he was also a kūpua [dual-formed being], who was born at Honouliuli. His youngest sister was known by the name of Kaihuku‘una. In the days that her body matured and filled out, she and some of her elders left ‘Ewa and went to dwell in the uplands of Lā‘iemalo‘o, at Ko‘olauloa, where she met her husband. The place known by the name Kaihuku‘una, at Lā‘iemalo‘o, is the boundary of the lands to which the ‘anae of Honouliuli travel.

At the time that Kaihuku‘una was separated from her elder brother and parents, Kaihuopala‘ai had matured and was well known for his fine features, and his red-hued cheeks. He was known as the favorite of his parents and all the family. There was a young woman, who like Kaihuopala‘ai, was also favored by her family. Her name was Ka‘ōhai, and she lived at the place where the coconut grove which stands at the estuary of Waikele and Waipi‘o. Thus, these two fine

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<sup>6</sup> ‘Ōlelo No‘eau #1545, “Ka pūhi o ke ale, ahu ke ‘olo.” According to Pukui, this ‘ōlelo no‘eau is an expression that was used to describe a prosperous person (1983:167).

children of the land of the fish that quiet voices [ka ia hamau leo], that is 'Ewa, were married in the traditional manner.

In their youth, the two lived as husband and wife in peace. And after a time, Ka'ōhai showed signs of carrying a child. This brought great joy to the parents and elders of these two youth. When the time came for Ka'ōhai to give birth, her child was born, a beautiful daughter, who also had the same red-hued nature as her father. While Ka'ōhai was cleaning the child and caring for the afterbirth, she looked carefully at her daughter and saw a deep red-spotted mark that looked like an eel, encircling the infant. Everyone was looking at the mark, contemplating its meaning, and Ka'ōhai was once again taken with birth pains. It was then understood that perhaps there would be a twin born as well. But when the birth occurred, an eel was seen moving about in the blood, on the side of Ka'ōhai's thigh. This greatly frightened the family and attendants, they fled, taking the child who had been born in a human-form, with them. Kaihuopala'ai also separated himself from his wife. Ka'ōhai remained with the blood stains upon her, and no one was left to help her.

It was the eel which had been born to her, that helped to clean Ka'ōhai. He worked like a human, and Ka'ōhai looked at the fish child which had been born to her, and she could find no reason to criticize or revile him. Ka'ōhai then called to her husband, Kaihuopala'ai, telling not to be afraid, and he returned. They both realized the wondrous nature of this child and cared for him at a good place, in the calm bay of Honouliuli. The named this eel child, Laumeki, and his elder sister, born in human-form, was named Kapapūhi. This eel became a cherished child, and was cared for as a God. Laumeki, the one who had been consecrated, asked that the first-born, his sister, also be cared for in the same manner, and a great affection was shared between the children born from the loins of one mother.

**November 15, 1895 (page 4)**

Thus, it is told in this tradition, that this is the eel Laumeki. It is he who caused the 'anae to remain at Honouliuli, and why they are known as "Ka Anae o Kaihuopalaai" [The mullet of Kaihuopala'a]. With the passing of time, the forms of this eel changed. At one time, he was red with spots, like the eel called pūhi Paka, at other times he was like the Laumilo eel.

A while after the birth of Laumeki, another child was born to Ka'ōhai, a son. He was named Mokumeha, and he was given to Wanue, an elder relative of Kaihuopala'ai's, to be raised. There are at Honouliuli, Ewa, places named for all of these people. The natives of that land are familiar with these places. For this Wanue, it is recalled in a song:

The thoughts are set upon the sea at Wanue,  
I am cold in the task done here...

...The eel-child Laumeki, followed the fish around in the expanse of the sea, and on the waves of this place. This was a work of love and care, done for his parents and family, that they would have no difficulties. In those days, this eel lived in the sea at a place where a stone islet is seen in the bay of Honouliuli, and he would not eat the fish which passed before him. He did these things for his parents and sister Kapapapūhi.

Laumeki was very watchful of his family, protecting them from sharks, barracudas, and the long billed marlin of the sea which entered into the sheltered bay of Honouliuli, the land of his birth. Because of his nature, Laumeki did many wondrous things. It was Laumeki who trapped the Pūhilala that had lived out in the sea, in the pond of Hanaloa. This Pūhilala was the one who bragged about his deeds, and when he was trapped his eyes glowed red like the flames of an earthen oven.

It is perhaps worthy here, my readers that we leave Laumeki and speak of Mokumeha and his journey around O’ahu. At the time when the sun rested atop the head [describing Mokumeha’s maturity], and his fine features developed. He was very distinguished looking. At that time, he determined to travel around the island of O’ahu. He asked his parents and guardian permission, and it was agreed that he could make the journey.

Mokumeha departed from Honouliuli and traveled to Wai’anae, and then went on to Lā’iemalo’o, at Ko’olauloa, the place where the youngest sister of his father dwelt. She [Kaihuku’una] was pounding kapa with her beater and thinking about her elder brother. She rose and went to the door of her house and saw a youth walking along the trail. Seeing the youth, her thoughts returned once again to her brother Kaihuopala’ai and his wife Ka’ōhai. The features of this youth in every way, looked like those of his father, and upon seeing him, tears welled up in Kaihuku’una’s eyes. She called to the youth inquiring about his journey, and he responded, answering each of the questions. The moment the youth said the name of his parents, and the land from which he came, Kaihuku’una wept and greeted her nephew in the custom of the people of old.

This greatly startled her husband who was out in the cultivated gardens tending to his crops. He thought that perhaps one of his own family members had arrived at the house. When he reached their house, he saw the strange youth and he quickly went to prepare food for their guest. In no time, everything was prepared, and he then went to his wife asking her to stop her crying, and invite the visitor to eat of the food that had been prepared. He told his wife, “Then, the talking and crying can resume.” She agreed and they sat down together and ate, and had a pleasant time talking.

Kaihuku’una then asked Mokumeha about the nature of his trip, and he

explained that he was traveling around O‘ahu on a sight-seeing trip. Kaihuku‘una told him, “It is wonderful that we have met you and can host you here.” She then asked him to consider staying with her and her husband at Lā‘iemalo‘o, where all of his needs would be met. “We have plenty of food and if you desire a wife, we can arrange that as well.” Mokumeha declined the invitation, explaining his desire to continue the journey and then return to Honouliuli.

**November 22, 1895 (page 4)**

Now it is true that at this place, Laiemaloo, there was grown great quantities of plant foods, but the one thing that it was lacking was fish. Mokumeha, his aunt, and her husband, Pueo, spoke about this, and it was determined that Pueo should go to Ewa. Mokumeha instructed him to seek out Kaihuopalaai, Kaohai, Kapapaapuhi, and Laumeki, and to ask for fish. He told them that “Laumeki will be able to lead the fish to you here at Laiemaloo.”

Pueo departed for Honouliuli [various sites and features are described along the way]... and he met with Kaihuopala‘ai. Kaihuopala‘ai’s love for his sister welled up within him, and it was agreed that fish would be given to her and her family. But rather than sending fish home with Pueo in a calabash—fish which would be quickly consumed, causing Pueo to continually need to make the journey between Lā‘iemalo‘o and Honouliuli—Kaihuopala‘ai said that he would “give the fish year round.”

**November 29, 1895 (page 4)**

When Kaihuopalaai finished speaking, Pueo exclaimed, “This is just what your son said you would do!” Kaihuopalaai and Pueo then went to the house of Kapapapūhi, who, when she learned that Pueo was her uncle, leapt up and greeted him. They discussed the request for fish, and ate while speaking

further. Kaihuopala'ai then asked, "Where do you come from?" Pueo answered, "Lā'iemalo'o," and he described the land to her.

The next day, Kapapapūhi and Pueo went on a canoe out to the stone islet where Laumeki lived. They took with them food, and as they drew near the stone, the water turned choppy like the water of the stormy winter season. The head of Laumeki rose out of his pit and remained on the surface of the water. Kapapapūhi offered him the 'awa and food she had brought with her. This eel was cared for just as a chief was cared for. When he had eaten his food and was satisfied, he rested on the surface. Kapapapūhi explained to Pueo that he too would need to care for and feed Laumeki, in order to obtain the fish he needed. Kapapapūhi then called out to Laumeki, "Here is an elder of ours, tomorrow you will go with him and take the fish of our parents with you."

#### **December 6, 1895 (page 4)**

...The next day, Pueo rose while it was still dark, and the stars, Aea, Kapawa and Kauopae were still in the heavens. He prepared the foods needed for Laumeki, and prepared the canoes. He and his wife's family and attendants then went towards Laumeki's house, where he was resting. When Laumeki saw the canoes coming toward him from Lae o Kahuka, he rose up before them. Together, they passed Kapākule, the place where the sharks were placed in ancient times as play things of the natives of Pu'uloa. When the canoes and people aboard reached the place where the waves of Kea'ali'i break, Laumeki cared for them, to ensure that no harm would befall them. This place is right at the entrance of Pu'uloa.

As the rays of the sun scattered out upon the water's surface, the people on the canoes saw the red-hues upon the water and upon those who paddled the double-hulled canoes. Pueo then saw something reflecting red, beyond the

paddlers, and below the water's surface. Pueo realized that it was Laumeki with the 'anae fish. The 'anae traveled with Laumeki outside of Kumumau, and past Āhua. They continued on past the Harbor of Kalihi at Kahaka'aulana, with the fish being urged on, by the people back at Kalaekao, Pu'uloa, and Laumeki was at the front, leading the fish at Māmala... They continued on around Kawaihoa, Makapu'u, and traveled passed Ko'olaupoko, and on past Laniloa at Lā'iemalo'o, Ko'olauloa...

**December 27, 1895 (page 4)**

...This is how the mullet came to regularly travel between the place called Kaihuku'una at Lā'iemalo'o and Honouliuli at 'Ewa...

**January 10, 1896 (page 1) and January 17, 1896 (page 1)**

...Mokumeha and Laumeki returned to Honouliuli, and Mokumeha offered a prayer chant to his elder brother:

O eel,  
O Laumeki,  
Who passed before the point,  
Dwelling in the pit,  
Eel of the cavern,  
You of the kauila (body) form,  
That is the form of the Laumilo,  
Your wooden body,  
It is Laumeki.  
Amen, it is freed...

...While Laumeki was resting at Honouliuli, Mokumeha set off once again to visit various locations around the island of O'ahu. He bid aloha to his family and

walked across the broad plain of 'Ewa. He arrived at Kapūkakī, which is the boundary of the land of the streaked seas, that land in the calm, reddened by the dirt carried upon the wind. This is where 'Ewa ends and Kona begins...

#### **8. He Kaa no Kauilani (A Tradition of Kau'ilani)**

The tradition of Kau'ilani spans various islands of the Hawaiian Archipelago and follows the children of chiefly parents with a godly lineage. The parents of Kau'ilani and Lepeamoa were Keāhua and Kauhao, both of whose names are commemorated as places in the Mānana-Waimano vicinity of 'Ewa. Kauhao's parents were Honouliuli (k.) and Kapālama (w.); the lands which are known by those names honor them. The daughter, Lepeamoa, was born in a supernatural form possessed of both nature and human body-forms. She participated in histories of great importance during the reign of Kākuhihewa as king of O'ahu. This account, published in *Ka Nupepa Kuokoa* between September 18, 1869 and October 30, 1869, was submitted by S. Kapohu and offers richer details to place, practices and history than those cited later by Westervelt (1915:204-245) and Beckwith (1970:428-429). The Hawaiian language resources have been summarized rather than directly translated.

##### ***Ka Nupepa Kuokoa***

##### **September 18, 1869 (page 1)**

Kau'ilani was the son of Keāhua (k) and Kauhao (w), and he was the younger brother of Lepeamoa (w). The family resided at Wailua Kaua'i, where Keāhua was the high chief. Kau'ilani was descended from high chiefs of Kahiki and Hawai'i, and both Kau'ilani and his elder sister, Lepeamoa, were possessed of supernatural powers.

The elders of Kauhao were Kapālama (w) and Honouliuli (k), and the lands on which they lived are now named for them. When Lepeamoa was born, she was born in the form of a hen's egg. Discerning the supernatural nature of her

granddaughter, Kapālama and Honouliuli sailed to Kaua'i on their canoe, Pōhakuokaua'i, and retrieved the egg. With the egg, they then returned to Kapālama, where they cared for the egg until it hatched. While sailing from Kaua'i to O'ahu, the canoe passed by Pōka'i, Wai'anae, and sailed along the fine shore of Kualaka'i, 'Ewa. From there, they sailed to the many harbored bay of Pu'uloa, and entered into the opening of Pu'uloa where they landed their canoe on the side of the bay. From there, they traveled along the plain to Kapālama...

[The story continues, describing the care given to the egg-grandchild, Lepeamoā. When she hatched, she was in the form of a beautiful bird with many brightly colored feathers.]

**September 25, 1869 (page 1)**

After Lepeamoā was taken to Oahu, her younger brother, Kauilani was born. He was taken and reared by his paternal grandparents, Lauka'ie'ie [k] and Kania'ula [w], in the uplands of Wailua. Kau'ilani was bathed in a sacred pool, which caused him to mature quickly, and his grandparents instructed him in various skills and forms of Hawaiian combat. During this time, a god Akua-pehu'ale rise up and fought against Keāhua and his people, capturing them and holding them prisoner. Following the instructions of his grandparents, Kau'ilani fought against the god, and vanquished him, returning the rule of Kaua'i to Keāhua...

**October 9, 1869 (page 4)**

After the battle, Kau'ilani and his father were reunited, and in this way, the youth learned that he had a sister who was being raised on O'ahu, by the elders of Kauhao. Kau'ilani determined to go and seek out his sister, and Kauhao instructed him about the lands he would pass and how he would know his

sister.

She told him that he must sail from Wailua and along the coast of Wai'anae, and along the shore of Pu'uloa, where he would find a landing and the path to Kapālama. Before his departure, Kauhao also gave Kau'ilani a supernatural spear named Koawī Koawā, which would help him along his journey, and lead him to his elders on O'ahu.

Departing from Wailua, Kau'ilani traveled to the shore at Nukoli'i. He threw the spear, and then took off after it, across Ka'ie'iewaho channel, sailing to O'ahu. In his canoe, Kau'ilani passed the coast line of Wai'anae, and he then drew near the shore of Kualaka'i where the spear had landed. While Kau'ilani was traveling from Kaua'i to O'ahu, two sisters, Kamalulena and Keawalau, who had been surfing at Kualaka'i, returned to the shore and found the spear. Seeing the spear, and recognizing its excellent quality, the sisters hid it, seeing no man who could claim it.

Shortly thereafter, Kau'ilani passed the coast of Wai'anae and landed on the shore of Kualaka'i to retrieve his spear. Upon landing, Kau'ilani saw the two sisters and noted that his spear was nowhere to be seen. Kau'ilani inquired of the sisters if they had seen the spear, which they denied. Kau'ilani discerned that they were lying, and told them so, and he then called out to his traveling companion, the spear, Koawī Koawā. The spear answered from where the sisters had hidden it, and Kau'ilani picked it up and threw it again. It landed near the entry way to Pu'uloa.

**October 23, 1869 (page 4)**

Arriving where the spear landed, the spear then told Kau'ilani to climb a wiliwili tree that was growing nearby. From there, he would see a rainbow at the shore, and a person picking limpets, octopus, and other things. That person would be

Lepeamoa, Kau'ilani's sister. Kau'ilani climbed the wiliwili tree and saw a red patch of a rainbow upon the water near the shore. He asked Koawī Koawā about this, and learned that it was the rainbow shroud of his sister, who was in her bird form near the shore...

## 9. Ka Moololo o Kalelealuaka (The Tradition of Kalelealuaka)

The tradition of Kalelealuakā touches on places throughout the Hawaiian Islands. Kalelealuakā and his father, Ka'ōpele, possessed supernatural attributes and their story describes several places in Honouliuli and the larger 'Ewa District. The tradition was published in *Ka Nupepa Kuokoa* and was submitted by J.W.K. Kaualilinoe between April 9, 1870 and June 4, 1870. The original account offers a richer narrative of places and practices than those cited Fornander (Vol. IV, 1916:464-471) and Beckwith (1970:415-418). There are several wahi pana named in the tradition with descriptions of place and how the names were given.

### *Ka Nupepa Kuokoa*

#### **April 9, 1870 (page 1) and April 23, 1870 (page 1)**

Ka'ōpele (k) and Makalani (w) were the parents of Kalelealuaka (k). Kalelealuaka was born on Kaua'i, the native land of his mother. His father had been born at Waipi'o, Hawai'i, and possessed certain supernatural powers. Ka'ōpele was a great cultivator of the land, and he is credited with the planting of large fields on Hawai'i, Maui, O'ahu, and Kaua'i. On O'ahu, it was at Kapapakōlea in Moanalua, and at Līhu'e (Honouliuli), in the district of 'Ewa that Ka'ōpele had cultivated large tracts of land. While Ka'ōpele worked the land with great speed, he was also overcome by a deep sleep that lasted for six months at a time. On many occasions, it was thought that Ka'ōpele had died, and then he would reawaken and resume his tilling of the land. When Makalani became pregnant, Ka'ōpele gave her certain items to identify the child as his own, and shortly before giving birth, Ka'ōpele went to sleep.

**April 30, 1870 (page 1)**

Kalelealuaka was born and grew quickly. When Ka'ōpele woke up from his sleep, he instructed his son in various techniques of fighting, and Kalelealuaka became known as an exceptional warrior, who moved so swiftly, that no one could even see him... One day, when looking out across the ocean, Kalelealuaka saw a land in the distance, and he inquired of Ka'ōpele, "What land is that?" Ka'ōpele told him that it was "Ka'ena on the island of O'ahu. Kalelealuaka then asked, "What is the village that is there beyond the point?" Ka'ōpele answered, telling him that it was "Wai'anae." When Kalelealuaka expressed a desire to travel and see that land more closely, Ka'ōpele made a canoe for his son to travel on.

When preparations were being made for Kalelealuaka's departure, he befriended a youth named Kaluhe, and it was agreed that Kaluhe would travel with Kalelealuaka. When everything was made ready, Ka'ōpele told Kalelealuaka:

Sail until you reach the point outside of the village of Wai'anae, then travel across the plain to a place where there is a pool of water. That will be the pool of Lualualei. Then you will ascend the pass of Pōhākea, from where you will see the flat lands spread out before you. You may also see the expansive cultivated fields of Keahumoe which I planted before coming to Kaua'i...

**May 7, 1870 (page 4)**

Kalelealuaka and Kaluhe sailed to O'ahu and passed the heiau of Kānepūniu and landed on the shore. There Kalelealuaka was met by a group of youth who were surfing. One of the youth inquired about the journey of the two travelers, and one asked if he might accompany Kalelealuaka and his companion. Kalelealuaka agreed, and the group walked across the plain and found the pool

## Existing Resources

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of Lualualei. From there, they then ascended the mountain, to the pass at Pōhākea, from where they looked out across the broad flat lands of Keahumoe. Descending the slope, they found a large banana patch that had been planted by Ka'ōpele.

Kalelealuaka then shot his supernatural arrow, and it flew down slope, passing the plains of Pu'unahawele and Kekua'ōlelo, and it landed at Kekuapō'ai, awaiting Kalelealuaka's arrival. This was at Waipi'o, above 'Ewa. The people of the area saw the flight of the arrow, and cried out "Ka pua lele hoi e!" ["How the arrow flies!"] That is why the place is called "Lele-pua" [Flying-arrow], to this day...

Kalelealuaka stayed in the uplands above Lelepua, at Kahalepō'ai, and asked his companions to go and fetch the arrow. He also told them to gather some clumps of 'awa and sedges for straining it. The two companions went and arrived at the edge of the stream called Kaniukūlou, where they saw some women bathing. They asked, "Have you perhaps seen our arrow?" The women denied having seen it, hoping that they might keep it for themselves. Because they had found it and greatly admired its beauty. Sensing that they were lying, Kaluhe called out to the arrow, and it leapt from the place at which it had been hidden, into his hands. The women were frightened by this, and fled away.

Kaluhe and his companion left the stream and arrived at a large house with clumps of 'awa planted all about it. Looking around, they found no one in the house or in the surrounding lands, so they began to gather some of the 'awa. While picking the 'awa, they heard a voice call out to them, "Set aside that which you have taken, or I shall return." Startled by this command, they dropped the 'awa and fled, returning to Kalelealuaka, and describing the house, its surroundings, and events to him. They noted that the house was an excellent one, and only lacked sleeping mats inside.

Kalelealuaka had them gather rolled sleeping mats and kapa and they then traveled to the house. Entering the house, they found that all was in order, and they prepared food, ate, and drank 'awa, with no other voices calling to them. The next day, Kalelealuaka arose, and he and his companions planted large fields with various crops. The field planted by Kalelealuaka extended from the uplands of Kahalepō'ai to the lowlands of Pu'unahawe. When the work was completed they returned to the house and prepared pōpolo, 'āheahea, and 'inamona as their food. These were the only things which presently grew around the house that could be eaten until their own gardens matured. While they were eating, The youth from O'ahu, ate with great haste and ferocity, and Kalelealuaka called to him, urging him to eat with patience. Because of this, the youth from O'ahu, came to be called "Keinohoomanawanui."

One of the problems in living in the uplands was that there were plenty of plant foods to be had, but there was no fish. One day, while preparing their food, Keinohoomanawanui was making 'inamona (kukui nut relish). When he struck a broiled kukui nut, the shell flew up and struck him in the eye, blinding him in that eye. Kalelealuaka then took up the task of preparing the food...

**May 14, 1870 (page 1)**

Kalelealuaka told Keinoho'omanawanui, "I will prepare that food which we two desire." Keinoho'omanawanui said, "That which I desire are the sweet potatoes of the planted fields below, and the eels of the pond at Hanaloa." Kalelealuaka told Keinoho'omanawanui, that "in time, you will have your desire." Now these foods were the property of the king Kākuhihewa, and they were kapu to all but him and his people. Kalelealuaka told Keinoho'omanawanui, "Tomorrow, Kākuhihewa and his people will arrive here in the uplands of Waipi'o, to gather wood with which to make new houses in the lowlands."

Now while Kalelealuaka and Keinoho'omanawanui were discussing these things, Kākuhihewa himself had come to the uplands to gather some of the 'awa that grew at Kahauone. Seeing the large house in which Kalelealuaka and his companions dwelled, he quietly drew near and overheard the conversation, curious about who these men were. He set a wooden image in the ground near the house to mark the area, and then departed, returning to Pu'uloa. Kākuhihewa thought about what he had heard, and the bold remarks that they would soon eat the favored eels of Hanaloa. Kākuhihewa spoke of this with his advisors and war leaders, some of whom suggested that a party go to the uplands to kill the impertinent youth.

Instead, Kākuhihewa sent to Waimānalo ['Ewa] for his priest, Nāpuaikamao. Nāpuaikamao traveled to Ko'olina where Kākuhihewa was staying, and listened to the words of his chief, describing the youth and their conversation. Nāpuaikamao thought about their words, and the symbolism of the desire for the eels of Hanaloa, and discerned that one of the youth was the great warrior, Kalelealuaka, of Kaua'i. Now at this time, Kākuhihewa was at war with a chief named Kūali'i, the two kings seeking to rule all of O'ahu. Nāpuaikamao told Kākuhihewa, that it was Kalelealuaka who would bring victory to his side, and that he should prepare a house for the youth and allow them to fulfill their desires.

Kākuhihewa agreed, and ordered preparations to be made. He then had his counselor, Maliuha'aino go to the uplands of Waipi'o and invite Kalelealuaka and his companions to the shore...

**May 21, 1870 (page 1)**

Maliuha'aino arrived before the youth, and following a discussion, it was agreed

that they would meet with Kākuhihewa... Descending to the coast, they passed the plain of Pu'unahawe. They then passed below Pu'uku'ua which is near the mountain ridge, and descended to the shore of Pu'uloa. Kalelealuaka and his companions were shown the houses and foods that had been prepared for them, and they took up residence at Pu'uloa...

[During this time, the identity of Kalelealuaka remained hidden from Kākuhihewa and his people. Because the king had heard Keinoho'omanawanui speaking about his desire for the eels of Hanaloa, and because Keinoho'omanawanui told people that he had been blinded in one eye by a spear, it was assumed that Keinoho'omanawanui was the great warrior that they sought.]

With the passing of several periods of ten days [anahulu], a messenger from the king, Kūali'i, arrived bearing the message that Kūali'i challenged Kākuhihewa to a battle on the field at Kanalua [Kauālua], in Moanalua... The warriors met, and a great battle took place in which the champion of Kūali'i was killed. It was thought that Keinoho'omanawanui [mistaken as being Kalelealuaka] had secured the victory for Kākuhihewa... During this battle, Kalelealuaka had stayed behind at Pu'uloa, and after the battle began, ran secretly with great speed to the battle ground, and killed Kūali'i's champion...

**May 28, 1870 (page 1)**

At each of the subsequent battles between the warriors of Kākuhihewa and Kūali'i, Keinoho'omanawanui was credited with, and accepted the honor of having defeated Kūali'i's champions. Because Kalelealuaka moved so swiftly, no one even saw him enter the battle field. Kalelealuaka had stayed behind at Pu'uloa, and secretly entered into the battle, killing Kūali'i's champions, and taking their capes and feather helmets, with which he returned to Pu'uloa,

hiding the items in his house.

**June 4, 1870 (page 4)**

At the last battle between Kākuhihewa and Kūali'i's champions, the forces met near Waolani, and Kalelealuaka killed all of the warriors of Kūali'i. Great honor was to be bestowed upon Keinoho'omanawanui, but Kalelealuaka arrived before the assemblage and claimed the privilege. Kalelealuaka accused Keinoho'omanawanui of deception, and challenged him to a fight to prove it. As quickly as the battle began, Keinoho'omanawanui was killed, and Kalelealuaka took his head to Maliuha'aino.

Seeing that all of his warriors had been killed, Kūali'i, thought that his life too was forfeit, but Kalelealuaka invited him to live under Kākuhihewa, to which Kūali'i agreed. The head of Keinoho'omanawanui was taken to Pu'uoloa and then set atop an 'a'ā hillock above Kalauao... Kalelealuaka, Kākuhihewa and Kūali'i, and their people lived out their days in peace...

**10. Na Wahi Pana o Ewa i Hoonalowaleia i Keia Wa a Hiki Ole ke Ikeia (Storied Places of 'Ewa, That are now Lost and Cannot be Seen)**

Between June 3, 1899 and January 13, 1900, the Hawaiian newspaper *Ka Loea Kalaiaina* published a series of articles titled "Na Wahi Pana o Ewa i Hoonalowaleia i Keia Wa a Hiki Ole ke Ikeia," which can be translated to "The noted places of 'Ewa that have been forgotten at this time and can no longer be seen." The author of the series is not identified, but it is a rich resource of traditions, named places and history of the district. Excerpts pertaining to Honouliuli as published in various issues are presented below. A careful review of the original Hawaiian texts has been made and the translations compiled with reference to notes developed by Mary Kawena Pukui.

***Ka Loea Kalaiaina***

**Na Wahi Pana o Ewa i Hoonalowaleia i Keia Wa a Hiki Ole ke Ikeia**

**Ianuali 13, 1900 (aoao 1)**

Aia no i keia aina kekahi puu kaulana o Puuokapolei, i keia wahi i noho ai o Kamaulaniho me kana moopuna me Kekeleaiku, kaikuaana o Kamapuaa. Mahope iho oko lakou haalele ana ia Kaliuwaa Kaluanui Koolauloa. Aole nae au e kamailio iki ae a e hoi au no Puuokapolei.

Ina e hele ana kamahale ma ke alanui aupuni no Waianae, aia a haalele ia Honouliuli ke kulanakauhale o ke Gula, e loaa mua mai ana ia ia ke kula o Puuainako, a hala ia, hele mai o Keoneae, alaila, pii aku no i ka piina o ka Puuokapolei, a ilaila, haliu ae oe a nana makai o ke alanui aupuni e ku ana ua wahi puu ala ia, oia hoi o Puuokapolei, na keia wahi puu i alai ia Ewa, ke huliaku hoi oe ma kela aoao o Waimanalo pau kou ike ana ia hope nei, hele aku he mau hoalu lillii a holo aku oe he kula, o keia kula, oia ke kula o Pukaua [Pu'ukaua], aia mauka io ke alanui e

**January 13, 1900 (page 1)**

[Honouliuli] There is on the land a famous hill, Puuokapolei. It was at this place that Kamaulaniho lived with her grandson, Kekeleaiku, the older brother of Kamapuaa. This was after they left Kaliuwaa, Kaluanui at Koolauloa. I did not speak much earlier about it so I will return to Puuokapolei.

If a traveler should go along the government road to Waianae when he leaves Honouliuli, the city of Gold, he will first come to the plain of Puuainako (Mounds of cane debris), and passing from there, arrive at Keoneae (The fine soil or cinder), and then from there shall go straight the ascent to Puuokapolei (Hill of Kapolei). Then when you look around, towards the shore side of the government road, this is the hill. It is Puuokapolei. When you go to the side towards Waimanalo, you see no more of the sight back here. This hill shields/blocks Ewa from view. When you are done, you go down a little on the plain. This plain is the kula of Puukaua. It is there above

ike ai oe he pohaku nui e ku ana i ke kula. Eia kahi moolelo i kaulana ai kela kula.

He wahi luahine kupua, a i ole ia he mau luahine hooehaa, he mau wahi luahine hahapaiea paha, no laua o Puukaua; ia laua i kai o Kualakai i ka lawaia i ke ahiahl, i kai no laua a i ka lawaia a wanaao hoi mai. Eia ka laua mau wahi i'a, he Aama ua i'a, he Pipipl ua i'a, a me na ano i'a like ole apau e loaa aku ana i ko laua nei mau lima. Ia laua nei e hoi ana i ke kula mai kahakai mai, me ko laua manao ana la e hiki poeleele aku ana la laua i kauhale, aole nae pela. Ua halawai laua me ka maka paa, oiai, laua e hookokoke aku ana i ua kula ala, ua malamalama loa ae la, a ua hiki ke ike ia aku na kanaka ke hele ae, a eia no nae laua nei ma kai o ke alanui e hoi nei, a no ko laua nei makau o ike ia laua e na kanaka.

Ia wa ua hoomaka mai la laua e holo,

the government road that you will see a large stone situated on the plain. Here is a famous story of this plain land.

There were some supernatural women, or peculiar women who possessed strange powers, they were of Puukaua; they would regularly go down to the shore of Kualakai to go fishing in the eveing. They would stay at the shore fishing until early morning. Here are the things they would catch, Aama crabs, pipipi shellfish, and all manner of fish, whatever they could catch with their hands. As they were returning to the plain from the shore and thinking of getting home before morning came, that it would still be dark. But it was not so. They met a blind person as they were getting close to the plain and it was getting light, and they could be seen by the people that were traveling by. They were still on the shoreward side of the trail, and they were afraid of being seen by people.

They then started running, and as they ran, they lept, fell and sprawled out,

oia holo ko laua nei, oia lele, a hina a palaha eia no nae, ala no holo no, a helelei aku la ka Aama a me ka limu, aohe nae he nana ia iho. Aia ka pono o ke kaa aku mauka o ke alanui, eia nae ua pale pono, oiai, ua ao loa ae la. I kela wa olelo aku la kahi luahine i kahi luahine o laua:

“E pee kaua, o ike ia mai auanei kaua e na kanaka?” a o ko laua nei pee iho la no ia. Lilo koke ae la ko laua kino i kino pohaku. A oia ke kaulana o keia kula i keia kino pohaku a hiki loa mai i keia wa.

O keia ka pau ana o ko laua moolelo. O ke kaahale malahini ana a hiki ia kula, aole no he hewa ke alawa ae mauka o ke alanui i ike ia laua i ke ku mai a i ke kula.

E nee mai kakou i Puuokapolei. O keia pu kekahi puu kaulana loa i ka wa kahiko. Mai keia puu mai i haku ia ai kekahi mele i kamaaina i ka poe lealea o ka wa kahiko, ua haku ia apuni Oahu nei, a ma ia mele e oli ai ka poe Pukaula a me ka poe Ukeke laau, ka poe kimo pohaku, hua Noni,

and their Aama, and limu all scattered about, but they took no care. Then one old woman said to the other of them:

“Let us hide, unless were be seen by the people.” And so they hid. Their bodies were then turned into a stone body. Their stone body is one of the famous things on this plain to the present day.

This is the end of their story. So when one visits the plain, there is nothing wrong with glancing above the trail to see them standing there on the plain.

Let us go on to Puu-o-Kapolei. This was one of the most famous hills in ancient times. It is from this hill that chant was composed by the natives, and those who were skilled in the games of olden times. It was composed to go around the Oahu. It was with this chant that the people who played pukaula (a guessing game) and those who played the wooden ukeke (a native bow string

hua kukui paha.

instrument), and those who juggled stones, noni fruit or kukui nuts.

Ua helu ia ka inoa o keia mele ma kainoa o ka aina, a oia ka'u e panee aku nei imua o ka poe aole i loaa a paa naau i neia mele. E like me na mele kahiko i loaa ole i kekahi poe, a loaa hoi kahi i kekahi poe:

This was a chant to recount land names, and I present it before the people, who may not have it memorized. It is like the old chants that are not known by some people, though it is familiar to other people [the chant is presented in a riddle stylem, stating a question and answering it by speaking the place name]:

E Kawelo e, e Kawelo — e  
E Kawelo mainui o Puuokapolei

O Kawelo, o Kawelo — e  
Kawelo with the large genitals, of Puu-o-Kapolei.

O Puuokapolei—  
Uliuli ka Poi a kua e ai nei —  
O Honouliuli  
Aeae ono—a Paakai e hoaeae  
O Hoaeae  
Pikele, Pikele ka i'a e Waikele—

It is Puuokapolei.  
The poi that we eat dark —  
It is Honouliuli  
Fine and delicious is the salt of Hoaeae  
It is Hoaeae  
Tiny and numerous are the fish of Waikele —  
It is Waikele  
A House arched like an egg —

O Waikele  
Ka Hale pio ka hua moa —  
O Waipio

It is Waipio  
Stop and eat of the awa fish —  
It is Waiawa

E ku a ai kua i ka la loko awa —	Let us not spread out the limbs —
O Waiawa	It is Manana
Mai hoomanana ia kua —	Many streams, hundreds and
O Manana	thousands —
Kini kahawi he lau he mano —	It is Waimano
	We two are drawn in by the currents
O Waimano	It is Waiau
Ko ia kua e ke au —	We two are in the shade of the kukui
O Waiau	trees —
Kukui malumalu o kaaua [kua] —	It is Waimalu
	Let us get up for it is day —
O Waimalu	It is Kalauao
E ala kua ua ao —	Let be hosted to eat —
O Kalauao	It is Aiea
E kipa kua e ai —	We two were almost plundered —
O Aiea	It is Halawa
Mai hao halawa ia kua —	Let us two go and dwell in a pit —
O Halawa	It is Moanalua
E hoi kua e noho i ka lua —	We make love in the hau —
O Moanalua	It is Kahauiki
Hooipoipo hau kua —	Let us go up to the lama trees —
O Kahauiki	It is Kapalama
E pii kua i ka lama —	Let us two make a bundle and carry it—
O Kapalama	Honolulu
E nunu a haawe kua —	Spurting there —
	It is Waikiki
O Honolulu	Cracked is the egg of the mud hen
Kiki kuoha ilaila —	It is Waialae
O Waikiki	This is a woman who flies a kite —
Kike ka hua a kaalae —	It is Wailupe

O Waialae	My companion bruised in a pit –
He wahine hoolupe keia –	It is Maunalua
O Wailupe	This is menstruating woman –
Mauna kuu hoa i ka lua –	It is Koko
O Maunalua	Gathered are the leaves of the
He wahine heekoko keia –	coconut
O Koko	It is Niu
Puo ka lau o ka niu –	Plying the canoes in the sea –
O Niu	It is Hanauma
Pauma na waa i ke kai –	A pop-eyed woman is she
O Hanauma	It is Makapuu.
He wahine makapuu keia –	
O Makapuu	My friends, pardon me for this is. This
	is that is known to me of the chant.
E na hoa e kala mai oukou ia'u. O	This may be an important thing for the
keia ae la kahi i paa ia'u o keia mele,	new generation who may not receive
a he mea nui no hoi i na hanaua hou,	the things of old.
ka loaa ole ana o na mea kahiko...	
	Let us not leave the other storied
E waiho kakou i na wahi pana o	places of Honouliuli until a time when
Honoluluuli i koe aku a hiki i ka	it appropriate.
kupono.	
	We are now moving to Hoaeae, Waihi
E nee mai ana kakou i Hoaeae, aia	is there. This place is found by looking
ilaila o Waihi a aia no ma ia wahi i ka	down towards the rail line, is it a gulch
huli e nana iho ana i ke alahao he	adjoining the railway track. It is the
wahi Owawa, ua pili loa i ke alahao.	place where the King of Oahu,
Oia kahi i make ai o ka Moi Oahu nei,	Kahahana, died.
oia o Kahahana.	It is said that Kahahana was an

Ua olelo ia o Kahahana he keiki hookama na Kahekili, ke alii o Maui, a i ole he keiki no paha na Kahekili. O ka nohoalii ana o Kahahana he nohoalii ino, he hookuli, a hoopale i na olelo ao a ke kahuna, na kakaolelo, a me na kuhikuhi puuone...

adopted son of Kahekili, the King of Maui, or perhaps the own son of Kahekili. The rule of Kahahana was an evil rule. He ignored and rebuked the advise of his priests, counselors, and those who interpreted the nature of the land...

**11. Ka Moolelo Hawaii – O kekahi mau mea i manao nui ia o ke kupapau (Hawaiian History – Some Things which are of Importance Pertaining to the Dead)**

Care for the dead (kupapa‘u), respect of the graves (ilina) and traditions associated with the spirit after death are subjects of great significance to Hawaiians – past and present. In his history of the Hawaiian people, Samuel M. Kamakau shares a collection of traditions and practices pertaining to the dead and identifies some of the places of importance in these practices. These narratives are of particular importance to lands and specific wahi pana of Honouliuli and are connected across the landscape to Moanalua.

***Ke Au Okoa***

**O kekahi mau mea i manao nui ia o ke kupapau.**

**‘Okakopa 6, 1870 (aoao 1, helu 43)**

...Hookahi anahuna kaulana ma Oahu. O Pohukaina ka inoa, aia ma ka pali o Kanehoalani mawaena of Kualoa a me Kaaawa, aia ka puka i manao ia ma ka pali o Kaoio e huli la i Kaaawa, a o ka lua o ka puka, aia ma ka punawai o Kaahuula-punawai. He anahuna alii keia, a he nui ka waiwai huna iloko a me na‘lilii kahiko. O Hailikulamanu, oia kekahi puka, aia a kokoke makai o ke ana Koluana i Moanalua, aia ma Kalihi, ma Puiwa, oia na puka ekolu o Pohukaina ma Kona, a o Waipahu ma Ewa, aia ma Kahuku i Koolauloa kekahi puka, a o

## Existing Resources

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kauhuhu o kaupaku o keia hale anahuna, oia no ka mauna o Konahuanui a iho i Kahuku. Ua olelo ia ma ka moololo a kanaka, ua nui ka poe i komo iloko me na ihoiho kukui, mai Kona aku nei a puka i Kahuku...

A maloko o keia anahuna, he mau halokowai, he mau muliwai a mau kahawai, ua hana kinohinohi ia, a ma kauwahi aku, he mau aina palahalaha...

### **Na uhane mahope o ka make ana o ke kino.**

...O ke ao kuewa; a o ke ao auana kekahi inoa; I ka make ana o ke kanaka kuleana ole, ua auana kuewa hele kona uhane me ka lalau hele i ka nahelehele, a ua hele wale i [Kamaomao], a i ka wiliwili o Kaupea, a hiki kona uhane i Leilono, aia malaila ka Uluolaiowalo; a i loa ole kona uhane aumakua i maa mau ia ia, a aumakua kokua hoi, alaila, e lele kona uhane ma ka lala ulu popopo a haule ilalo lilo i ka po pau ole i o Milu la...

O Leiolono; Oia kekahi wahi e make ai na uhane i ka po pau ole. Aia o Leiolono kokoke i ka pohaku o Kapukaki a ma nae aku, e kupono ana i puu hoilina kupapau o Aliamanu, a huli i ka aoao akau o Hokupaa, aia ma ke kapaluna o ke alanui kahiko, aia he hapapa pahoehe pohaku, aia maluna he wahi ponaha, he alua paha kapuai ke anapuni, oia ka puka e iho ai ilalo, o ka nuu ia o Papa-ia-Leka he ao aumakua ia wahi, aia ma ka puka e iho ai o ka puka o Leiolono, he ulu o Leiwalo, elua lala ma ka hikna kekahi a ma ke komohana kekahi, he mau lala ulu hoopunipuni keia, a o kekahi lala niu, he lala e lele ai i ka po pauole, a o ka lua o ka lala ulu, aia a kokua ia mai e ka uhane aumakua kokua, alaila, e ike auanie maia ao aumakua, i na kupuna i olelo ia o Wakea a me ka huina kupuna a pau, a me ko ke ao holookoa e hele nei, i ka lakou huakai; a o kekahi hapa, aia ma kela lala ulu hoopunipuni i ka po pauole. O ka palena o Leilono, o Kapapa-kolea ka palena hikina, he peelua nui launa ke kiai hikina o Koleana; a o Napeha ka palena komohana, a he moo ke kiai malaila,

a i makai i keia mau kiai, alaila hoi hou i hope, a i kokua hou ia e na uhane aumakua, alaila, ua hou, a ua alakai ia i ke ao aumakua.

A i makau i ka peelua e alai ana i ke alanui mai kela aoao mai o Alia, kiei ke poo ma ka pali o Kapakolea, alaila makau ke uhane a auwana, a pili aoao ma ke kahawai ma ka hale hana ili, aole he alanui aupuni mamua, aka, he alanui kamaaina no Kauhilaee, a ua oleloia aia a komo ka auwana maloko o na palena, he make wale no kona uhane, a o ke lele i ka po pau ole; aka, ua oleloia ua ola mai no kekahi poe uhane auwana ke loa i na uhane aumakua kokua, a o ka poe kokuaole, e make no i ka po pauole, a i o Milu la. Aia ma ke kula o Kaupea, ma ke kaha o Puuloa, e hele ai na uhane auwana e poipoi pulelehua, a e poipoi nanana, oiai aole e hele loa na uhane auwana i na wahi i olelo ia mamua, a i loa paha i na uhane aumakua e poipoi nanana ana, a ua hoopakeleia, a o ka poe uhane kokua ole, he poe uhane haukae lakou, a mai ka wiliwili i Kaupea, i Kanehili, he nui no na wahi i oleloia ma keia inoa. O Kaleia-a-kauhane [Ka-leina-a-ka-uhane], a me ka Ulu o Leiwalo, aia ma Hawaii, ma Maui, ma Molokai, ma Lanai, ma Kauai a me Niihau, hookahi no moololeo like no keia mau wahi...

**Translation – Hawaiian History:**

**Some things which are of importance pertaining to the dead.**

There is only one famous hiding cave [ana huna] on Oahu. It is Pohukaina. The opening on Kalaeoka'o'io that faces toward Ka'a'awa is believed to be in the pali of Kanehoalani, between Kualoa and Ka'a'awa, and the second opening is at the spring Ka'ahu'ula-punawai. This is a burial cave for chiefs, and much wealth was hidden away there with the chiefs of old. On the Kona side of the island the cave had three openings, one at Hailikulamanu—near the lower side of the cave of Keleana in Moanalua—another in Kalihi, and another in Pu'iwa. There was an opening at Waipahu, in Ewa, and another at Kahuku in

Ko'olauloa. The mountain peak of Konahuanui was the highest point of the ridgepole of this burial cave house, which sloped down toward Kahuku. Many stories tell of people going into it with kukui-nut torches in Kona and coming out at Kahuku. Within this cave are pools of water, streams, creeks, and decorations by the hand of man (hana kinohinohi'ia), and in some places there is level land (Kamakau, 1964:38).

The leina a ka 'uhane on Oahu was close to the cape of Ka'ena, on its right (or north, 'akau) side, as it turns toward Waialua, and near the cutoff (alanui 'oki) that goes down to Keaoku'uku'u. The boundaries of this leina a ka 'uhane, it is said, were Kaho'iho'ina-Wakea, a little below Kakahe'e, and the leaping place (kawa-kai) of Kilauea at Keawa'ula. At these places would be found helpful 'aumakua souls who might bring back the spirit and restore life to the body, or if not, might welcome it to the realm of the 'aumakua. Places within the boundaries mentioned were where souls went to death in the po pau 'ole, endless night.

Leilono at Moanalua, Oahu, was close to the rock Kapukaki and easterly of it (a ma ka na'e aku), directly in line with the burial mound of Aliamanu and facing toward the right side of the North Star (a huli i ka 'ao'ao 'akau o ka Hokupa'a). On the bank above the old trail there was a flat bed of pahoehoe lava, and on it there was a circular place about two feet in circumference. This was the entrance to go down; this was the topmost height (nu'u) of Kapapaialaka, a place in the 'aumakua realm. Here at the entrance, ka puka o Leilono, was a breadfruit tree of Leiwalo, he 'ulu o Leiwalo. It had two branches, one on the east side and one on the west.

These branches were deceiving. From one of them, the soul leaped into the po pau 'ole; if he climbed the other, it would bring aid from helpful 'aumakua ('aumakua kokua). From that branch the soul would see the 'aumakua realm

and the ancestors spoken of, Wakea and all the rest, and those of the entire world who had traveled on this same journey.

The boundaries of Leilono were, Kapapakolea on the east, [with] a huge caterpillar (pe'elua nui) called Koleana as its eastern watchman, and the pool Napeha on the west, with a mo'o the watchman there. If the soul was afraid of these watchmen and retreated, it was urged on by the 'aumakua spirits, then it would go forward again and be guided to the 'aumakua realm. If a soul coming from the Alia (Aliapa'akai) side was afraid of the caterpillar, whose head peered over the hill Kapapakolea, and who blocked the way, it would wander about close to the stream by the harness shop. This was not the government road (alanui aupuni) of former times, but was a trail customarily used by "those of Kauhila'ele" [figuratively, the common people; the la'ele, old taro leaves, as contrasted with the liko, the new and choicer leaves—that is, the chiefs]. It was said that if a [page 48] wandering soul entered within these boundaries it would die by leaping into the po pau 'ole; but if they were found by helpful 'aumakua souls, some wandering souls were saved. Those who had no such help perished in the po pau 'ole of Milu.

On the plain of Kaupe'a beside Pu'uloa, wandering souls could go to catch moths (pulelehua) and spiders (nanana). However, wandering souls would not go far in the places mentioned earlier before they would be found catching spiders by 'aumakua souls, and be helped to escape. Those souls who had no such help were indeed friendless (he po'e 'uhane hauka'e lakou), and there were many who were called by this name, po'e 'uhane hauka'e.

There were Leina-a-ka-'uhane and 'Ulu-o-Leiwalo on Hawaii, Maui, Molokai, Lanai, Kauai, and Niihau as well as on Oahu. The traditions about these places were the same. They were where spirits were divided (mahele ana) to go into the realm of wandering spirits, the ao kuewa or ao 'auwana; or to the ancestral

spirit realm, the ao 'aumakua; or to the realm of endless night, the po pau 'ole.

The places said to be for wandering spirits were: Kama'oma'o for Maui; Uhana [Mahana] at Kahokunui for Lanai; Ma'ohelaia for Molokai; Mana for Kauai; Halali'i for Niihau; in addition to Kaupe'a for Oahu. In these places the friendless souls ('uhane makamaka 'ole) wandered (Kamakau, 1964:48-49, M.K. Pukui, translator).

## **12. Alahula Pu'uloa, he Alahela na Ka'ahupāhau (The Swimming Trails of Pu'uloa [Pearl Harbor], are the Trails Traveled by Ka'ahupāhau)**

In 1870, Kamakau wrote about several practices and beliefs pertaining to manō (sharks) in ancient life. One practice of note in the Pu'uloa region was the practice of transforming deceased family members into manō as 'aumākua (family gods/guardians). These family 'aumākua would help their relatives when in danger on the sea—if a canoe capsized or a man-eating shark was threatening attack. Hawaiians also worked with and tamed manō so that one could ride them like a horse, steering them to where one wished to go (S.M. Kamakau, 1976). Kupuna Mary Kawena Pukui shared that there were two basic classes of sharks — manō kākana (sharks with human affiliations) and manō i'a (wild sharks of the sea—man eaters). The manō kākana were revered and cared for, while the manō i'a were at times hunted and killed following ceremonial observances (M.K. Pukui, pers. comm., 1976). The practice of chiefs hunting sharks using the flesh of defeated enemies or sacrificial victims as kūpalu manō (shark fishing chum) and of commoners using rotted fish as kūpalu manō are further described in several historical narratives.

Ke Awalau o Pu'uloa (the many bays of Pu'uloa) are famed in traditional and historical accounts of manō. The traditions center around the several deified sharks, foremost of whom is the goddess, Ka'ahupāhau, then followed several others, including but not limited to Kahi'ukā, Kūhaimoana, Komoawa, Ka'ehuikimanōpu'uloa, Keli'ikau-o-Ka'ū (Kealiikauaoka'ū) and Mikololou. With the exception of Mikololou, all these shark gods were friendly to people, and dedicated to keeping manō i'a out of the Pu'uloa-'Ewa waters, and

protecting people.

Traditions of Ke Awalau o Pu'uloa tell us that one of the most important k n wai (laws) governing man  was that they would not attack humans. This k n wai was created by the shark gods themselves. Kamakau wrote about the establishment of this k n wai stating that:

Oahu was made a kapu land by this kanawai placed by [the shark gods] Kanehunamoku and Kamohoali'i. But their sister Ka'ahupahau broke the law and devoured the chiefess Papio. She was taken and "tried" (ho'okolokolo) at Uluka'a [the realm of these gods], but she escaped the punishment of death. It was her woman kahu who paid the penalty of the law because it was her fault—she reviled Papio. The trouble arose over a papahi lei of 'ilima flowers which belonged to Ka'ahupahau that her kahu was wearing. [The kahu refused to give it to Papio, and] Papio said, "I am going bathing, but when I come back you shall be burned with fire." But Ka'ahupahau devoured Papio before she could carry out her threat, and she was punished for this. That is how Pu'uloa became a [safe] thoroughfare (alahula). After her confinement ended several years later, Ka'ahupahau was very weak. She went on a sightseeing trip, got into trouble, and was almost killed. But she received great help from Kupiapia and Laukahi'u, sons of Kuhaimoana, and when their enemies were all slain, the kanawai was firmly established. This law—that no shark must bite or attempt to eat a person in Oahu waters—is well known from Pu'uloa to the Ewas. Anyone who doubts my words must be a malihini there. Only in recent times have sharks been known to bite people in Oahu waters or to have devoured them; it was not so in old times (Kamakau, 1964:73, M.K. Pukui, translator).

Several place names commemorate the shark gods of Pu'uloa. Among them are three recorded in the *Saturday Press* of December 29, 1883 (page 6):

**Kealii**            A cave in the sea at the entrance to Puuloa harbor, and known by the natives to have been formerly the home of a large shark

called Komoawa, who has been generally credited as the watchman on guard at the entrance of Kaaahupahau's waters. The latter's royal cave-dwelling was in the Honouliuli lagoon.

**Kuhia loko** Waiawa. Named for one of the attendants/purveyors of the shark goddess, Kaahupahau.

**Kuhia waho** Waiawa. Named for one of the attendants/purveyors of the shark goddess, Kaahupahau.

Nahu-Papio or Ka-nahuna-Papio (The biting or shredding of Papio) (*Ka Loea Kalaiaina*, 1899-1900), is found along the shore of the Waipi'o Peninsula, south east of Hōmaikai'a or Walker Bay (Register Map No. 322) (Figure 8). This place name identifies the location where Ka'ahupāhau killed Papio.

The role of Ka'ahupāhau as a goddess and guardian in the waters of the Pu'uloa bays remains alive in the minds of natives in the 'Ewa District. Her brother Kahi'ukā (The smiting tail) is also remembered and it is said that with his great tail, Kahi'ukā was responsible for destroying any foreign sharks "that offended his sister" Ka'ahupāhau (Pukui, 1943:57-58). His cave is reported in several locations, including Drydock No. 1, between Moku'ume'ume and Keanapua'a, and another in the Waiawa Estuary. The cave, destroyed in the construction of Drydock No. 1, was once his home.

Another locational reference to a cave, and the home of Ka'ahupāhau, is found in the cartographic records of the Kingdom, cited on Register Map No. 322 (J. Lidgate/Lydgate, surveyor, 1873). On the map, the cave is identified as "Shark's Den" along the Honouliuli shoreline of the West Loch, a short distance inland from the old boundary wall between the 'ili of Pu'uloa and the larger ahupua'a of Honouliuli. These storied places are a part of the fabric of Hawaiian history and breathe life into the traditions of old.



Figure 6. Map of the West Loch and the Peninsula of Pearl River (Hawaiian Government Survey, Registered Map No. 322 by J. Lidgate, 1873)

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In addition to the traditions of Ka'ahupāhau, two other accounts center around the nature of sharks in the 'Ewa District and battles that were fought to kill offending sharks. In the early 1820s, members of the Protestant mission station traveled to the 'Ewa District and learned something about the shark gods of Pu'uloa.

Hiram Bingham accompanied King Kamehameha II (Liholiho), the royal family and attendants to 'Ewa in 1823, where they stayed near the shore of Pu'uloa. During the visit, the King and party, along with Bingham, visited the dwelling place of a noted shark god. The name of the god was not recorded in Bingham's journal, though one must infer that it was either the goddess Ka'ahupāhau or her brother, Kahi'ukā. Bingham wrote:

I one day accompanied the King [Liholiho] and others by boat to see the reputed habitation of a Hawaiian deity, on the bank of the lagoon of Ewa. It was a cavern or fissure in a rock, chiefly under water, where, as some then affirmed, a god, once in human form, taking the form of a shark, had his subterraqueous abode. Sharks were regarded by the Hawaiians as gods capable of being influenced by prayers and sacrifices, either to kill those who hate and despise them or to spare those who respect and worship them. It had been held that, when a mother gave her offspring to a shark, the spirit of the child dwelt in it, and the shark becoming an akua, would afterwards recognize and befriend the mother on meeting her, though ready to devour others... (Bingham, 1969:177)

Later in January 1825, Elisha Loomis also traveled to 'Ewa and stayed along the Pu'uloa shore (Loomis Journals, Jan. 18, 1823, in Westervelt, 1937). During his visit, Loomis learned the name of the shark goddess who protected the waters of the Pearl Harbor region and also reported hearing about a war between the good sharks and those who sought to eat human flesh. It will be noted that due to his limited Hawaiian language skills, Loomis apparently transposed she for "he" in his journal.

After supper I conversed with them a long time on the subject of religion... during the conversation one of them mentioned that in former times there dwelt

## Existing Resources

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at Puuloa a famous shark named Ahupahau. He had a house in the hole of a rock. He was one their gods. On one occasion a strong shark 3 or 4 fathoms long came into the channel to make war upon the sharks and upon the natives that dwelt there. Ahupahau immediately communicated to the natives information advising them to get a net out and secure him. They took the hint and spread their nets, and in a little time the stranger was captured.

Loomis's reference to a "war" between an invading shark coincides with the traditions of Ka'ehu-iki-manō-o-Pu'uloa (Uaua, 1870-1871), Mikololou and Keali'ikauaoka'ū (*Home Rula Repubalika*, 1902), in which battles between sharks are fought in order to protect the people of the 'Ewa region from attacks by manō i'a.

J.S.

presented a paper titled "The Lesser Hawaiian Gods" before the Hawaiian Historical Society on April 7, 1892. In this report are details of Ka'ahupāhau, Kahi'ukā and Mikololou in the history of 'Ewa and the waters of Pu'uloa:

One reason for the affection shown to the shark aumakua was the fact that so many of them claimed human parentage, and were related by ties of kinship to their kahus. Such was the case with Kaahupahau and her brother Kahi'uka, the two famous shark-gods of the Ewa Lagoon on this island. Their birth and childhood differed in no essential features from that of other Hawaiian children up to the time when, leaving the home of their parents, they wandered away one day and mysteriously disappeared. After a fruitless search, their parents were informed that they had been transformed into sharks. As such, they became special objects of worship for the people of the districts of Ewa and Waianae, with whom they maintained pleasant relations, and were henceforth regarded as their friends and benefactors. After a time the man-eating shark, Mikololou, from the coast of the island of Maui, paid them a visit and enjoyed their hospitality until he reproached them for not providing him with his favorite human flesh. This they indignantly refused to give, whereupon, in spite of their

protest, he made a raid [page 10] on his own account upon the natives, and secured one or more of their number to satisfy his appetite. Kaahupahau and her brother promptly gave warning to their friends on shore of the character of this monster that had invaded their waters. To ensure his destruction they invited their unsuspecting guest to a feast made in his honor at their favorite resort up the Waipahu river. Here they fed him sumptuously, and at length stupefied him with the unusual amount of awa which they supplied him. While he was in this condition, their friends, who had come in great numbers from the surrounding country, were directed to close up the Waipahu river, which empties into the Ewa Lagoon, with their fish nets, brought for the purpose, while they attacked him in the rear. In his attempt to escape to the open sea he broke through one net after another, but was finally entangled and secured. His body was then dragged by the victorious people on shore and burned to ashes, but a certain dog got hold of his tongue, and, after eating a portion, dropped the remainder into the river. The spirit of the man-eater revived again, and, as a tongue, now restored and alive, made his way to the coasts of Maui and Hawaii, pleading with the sharks of those waters for vengeance upon the sharks of the Ewa Lagoon. They meantime secured the aid of Kuhaimoana and other notable sharks from the islands of Kaula, Niihau, Kauai, and Oahu. A grand sight it was to the numerous spectators on the shore when these mighty hosts joined in combat and began the great shark-war. It was a contest of gods and heroes whose exploits and deeds of valor have long been the theme of the bards of the Hawaiian Islands... [I]n the first great battle the friends and allies of the cruel man-eater were touted by the superior force of their opponents, which the good Kaahupahau and her brother long continued to enjoy the affectionate worship of their grateful people. It is said that she is now dead, while her brother Kahi'uka still lived in his old cave in the sea, where he was visited from time to time by his faithful kahu, Kimona, now deceased. Sometimes Kimona missed his fish nets, when he was pretty sure to find that Kahi'uka had carried them to a place of safety, to preserve them from destruction by hostile sharks (Emerson,

1892:10-11).

Mary Kawena Pukui wrote about visits she made to 'Ewa and the Pu'uloa region in 1907. She observed that the name "Ka'ahupāhau" could be translated as "Cloak well cared for;" her place in the history of the land is commemorated in the saying, "Alahula Pu'uloa he alahela na Ka'ahupahau, Everywhere in Pu'uloa is the trail of Ka'ahupahau" (Pukui, 1943:57).

### 13. He Moolelo Hawaii – No na Aumakua Moo

(Hawaiian History – About the Mo'ō Guardians/Ancestral Gods)

This excerpt from "A History of Hawai'i" introduces the mo'ō (water spirit) goddess, Kānekua'ana. It was to her that the heiau waihou (heiau specifically for mo'ō spirits) were established along the Pu'uloa lochs to ensure the abundance of various fisheries, particularly the pipi, nahawele, mahamoe and other bivalve species for which 'Ewa's inland fisheries were famed. Among the kapu (restrictions) of Kānekua'ana was that fisher-people needed to be very quiet when going to sea to gather the pipi (pearl oysters) and bivalves. The slightest voice would cause the wind to blow, thus making the pipi and other bivalves sink deep into the sands where they would be difficult to find.

It is because of this kapu associated with Kānekua'ana that the famous saying of 'Ewa, "ka i-a hamau leo o Ewa," came into being.

#### *Ka Nupepa Kuoakoa*

**No Na Aumanua Moo – About the Moo Guardians/Ancestral Gods**

**He Moolelo Hawaii (Mokuna VII.)**

**Hawaiian History (Chapter VII)**

**Mei 20, 1893 (aoao 1)**

...Kānekuaana ko Ewa moo kiai,  
hilina'i nui ko Ewa poe kamaaina  
iaia, mai Halawa a Honouliuli. Ina e

**May 20, 1893 (page 1)**

...Kānekua'ana is the mo'ō [water spirit]  
guardian of 'Ewa; many of the natives of

pilikia i ka ia, hoeu like na kanaka i na waihau e pili ana iaia, a o ka ho-a no ia o ke ahi e hoala i ka pomaikai o ka aiona. O ka Pipi ka ia kaulana o Ewa. Aole e hala na mahina eono e ku ai ka lala hau ua piha ka aina i ka Pipi, mai Namakaohalawa a na pali o Honouliuli, mai na kua-pa o uka a na pa akule [Pākule]; mai ka hohonu a ka papa nahawele o kula; mai kaliawa a ka pohaku ona loko a pela aku.

Aia maloko o ka io o ka Pipi momi nani, e like ka nunui me ka onohi ia; he onohinohi keokeo kekahi, ua kapaia he muhee kea; onohinohi ulaula kekahi me he anuenuela, he muhee makoko ia. He liliu a nunui kekahi; a he waiwai kumukuai nui ko ia mea.

O ka Opaehuna a Opaekala kekahi ia; paapu mailoko o ke kai a na loko kua-pa a no loko puuone.

O ka nehu pala kekahi ia; piha mai

‘Ewa, from Hālawa to Honouliuli followed [believed] in her. If there was trouble with the fishing, the people dedicated her temple [Waihau] with the lighting of a fire to bring about blessings upon the land. The pipi [pearl oyster] is the famous fish of ‘Ewa. Before six months would pass the hau branches would take hold, and the land would be filled with the pipi, from Nā-maka-o-Hālawa to Honouliuli, from the inland pond walls to the Pā-akule. From the depths to the nahawele reefs and flats. From the channel inlet to the stone-lined ponds, and so forth.

There is within the flesh of the pipi a beautiful pearl, its size is similar to the eyeball of a fish. Some are like the shiny white of an eye, and are called mūhe‘e kea. Others are shiny red, like a rainbow, and are called mūhe‘e mākokoko. Some are small and others are larger, and they are highly valued.

The ‘ōpae huna and ‘ōpae kala [types of shrimps] are other fish, that are in the sea, the walled ponds, and dune banked ponds.

ka nuku o Puuloa a uka o na Ewa, pela me na nuku awalau a pau; no laila ka olelo ia ana:

“He kai puhi nehu puhi lala  
Ke kai o Ewa—e.  
E noho i ka lai o Ewanui—  
A Laakona—a.”

He Mahamoe kekahi ia kaulana, a he Okupe a mau ia e ae no kekahi. A ina i ike ia keia mau ia a pau alaila, eia ka olelo a na pulapula:

“Hoi mai nei ua luahine nei mai na kukulu mai o Kahiki; noho mai la paha a aloha i na moomoo ana.”

O lakou no kekahi i hai mai i ke ano o na pae aina o Kahiki a me na aina e ae i ike ole ia...

...O Hauwahine, he kiai ia no na loko o Kawainui a me Kaelepulu. O Laukupu ko Moanalua; he malama lakou i ka pomaika'i, e pale ana i na pilikia maluna o ke kina a me ka ohana...

The nehu pala is another fish which fills the waters from the entrance of Pu'uloa to the coastal flats of 'Ewa. It is the same with all of the lochs (awalau). This is why the saying is told:

“Nehu appear to be blown upon the sea, causing the water to shine  
It is the sea of 'Ewa,  
Dwelling in the calm of great 'Ewa, of La'akona”

The mahamoe is another famous fish, and the 'ōkupe, another, and there are others. And if all these fish are seen there, here are the words of the natives of the land:

“The old woman (Kānekua'ana) has returned from the foundations of Kahiki; she dwells here perhaps for the love of her descendants...”

They are the ones spoken of coming from the Kahiki and the other lands which have not been seen...

...Hauwahine is the guardian of the ponds of Kawainui and Kaelepulu. Laukupu is of Moanalua; it is they who tend to the blessings, protecting the

lands and people from trouble...

#### **14. He Moolelo Kaa Hawaii no Laukaieie... (A Hawaiian Tradition of Lauka'ie'ie...)**

Hawaiian historian Moses (Mose) Manu penned several lengthy traditions for *Nupepa Ka Oiaio*, in which he included detailed accounts of a wide range of practices, including those associated with fisheries and deified guardians of the ocean and fresh water fisheries. This account, "He Moolelo Kaa Hawaii no Laukaieie...", was published between January 5, 1894 and September 13, 1895. The tradition is a rich and complex account with island-wide place name references and details for Honouliuli and the larger 'Ewa District. The tradition also includes descriptions of fisheries and aquatic resources, history, and mele, interspersed with accounts from other traditions and references to nineteenth century events.

The following excerpts of Manu's account were translated by Maly and include an overview of the mo'olelo while referencing narratives which recount the travels of Makanike'oe, one of the main figures in the account. During his travels, Makanike'oe sought out caves and tunnels that served as underground trails. Through the description of his travels, we learn about some of the wahi pana and resources of the lands through which he traveled.

The following accounts, describing places of the 'Ewa District and neighboring lands, are excerpted from the longer narratives which describe the travels of Lauka'ie'ie, her younger brother Makanike'oe, and their companions. The lei momi (pearl garlands) of 'Ewa were described while Lauka'ie'ie and her companions were at Ka'ana, Moloka'i:

##### **March 9, 1894 (page 4)**

Leiomanu (a youth of Ka'ala, O'ahu) gave Ka'ana of Moloka'i, and Kawelonaakalāilehua, the prized lei momi of 'Ewa as gifts. The characteristics of these pearls (momi) included those with a fine yellowish tint, others had

bumps like diamonds, and some were bluish-yellow. There were many types of pearls, and they were once regularly seen in the sheltered bays of 'Ewa at O'ahu. They came from the Pipi (oysters), and the pearls were found near the edges of the Pipi shell. They were a thing greatly cherished by the chiefs of old and worn in lei (necklaces). This is why it is said:

My fish which quiets the voices,  
You mustn't speak or the wind will blow.

This is the famous thing of 'Ewa, where the fish quiet the voices, to these new times.<sup>7</sup> This is the type of lei which had been given to the ali'i of Lehua, the island which snatches the sun...

**April 19, 1895 (page 1)**

...Lauka'ie'ie and her companions, Hinahelani and Ko'iahi arrived at Honouliuli and were greeted by the natives of that land. Ko'iahi, a chiefess from Mākua, Wai'anae, was related to Kaho'onani (w), 'Ulalena (w), and Kauaki'owao (k), the ali'i of Honouliuli. It is for these ali'i that the chant is sung:

Kaho'onani resides upon the plain,  
'Ulalena is completely surrounded by the Kauaki'owao rains...

While they were being hosted at the house of these natives, they saw the beginnings of a red-hued rainbow form near the shore and knew that Kauaki'owao, the elder brother of the two beautiful sisters, was crossing the flat lands, drawing near to house. When he arrived, Hinahelani asked Ko'iahi to invite Kauaki'owao to accompany them on their journey to Kaua'i... The party

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<sup>7</sup> Tradition has it that the pipi (mother of pearl oysters) were very sensitive to any sounds and those who were noisy would scare the shellfish into hiding. Thus, when going to catch pipi and other similar oysters, no one spoke (see Pukui, 1983 No.'s 493, 1357 & 1377).

departed from the residence at Honouliuli and traveled to Pu'uokapolei, where they met the young maidens Nāwahineokama'o and Pe'ekāua, the beauties who dwelt upon the lowlands of Pu'uloa. These two maidens accompanied the travelers to Waimānalo and Kaiona, for which the song writer of the late chiefess Bernice Pauahi Bishop wrote:

Respond o woman,  
Who travels the plain of Kaiona,  
Pursuing the mirages,  
On the plain covered with 'ōhai blossoms.

Thus, all these beautiful residents of the land of Honouliuli were gathered together, by the famous beauty of Wai'anae (Ko'iahi), who is there on the resonating and fine sands of Mākua...

**April 26, 1895 (page 1)**

...While Lauka'ie'ie and her companions were traveling through Wai'anae, Makanike'oe was following behind. Having landed on the shores of Māmala, he then traveled to Kahaka'aulana and the landing at Kalihi. He then looked down along the glistening sands and waters where the mullet are found, outside of Keāhua, at the place called Keawakalai. There he saw a crevasse open in the sea. In this place, were sleeping many sharks and turtles, almost as if under the sand. Makanike'oe quickly entered into the cave with the turtles and sharks, to see them more closely. Because of his great speed, they didn't know that he had entered their house. Makanike'oe crawled along one of the crevasses in the sea, and going beneath the land, he exited out at Āliapa'akai, at the place called Manawainuikeo'o. That is the entrance of the sea into that great salt water pond of Moanalua...

Let the author explain here, that this channel was first made when Pele traveled

along the islands making craters here and there. This crater is something like the crater of Kauhakō, at Kalaupapa, Moloka'i.

By this little explanation my readers, you may also know that the remaining crater is there above Āliamanu, the hiding cave of the chief Kahahana, his companion, Alapa'i, and his beautiful wife, Kekuapo'i. He (Kahahana) is the one who killed the priest Ka'ōpuluhulu and his son Kahulupue, at Wai'anae. This is how the famous words of the priest came to be spoken:

Strive for the sea my son,  
for from the sea shall come (others of) another land.

And this cave has been given the name "Pililua" from the time of the death of the chief Kahahana.

Pililua, the two of you shall go to 'Ewa,  
You are like a canoe,  
Pulled by the rope,  
To the cliff of Keālia,  
At Kama'oma'o,  
There at Kinimakalehua.

After seeing these places, Makanike'oe then went to the top of Leilono, one of the deity of ancient times. There is a pit dug there in which the foul smelling bodies of the dead and the defiled matter of the dead are thrown.

Makanike'oe left that place and went to a place that was covered with something like a rough pahoehoe surface, below the present-day 5 mile marker on the road at Kapūkakī. There he saw the spirit of a woman moving swiftly over a portion of the pāhoehoe. Makanike'oe recognized that this was a spirit form

rather than that of a living woman, and he felt compassion for her. He then saw that there was a deep pit there, filled with the spirits of dead people, swaying back and forth, and crying out, with moaning and wailing. This is the pit which in ancient traditions is called Kaleinaaka'uhane. The spirits of the dead go there and can only be freed if their 'aumakua (ancestral family god) fetches them. They might even be returned back to life again...

Now you may be wondering my readers, what was the name of this woman that Makanike'oe took up in his hands. Well the writer will tell you the name of this beautiful young woman of Kai'ahāmauleo o 'Ewa-nui-a-La'akona [The fish that quiets the voice of Great-'Ewa-of-La'akona], it was Kawaili'ulā. She was a native of two lands of 'Ewa, Waiau and Waimano. And it is for this woman that Kawaili'ulā, between the 9 and 10 mile markers from Waiau and Mānana 2<sup>nd</sup> is named; it is near the present-day court house of 'Ewa...

At this place, Kaleinaaka'uhane, hundreds and thousands of spirits have been lost...

**May 3, 1895 (page 1)**

...Makanike'oe then went to the uplands, atop the cliffs and ridges of Ko'olau, where he looked down and chanted:

Beautiful is Hālawā in the Wa'ahila rains,  
Which visits also, the heights of Aiea,  
The heat and warmth travels across the plain of Kalauao.

It is true, that he then went to Kalauao, where he saw the pool of Kahuawai. He turned to the uplands and saw the source of the water coming out of the earth, near the top of the cliff of Waimalu. The source of this water, from where it flows, cannot be easily seen because it comes out from the ground in an area

where there are many deep holes hidden on the side of the cliff of Waimano. It is from one of these pits that the water flows. It is also at one of these places that the body of David Malo<sup>[8]</sup> was laid to rest.

This place, between Waiiau and Waimano, called Waipuhia, is the place of Kawaili'ulā, who was brought back to life at Kaleinaaka'uhane, at Kapūkakī...

Kawaili'ulā invited Makanike'oe to her home where food was prepared, the 'anae (mullet) from the pond of Welokā and the famous foods of the land. Kawaili'ulā invited Makanike'oe to stay with her, but he declined, explaining that his elder sister and her companions were waiting for him at Wai'anae... Kawaili'ulā bid farewell to Makanike'oe and he disappeared from sight, born by the wind, Moa'ekū of 'Ewa.

Makanike'oe then traveled to Mānana, now the 10 mile marked, and the place where the court house of 'Ewa stands. This is the place where 'Oulu, the famous warrior of Kahekili, king of Maui, was surrounded by warriors who thought to take him prisoner. It is there that 'Oulu fought like the eel, Palahūwana, and with great strength and skill, overcame those who fought against him. The place where this fight occurred is called Kaoinaomakai'oulu to this day.

Makanike'oe then followed the trail to a place where he saw a large gathering of youth along the trail, at the place called Nāpōhakuhelu. The activity of the children at this place was the shooting of arrows, something that was always done by the youth of those times.

There was among this gathering of youth from Waiawa, a handsome boy named Kanukuokamanu (not to be confused with a place of the same name in Hilo,

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<sup>8</sup> This is not David Malo of Lahaina Luna, but a namesake, who was also a historian and active church member.

Hawaii). His place of residence was on the shoreward side of the government road, a place something like a hillock from where one can look to the estuary of Waiawa. It is about at the ten and a half mile point, and the place is known by the name of this youth today.

When Mekanike'oe arrived at the place where the youth were playing, he was saddened at seeing the young boy crying. This was because the older children had taken all the arrows, and left none for the younger child to play with. Mekanike'oe took the young boy away from the group to a place off to the side. He told the boy "Stop crying and I will give you an arrow of your own. This arrow will fly farther than any of the arrow of your friends." Mekanike'oe then gave the boy an arrow like none other he'd seen.

Now Kanukuokamanu was the son of the chief of Waiawa...When he returned to the group of other children who were still playing, he prepared to compete as well. He chanted first to his arrow:

Ka'ailehua flies,  
Ka'iniki flies,  
Ahuahu flies...

**May 8, 1895 (page 1)**

Kanukuokamanu shot his arrow and it flew beyond all the other arrows of the competitors. It flew all the way to "the end of the nose of the pig" at Waimano, and then returned to the youth who had shot it...

Mekanike'oe then departed and was lost from sight. Looking seaward, Mekanike'oe saw the fin of a shark passing by, in front of a stone in the estuary of Waiawa, on the west side of Kanukuokamanu, next to Piliaumoa. Seeing the shark, Mekanike'oe drew nearer and he saw that it was Kahi'ukā, a native of

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this estuary. His cave was comfortably situated on the side of the stone. Kahi'ukā was a good shark, and in his story, he is the guardian of Mānana and Waiawa.

The author has met a man at Mānana who was known by the name, Kahi'ukā. He learned the traditions of this shark in his youth, and was taken by this shark for a period of time, and returned again to the land in good health. The man has since died, but his daughter is still alive, and his story is an amazing one.

After seeing the house of this hero of the sea [Kahi'ukā], Makanike'oe turned and walked along the place where the waters flow from the land at Piliaumoa, Moka'alina, Pānaio, Kapuahalulu, Kapāpa'u, and Manuea. The trail then turned and went to the top of Hā'upu, where the foundation of the Luakini [Church] of 'Ewa was later situated. Near there, was a large pond in which awa [milkfish], 'anae [mullet], and āholehole [*Kuhlia sanvicensis*] fish were found.

Oh readers, let the author explain something here. At the time Lū'au came from Maui to dwell on O'ahu, he arrived at Waiawa, 'Ewa. He saw some men thatching dried ti leaves on the Luakini [Church] that was being built there. Lū'au asked some people, "Who is the one that is having this important house built?" They answered, "Kānepāiki." Lū'au then stated, "The house shall not be finished to its ridge pole before the one who is having it built dies." The people asked, "Why?" Lū'au answered, "The house is atop the Heiau [temple] and the fishpond is below, it is because the waters [life and wealth] are flowing out from this place. [So too shall the life flow out.]" These words of Lū'au were true, the Luakini of Waiawa was not completed before Kānepāiki died. His body was buried in the uplands of Waimalu.

These were the words of Lū'au. The one who discerned the nature of the land [kuhikui pu'uone], in the time of the King Kauikeaouli K. III. And his

descendants are still living at Kanaio, Honua'ula, Maui...

From this place, Makanike'oe then turned and looked to the calm waters of Kuhia Loko and Kuhia Waho. He went to the ponds and saw water bubbling out, and in the pond were many fish of the sea. It was of this pond, that Kāne and Kanaloa spoke, while in Kahiki, as heard by the prophet Makuakaumana, who crossed the sea and traveled to Hawai'i:

The mullet are at Kuhia-loko,  
The seaweed is at Kuhia-waho,  
The salt is at Nīnauele,  
The nehu pala are at Muliwai  
The lone coconut tree stands at Hape,  
The taro leaves are at Moka'alika,  
The water is at Ka'aimalu,  
The 'awa is gathered at Kalāhikiola.  
Behold the land.

All of these places named by the gods can be seen, extending from the sea of Waiawa, to Halalena at Waiawa uka.

From this place, Makanike'oe then went to a large deep spring which flows from waters beneath Waipi'o and Waiawa. At a place where the priests discard their offerings. He then came upon another spring at the entrance of the estuary of Waiawa. The trail then turned towards Palea and Pipiloa, where there grew groves of kou and hau in ancient times, and it was the residence of the rulers of O'ahu. This is the place where the king of O'ahu, Kūali'i-a-Kauakahiakaho'owaha, found his first wife, Kawelaokauhuki, who was of the uplands of Waimano. It is this Kūali'i who built the long house called Makana'ole, on the inland plains of Mānana 2<sup>nd</sup>. It is near the place now called

Kūlanakauhale Momi [Pearl City].

Makanike'oe then traveled to the fishponds of Hanaloa and 'Eo, the great ponds of 'Ewa. It is for these ponds that the lines of the song say:

The water of 'Eo is not fetched,  
It is the sea of Hanaloa that ripples forth.

At this pond, Makanike'oe saw a deep crevasse and inside, there was a giant eel sleeping. The name Hanaloa was given because of the great amount of work that was done by the chief and the people in carrying the stones with which to surround the crevasse and build the pond wall. Thus the pond was built. And it is a famous pond for it is rich with fish, and for the eels which Keinoho'omanawanui desired to eat.

From the pond, Makanike'oe then walked to a place where there were several small points of land, near where Pāpio was bitten and where the sea enters Honouliuli. He noticed how very calm the surface of the water was here, but he also saw that it was agitated in its depths. Looking more closely, he saw in the depths some very large fish, as if guarding the entrance to the harbor. One of these two large fish was like a marlin with a long bill and rows of teeth. The other one was a barracuda whose teeth protruded out of both side of its mouth. These two fish of the bays of 'Ewa, had ears with which to hear. They leapt in the ocean like flying fish, and are spoken of in some of the traditions of Hawaii.

The marlin is the one, who with his sharp bill, divided the waters that enter into 'Ewa. Thus, Makanike'oe understood the nature of these fish, and what their work was. They were the guardians of the place. It is true also, that in a short while Makanike'oe saw a procession of many sharks arrive. There was in this group, the famous chiefess, Ka'ahupāhau, of Pu'uloa, and the messengers of

the king shark [Kamohoali'i] of Kaho'olawe. She was taking them on a tour and to drink the waters of Waipahu and Wai'āhualele, and to drink the awa from Kahauone, in Waipi'o uka...

Makanike'oe then turned again to the place where Pāpio had been bitten as a result of her asking for the 'ilima garlands of the old woman, Koihala. This is what the old woman told Pāpio:

The beautiful girl asks,  
That the garlands of the old woman be given to her.  
Heed my words dirt of the dog, dirt of the pig,  
String your own garland and let it wilt.

Makanike'oe then departed from this place, turning to the plain of Pu'uloa. He passed many pits in this place where the bones of men have been left. He then followed the trail to the of the breadfruit tree, Leiwalo, at Honouliuli. This is the breadfruit tree of the expert sailor, Kaha'i (Ka'uluakaha'i), so told in his story.

There are also many pits in which were planted sugarcane and bananas, and planting mounds. He also saw manu 'ō'ō (honey creepers) sipping the nectar of noni blossoms. There were also two ducks that had gone into a pit, and with a great strength, they were trying to push a stone over, to hide the pit. This Makanike'oe knew what the ducks were trying to do. They wanted to hide a spring of water which flowed underground there. It is this spring which in calm times could be heard, but not found by the people who passed through this area. It was a secret spring, known only to certain native residents of the area, and its name is recorded in the last line of the song:

The 'ō'ū is the joyful bird of Kaupe'a,  
The joyful voiced 'ō'ō is of Pu'uloa,

Softening the blossoms of the wiliwili,  
Drinking the drops of nectar from the noni,  
The birds drink and pass time,  
The eyes cast about seeking,  
The water of the natives,  
The eyes seek the water of Kaiona.

This hidden spring, known only to the natives, was not hidden to Makanike'oe. From there, Makanike'oe then turned back towards Honouliuli and saw the pit of the native eel, Kapapa'apuhi, the elder of Laumeki, whose stone-form body is there at the base of Ka'uiki, Hāna, Maui. He was an eel of O'ahu who traveled to Hāna where he stayed and was turned into stone.

There is also at this place, Kaihuopala'ai, where the 'anae (mullet) begin their journey from Honouliuli to Kaihuku'una at Lā'iemalo'o, Ko'olauloa.

Seeing this pit, Makanike'oe swiftly ran back to Waipahu, where he looked at the source of the water, where it came out of the earth, and flowed to the estuary of Waikele. Makanike'oe dove into the water to determine its hidden source. He swam underground, and first arrived at Kahuaiki, at Waipi'o, for which the song is sung:

Return to the coolness of Waipi'o,  
The cold water of Kahuaiki...

He then dove under and came out on the plain of Pu'unahaweale, that barren and peopleless plain. There he saw the source of the water of Kahuaiki. It is near a hidden stone [shaped like a hook pendant] and close to Kekua'ōlelo, along the trail which ascends straight up to Waipi'o uka. Makanike'oe then turned and followed the water path, and with great strength, he arrived at

Kawaipū'olo, at Waialua. There, he saw the pool of Lanawahine in the famous pond of 'Uko'a. He then quickly went from Waialua to Kawela, and from there, to Punaho'olapa, a deep spring on the plain of Kahuku. There he found the water source that the kapa anvil fell into and was carried to Waipahu, at 'Ewa. Makanike'oe the crawled along another path and arrived at Punamano, also at Kahuku...

[Makanike'oe continued his journey through the various springs of O'ahu, until he rejoined his sister and companions at Wai'anae. The group then continued on their journey to Kaua'i...]

**15. He Moolelo Kaa Hawaii no Keliikau o Kau  
(A Hawaiian Tradition of Keliikau o Kau)**

Keli'ikau-o-Ka'ū was a shark god who traveled to Pu'uloa, 'Ewa from the island of Hawai'i. The tradition appears only in the short-run Hawaiian language newspaper *Home Rula Repubalika* and is incomplete. The following narratives are different in relation to the events and their outcome than those found in more widely reported narratives. There is no specific reference to the source of the account, and only two articles in the series are available. These narratives offer some details on named localities and events that are of significance in the history of Pu'uloa at Honouliuli.

***Home Rula Repubalika***

**He Moolelo Kaa Hawaii no Keliikau o Kau.**

**January 6, 1902 (pages 7-8) & March 15, 1902 (page 7)**

**Summary — A Hawaiian Tradition of Keli'ikau-o-Ka'ū**

Keli'ikau-o-Ka'ū was born to his mother as the result of her relationship with the spirit form of Kalani, a king of the sharks. He was a favorite of Kalani, and

transformed into a shark, whose body was almost three fathoms long.

At this point in our story, we now look to another mysterious formed shark, and his death at the entrance of Pu'uloa at 'Ewa. His name was Mikololou, it was him who was killed at Pu'uloa, and this is why Keli'ikau-o-Ka'ū went there. The background of this shark, Mikololou is given in the traditions Kāneialehia, and Pāpa'i and Paukūpahu of Puna, Hawai'i. Kāneialehia, protected the lands from Lelewi and Makaokū, near the low islet of Mokuola, and all the way to Makahanaloa of Hilo Palikū. Under the law of Kāneialehia, it was forbidden to kill any human. Kāneialehia saw swimming past the cliffs, and discerned Mikololou's nature as an spirit-transformed shark, he also recognized that Mikololou was a man-eater.

Kāneialehia decided to take Mikololou as an attendant, perhaps even as a foster-son, and to teach him how to live under the law of not killing humans...

[We know from various accounts, as cited earlier in this section of the study, that Mikololou departed from Hawai'i, in the company of other man-eaters, and traveled to Pu'uloa, where he was eventually killed by Ka'ahupāhau, Kahi'ukā and the people of 'Ewa. Based on other accounts, Mikololou was restored to life, and returned to Hawai'i, where he enlisted the aid of Keli'ikau-o-Ka'ū and other sharks to avenge his treatment by the sharks and people of Pu'uloa. The issues of the paper with this portion of the tradition are missing, and the account is picked up again on March 15, 1902.]

Keli'ikau-o-Ka'ū fought with and killed Ka'ahupāhau, and it is because of this event, that the famous saying, "Mehameha Pu'uloa, ua make o Ka'ahupāhau" (Pu'uloa is alone, for Ka'ahupāhau is dead), came about. Keli'ikau-o-Ka'ū assumed various body forms he possessed and attacked Ka'ahupāhau from within, and outside her body. Ka'ahupāhau went in spirit form to her attendant,

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Koihala, calling to her, saying that she was dying. Upon her death, Keli'ikau-o-Ka'ū called out to Kamoana and Kahi'ukā, taunting them. He then proceeded to swim through Pu'uloa, biting and tearing at the native sharks of the region, throwing their bodies up onto the dry land from Kalaekao, Kapua'ikāula, Keanapua'a, Kamoku'ume'ume, Aiea, Kalauao, Waimalu, Waiau, Waimano, the two lands of Mānana, Waiawa, Hanapōuli, Waipi'o, Waikele, Hō'ae'ae, Honouliuli, Kalaekahuka, Kanahunaopāpio, Kepo'okala and Pu'uloa.

Keli'ikau-o-Ka'ū destroyed all the sharks of 'Ewa, and the stench rose upon the land. Thus came about the saying, "Pu'uloa is alone, for Ka'ahupāhau is dead." Upon her death, Ka'ahupāhau's body became a coral formation near the place called Pāpio, and that place is still seen on the side of Honouliuli to this day.

Following the death of Ka'ahupāhau in this war between the sharks, the shark chiefs of both sides met in council and agreed to no further wars should be fought between them...

It should be noted here, the elder kama'āina of the 'Ewa District still claim that Ka'ahupāhau was seen and cared for during their lifetime.

### **16. Kaa no Namakaokapao (Tradition of Nāmakaokapāo'o [Eyes of the Goby Fish])**

There are several traditions pertaining to a youth named Nāmakaokapāo'o that have been published in the Hawaiian language newspapers, with lengthy accounts in print between the 1877 to 1917. The March 1877 account, published in the newspaper, *Ka Lahui Hawaii*, references the sweet potato fields of Nāmakaokapāo'o, observing that Nāmakaokapāo'o was the skilled fighter of the cliffs of Līhu'e.

Later accounts of the tradition provide detailed narratives of events on Maui and Kaua'i, with passing, poetic references to O'ahu, Hawai'i, Ni'ihau, and other locations. It is in Abraham Fornander's "Collection of Hawaiian Antiquities" (Vol. V, 1918:274-283) that we find events

in the life and deeds of Nāmakaokapāo’o taking place on O’ahu. A summary of the O’ahu version of the tradition of Nāmakaokapāo’o follows below and cites several names and features of the ‘Ewa District:

Nāmakaokapāo’o was born at Hō’ae’ae. His father was named Ka’uluakāha’i (descended from gods of Kahiki) and his mother was Pōka’ī. After Pōka’ī became pregnant, Ka’uluakāha’i traveled to Kahiki. Thus, when Pōka’ī gave birth to Nāmakaokapāo’o, the two of them lived with little to sustain them. One day, Pūali’i, a man who lived in the uplands at Keahumoa, situated just below Kīpapa, went to the shore of Līhu’e to fish. While on his way, he passed the place where Pōka’ī and Nāmakaokapāo’o lived. Seeing Pōka’ī, Pūali’i fell in love with her, and asked her to be his wife. Agreeing, Pōka’ī and Nāmakaokapāo’o went to live at Keahumoa. There, Pūali’i tended two large māla ‘uala [fields of sweet potatoes].

In his work, Pūali’i had made an oath that none of the potatoes would be eaten until he had made an offering of an ulua fish, and then eaten of the produce first, himself. When the māla were ready to harvest, Pūali’i went down to Līhu’e to catch his ulua. While Pūali’i was on the shore fishing, Nāmakaokapāo’o and a group of his friends went to the māla ‘uala and pulled up all the potatoes and began to cook them. Pūali’i returned, saw what had been done, and went with a large ko’ilipi [stone adze] to kill the boy. As the ko’ilipi fell, Nāmakaokapāo’o offered a prayer to his deified ancestors, and the adze turned and cut off Pūali’i’s head.

“Nāmakaokapāo’o picked up Pūali’i’s head and threw it towards Waipōuli, a cave situated on the beach at Honouliuli [a distance of about five miles]” (Fornander, 1918:278).<sup>9</sup>

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<sup>9</sup> While the exact location of the cave named Waipōuli is not known in the present-day, the narrative provides readers with several reference points that help us determine that it is not in the area of the rail corridor. The location being five miles makai and on the shore from the Keahumoa-Kīpapa vicinity would place Waipōuli

The māla ‘uala where this occurred have been called “Nāmakaokapāo’o” since that time, and are found on the plains of Keahumoa.

Word of this event reached Amau, king of O‘ahu, who was dwelling at Waikīkī. The king wanted to challenge the youth, and proceeded to Keahumoa for the contest. Learning of this, Nāmakaokapāo’o went to his mother and took her down to a cave situated at Waipōuli, where he hid her for a while. He then returned to Keahumoa and met with Amau and his warriors and killed them all. Nāmakaokapāo’o then established his mother, Pōkaī, as ruler over O‘ahu.

#### **17. Ka‘uluakāha‘i (The Breadfruit Tree of Kāha‘i) at Kūalaka‘i**

As cited in the tradition of Nāmakaokapāo’o, Ka‘uluakāha‘i was the true father of Nāmakaokapāo’o. In Fornander’s account, following his victory over the king of O‘ahu, Nāmakaokapāo’o traveled to Kūalaka‘i where a supernatural breadfruit tree grew in a sink hole-cave, in which had been hidden the royal gifts left to him by his father. Retrieving the items from Kūalaka‘i, Nāmakaokapāo’o then traveled to Hawai‘i:

After the complete possession of Oahu by Namakaokapaoo, he was desirous of visiting Hawaii for observation. He then went and got a small gourd wherein to place his garments which his father had left him. This gourd was deposited at Kualakai, where a breadfruit tree is standing to this day. This is the breadfruit impersonation of his father, Kahaiulu. When the real person went home the breadfruit tree remained, being in the supernatural state.

Inside of the gourd was a garment, a girdle and a royal cloak (feather cloak). After he had obtained the gourd he journeyed on till he reached Hanauma, in Maunalua. There he found a canoe which was preparing to sail for Hawaii... (Fornander, Vol. V 1918:278)

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near the Honouliuli-Hō‘ae‘ae boundary, and likely near the shoreward ‘ili of Līhu‘e (cf. oral history interview with Shad Kāne dated August 26, 2011).

## 18. He Wānana — A Prophecy and the Death of Kahanana

Pu'uloa at Honouliuli has a significant place in the traditions of O'ahu, based on events which took place between 1825 to 1785. As a part of his plan to take control of O'ahu, Kahekili, then king of the Maui group of islands, tricked his nephew, Kahahana, King of O'ahu, into killing his high priest, Ka'ōpuluhulu. Kahekili had raised Kahahana and he desired to make O'ahu a part of his kingdom. It was Ka'ōpuluhulu who instructed Kahahana and warned him against certain actions proposed by Kahekili. In January 1862, J.H. Kanepuu, a frequent contributor of island history to native newspapers, penned one of the earliest native accounts pertaining to the death of Ka'ōpuluhulu and his son Kahulupu'e and the prophecy uttered at their deaths.

### *Ka Hoku o ka Pakipika*

#### **Ianuari 23, 1862 (aoao 2)**

...Ua hooko mai ke Akua ia wanana ma o Kaopuluhulu la, kekahi kaula mana Oahu nei, e haawi mua ana no i ka aina no na mamoa Sapeta, penei kana olelo i kana keiki, i nui ke aho a make i ke kai, no ke kai ka hoi ua aina, aia la, lilo ka aina ia kai. Mai kai mai no o Kahekili maluna mai o ka waa, a pae ana i Oahu nei, kaula me Kahahana, a holo o Kahahana i ka nahelehele, lilo ka aina ia kai. Mai kai mai no o Kamehameha, a kaula me Kalanikupule ma Nuuanu nei, a hee o Kalanikupule, lilo ka aina ia kai. Mai kai mai nei no ka haole

#### **January 23, 1862 (page 2)**

God has fulfilled the prophecy of Ka'ōpuluhulu, one of the powerful prophets of O'ahu—giving the land to the descendants of Japheth [cf. Genesis 9:27]—who spoke thus to his son, “Strive to die in the sea, for those of another land shall come from across sea, and the land shall belong to them from across the ocean.” Kahekili came from across the sea on a canoe and landed on O'ahu. He then engaged in war with Kahahana, who fled to the forests. Thus the land was taken by the sea. Kamehameha then came from across the sea and engaged in war with Kalanikūpule at

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maluna mai nei o ka moku a noho ana i uka nei, he oluolu wale no ka lakou la hana ana mai i na'lii o kakou, aohe i eha ka ili, lilo no ia lakou la na hooponopono aupuni, na aina, na kuleana ma ka hoolimalima, ma ke kuai, ma ka hoai e i kahi awelu lole, i ka rama, ia mea ae ia mea ae, ua lilo ia lakou la, o kau no ia o ka hoaa aku ma ka palekai.

Nu'uanu. Kalanikūpule was defeated, and the land was taken by the sea. Then the foreigners came from the across the sea on ships and now reside on the land. Their deeds for our chiefs were kindly, and they took on the work of setting the nations right, the land, the properties and leasing, selling, creating debt for new clothing, rum, this thing and that, it is all thiers now. And built up on a breakwater...  
[Maly, translator]

S.M. Kamakau (1867) elaborated that about eight years into Kahahana's reign as king of O'ahu, Kahekili succeeded in tricking Kahahana into killing Ka'ōpuluhulu.

Kahahana ordered that Ka'ōpuluhulu and his son, Kahulupu'e to be brought before him at Wai'anae. The call was made from Pu'ukāhea [Hill of calling]. Upon the summons, Ka'ōpuluhulu prayed to his gods and discerned that he and his son would be killed once in the presence of the chief. Arriving at the place now called Nānākuli, Ka'ōpuluhulu called out to Kahahana who looked at him, but made as if he didn't hear the call [nānā kuli]. Ka'opuluhulu then knew for certain that he and his son were to be killed, and he told Kahulupu'e:

“I nui ke aho a moe i ke kai! No ke kai ka hoi ua aina!”

Strive to lie down in the ocean! For our revenge will come from other lands across the sea (Kamakau, 1867).

Kahulupu'e ran into the water near Pu'uohulu where he was killed. Ka'ōpuluhulu continued his flight across the Honouliuli plain to the shore of Pu'uloa, where he was then killed

(Kamakau, 1867). Kamakau also wrote about the last years of Kahahana’s life and his death at the command of Kahekili, placed by some native writers at Hō‘ae‘ae:

For two years and six months Ka-hahana and his wife and Ka-hahana’s friend, Alapa‘i, hid in the mountains and were fed and clothed by the commoners, who had compassion upon them. Thus, were the misdeeds of Ka-hahana justly repaid. They were finally betrayed by Ke-ku-manoha’, father of Ka-lani-moku and half brother of Ke-kua-po‘i, Ha‘alo‘u being the mother of both. Their last place of hiding was near Wailele at Waikele in ‘Ewa. Alapa‘i said to Ka-hahana, “Let us kill our wife and then we shall be able to escape.” Ka-hahana was more merciful, perhaps because he could not endure to lose Ke-kua-po‘i, who was an incomparable beauty. He said, “Why kill our wife who has been so faithful a companion to us while we have dodged death in cold and wet, wandering here in the mountains, in the thickets of Wahiawa, in this ocean of Ka‘ie‘iea? Perhaps she can persuade her kinsmen to help us some day.” Learning that Ke-ku-manoha’ was at Waikele and Ka-lani-ku-pule and Koa-lau-kani at Kapapahu [on the Hō‘ae‘ae-Waikele boundary], Ke-kua-po‘i made herself known to her brother, hoping that he would save them all three for her sake. “Where are Ka-hahana and his friend?” asked her brother. “Will you spare us three?” asked the woman. “Why should you die? are we not all chiefs?” he answered; but his words were false; he intended to give up his brother-in-law to Ka-hekili. Alapa‘i urged, “O heavenly one! let us flee. We shall die if we stay here; only Ke-kua-po‘i will be saved.” “If Kekua-po‘i is saved, we shall be also.” “You will not be saved; you are a chief, a ruler by descent.” Then Ke-ku-manoha’ sent men to Ka-hekili at Waikiki to tell him that Ka-hahana was at Waikele. Ka-hekili ordered him to be killed and brought to Waikiki and he sent double canoes to Halaulani at Waipi‘o in ‘Ewa. Ke-ku-manoha’ killed Ka-hahana and his friend Alapa‘i, wrapped them in coconut leaves, placed them on the platform of the canoes, and took them to Kahekili at Waikiki... (Kamakau, 1961:136-137)

The words of Ka'ōpuluhulu's prophecy remained fresh in the minds of elder kama'āina through time and was often the subject of writings. As noted above in the account of Kānepu'u (1862), many considered that the priest's words were fulfilled a short time later with the arrival of Kahekili and his forces on the shores of O'ahu. This was followed by the arrival of foreigners, Hawaiians' loss of their land and kingdom, and military control over a large area of the 'Ewa District.

In 1900, the native leadership of the Independent Hawaiian party conducted a tour of O'ahu to advocate for restoration of Queen Lili'uokalani to the throne. David Kaluokalani, president of Hui Kalai'āina, spoke to district residents while in Wai'anae, recalling the power of the prophecy. His talk was described in *The Pacific Commercial Advertiser* (1900a:5). While some facts differ from the earlier account, the connection between events is significant:

Kaluokalani waxed reminiscent in his speech at Waianae and referred to an incident of the early days of Oahu which he said was applicable to the present situation of affairs as the natives were concerned with relation to their political status. He referred to the time when Kahahana was chief of the island of Oahu. There was then living in Waianae a famous kahuna named Kaopuluhulu whose son Kahulupue had committed a crime for which he fled the district. When he was being closely pursued the old kahuna called after his son, saying: "My child, bear up until you reach the water, for when you touch the water, then the land shall belong to those who come over the sea."

The speaker said this prophecy had been fulfilled, and had culminated in the overthrow of the monarchy. He appealed to the people to rectify the evil which the old kahuna had brought upon them.

Similar recollections of the meaning and fulfillment of Ka'ōpuluhulu's prophecy were shared by Samuel Hoapili Lono (1973, pers. comm.) and Sister Thelma Genevieve (Dowsett) Parish

(1997, pers. com.).

Native historian Moke Manu wrote further on these events in 1907. Following his defeat at the hands of Kahekili in ca. 1783, Kahahana went into hiding in the 'Ewa District. In 1785, while Kahahana was at Honouliuli, Kahekili sent his warriors to kill him and they landed their canoes at Kūpahu at the estuary of Hanapouli. The warriors killed the O'ahu chief on the plains of Hō'ae'ae (west of Waipi'o) and brought his body back to Hālaulani at Waipi'o. From there the body was taken to be offered on a temple in Waikīkī (Thrum, 1907b:213-214).

## **B. Historical Accounts of the Changing Landscape of Honouliuli and 'Ewa**

There are thousands of historical accounts in both Hawaiian and English language that describe the region of Honouliuli. The narratives in this section of the manuscript were penned by native Hawaiians, foreign visitors and residents, and include some of the earliest accounts describing the Honouliuli vicinity following western contact. The narratives provide an overview of: (1) changes in the landscape; (2) the decreasing Hawaiian presence; (3) loss of wahi pana and noted places; (4) development of ranching and plantation business interests in the region; (5) concerns about United States control over Pearl Harbor and "Reciprocity;" (6) the changing make-up of the communities; and (7) travel on the land. The narratives are generally cited chronologically, by period or activities being described.

### **1. Kama'āina and Visitors Descriptions – Travel in Honouliuli and the Larger 'Ewa Moku**

The historical record shares a wide range of descriptions of the Honouliuli landscape, life of the people, and expressions of aloha for place—the cultural attachment—shared by Hawaiians in their living environment. The narratives below were found in Hawaiian and English language sources and reflect both native and foreign experiences and observations on the land. The texts include some of the earliest descriptions of the native communities shortly after Western contact; provide descriptions of travel across the 'Ewa District (as well as the evolving trail and road systems); include mele describing the cultural landscape; and cite first-hand accounts of the challenges faced by native residents and loss of access and title to the land.

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The excerpts of articles help to understand how quickly change came to the land and lifeways of the people.

**a. Sites and Trails of the ‘Ewa District (1800-1811)**

John Papa ʻĪʻĪ, one of the preeminent native Hawaiian historians, was born at Kūmelewai, Waipiʻo in ‘Ewa in 1800. Raised as an attendant to the Kamehameha heirs, he was privy to many facets of early history, practices and events during his life. In the 1860s, ʻĪʻĪ published a history under the title, “Na Hunahuna o ka Moololo Hawaii,” translated by Mary Kawena Pukui under the title of “Fragments of Hawaiian History” (1959). Based on the translations, Paul Rockwood produced a map of the trail routes and several locations identified by ʻĪʻĪ in his narratives (Figure 9).

**Trails from Honolulu to ‘Ewa**

...Let us turn to look at the trail going to Ewa from Kikihale, up to Leleo, to Koiuiui and on to Keoneula. There were no houses there, only a plain. It was there that the boy li and his attendants, coming from Ewa, met with the god Kaili and its attendants who were going to Hoaeae... [page 95]

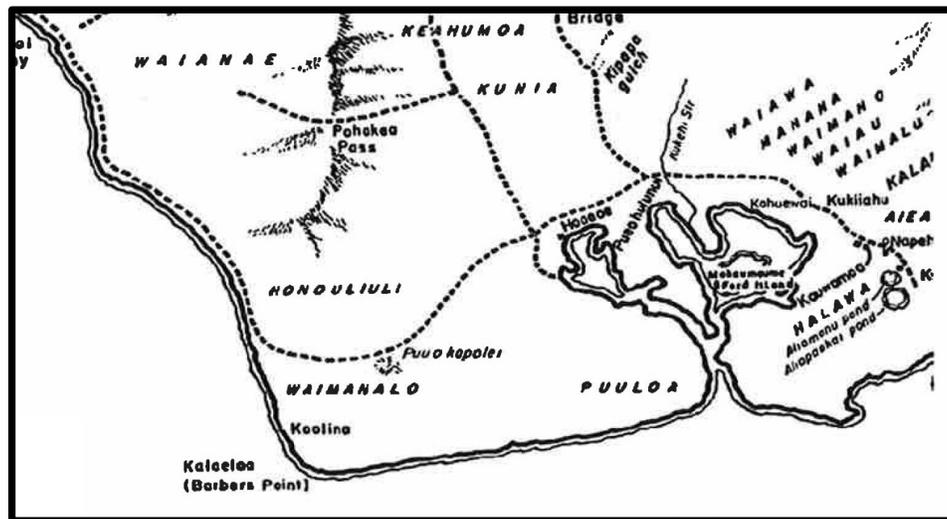


Figure 7. Portion of Map of Trails of Leeward O'ahu (Paul Rockwood, based on description by Papa ʻĪʻĪ, 1959: 96)

The trail went down to the stream and up again, then went above the taro patches of Waiau, up to a maika field, to Waimano, to Manana, and to Waiawa; then to the stream of Kukehi and up to two other maika fields, Pueohulunui and Haupuu. At Pueohulunui was the place where a trail branched off to go to Waialua and down to Honouliuli and on to Waianae. As mentioned before, there were three trails to Waianae, one by way of Puu o Kapolei, another by way of Pohakea, and the third by way of Kolekole.

From Kunia the trail went to the plain of Keahumoa, on to Maunauna, and along Paupauwela, which met with the trails from Wahiawa and Waialua. The trail continued to the west of Mahu, to Malamanui, and up to Kolekole, from where one can look down to Pokai and Waianaeuka. There was a long cliff trail called Elou from Kalena and Haleauau on the east side of Kaala coming down to Waianae. There was also a trail called Kumaipo which went up and then down Makahauka... [page 97]

#### **Entering the 'Ewa District from Wai'anae uka**

There the trail met with the one from Kolekole and continued on to the stream of Waikakalaua, Piliamo'o, the plain of Punalu'u, to a rise, then down to Kīpapa and to Kekualele [Kekuaolelo]. A trail ran from this main trail to Kalakoa, O'ahunui, and other places much visited, such as Kūkaniloko. From there it extended to the digging place of Kahalo, then went below to Pa'ūpalai, thence to Lelepua, and to Kahalepō'ai, where the legendary characters Kalelealuaka and Keinoho'omanawanui lived. Then it reached Kekuaolelo, the stone in which the niho palaoa was hidden, then went on to Pu'unahawe and Pueohulunui, where it met with the Waialua trail.

All of these places mentioned had large populations. The land was rich, and

there were many trees in olden times. Who has “closed” these places today? We do not know enough to say, “It was so-and-so.” But there would be commercial wealth in the trees of these mountains if they were fenced off from animals. So it is with the planting places of every poor person. The person who manages these mountains and valleys could become prosperous. [page 99]

**b. Honouliuli Trails Cited on Malden’s Map of 1825 (Visit of 1794)**

As a part of the Vancouver expedition, cartographer, Lt. C.R. Malden, prepared a map of a portion of O’ahu, which also covered the Honouliuli – Pu’uloa region (Figure 10). Malden’s map was published in 1825 (Register Map No’s 437 & 640) and provides the earliest cartographic record of the Honouliuli region. The map depicts several clusters of houses, fish weirs, and fishponds in the Honouliuli/Pu’uloa area. Being recorded during the early period of western contact, the map is believed to represent the basic pre-contact coastal settlement pattern of Honouliuli and vicinity. Even though the map and visit is of an early date, given the rapid decline of the native population just after western contact, it is likely that the pre-contact population would have been higher and settlement denser than indicated by Malden.

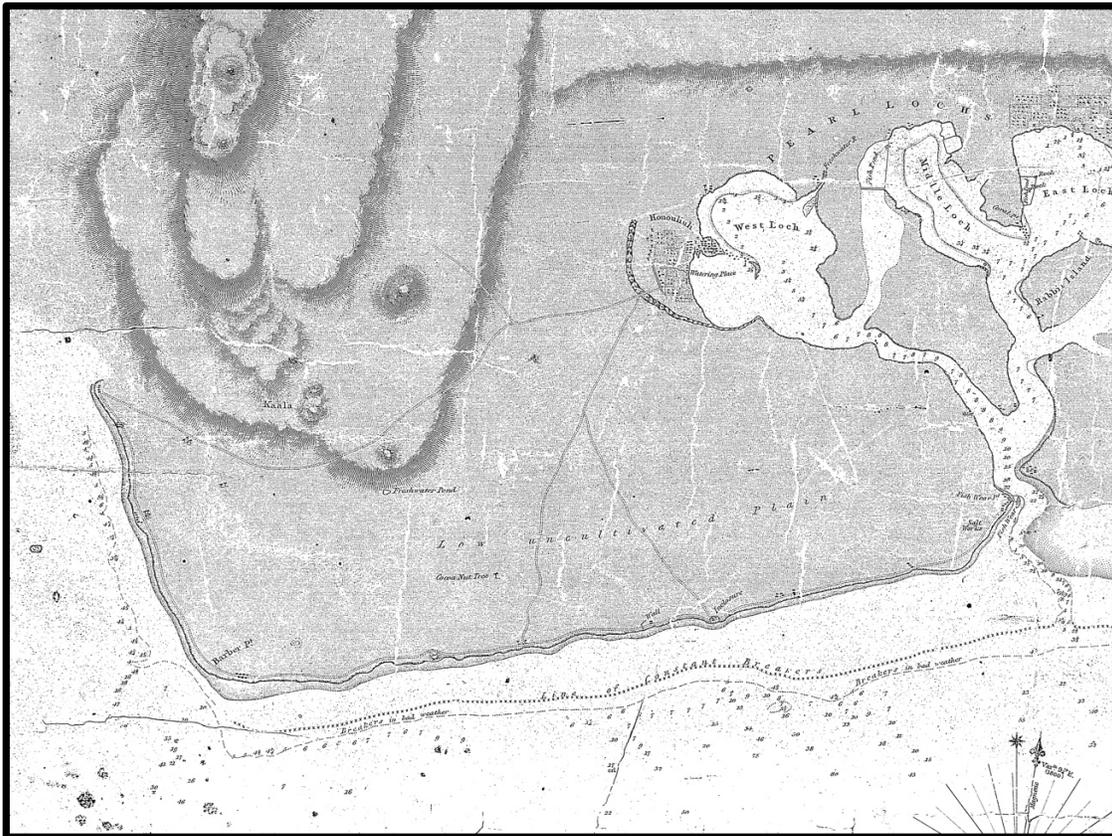


Figure 8. Portion of Map of Trails and Landscape of the Honouliuli Region ca. 1793  
(Registered Map No. 437 by Malden, 1825)

### c. Tours Made around O'ahu in 1826 & 1828

In 1820, the first contingent of Protestant missionaries associated with the American Board of Christian Foreign Missions (A.B.C.F.M.) arrived in the Hawaiian Islands. The Honolulu station became the focal point of the missionary's operations, with sub-stations on the major islands in the largest population centers. Periodically, the Honolulu station managers traveled around O'ahu to inspect the work progress in the outlying stations, including church work, educational endeavors, and facilities to support the foreign missionaries' living situation. Levi Chamberlain (1828) toured O'ahu in 1826 and 1828, writing fairly detailed descriptions of the districts he visited, including lands of the Honouliuli-Moanalua region. Excerpts of Chamberlain's original handwritten notes are provided below (digitized from the A.B.C.F.M. archives at Harvard, by

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Kumu Pono Associates LLC in 2004).

**September 12, 1828**

**Levi Chamberlain to Rufus Anderson**

**A description of two trips made around the island of O‘ahu, one in 1826, the other in early 1828 to examine the schools on O‘ahu, and determine progress in education of the natives.**

(Typed from a copy of the original handwritten letter in the collection of the A.B.C.F.M., Houghton Library, Harvard – Reel 794)

About two years ago I performed a tour around this island, and I have recently made another. It was my intention to give you a brief account of my first tour, but I could not find time to do it while the scenes that passed under my observation and the events that transpired were fresh to my mind & retained their hold upon my feelings.

I propose now to give you a history of my last tour, and in doing it I may refer to my minutes of the former tour... [page 1]

[Departing from the Wai‘anae District, Chamberlain wrote]:

...The food by which the inhabitants are supplied, is cultivated in the vallies, which open among the mountains two or three miles from the shore.

It was quite dark when were reached Waimanalo [western Honouliuli], and our arriving at the school house in which we expected to put up, we were disappointed to find it deserted; and [page 28] it was infested with fleas that we feared we could not make ourselves comfortable in it. Some of the people of the place gathered around us, & we besought them to afford us accommodations in some of their houses. One man whose house stood nearest us and who was, I believe, the head man of the place, readily offered us his,

and immediately began to put things in order for our accommodations; he did what he could to make us comfortable, and, as the house was small, vacated it entirely for our use.

Saturday Feb. 9<sup>th</sup>. I enjoyed comfortable repose during the night and awaked refreshed. I arose and united with my attendants in singing a hymn, and offering a tribute of thanksgiving to God for his care & unfailing kindness. After breakfast a few scholars assembled in front of the house. I examined them and to one of them I gave a catechism and a Sermon on the mount.

Their teacher was absent, and I exhorted them not, on that account, to neglect instructions, but to give more attention to it, to assemble on the Sabbath, and learn the catechism, and repeat passages from the word of God. At 10 minutes before 8 o'clock, after thanking our kind host for his attention to us, we set out for the next district. In consequence of the recent heavy rains the roads were very muddy, & the travelling very bad. We had met with nothing like it in any part of our previous journey travelling. After walking three hours & most of the time in mud, we reached Honouliuli in the district of Ewa. A school of 22 scholars had assembled which I examined. The head man, Kawaa, very kindly entertained me, caused a fowl to be cooked and some kalo to be nicely prepared, and furnished the native with a liberal supply of fish and poi. He invited [page 29] me to stop and spend the Sabbath with him; but as his house was small, and our company had now become large by the accession of the teachers & their attendants who separated from us at Waialua and had crossed the inland and had put up at this place, I thought it best to decline his offer. But feeling desirous that religious worship should be conducted here on the morrow, I recommended that the party who had crossed the island should spend the Sabbath here, while we who had travelled round the shore, should proceed to the next considerable settlement, and make arrangements for spending the Sabbath.

Having expressed to Kawaa my thanks for his kindness, I set forwards with my attendants, and between the hours for three & four o'clock P.M. arrived at Waikele. Towards evening I attended to the examination of two schools, which met in front of the house where I had put up, At the close of the examination I gave information that religious worship would be conducted in the same place on the morrow & requested that all the people of the place should be informed & invited to attend. [page 30]

**d. 'Ewa Described in Notes of a Tour Around O'ahu (1839)**

In 1839, E.O. Hall and a group from the mission in Honolulu, traversed the island of O'ahu, visiting various localities. His notes from the journey were published in Volume II, No. I of *The Hawaiian Spectator* under the title "Notes of a Tour around Oahu" (1839). Hall's narratives include descriptions of places visited, changes in agricultural endeavors and living conditions, with notes from Honouliuli ahupua'a and neighboring lands.

...The objects of the tour were, principally, to become better acquainted with the people, by seeing them at their own houses; and, by being cut off from the English language for a time, to acquire of the people among whom I expect to spend the remainder of my days...

As the journey from Honolulu to Ewa, or Pearl River, is so frequently made, it will be unnecessary to dwell on that part of the route... [page 95] The rest of the way to Ewa presents little of interest to the traveler. There are however several beautiful spots, where the eye will rest with delight, when the blessing of civilization and Christianity shall have through around them the comforts of other lands; and systematic agricultural pursuits have covered the field with golden harvests, and filled the lap of the cultivator with the prolific bounties of a beneficent Providence. Ewa is a place of little interest to the tourist except in a moral point of view. In this respect, however; its inhabitants, about 3,500 in

number, may be regarded with peculiar pleasure by the philanthropist and Christian; for their improvement in morals, and consequently civilization, during the past four years is very striking. And the attention they are beginning to bestow upon their persons, children, houses, yards, etc., in the immediate vicinity of the missionary establishment is far better evidence on the subject of missionary influence, than any other that can be obtained. [page 97]

Rising before the dawn, we left the low ground of the river, just as the natives were assembling in great numbers to spend their accustomed hour in the worship of Jehovah; and as we wound slowly up the hill which we have to ascend on leaving the quiet and secluded residence of the missionary, and cast our eyes around on the many interesting objects immediately about us; and looked still farther back on the distant city of Honolulu on which the sun was just shining as he rose in all his majesty above the high range of Konahuanui, the beauty of the scene and the quiet and peace of the hour, called up in the mind meditations of the most pleasing character. Lifeless, indeed, must be the heart that does not vibrate in unison with nature at such hours, and whose better sympathies are not called out in moments like these.

Passing all the villages, at one or two of which we stopped, we crossed the barren, desolate plain, at the termination of what is Barber's point; and after passing round the south-east termination of the mountain range of Kaala, and traversing a barren tract of ten or twelve miles, we arrived at the most considerable settlement in Waianae, called Pukahea [Puukahea]... (Hall, 1839:98)

**e. United States Exploring Expedition Trip Through the 'Ewa District (1840-1841)**

In the period between 1840 and 1841, Commander Charles Wilkes of the United States Exploring Expedition toured the Hawaiian Islands (Wilkes, 1970). During the month of July 1840, Wilkes and other members of his party toured the Kona and 'Ewa Districts on O'ahu.

## Existing Resources

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Notes compiled by Wilkes from the various exploration trips provide descriptions of the 'Ewa-Honouliuli region. Through these narratives, we learn about cultivation of the land, the abundant flow of water from springs and streams, use of fishponds, various marine and forest resources, the making of salt, and the continued decline of the native Hawaiian population. In 1835, the population of the 'Ewa District was given as 3,423, while in 1841, Wilkes provided the number at 2,792 (Wilkes, 1970:82), a decline of 631 people in a five-year period.

[Traveling in the company of Reverend J. Emerson, Wilkes reported that his men departed from Waialua, crossed Wai'anae uka and]... proceeded on their way to Honolulu, across the plain between the two ranges of mountains. This plain, in the rainy season, affords abundance of food for cattle in three or four kinds of grasses, and is, as I have before remarked, susceptible of extensive cultivation by irrigation from the several streams that traverse it. The largest of the streams is the Ewa. Scraggy bushes of sandalwood and other shrubs are now scattered over a soil fit for the cultivation of sugar-cane and indigo. [page 79]

At Ewa they were kindly received by the Reverend Mr. Bishop and lady, who have charge of the station. The district of Ewa commences about seven miles to the west of Honolulu, and extends twenty miles along the south shore, or from the hill in the vicinity of the Salt Lake to beyond Laeloa or Barber's Point. There are no chiefs or any persons of distinction residing in the district; the people are labourers or Kanakas, and the landholders reside near the king at Lahaina, or at Honolulu. The taxes and occasional levies without any outlay have hitherto kept them poor.

In this district is a large inlet of the sea, into which the river Ewa empties; at the entrance of this inlet is the village of Laeloa: the whole is known by the name of Pearl River or harbor, from the circumstance that the pearl oyster is found here; and it is the only place in these islands where it occurs.

The inlet has somewhat the appearance of a lagoon that has been partly filled up by alluvial deposits. At the request of the king, we made a survey of it: the depth of water at its mouth was found to be only fifteen feet; but after passing this coral bar, which is four hundred feet wide, the depth of water becomes ample for large ships, and the basin is sufficiently extensive to accommodate any number of vessels. If the water upon the bar should be deepened, which I doubt not can be effected, it would afford the best and most capacious harbor in the Pacific. As yet there is no necessity for such an operation, for the port of Honolulu is sufficient for all the present wants of the islands, and the trade that frequents them.

Pearl-River Harbour affords an abundant supply of fine fish. Two species of clams are procured here, called by the natives okupe and olepe. Mr. Drayton, who went to Pearl River for the purpose of examining its shores, and obtaining shells, reported that he found a large bed of fossil oyster-shells, extending into the bank in a bed from one to four feet wide, and half a mile in length: they were found cemented together with soft limestone and a reddish sand, and were so numerous that there was scarcely enough of the cement between to hold them together. The dredging was unsuccessful, a small spotted Venus being the only shell that was obtained, although it was the general belief, among both the foreign and native inhabitants, that it would have produced an abundant reward for the trouble... [page 80]

This district, unlike others of the island, is watered by copious and excellent springs, that gush out at the foot of the mountains. From these run streams sufficient for working sugar-mills. In consequence of this supply, the district never suffers from drought, and the taro-patches are well supplied with water by the same means.

The soil on the sides of the hills is a hard red clay, deemed useless except for pasturage. Here and there in the valleys passing through these hills and in the low grounds, is found a soil capable of producing all the varieties of tropical vegetation.

There is every indication that an elevation of the island has taken place: the flat land is now fifty or sixty feet above the level of the ocean, and the upper rock has the appearance of calcareous sandstone. The latter lies on the bed of lava, part of which is above, but a greater portion below the ocean level. There are above this rock and on the plain behind some horizontal beds of sea-worn pebbles. It seems remarkable, however, that although this upper rock will effervesce with acids, yet all attempts that have been made to convert it into lime have failed. It has been put into the same kiln with the present reef coral, and while the latter produced good lime, the former came out unchanged,—a pretty conclusive proof that it is not coral rock, as it appeared to be. As this rock will be treated of in the Geological Report, I shall refer the reader to it for further information... (Wilkes, 1970:81)

**f. Hookahi Po i Lihue (A Night at Līhu'e) – 1876**

In the narratives below, Kalakini, a resident of Kalihi, shares with readers of the newspaper, *Ka Lahui Hawaii*, a description of his trip to Honouliuli and the uplands of Līhu'e. Kalakini mentions the potential of development in the 'Ewa District should the Reciprocity Treaty (with the opening of Pu'uloa to American ships) be passed, and the possible economic benefit to the Hawaiian Islands. The visit took Kalakini to the Meek family ranch estate at Līhu'e in Honouliuli, and he refers to several notes places in the region through place names and mele.

***Ka Lahui Hawaii***

**Hookahi po i Lihue.**

**Pepeluali 3, 1876 (aoao 3)**

E Ka Lahui Hawaii; Aloha oe:—

He wahi kanaenae iki keia e waiho aku nei i kou ahonui palena ole, a nau ia e lawe aku iwaena o kou lahui, ke hiki.

I kekahi la o na pule i aui ae nei, i ke kupono ana o ka wati i ka hora 10, e hele ana he huakai makaikai ma na kula akea o Lihue, me he mea la i ka hoomaopopo iho, ua hiki aku ka huina i ka eiwa a umi paha. I ka ike aku a ka mea e kakau nei i keia mau kula, aohe wahi a ka manao e hooalahala ai. He mau wahi oi loa no na hanai holoholona ana ma keia mau mokupuni, a maluna aku o keia ke holo ke Kuikahi Panailike, aohe wahi e ae a na Hui Kalepa nui o kakou nei e manao ai i mau mahina ko e like me keia. Aka, me ka nui no paha o na lilo e wehe ia ai ka nuku kaulana o Puuloa i hiki ai ke komo na moku nui, ke ole e kuhihewa ka mea kakau, me he mea la, he mau makahiki helu wale no paha, e hoihoi ia no na poho ke holopono na hana.

**No Na Awawa a me na Alu.**

O Kipapa oia kekahi o na awawa nui a akea a'u i ike ai ma keia ala, a he malihini no hoi au i ka hele ana ma keia mau wahi. He awawa maloo loa keia, a me he mea la paha i ka wa hooilo e ike ia ai he wahi wai malaila, i ka nana ana aku, ua piha pono i na holoholona, e ai ana, e moe ana, iluna kekahi i ka nihinihi, ilalo kekahi i ke apoopoo, a me na alu. I ko makou kau ana ma kela aoao o keia awawa, ua koe aku makou ekolu wale no, ua huli mai la e nana ia hope, aohe maalo kanaka, o na bipi kupelu o ia kula i hoomaopopo ole mai ia makou ka mea ike e nuu ana i na mauu i paa mau i na kehau waikoloa oia kula uliuli.

Ku iho la makou no kekahi mau minute a nana aku la ia mua, a pela hoi mahope, a ike iho la ua loihi kahi i hele ia, a eia no hoi kekahi, o ko makou wahi pailata, aia aku la oia me ka poe mahope. I keia manawa ua hiki i ka hora 2, a ke hakumakuma mai la no hoi na ao ua, a o na kauhale kokoke imua o ko makou mau alo; oia no na hale noho kuahiwi o ka makua Capt. John Meek, i

hala aku la ma kela aoao, iloko o kona mau la kanikoo. I keia wa, ua kuka iho la makou no ka pono o ka hoi ana i hope, a no ka hele ana imua, ia manawa, ua hooholo koke iho la makou no ke kipa ana i na hale i kokoke imua o ko makou mau alo, a o Lihue ka ihu o na lio. I keia wa a makou e holo nei maluna o ko makou mau lio, o ko makou kokookolu he wahi opio, nona ka leo e hoopuiwa mau ana ia maua i na wa a pau, ma ka uwa me ka akena ana, no ka ikaika me ka holo o kona wahi lio uuku, i oi ae ka mamua o ko maua, a pela io no i ka'u nana iho, ua ano nawaliwali io no ko maua mau lio, ua hilina'i ia no paha ia, no ke nui o ko mau kino, a me ka loa o kahi i hele ia.

**Ka Hoes Ana i Kauhale.**

He hapalua mile paha hiki aku makou i na hale, no ka nui makewai o ko'u mau hoa, ua kipa koke aku la laua malalo o kekahi alu i eli ia he punawai, a i makaukau no hoi i ka bakeke e huki ai, ua kahea mai la laua ia'u. A aole nae o'u wahi mea a hoomaopopo'ku. Auau loa aku la ko'u lio, me ka manao e hiki koke i kauhale, a e ike paha i kekahi mea i launa a i kamaaina hoi. A i ko'u kaalo ana ae mamua iho o na hale, pae ana he leo, a o keia leo, no kekahi wahine a'u i ano kamaaina iki ia'u mamua, me ka peahi pu mai, ia wa ua komo mai ka hoomanao ia'u no keia mau wahi lalani:

Pa kahea a ke Koolauwahine o Puakei—e  
He pua lau kona na ka moe e aloha ai,  
Oia aloha la e hoi hou iho,  
I kaulele no ka po i hala ae nei.

Iloko o ka eleu, a me ka hiki wawe o ke kamaaina wahine; a kahea ae la ia he mau kanaka elua, na laua i miki aku e malama i kuu lio. Aohe no hoi i upu iho, ua hoea mai ko'u mau hoa, a ua apo koke ia mai la makou e ke kamaaina wahine i piha i ke aloha akea me ke ahonui. A nona ko makou mahalo piha, ma ke ano o kana hookipa ana, he makamaka heahea oiaio oia, a he ano lede

maoli, a hoomaopopo ae la au o ka wahine mare oia a Mr. Richard Meek, kekahi o na ona o ia kulanakauhale, na kula akea a me na kuahiwi kualono. O na mea i oi aku ke kamaaina ia makou, oia no o Thomas Meek me kona kaikaina nona ka inoa maluna ae, he mau kanaka hoi i ikeia no ke ano akahai a hookipa oluolu i ka poe e kipa aku ana ma ko laua home.

A iloko o ka lokomaikai palena ole o na Keonimana no laua keia wahi, ua oluolu loa laua i ke noi ana mai ia makou e moe ilaila ia po, a ua ae koke ia keia noi, a no ke ano nawaliwali no hoi kekahi o ko makou mau lio, nolaila, ua holo lea loa ke noi. Ua nanea iho la ia koena o ka manawa, a hiki i ka makaukau ana no ka paina ahiahi, ia wa, ua ku like mai na kamaaina iluna e hoomakaukau ia, a i ko'u nana ana iho i na mea o ka papaaina, ua komo koke mai la ia'u ka pololi, a hoomanao ae la au i na lalani malalo iho:

Me he lamalama la ka pua lena o ke koolau,  
I ka pala luhi ehu ma kauka o ka Ako.

Ua ai, ua honuu, a ua inu a piha, aole au e poina iki ana i na hoowehiwehi hanohano ana a na keiki lalawai o ia uka iloko o ka hapa hope o ko'u mau makahiki e hele nei, no laua ko'u aloha a nui loa. Ua ano powehiwehi iho la i ka wa i pau ai ko makou paina ana. Ia wa puka aku la mawaho o ka hale, e ike i ke Aliiwahine hoomalamalama o ka po e pahola ana i kona nani maluna o na papalina o ka honua. A ia wa no hoi au i ike maka iho ai i ke kololio ana mai a ka welau makani kehau, ke hele la au a maele, i ka ua mea o ke anu e, ke "Hao la na kepa ka hau o Lihue."

I keia wa, ke ke mai la ke ahiihiu makani mai na oawawa mai, me ka halihali pu mai hoi i ke ala kupaoa launahale, a me ke onaona o ka mauu nene, o ia uka aloha a'u e hoomanao ai i keia mau lalani:

“Paoa Lihue i ke ala o ke Kupukupu,  
I ke ala o ka mauu pua nene,  
I honia e Kokoloea a Malamanui,  
Maewa ke oho o ke Kaunoa i ka la.”

Aole no hoi au e poina ana ma keia i ka haawi ana i ka mahalo ia Keoni Miki Liilii, i kona akamai luaole ma ka hookani ana i ke Guitar, (Ki-ka,) ua like no ia me ka ipo malalo o na kohaihai o kekahi po mahina konane like me keia. Ua hoalo ia ka manawa ma na nanea ana o keia ano, a hiki wale i ka wa i hoalii iho ai ka hiamoe i na maka, ua hoi aku la makou e moe.

A ma ke kakahiaka ae o kekahi la, ua ala ae la, a mahope o ka aina kakahiaka, ua hoomakaukau iho la makou no ka hoi ana mai. Ua paa ko ko’u mau kokoolua lio, a o ko’u ahi lio, ke noke ia mai la i ka homalimali ia, a aohe wahi mea a maliu mai, me he mea la ua

Makemake wale aku no ia i kanahele,  
Ua hiaai wale aku no i ka lehua.

Ke puiwa la kela, ke owala ‘la. Me ka leo nui ka hoa’loha Thomas Meek i kahea ae ai i na Paniolo ona, ia wa no hoi makou i ike aku ai i ka eleu nui, me ka hikiwawe i ohi mai ai na keiki o ia nahele, me na kaula ili pakahi ma ko lakou mau lima, a me he mea la aole i elua minute mahope iho ua hihipea ka a-i o ua lio nei o’u i na kaula i lele mai ma o a maanei. He wa pokole loa mahope o keia, ua kau like ae la makou maluna o na lio, me ka hawi ana i na aloha lulu-lima i na makamaka oiaio o ia uka ano iui i paa mau i ka ohu.

A pela iho la i hoalo ia ai he manawa pokole o ka mea nana i kakau keia, mawaena o na hoa’loha, me ka haalele aku i ko laila mau kaiaulu. Me ka Mahalo i ka Lunahooponopono a me na Keiki o ka Hale Pai.

Kalakini.

Kalihi, Honolulu, Dek. 15, 1875.

### **Summary – A night at Līhu‘e**

...One day, a few weeks past, a trip was made to Līhu‘e to understand events. Upon seeing the plains, the writer found nothing to criticize. There are many excellent grazing lands upon these islands, and if the Reciprocity Treaty moves forward, there is no place else that the Merchants Association is looking at that would be like the lands here for fields of sugar cane. But it is only to give the opening of the famous enter of Pu‘uloa so that large ship may enter. Unless the writer is mistaken it will be a number of years for the completion of this work.

### **The Valleys and the Ravines.**

Kīpapa is one of the large, wide valleys that I saw on this road and I was unfamiliar with travel in these places. This is a dry ravine, though perhaps during the winter water may flow. Upon looking there, it was seen that it was filled with livestock, eating and lying down. Reaching the other side, we found on the plains green grasses moistened by the Waikōloa dew.

At 2 o'clock, we arrived at the mountain home of Capt. John Meek, who had passed on to the other side in his old age. We then continued on to Līhu‘e.

### **Arriving at the Residence.**

Going on about a half mile we arrived at the house, and because of the thirst of my companions, they went on down to a ravine where there have been dug a spring. I then heard the greeting of a voice from the house, coming from a woman with whom I was somewhat familiar. Two men came out and took my horse as she greeted us. This lady was the wife of Mr. Richard Meek, one of the owners of this house of the broad plains on the mountain slopes. We were also

greeted by his older brother, Thomas Meek...

After eating dinner, we went outside and I saw the wisps of the wind born dew descending. It was becoming dark and cold in the rains, as said, “The spurs of Līhu‘e dig in with cold.” Then a wild wind came down from the gullies, bearing with it the fragrance of the forests and grasses. There is remembered the lines of this song:

“Līhu‘e is scented with the fragrance of the kupukupu fern,  
By the fragrance of the flowering nēnē grass,  
Kissing Kokōlea and Mālamānuī,  
As the kauna‘oa strands turn in the sun.”

The next day we arose, had breakfast, and made prepared for our return journey. Thomas Meek called his cowboys, our horses were prepared, and in a short time we were making our way by to town...

Kalakini.

Kalihi, Honolulu. Dec. 15, 1875.

**g. An Itinerary of the Hawaiian Islands (1880) with A Description of the Principal Towns and Places of Interest (Developments in Honouliuli and the ‘Ewa District)**

George Bowser, compiler and editor of “The Hawaiian Kingdom Statistical and Commercial Directory and Tourists Guide” (1880) documented various statistics and places of interest throughout the Hawaiian Islands. The following excerpts from Bowser’s publication provide descriptions of the communities and development in Honouliuli. Entering the ‘Ewa District from Wai‘anae, Bowser reported:

...My next halting place after leaving Nanakuli, was at Honouliuli, at Mr. James Campbell’s. This gentleman owns, also, the Kahuku ranch, on the extreme

north point of the Island, of which I have already spoken. The Honouliuli ranch is an extensive property. The main road runs through it for about twelve miles, and the general breadth is seldom less than four miles. The surveyed area is 43,250 acres. One large tract of this land is perfectly level, with the exception of a few acres near the center, where there is a knoll of rising ground.

From Mr. Campbell's veranda, looking eastward, you have one of the most splendid sights imaginable. Below the house there are two lochs, or lagoons, covered with water fowl, and celebrated for their plentiful supply of fish, chiefly mullet. In the far distance, some twenty miles away, you can see the range of mountains which form the backbone of the island. It was on the northeastern side of the mountains that the earlier part of my ride was taken. The chain runs from Mr. Campbell's place at Kahuku, away to the easternmost point of the island. The soil at Honouliuli is good, and, with the aid of irrigation, will grow anything. In the meantime, it is wholly pasture land, but the means of irrigation have recently been secured by Mr. Campbell, who has sunk an artesian well to the depth of 273 feet. This well has delivered a continuous stream of water equal to 2,400 gallons per hour, ever since the supply from which the present flow comes, was struck on the 22d of September, 1879. Besides Mr. Campbell's residence, which is pleasantly situated and surrounded with ornamental and shade trees, there are at Honouliuli two churches and a school house, with a little village of native huts.

Leaving Mr. Campbell's, I came next at Waipio, at which place resides Mr. W. G. Needham, the District Judge for the districts of Ewa and Waianae. Here, also, is his courthouse, and near it a considerable village. The neighborhood is celebrated for its fish-ponds and rice plantations which extend for many miles around the Lochs through which the stream—best known under its English name as the Pearl River—finds its way to the sea... [page 495]

## 2. Honouliuli Ranching and Land Development (1830-1900)

## Existing Resources

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Grazing of small herds of cattle, and eventually larger ranching operations began developing in Honouliuli by the 1830s. Initially, native tenants and a few foreign residents vied for access to the land. By the 1860s, few native residents could compete and individuals like Isaac and Daniel Montgomery, John Meek, James Dowsett and James Campbell came to control the majority of the land in Honouliuli. The consolidation of land title set the foundation for radical changes in the landscape, led to problems with access to the Honouliuli fisheries, and changed the makeup of Honouliuli's population. The articles in this section of the study focus on the large estates and ranching endeavors in Honouliuli (Figure 11). The consolidation of title under James Campbell in 1877 led to the formation of serious business endeavors. In 1879, Campbell had dug the first artesian well in Hawai'i. With a reliable water source, initiatives like "Honouliuli Colonization Land and Trust Company" and large-scale plantation programs was within reach at Honouliuli and neighboring lands, where a few people controlled nearly all of the land. The following narratives document the relationship between Honouliuli business interests with those of other locations in the 'Ewa District and in the larger development plans on the island.

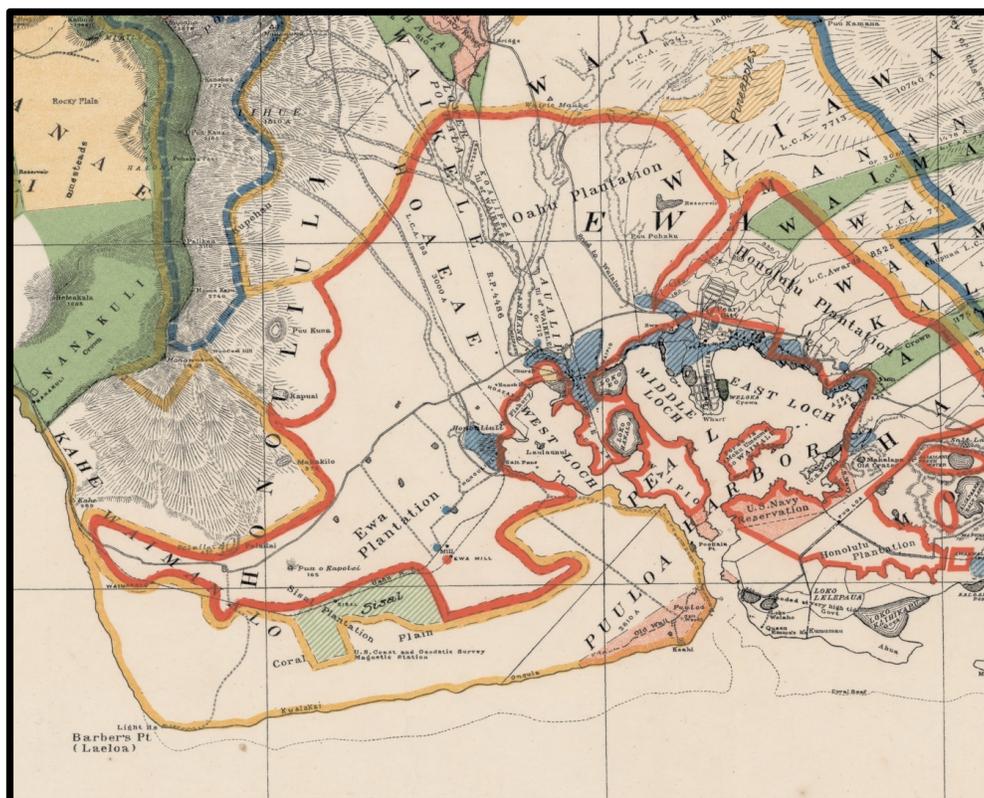


Figure 9. Portion of the Island of O'ahu (W.E. Wall, 1902). Yellow lines depict grazing lands, orange lines depict sugar plantations, green areas depict sisal plantations.

#### a. Agricultural Development Potential (1868)

In 1868, *The Pacific Commercial Advertiser* published an article filled with details of a journey from Honolulu through the 'Ewa District to Honouliuli and beyond. The unidentified author describes places and features passed along the old government road and speaks at length about the potential for agricultural development throughout the district, urging businessmen to take action and end waste of the land resource.

*The Pacific Commercial Advertiser*  
Kaala Mountains, January 1868.

**Ride to Ewa.**

**January 18, 1868 (page 1)**

...We galloped out of King Street on the excellent road that leads in the direction of Ewa. This is decidedly the best highway leading from Honolulu, as far as the Kalihi bridge. It is macadamized with coral, broad, graded, convex enough for the water to flow to either side, and is compact and durable...

Beyond Kalihi, the cactus and yellow-flowered mimosa, which filled the air with its delicious fragrance...Descending a hill which was the terminus of an ancient volcanic wave of tufa, we enter the romantic valley of Moanalua. The bright waters were murmuring over a pebbly bed between green and fertile banks, where there were some evidences of cultivation. Our road wound up the valley for some distance, past substantial farm-houses, quietly nestled between hills, where we left the valley meandering away with Arcadian beauty among the green wooded mountains to the right, and ascended the volcanic ridge. On the summit of the ridge to the left were several piles of stone rising like rude obelisks, that were surrounded with superstitious traditions of the past. There mark the descent, the jumping of place, to Kapapakolea, or the infernal regions of Oahu. We rode to the summit of the ridge below the weird piles, and stood on the sheer brink of a precipice that overlooked the Hawaiian Lake Avernus [Āliamanu]. Far below, having the base of the dark volcanic cliff, in the cavern of an extinct crater, a gloomy lake was sleeping in a green meadow pastured by cattle...

As a dark cloud swept over the scene, it gave it that impress of awe and grandeur that created in the Hawaiian mind the idea of its being the place of descent to the regions of the dead. One of the native legends bears... An enamored youth in ages long past, lost the lady of his love, and he determined to seek her among the shadows of the dead. He made the descent , found the

shade of his beloved... by trick he outwitted Milu, the prince of the realm of darkness, and returned to the upper world with her spirit, which was restored to her body and she lived a life of bliss in the Eden of the Islands. The Hawaiian idea of the immortality of the soul, before the intercourse with the Europeans, was more brilliant and spiritual than that of the Jews, and most of the civilized nations of antiquity...

The Hawaiian Avernus is a fresh water lake; but beyond it to the south-east, also in the crater of an extinct volcano, nearer the sea, is a larger lake of salt water, called Kealia, [Āliapa'akai] which it is said rises and falls with the tide, showing a subterranean oceanic connections. The view above these lakes from the ridge is beautiful, extending over mountain, vale and ocean. Away to the west and north-west extended the green undulating and wide plain of Ewa, bounded by the Kaala or Waianae range of mountains, over which was spread a gossamer veil of clouds, which gave a softened beauty to the scene, and contrasted the brighter emerald of the grassy glades with the deeper variegated green of the wood-lands. The bright bay of Ewa, or Pearl River, lay before us, spread around its verdant islands, extending deep into the plain, and affording excellent inland navigation for miles. What a magnificent site for a city—a commercial emporium of the Pacific—on its shores!

The narrow entrance that leads into the bay is shallow, but the coral bar is short, and can be dredged and deepened at no considerable expense so as to admit the largest vessels. When once inside, the harbor is land-locked, secure and capacious enough to furnish anchorage for all the ships engaged in the commerce of the Pacific. There is not only one, but many harbors and anchorages. The purest spring water gushes in abundance from the bold shores, and two limpid, never-failing streams from the mountains pour their bright waters into the bay. Then there are the Waiawa and Waikele, furnishing water enough to supply the largest metropolis...

We descended the ridge rapidly, passed the ravine of Halawa, and over an elevated table land into the bright fairy-like valley of Waimalu, where a Roman catholic church and the sugar mill and plantation of Mr. Williams are situated [at Waholoa]. On over the table land we galloped, descended into another valley where a bright stream was winding its way, and some neat cottages and *hale pilis* appeared to the right and left of the road, with some evidence of cultivation around. The sugar plantation of Mr. McColgan was passed to the left of the road. It is immediately on the margin of the bay, where several large springs gush out of the bluff near the sugar mill. We paused not, but continued on to where two cyclopean rocks formed a gate-way leading to the left of the road, where a few rods ride brought us to the hospitable residence of Victor, near the murmuring shores of the bay. We were cordially received, enjoyed his hospitality in the form a most excellent roast beef, fresh butter, the best French bread and cool spring water...

The neighborhood appeared populous, several respectable cottages and farm-houses were around, and it had the appearance of a village. There was much evidence of cultivation. We saw corn and beans flourishing as finely as in any of the States of the West, and we do not know why cotton would not do as well... No irrigation is resorted to for cultivating the corn and beans. They derive sufficient moisture from the soil and atmosphere, and where these products grow, cotton will generally succeed. We passed the cattle ranch of Messrs. Bernard & Raymond [Mānana], and by the local District Judge's, over fine lands, and forded the bright dashing waters of the Waiawa, a perennial mountain stream that waters a beautiful and well cultivated valley. We rode slowly on out of the valley over the plain for the purpose of admiring the excellent corn and cotton lands which lie between this stream and the Waikele. There are several thousand acres lying waste and idle, that could be made to produce an annual income of thousands of dollars? Why is this? and why such a want of enterprise

and knowledge of the agricultural interests of the Islands? We passed by the old residence of the late Wm. Hunt [in the 'ili of Pāpa'a] on a conspicuous elevation, saw two beautiful springs that gushed out of the cliff in waterfalls, crossed the Waikele Bridge and the narrow valley of the stream, where many deserted taro patches appeared, and the cocoanut palms seemed to droop over the desolation around. We ascended the bluff beyond by a hedge of Mexican-like cactus, and were attracted to a mound on the left that appeared like a miniature Cholula. We rode upon its summit and enjoyed the view. It is one of the most beautiful and rural in the islands. Although thirteen miles distant, Honolulu appeared almost at our feet; every outline of the coast, plain and mountain was distinct and clear; the rolling, green plain of Ewa between the grand ridges of mountains, the windings of the bright bay and the great blue sea, with several sails in the distance, completed a scene of beauty. But a short ride by a long an new stone wall brought us to Hoaeae, the *ranch* or cattle station of James Robinson, Esq., where we were kindly welcomed by his *mayordomo*, or head man, Mr. Patrick Curran... He kindly welcomed us, gave us the best of cheer, and ascertaining that we wished to for ride the mountains, prepared to furnish us with fresh horses...

We had a few glorious showers in the evening, but when these passed away, the setting sun peered gloomily through the hazy clouds, and we walked down to the shores of the bay. On either hand were evidences of former populations, in deserted and dried up taro patches, the foundations of ruined buildings, piles of shells near them, like those of the pre-historic races on the shored of the Baltic, and over all, the ancient and decaying cocoa palms appeared like melancholy monuments, drooping over this scene of desolation. We were informed that before the era of the small-pox in 1853, there were twenty-five native houses in the little valley between Patrick's residence and the bay. Now there are none—a sad evidence of the withering away of the native population...

[Rising the next morning and traveling the uplands of Honouliuli, it was reported:]

Thousands of acres of the best cotton lands extended on either hand, and few wandering cattle seemed all the enjoyed any profit from it. We crossed several deep ravines in the ascending plain and came to a the green rounded foot hills where the wiliwili and kukui trees first made their appearance in the ravines. We ascended the grassy foot hills by winding cattle paths, and when we arrived the region of the koa, we discovered a flock of about sixty turkeys in a glade... The koa forest was young and low... Higher up the mountain we discovered signs of wild hogs, and on a lofty ridge in the midst of a koa forest we came upon a “bee tree,” in the form of a hollow koa that had been blown down by some wrathful tempest, but was yet green and flourishing...

The scenery as we ascended the mountain benches opened out grandly. From the summit of the loftiest ridge of Kaala mountain more than half of Oahu can be taken in at a glance; eastward beyond Diamond Head; northward to the summit of the eastern mountains; the plain of Ewa, from wave to wave and mountain to mountain...We have never witnessed a more lovely place than that of Ewa and the peninsular plain that extends along the sea form the southeastern terminus of the Kaala mountains to the [Pu‘uloa] Salt Works at Ewa bay...

**b. Leases and Grazing Rights in Honouliuli**

In the 1870s, a dispute arose over the trespass of cattle between J.H. Coney, who owned the ‘ili of Kaulu in Honouliuli, and J.I. Dowsett, who owned the ‘ili of Pu‘uloa in the same ahupua‘a. Dowsett also held leasehold rights to larger tracts of Honouliuli. Results of the court proceedings were published in *The Hawaiian Gazette* and contain summaries of the leases and grazing rights in the ahupua‘a.

***The Hawaiian Gazette***

**Honouliuli Land Case – Coney v. Dowsett before the Supreme Court**

**Wednesday, January 17, 1877.**

**Supreme Court of the Hawaiian Islands. October Term, 1876.**

**John H. Coney vs. Jas. I. Dowsett.**

**Opinion of A. Francis Judd.**

**January 17, 1877 (page 4)**

This is an action in which \$10,000 are claimed as damages for the trespass of the defendant's cattle upon the land "Honouliuli" in Ewa Oahu, the property of the plaintiff, since Oct. 16<sup>th</sup>, 1875.

The jury returned a verdict for the plaintiff of \$200, and a motion is made to set aside this verdict and grant a new trial on the ground that the jury must have mistaken or disregarded the instructions of the court on the effect of certain leases under which the defendant justified, or that the jury misunderstood the evidence.

The first lease in question is dated March 3d, 1846, and running for twenty-five years from the 1<sup>st</sup> of February of that year, expired on the 1<sup>st</sup> of February, 1871. It demises to John Meek and his heirs, the kula land at Lihue, and the privilege that his cattle should be undisturbed at Honouliuli, if they should go there.

The second lease is dated 13<sup>th</sup> of July, 1851, and leases to John Meek and his heirs and assigns the land called Waimanalo, at Honouliuli, particularly as follows: The kula and the kuahiwi and the rights appertaining thereto, and the Poalimas, the river with all the rights appertaining thereto. It gives the boundaries as follows: On the mauka side the lands previously leased to John Meek, that is, the kula of Lihue and the kula of Honouliuli; on the makai sides Nanakuli and the Koolina. This lease expired on the 5<sup>th</sup> of July, 1876.

The third lease is dated the 16<sup>th</sup> of February, 1853, and it being for twenty-five years, does not expire until the 16<sup>th</sup> of February, 1878. By this lease there is conveyed to John Meek, his heirs and assigns, all the remaining portions of the lessor's kula land at Honouliuli: this being explained as follows: All parts of this kula land not included in the previous leases made between A. Keliiahonui, M. Kekauonohi and Jno. Meek for that land called Lihue, on the 3<sup>rd</sup> of March, 1846, and another lease between J. H. L. Haalelea and John Meek, of all that land called Waimanalo, on the 15<sup>th</sup> of July, 1851, the rents of these two lands shall continue and their lease, until the expiration thereof. they are not included in this lease. Before considering the reservations, which are made at length and with considerable particularity.

Let us go on to the fourth lease, which is dated the 1<sup>st</sup> of February, 1871, and which conveys all of that certain piece of parcel of land situated in the Ahupuaa of Honouliuli, district of Ewa, island of Oahu, known as the Ili of Lihue, for seven years, and which will not expire until the 1<sup>st</sup> of February, 1878.

The plaintiff claims that lease No. 1 conveyed not only Lihue but a portion of the kula of Honouliuli, and builds up an argument in sup- of this from the words of description of Waimanalo, above given, in which the mauka boundary of Waimanalo is stated to be the kula of Lihue and the kula of Honouliuli, and that the portion of Honouliuli conveyed by the first lease and not included in the third lease, was not covered by the fourth lease, which was a lease of the Ili of Lihue only. The plaintiff claims that as there was abundant evidence that the defendant's cattle pastured upon this tract of land within the dates in which this trespass is laid, the award of the jury of \$200 is far from excessive and should be sustained. But can this position of the plaintiff be sustained?

The first lease conveyed only Lihue, the lessor covenanted in addition that the lessee's cattle should be undisturbed on Honouliuli, if they went there. This

does not lease any portion of Honouliuli outside of Lihue, but only protected the lessee from being held liable for trespass if his cattle strayed on Honouliuli. This view is strengthened by the wording of lease No. 3, made in 1853, which shows the interpretation put by the parties on their previous leases after seven years of dealings with each other as landlord and tenant. This lease No. 3 distinctly says that the lease of 1846 was for that land called Lihue, and that the lease of 1851 was for that land called Waimanalo. Now, as this lease No. 3 conveyed all parts of the kula of Honouliuli, not included in leases No. 1 and 2, it conveys all of Honouliuli except Lihue and Waimanalo and the reservations.

...The reservations in lease No. 3 are as follows: "These are the places reserved to the party of the first part; the fish ponds in said kula land, having fish in them, and two lots intended to be enclosed hereafter: also Mokumeha adjoining the enclosed taro lands: and also that piece between Kualakai and C. W. Vincent's lot; that places known as Ka pa Uhi is also reserved; the sea fishery and its rights are also reserved, similar to the Waimanalo sea-right reservation; also the Pa aina at Honouliuli and the said enclosure: and also the cultivatable land at Poupouwela; all of which are reserved and not included in this lease, but John Meek's cattle shall not be molested should they go on to these places reserved if not fenced in with a fence sufficient to prevent cattle from trespassing. Poupouwela will still remain as in times gone by, and is not intended to be fenced in as its situation is good, not needing a fence. The tabued woods of the mountains of the lands mentioned in this lease are also reserved to the party of the first part, but he, John Meek, can take said tabued wood for his own use, as much as he wishes, but not to dispose of to other parties."

...As regards Poupouwela, its aina mahiai is reserved. This is translated cultivated or cultivatable land. Whichever rendering is taken there is no evidence that Dowsett's cattle trespassed upon either the cultivated land or the

land capable of cultivation in Poupouwela. The evidence was confined to the statement that the cattle driven from Waimanalo between the 11<sup>th</sup> and 18<sup>th</sup> of July were driven from Lihue to water at Poupouwela and back again, but there was no evidence that this water was in the limits of the aina mahiai. I am of the opinion, though the jury were not so instructed, that no trespass could be maintained even on the aina mahiai of Poupouwela, as the clause in reference to immunity from trespassing applies to it, and the lessor disavows his intention of fencing it, as the situation of the land did not require it. The legal inference from this is, that he took the risk of cattle trespassing on it, though unfenced...

A. Francis Judd,

Justice Supreme Court.

L. McCully and E. Preston for plaintiff. A. S. Hartwell and W. C. Jones for defendant.

Honolulu, Oct. 23, 1876.

John H. Coney vs. James I. Dowsett.

On Exceptions to the Decision of Mr. Justice Judd.

Present: Chief Justice Allen, Justices Harris and Judd.

The question upon which the opinion of the fall court is desired, is the construction of the leases on file in the case.

The arguments of the counsel for the plaintiff are exceedingly ingenious, and we have given them full consideration. We have likewise reviewed and weighed the opinion given by Mr. Justice Judd, which is excepted to and we concur in that opinion fully, seeing no reason for altering, amending or expanding it.

The jury will be instructed in accordance with this opinion, in case a new trial is proceeded with.

Elisha H. Allen,

Chas. C. Harris,

A. Francis Judd.

E. Preston and L. McCully for plaintiff, A. S. Hartwell and W. c Jones for defendant.

Honolulu, Dec. 29, 1876

**c. Honouliuli Ranch**

*The Daily Bulletin*

**Honouliuli Ranch**

**August 14, 1885 (page 6)**

**Viewing the Ranches.**

...If observation is anything, and scientists say it is everything, these hills and glades go to prove that a least the island of Oahu has been perverted from its original purpose in the economy of nature, and that “someone had blundered.” inasmuch as large areas of its best lands are devoted to the sustenance of the cow, the ox and the goat, the people to shift for themselves as best they can about the docks and street corners of Honolulu. Where cultivation appears, it proves an unmistakably grand success. Wherever improvements break up the soil, the soil gives manifold returns. Coming over the brow of one of the hills, an immense structure appears in the distance. It reminds the observer of the bridges over some of the mountain gorges on the line of the Union and Central Pacific railroads. It turns out to be Robinson’s irrigating flume, running along on trestle work over a wide gorge at the bottom of which is the Waipahu stream and spring. The road leads down towards the water, and passes under the highest part of the trestle bridge, the flume at the roadway being apparently

about eighty feet overhead. Right by the road is a big pump for raising the water to the flume. It is brought by this conduit to Robinson's banana plantation, covering about fifty acres of land at Ulalena. There is an opinion among the natives that this Waipahu stream has subterranean connection with Kahuku. In support of this theory the story goes that a woman at Kahuku accidentally let a tapa stick fall into the water, and all efforts to recover it proved futile, but some time afterwards being at Ewa, she saw her lost tapa stick and accused the possessor of having stolen it, but the alleged pilferer was acquitted on proving that the stick had been picked up in the Waipahu stream. The "fourth estate" cavalcade passes on, and after another hour's equestrianism, that by this time is beginning to be more painful than romantic to some members of the party, the Honouliuli ranch is reached, horses are taken care of, the pressgang, professor and all, are shown to well furnished apartments, and every man is hospitably directed to make himself perfectly at home. A sumptuous dinner soon follows, the soup and fowl are excellent, and the fish, a fine Papiopioulua, is simply magnificent. In next letter, you will have an attempted account of a two days' ride over the great Honouliuli ranch, covering a tract of about 43,000 acres.

***The Hawaiian Gazette***

**Honouliuli Ranch.**

**August 19, 1885 (page 2)**

With a good horse and agreeable companions the ride from Honolulu to Mr. Campbell's ranch at Honouliuli a very pleasant undertaking, and so it proved to a party of gentlemen of the press and others who made the journey on Monday last.

To a traveler who has not been over the ground for some seven or eight years, considerable changes are observable, chiefly in the direction of increased

farming and cultivation. The extent of rice and banana land is much enlarged, and Mr. Mark Robinson's flume and pumping engine at Ulalena is a remarkable piece of work. Though apparently of the slightest conceivable scantling it stood through the late gale without injury. This flume irrigates over 200 acres of land fit for banana, watermelons and a variety of produce and of which 35 acres are in bearing.

Of Honouliuli itself there is a great deal to be said. Mr. Campbell's estate contains about 13,250 acres and has been in his hands for eight years. During this time he has put up 30 miles of fencing of which 20 miles are of wire and 10 miles of batten. The estate is thus completed enclosed; either by fence, by the impenetrable ridges of the Waianae Mountains, by the water front of Pearl Harbor or by the open ocean, Hon. J. I. Dowsett's place at Puuloa cuts off a corner stretching from Pearl River to the seabeach behind. There is little of any of this land which is not capable of being made productive in one form or another. At present it only carried 5500 head of cattle, and one rides along the foot-hills of the Waianae range and the plain below through miles of manienie grass above fetlock deep, only sprinkled here and there with high bred cattle in splendid condition. Occasionally one comes to a batch of some acres of mimosa bush and sometime of blue weed. Again on the high plateau on the western terminal slope of the mountains large batches of Spanish clover, kukaepuaa are amongst the prevalent manienie.

On taking possession of the property, Mr. Campbell found it heavily overstocked and wholly unfenced. Buying out the Kahuku property on the north side he caused to be removed 32,300 head of cattle, reserved Kahuku for breeding purposes, and after letting the land rest for twelve months, gradually raised the stock on the two estates to the present figure, viz, about 5300 on Honouliuli and 3300 on Kahuku.

The young stock are driven from the last named place to the Eastern, or Lehue [Lihu'e] end of the former, and so onwards till they reach the fattening ground of some 15,000 acres, towards Manikuli [Nanakuli] and thence is an easy drive to the slaughter house on the Pearl Harbor, whence the carcasses are carried by steamer to the Capital, thus avoiding the deterioration inseparable from long drives to market.

Among the ravines and narrow valleys between the span of the main mountain range towards the Leilehua boundary, are evident traces of extensive taro grounds, sufficient proof that there at least, abundant supply of water has formerly been available. Though the great bulk of the land from Honouliuli to the "big tree" is available at present for cattle runs only, there seems to be no reason why, at reasonable expense a good portion of this might not be irrigated for dairy, grape, vegetable and many other marketable produce.

A well at Kunia, 400 feet above the sea and sunk 50 feet brings water to within twelve feet of the surface, except during long droughts, while an Artesian well (Waianiani) about fourteen feet above sea level has yielded 2,400 gallons an hour since it was sunk in 1879. The water front on Pearl Harbor affords on one side promising bathing places, while the whole area of the sheltered harbor offers unrivalled opportunities for yacht sailing. The rice grounds are in the hands of the Chinese, who pay a low rental for the first seven years, which are nearly expiring, but they are desirous of renewing for another seven years at a considerable advance. Fishing rights, lime and building stone are also valuable considerations.

The soil almost throughout this estate is the rich red volcanic mould familiar in these island, its depth is shown by the numerous cracks and slopes, and its fertility by the spontaneous growth which covers it.

At present the Campbell estates send an average of six carcasses per diem to Honolulu being rather more than one third of the consumption. The cattle are all in prime condition, and judging from the large areas on which mere traces of cattle are now visible and the immense amount of available feed, this quantity could be readily increased by 50 per cent. Without distressing the land. No doubt a large portion of this land is available for cultivation by small freeholders; how much, can only be ascertained by experiments in the way of raising and distributing water, especially between Honouliuli and Lihue. The questions of market and ready access thereto, may be left for the present to await further information based on actual experiments.

At the ranch itself Mr. Cecil Brown did the honors in most hospitable style, and rode each day with the party ready to lead the way over the country and afford every information asked for, and to him members of the party are indebted for a pleasant trip.

***Daily Bulletin***

**Honouliuli Ranch.**

**August 31, 1885 (pages 2-3)**

**Tuesday, Aug. 11<sup>th</sup>.**

[riding in from Waialua, across Wai'anae Uka]

...Passing on, the party soon reach the Kunia windmill, drawing from a well about thirty feet deep a continuous stream of water. The elevation at this point it estimated to be about 450 feet above sea level. The Kukui windmill is about as good an indicator as can be that these lands may one day be dotted over with the habitations of an industrious agricultural population. If one windmill draws a continuous stream of water from a depth of not more than thirty feet at this elevation, it may reasonably be inferred that a water supply for purposes of settlement can be had at other points as well as here.

The next halting place is in the umbrageous shade of The Big Trees at Lihue. There are two gigantic kukui trees standing about ten feet apart, on the top of a high hill, like sentinels keeping guard over the surrounding country. As every object of note must have a legend, that of The Big Trees is that a native has his six by two resting place under each tree. Several visitors in years gone by have carved their names on the bark, thus leaving to the kukui trees the sacred trust of bearing their names, as the years roll on, higher and higher in view of all who pass this way, in proof of the fact that they had at least made their mark in the world. Nearby is a dilapidated old building, once the residence of Captain John Meek. With reference to the capabilities of the soil it is related that Captain Meek raised oats and corn here in his time.

A few miles further on, another halt is called at a magnificent stream, and right by is a fine dairy kept by a Portuguese. It need hardly be said that every milk drinker in the party had his wants supplied to his own satisfaction and the credit of the ranchman's cows. The outward bound ride at length comes to an end at the Papowela [Poupouwela] stream and well. Here, a hole was bored years ago with hand tools, and, as the water did not come at the time, the pipe was plugged. Six months after the plug was taken out, the water flowed and has flowed on ever since.

The order rings along the line, "Back to the ranch house." The march back is close along the line of the Leilehua Ranch. About half way down the home stretch, the ride is mostly over level ground. A gallop of a mile or so over a rich carpet of verdure, then a slow march down a steep bank and across a ravine under clusters of kukui nuts, and up the opposite bank, then off again on another steeple chase (all but the steeple), over another ravine, and so on for five or six miles. Occasionally we pass a drove of cattle, so rolling fat that their sleek coats glisten in the sun. The ilima plain traversed in the morning is again

entered, though on a different trail, and at half past one, P.M., a rather sore, but much delighted party of the wise men of Honolulu are luxuriating, in the bath room, on the breezy verandahs and at the sumptuous dinner table of the Honouliuli ranch house.

**Wednesday, Aug. 12<sup>th</sup>.**

This was the second day's riding over the Honouliuli Ranch, and a more exciting and romantic excursion could hardly have been made. The start was made, as before, from the ranch house, and lay over a part of the wide flat traversed yesterday, and which, as before stated is well covered with the ilima, indigo and other shrubbery much relished by cattle. The shrubbery, I omitted to mention yesterday, is richly supplemented by an undergrowth of manienie grass. The route this morning is to the mountains. The climbing begins. Looking forward and upward at an angle of about 40 degrees to a height of some 800 feet, the first peak to be scaled [Pōhākea] is in full view. The prospect is not a comfortable one to the ranch horses. They face the acclivity, however, with commendable equine determination, pawing their way with sure-footed care up the slope, through heavy grasses growing knee-high. The whole slope is heavily coated with manienie and native grasses, and some Spanish clover, and is well dotted over with trees, chiefly the kukui. After reaching the top of the first peak, the trail winds down, corkscrew fashion, through heavy verdure and under the umbrageous shades of large wide spreading trees into a deep ravine, out of which there is another corkscrew trail up on to the next peak and reaching a little farther into the clouds. Parts of the trail just gone over runs along the margins of immense gulches into which the rider looks down over precipitous descents of some nine or ten hundred feet through the dense foliage of trees that have somehow got rooted in the sides of the declivities, so that they suggest the idea of an aerial vegetation. The prospect up these mountain sides and through these ravines, is grandly picturesque. These exhibitions of mountain scenery grow upon the view. The first hour among them extorts

expressions of wonder and admiration. Passing on, their majestic grandeur repeats itself in ever increasing variety. The faithful horses climb almost perpendicular ascents over the rugged natural stairways, and again descend similar hard places, with equal care and safety. “Jerry” proved himself an able and reliable steed. “Sooner,” by the way, had been discarded, as deficient in intellect and understanding, and unfit for the service of the Bulletin, But “Jerry” is an intelligent big bay, wanting neither whip nor spur, but always knowing just where to go, and regulating his paces with infallible correctness, whether on the slow march over rough and rugged ways, or on a streaking gallop over pieces of smoother roadway. Midday finds the whole party on the highest point, but one, of the Waianae. The scene at this point is grand. It is magnificent. It is stupendous. We stand here on the rim of an immense basin scooped out of the mountain, with the seaward side broken out. This vast cavity is about a quarter of a mile wide, with almost perpendicular walls a thousand feet high. Beyond the basin northward, the mountains shoot up skyward in colossal isolated cones. Spreading out in the spacious concave of the western horizon, are the deep blue waters of the great Pacific Ocean, the “boundless, vast, illimitable waste of waters.” The Nuuanu Pali, with all its grandeur, is surpassed by this exhibition of nature’s wonders in the Waianae. All these mountain elevations, with their deep broad gulches are valuable, from the utilitarian standpoint as they are from the romantic and sentimental. Herds of splendid cattle are seen feeding on the slopes and in the valleys. The cavalcade moves on down the seaward side of the mountain, in view of thousands of acres of flat land lying along the seashore. These seaward paddocks are pointed out as the territories that will be in order for the explorations of tomorrow...

**Thursday, Aug. 13<sup>th</sup>.**

[Returning to ‘Ewa via the low land trail] ...The trail leads over coral which is evidently upheaval. Up through every crevice and around every boulder, big and little, there are thick growths of pili, makuekue, pualele (milk weed), manienie,

kukaepuaa and other native grasses. At one place, a cavity in the rocks contains luxuriant growths of breadfruit, bananas, sugar-cane, and numbers of wiliwili trees, with their exceptionally pretty red seeds. The natives say when these seeds are ripe and red, there are plenty sharks off Puuloa. On the lower part of this land among the rocks, fine clumps of algaroba trees appear in different stages of development. All these trees have grown up within about six years. The large progeny of baby algarobas whose frowsy heads appear here and there over the plains, if not nipped by cattle would evidently evolve, within a very few years, a race of sylvan giants. Cattle kept off, and the natural propagation of these fine trees assisted by some planting, there is here the possibility of a big bonanza in a ten thousand acre forest within ten miles of the city of Honolulu. As pasture land this portion of the land is unsurpassable in richness. It is the part of Honouliuli designated the fattening paddock. Cattle intended for the slaughter house are brought here to have the "gilt edge" finish put on them. About six head are slaughtered every day for the Honolulu market and forwarded by the steamer Kapiolani. The ranch is capable of supplying a much larger daily quota of beefs, but the demand is limited, and the ranch is of course stocked considerably short of its capacity. There are at present on it some 5,500 head all told. But if the grasses, and other plants in their present condition, mean anything, they indicate enough and to spare for herds numbering twice five thousand.

A fact deserving of special note is the improved breeds with which the ranch is almost wholly stocked. Durhams, Herefords, Jerseys, Ayrshires and Holsteins are pointed out. And, really, it needs not the eye of a connoisseur or a grazier to notice that the animals are no "square piles of bones built on four uprights of the same;" for no one can view them roaming in herds over the mountains, scattered in squadrons over the plains or massed in closer order around the reservoir on the fattening paddock without noticing many of the points of superiority characteristic of the several varieties of improved stock...

**d. Honouliuli's Great Land Colonization Scheme (1885)**

*The Daily Honolulu Press*

**Great Land Colonization Scheme, Island of Oahu, Hawaiian Islands.**

**October 31, 1885 (page 2)**

A property of 115,750 acres offered for sale to a joint stock company, which will sell the same as suitable for sugar, rice, grazing, homestead, dairy, fruit and other purposes.

63,250 acres in fee simple and 52,500 acres held under lease, at present carrying between 12,000 and 15,000 head of cattle and 250 horses and mules.

A large area of this property is suitable, according to locality, for Sugar, Rice, Vinyards, Fruit Orchards, and small Homesteads, the remainder being fine mountain side grazing ground.

Under the proposed arrangements of the Company to be formed an exceptional opportunity is offered for acquiring homesteads, by a system of deferred or gradual payment as may be agreed upon; the whole being within easy reach of Honolulu, the capital city and principal port, with a steadily growing market.

**Climate.**

The climate is pre-eminently healthy, the North-east trades sweeping across the island for the greater part of the year.

While there are no available registers barometer, thermometer or rainfall for this particular district, there is no reason to question their strict analogy with that of the Nuuanu Valley, in the same island, and in which Honolulu and its

suburbs are situated, where the rainfall amounts to 33.28 inches per annum from a minimum of 0.94 in March to a maximum of 3.43 in December; but these figures relating only to the lower levels in and about Honolulu do not by any means represent the rainfall on the Waianae Mountains, which is very much heavier.

Thus the temperature may be said to range from 68 to 85 Fahr., varied of course by situation, elevation above the sea, accessibility to trade winds, etc..

**Honouliuli Ranch.**

Containing [43,250] acres in fee simple. This land is favorably situated, having direct communication with Honolulu by water, distance 10 miles, or by land by a good road, distance 17 miles, the latter offering singular facilities for an inexpensive railway track.

The water route to Honouliuli is from Honolulu harbor skirting the reef to Pearl harbor, a magnificent inlet of the Ocean protected by a reef or bar with 11 to 13 feet, but inside with from 20 fathoms to 3 fathoms of land-locked, protected anchorage, fit for all classes of coasters and yachts. On the west arm of this harbor Honouliuli has a frontage of no less than five miles, all steep-to, with from three to twenty fathoms in front of it. The whole fishing rights of this west arm are part of the property.

Honouliuli Ranch is bounded by the sea and Pearl River on two sides, and extends in a westerly direction to the divide of the Waianae Mountains which form a natural boundary so well defined and so difficult to pass as to render fencing on this line unnecessary. But where Honouliuli adjoins the neighboring properties, it is securely fenced. There are twenty miles of five-wire fence with redwood posts, and ten miles batten fence, all in good order and erected within the last seven years.

Stretching from Pearl harbor and skirting the base of Waianae mountains southward and eastward is a plain of about 7,000 acres of rich alluvial soil, eminently suitable—the upper portions for sugar and the lower for rice lands. Of these latter, from 3,000 to 4,000 acres may be irrigated by artesian wells, the elevation above high water mark being between 12 and 35 feet. One well sunk in this district in 1881, to a depth of 186 feet, has yielded unceasingly 2,400 gallons per hour since completion.

On the eastern slopes, among the foot hills of the Waianae mountains, are over 10,000 acres of land, suitable for small farms, vineyards, orchards, &c. several perennial spring, flow through these valleys and ravines, and the extensive traces of taro culture show that in the hands of the old natives there was no lack of water.

Wells have been sunk at elevations from 400 to 700 feet above the sea level. Water was found at from 30 to 60 feet below the surface. One is a flowing well; on the other a windmill suffices to raise drinking water for surrounding herds.

The ravines of the Waianae slope are narrow and readily lend themselves to favoring the construction of storage dams for purposes of irrigation.

The Waianae mountains attract or precipitate a sufficient rainfall in ordinary seasons for the maintenance of the present heavily-grassed condition of the slopes, and due attention to the forestry will enable them to carry more numerous herds of cattle than those which now fatten hock-deep on the Manienie or Bermuda grass.

The lower and more open slopes are suitable for dairy, poultry or fruit raising. They are within easy reach of the main road to Honolulu, and when peopled

must soon invite the construction of a railway to the capital.

The Sugar cane and Rice land of this property is valued at from \$100 to \$200 an acre, and may be taken up in large or small tracts at these figures; the grazing, farm and fruit lands are valued at from \$10 to \$50 per acre. It is at present intended to offer some 10,000 acres of first-class agricultural land for sale, upon convenient terms, at \$50 an acre for colonization purposes, for resident and improving occupants...

**General Remarks.**

[Author references the additional ranching operations of the Kawailoa and Waimea Ranches which contain 72,500 acres of land]. The Honouliuli property is distant about twelve miles, but is connected with them by an excellent road. These properties have at present 66 miles of good fencing. The land is well grassed with a fair proportion of timber throughout. Livestock of all kinds thrive and fatten on the pastures, and by increasing the number of enclosed paddocks and working the combined estates systematically the number of cattle and horses on the land might be largely increased.

The number of cattle, 12,000 to 15,000. Now on these estates has been already mentioned, also 250 head of horse stock and mules, together valued at \$312,000. The horned cattle are bred from "Hereford" and "Short-horn Durham" imported for these estates, and they thrive and fatten without any stall feeding or housing.

The horse stock is exceptionally good, one sire, "Shenandoah," having won over \$20,000 as a two-year-old in the United States. There are also three trotting stallions, two of which cost \$1,000 each, and there are unbroken colts and fillies from these sires, some four or five years old, which may be readily broken for saddle or harness.

These properties, if united, would give the proposed company a controlling interest in the Honolulu market, for produce of all kinds, with a steadily increasing demand; to which the contracts recently entered into by the Pacific and Oceanic Steamship Companies may prove a valuable stimulant. Indeed it is possible to create a trade with San Francisco for carcasses of beef and mutton carried in refrigerating chambers by the Oceanic Steamships.

The income from these estates at present, including leases, is \$70,000 a year. Moderate calculations show that these figures might be nearly quadrupled.

The fishing rights on Pearl harbor pertaining to the Honouliuli estate, now leased for a short term at \$1,700, can be rented at \$2,500 on the expiration of the present lease.

A limestone quarry on the Honouliuli property at present pays a small annual rent, and a royalty on the lime produced. The entire demand for this kingdom may be supplied from this quarry, instead of, as hitherto, importing lime from California. The builders of Honolulu consider this lime superior in quality and preferable to the Californian lime. There is also a fine limestone quarry on Kahuku Ranch.

The five mile frontage on Pearl harbor spoken of suggests a town site for a summer resort there, the facilities for yachting and boating being unsurpassed, while the climate is all that can be desired.

A vast variety of fruit or timber trees grow with extraordinary rapidity. The whole Eucalyptus family, the algarroba or locust tree (pseudo-acacia), the tamarind, "alligator pear," guava, bread fruit, &c. Citrus fruits especially thrive without care or cultivation. Many ornamental woods known as koa, kou, 'ōhi'a, &c., grow

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well. India-rubber (caoutchouc), quinine (cinchona), and perhaps above all the ramie will flourish, each in its suitable locality, which may be found on these estates.

Proposed plan for forming a Joint Stock Company to purchase, sub-let, sell or work these Estates.

It is proposed to form a Joint Stock Company to buy the properties described below, both freehold and leasehold, to divide them for purchase or lease on convenient terms, and to work the unsold or unleased portions for the benefit of the shareholders.

Property consisting of-

63,250 acres in fee...	\$ 822,250
Capitalized value of leased land, 52,500 acres...	\$ 65,750
15,000 head cattle at twenty dollars each...	\$ 300,000
260 head horses, &c...	\$ 12,000
	\$1,200,000

The Company's stock to consist of-

12,000 shares of \$100 each...	\$1,200,000
8,000 of said shares, par value \$100 each...	\$ 800,000

To be offered for sale and

4,000 of said shares, par value \$100 each...	\$ 400,000
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To be held by the promoters of the Company, viz., Jas. Campbell Esq., owner of the Honouliuli and Kahuku estate; Jno. H. Paty Esq., of Messrs. Bishop & Co., Bankers, principal owner of Kawaihoa and Waimea estates; M. Dickson Esq.,

and J. G. Spencer Esq., part owners of Kawaihoa and Waimea ranch; Mr. B. F. Dillingham, President Pacific Hardware Co.

As soon as 8,000 shares of the capital stock have been subscribed for by responsible persons, the Company will be incorporated and the stock issued.

Receipts from the sale of the stocks will be paid over to the owners of the properties. Deeds, leases, and bill of sale of landed property and of live sock to be placed in the lands of the officers of the Company appointed to receive them.

The following gentlemen have consented to accept office: President, James Campbell. Vice-President, J. H. Paty. Secretary and Treasurer, Godfrey Brown.

The following gentlemen have consented to be nominated for Directors: James Campbell, J. H. Paty, S. G. Wilder, A. J. Cartwright, W. F. Allen, S. B. Dole, W. Austin Whiting, W. R. Castle, B. F. Dillingham. General Manager, B. F. Dillingham, Sub-Manager, M. Dickson.

***The Daily Honolulu Press***

**Local News.**

**November 19, 1885 (page 3)**

The Hawaiian Colonization Land and Trust Company have issued a preliminary prospectus setting forth the merits of the Honouliuli, Kahuku, and Kawaihoa and Waimea ranches. The introduction to the prospectus contains the following clause: "The object and purpose of this company shall be to purchase the land and leases herein-after described, also other desirable property in the Kingdom which may be offered for sale or lease upon favorable terms, and sell or sub-lease them for colonization purposes, in lots or parcels to suit purchasers, and

upon terms which will make it not only possible but convenient for those with very limited means, to gain a ‘foot hold’ in this country,” Occasion will be taken here-after to review the scheme at greater length.

***The Daily Honolulu Press***

**The Colonization Scheme.**

**November 30, 1885 (page 2)**

Governments are the natural guardians of the people; therefore to protect the rights of an individual is no less the duty of their rulers than it is their duty to foster schemes for the development of the country’s natural resources. While it would be impracticable in most instances for a Government to become a party to a corporation, yet it can give protection and add support to its subjects, who are its direct agents for the improvement and development of the country at large. But development is a basis for security, and increased security means financial protection, and financial investment always assumes that the Government is a natural guardian under whom both capital and industry can rest secure and increase without molestation.

It follows that all reasonable projects for developing the resources of these Islands should be furthered and protected by this Government. It is the duty of every citizen to aid in bringing about such a state of reciprocal interests. Such a chance is now offered both Government and citizens in a scheme for the colonization and development of the Island of Oahu by a *bona fide* joint stock company, known and existing under the style and name of the Hawaiian Colonization Land and Trust Company. The men whose names figure in the preliminary prospectus of the company preclude any doubt as to the sterling worth and merit of this enterprise.

It is proposed by this company to buy up some of the great landed estates of

these Islands, the present scheme embracing the Honouliuli ranch containing about 45,000 acres of land, the Kahuku ranch containing about 25,000 acres and the Kawailoa and Waimea ranches containing about 45,000 acres of surveyed and unsurveyed land. The company proposes to sub-let, sell or work these estates on terms the most favorable to settlers, as will be seen by perusing the preliminary prospectus heretofore published in the Press, as well as in pamphlet form for general distribution.

Some of the main points connected with the situation and resources of these ranches may be briefly summed up as follows: The different properties are easy of access either by land or water; they are all fertile valley lands or fine uplands for grazing; all the properties are well watered by springs, artesian wells and natural water sheds with easy constructed reservoirs; they are all well stocked, well grassed, well wooded and well fruited; they contain excellent fishing possibilities which may be practically developed into an immense source of revenue; these different ranches are capable, according to locality, of producing sugar and rice, vineyards and fruit orchards, and are also suitable for small farms or larger grazing tracts.

One of the main things to be taken into consideration, in the present offer of the company, is, that each and every one of the properties embraced in the scheme is at the present time a *paying property*. Another feature to be looked at is, that no matter how poor a man may be he can enter upon the land offered and by his own labor and enterprise can not only make a living but can lay by enough money to purchase in a few years, on the installment plan, the homestead upon which he lives, thereby rendering himself and his family independent.

The scheme is a gigantic one but it is backed by men of sterling moral and financial worth, who will use every endeavor to carry it through to a successful

consummation. Embracing as it does an estate containing 63,250 acres of land in fee simple and 52,500 acres of leasehold land, it is a scheme that necessarily calls for foreign immigration and home support. What one man may do for the development of these Islands has already been seen and appreciated by many; what an organized company of our best citizens can do, with the proper support from the Government, will by far eclipse any instance of private enterprise and will open up and develop the resources of Hawaii until public debts will not only be a thing of the past, but “Money to Lend” will be posted in every doorway from the Government building to the confines of Chinatown.

*The Daily Bulletin*

**Prospective Returns of the Colonization Scheme.**

**December 17, 1885 (page 2)**

A communicated article in a contemporary presents some of the sources of profit to investors, and advantages to settlers, held in prospect by the promoters of the “Hawaiian Colonization, Land and Trust Company.” For the information of our readers we summarize the leading facts. The Honouliuli territory, of which the company has the refusal, contains 17,000 acres of land suitable for growing sugar cane. Of this amount 7,000 acres are comprised in a plain requiring artificial irrigation. To effect that object artesian wells are proposed for the portion lying at an elevation not exceeding thirty-five feet above sea-level, and a series of dams, in a natural gulch, for higher levels. Both means are proved feasible beyond any reasonable doubt, by the complete success attending their adoption, under similar conditions and in contiguous areas. Their estimated cost, for this company’s purpose, is \$125,000. When the land is furnished with watering facilities, it is assumed that at least from 2,500 to 5,000 acres will be occupied by responsible cultivators of sugar cane. The cane would be raised on shares, in the proportion of, say, five-eighths to the planter and three-eighths to the company. Milling facilities, with

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transportation of cane to mill and sugar to place of shipment, should be provided by the company, while the planters should do the harvesting and loading. Four tons to the acre is the very lowest estimate of the soil's productiveness, but experience dictates a higher figure by two or three tons. Taking the smallest amount of both land and yield, however, we have 2,500 acres producing an aggregate of 10,000 tons of sugar. Of this the company's share would be 3,750 tons, worth, at present value, \$375,000 net. As to the cost of accomplishing the result just given, the author of the article herein drawn upon presents the following statement:-

Cost of 30-ton mill, say...	\$150,000
Cost water supply for mills and dams...	\$125,000
Cost tramway and cars for trains porting cane and sugar, say...	\$ 25,000
Total estimate outlay...	\$300,000

On this estimated outlay of \$300,000, which he explains, is a liberal one, the following reductions are allowed: -

Interest at 9 percent...	\$ 27,000
Wear and tear on mill and tramway, and repairs to dams, say...	\$ 28,000
Current expenses, taxes, Insurance, etc...	\$ 75,000
Total annual expense...	\$130,000

Ultimate results are thus deduced from these figures: "If this amount for annual outlay under every legitimate head of expenditure be deducted from \$375,000, the value of a season's sugar crop, there is left a balance of \$245,000 and interest of 9 percent on investment. This is calculated on the basis of existing prices. But suppose that the price of sugar should drop 40 per cent., or 3 cents per pound, as an extreme limit, which is very unlikely, there would be \$150,000 to write off the value of the sugar crop, reducing the \$375,000 estimate to

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\$225,000. Now, deducting from this sum of \$225,000 the estimated expenditure of \$130,000, there would remain a net profit of \$95,000 and interest at 9 per cent. on the investment, making a total income on the investment of \$122,000 per annum.”

It is asserted that most, if not all, of the ten thousand acres to be devoted to colonization is good rich soil. Extending from Pearl Harbor to the foothills of the Waianae mountains, the area gradually reaches an elevation of about 1,000 feet. A large proportion of the land may be irrigated by storing water as above mentioned, but, besides that recourse and artesian wells, water is obtainable at many points from springs and similar favors of nature. Being in the most elevated region of Oahu, the rainfall of the area is very large, and it is anticipated, upon the strength of wellknown natural law, that, once under cultivation, more humid conditions still would be induced.

Already over forty applications for lands have been received by the provisional company, the aggregate amount applied for exceeding two thousand acres. The applicants, some of whom are long residents in the country, are confident of being able to make a fair living from products they can raise for even the local market. By raising sugar on shares with the company, the owner of five acres, it is estimated, is assured of a net income of from \$1,000 to \$1,500 a year, besides minor sources of living that an agricultural holding affords. This would indeed, be a princely existence to many millions of people throughout the globe, “who,” as the correspondent says, “toil unceasingly six months of the year to exist the remaining six.”

Besides the foregoing inducements to settlers, it is intimated that persons disposed to engage in stock-raising can be accommodated with lands of the company, by purchase or lease, with the opportunity of buying a high class of stock now subsisting on the property. The company would even “cut up and

dispose of the whole property on very favorable terms to a desirable class of bona fide settlers.”

**e. Honouliuli Water Development**

***The Hawaiian Gazette***

**Honouliuli Ranch**

**A Very Large Reservoir to be Constructed to Hold a Million and a Half Gallons of Water.**

**November 18, 1890 (page 10)**

Mr. H. M. von Holt, superintendent of ranches for the O. R. & L. Co., is having constructed on the Honouliuli ranch, about five miles from the new Ewa plantation works, a storage reservoir which when completed and full of water will be about 1250 feet long by 150 feet wide, and have a depth of water at the dam of 15 feet. A trench or puddle dam was dug through the fall of the gulch to a depth of from 3 feet on the ends to 7 feet in the center, where a hard pan, impervious to water, was found. This was then filled up with earth only, and packed down and over this the dam of earth is being built. When completed it will be about 50 feet wide on the middle bottom, sloping upwards to a width of 10 feet on top, 160 feet across the gulch and 17 feet high. The dam is situated on one of the large plains extending from the easterly slopes of the Waianae mountains, while deep ravines on either side of the plateau will prevent any chance of mountain freshets. Two gulches starting from zero on the plain about half a mile from the mountains and a quarter of a mile apart run nearly parallel for about a mile, where they join, running out to the plain again at zero. The dam is a quarter of a mile below the junction of the gulches, and the reservoir when filled with water, as it is hoped by the winter rains, will be backed up as far as this junction. The reservoir will be fenced off and water led into troughs below the dam through a two-inch pipe, so that the stock can have clean and clear water. The survey plans and detail of work were furnished by Mr. G. C.

Allardt, civil engineer, who returned on Monday afternoon from inspecting the progress of the work. A gang of twenty Chinese are doing the labor, and are encamped near the works, at a spring of water. After the heavy rains of the beginning of the year, the water seeping out from the clay beds in both gulches continues to flow quite a stream until the middle of June. This supply, together with what storm water may fall on the plains, and flow into the gulches, will be utilized to fill the reservoir, a waste way being provided for the overflow. Mr. Allardt estimates the reservoir when full to hold 1,500,000 gallons of water, which once full will no doubt be sufficient to stand an eighteen months drought, allowing for evaporation and stock purposes.

### **3. Plantations and Oahu Railway & Land Company Development**

While ranching remained a part of Honouliuli's history through the middle 1900s, the development of the 'Ewa Plantation Company took over as the major revenue generator and source of the major changes on the land (Figure 12). Thousands of acres were cleared for sugar fields, work force populations were developed, housing and commercial interests grew, and traditional cultural resources were erased from the landscape. Sugar cultivation dominated the Honouliuli ahupua'a through the 1970s.

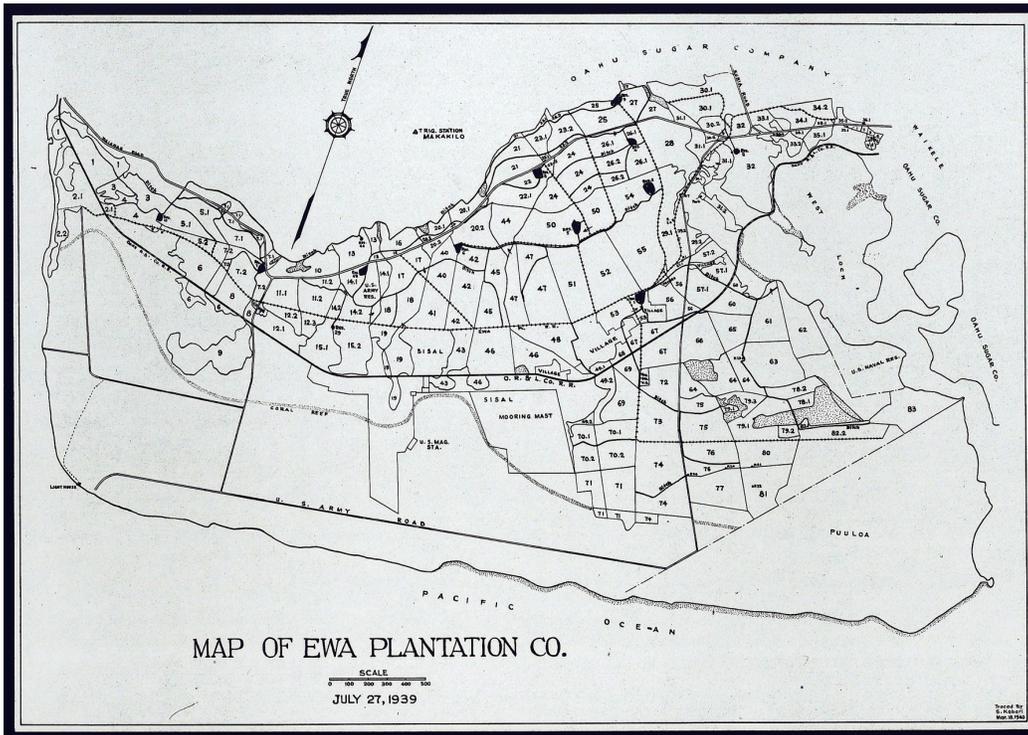


Figure 10. Map of the 'Ewa Plantation Fields (1939)

James Campbell purchased the ahupua'a of Honouliuli in 1877 (Liber 52:201-201). He continued the ranch operations of his predecessors, and sought ways to develop further business opportunities on the land. In July 1879, James Campbell contracted with John Ashley to drill a well near his ranch house. The well was successful and resulted in the first artesian well in the Hawaiian Islands, which remained in use through 1939 when it was capped. When it was determined that water supplies could be relied upon, planning for large scale commercial agriculture began on the Honouliuli plain.

In 1885-1886, James Campbell entered into an agreement with Benjamin Franklin Dillingham to implement a "great land colonization scheme" for Honouliuli (Thrum, 1886:73). It was their goal to offer small tracts of land for agricultural and homestead uses. It was reported that "a large area of this property is suitable, according to locality, for Sugar, Rice, Vineyards, Fruit Orchards and Small Homesteads, the remainder being fine mountain side grazing ground"

## Existing Resources

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(Thrum, 1886:73). There was little interest in the land scheme at the time, but within a few years, Dillingham was developing the O‘ahu Railway and Land Company. By 1889 the rail system ran from the Honolulu Harbor to Mānana, ending near the old ‘Ewa Court House (Whitney, 1890:155).

On January 29, 1890, the ‘Ewa Sugar Plantation Company was chartered, and operations set in motion. The region that had formerly been described as a “veritable desert,” grew “into a full-fledged sugar venture” (Conde and Best, 1973:278). Within the year, 5,000 acres of land had been put into cultivation for the ‘Ewa Plantation (Whitney, 1890:159). In June 1890, it was announced that the OR&L operations had been extended to the ‘Ewa Mill. Local papers reported:

The first carload of freight to ‘Ewa Plantation went over the Oahu Railway Y Land Co.’s line yesterday (*The Pacific Commercial Advertiser*, 1890b).

On Wednesday last the track of the Ewa railway was completed to the harbor front, so that the first train reached the wharf, and several car loads of bananas were placed in scows and put on board the Australia (*The Pacific Commercial Advertiser*, 1890a).

By 1895 the tracks were extended through Honouliuli to Wai‘anae. The railway facilitated the continued development of the sugar plantations, ranching, and successive developments throughout the ‘Ewa District up until 1947 (Conde and Best, 1978:279-280, 315-316).

The plantation operators recognized the agricultural potential of the coral plain. For a few years during the early part of this century, ‘Ewa Plantation undertook a land reclamation project. In order to put some of this wasteland into cultivation, they devised a complex system of drainage ditches running from the lower slopes of the Wai‘anae Range to the coral plain. Before the rainy season, men plowed the slopes so as to induce erosion. When the heavy rains began, great quantities of soil were carried down into the drainage ditches and onto the

## Existing Resources

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coral plain. While the modern-day promotion of sedimentation is contrary to wise use of resources, the experiment was considered successful and approximately 373 acres of coral wasteland were “reclaimed” (Immisch, 1964:70).

As early as the 1860s, visitors to the region were describing a land ripe for commercial agriculture. A series of articles published between the 1880s to 1910 provide a history of the changing landscape, evolution of the plantation, and the diversification of the population. Selections from those articles follow below.

### *The Daily Bulletin*

#### **Development of Water at Honouliuli**

#### **Water Prospects of the Colonization Lands.**

#### **April 8, 1886 (page 4)**

A few weeks ago the writer was one of a party of explorers, to examine the prospects of irrigation on the lands proposed to be developed by the Oahu Colonization Company. The particular occasion was a request from Messrs. John Fowler & Co., a large manufacturing firm of London and Leeds, to Mr. A. M. Sproull, B. E., their practical engineer and correspondent in these Islands, to report on the water prospects of those lands. Since Mr. Sproull’s arrival in this kingdom about five years ago, that firm has supplied a good deal of sugar making machinery to plantations here, and has also acquired a financial interest in some of them. It is gratifying to have such an influential and wealthy firm, so far away as England, manifesting a practical interest in the colonization scheme, the success of which implies a vast increase in the productive resources of this country. What Mr. Sproull’s report will be time may show; but, so far as the unprofessional eye of the Bulletin could judge, the feasibility of ample irrigation of the lands, at a cost not disproportionate to the certain returns, is assured. This conclusion is reached from evidence that may be summarized briefly: 1, Water has been obtained wherever a hole has been

bored in the dryest of the different properties; 2, the best and widest stretches of soil are below elevations where steady streams have been obtained; 3, Water in great abundance has been procured on other properties, where the conditions do not appear to have been any more favorable than on the colonization lands; In one case, at least, it is demonstrated that the storage of water in mountain gulches is an available resort to a certain extent.

Incidentally the expedition gave an opportunity of inspecting, at close range, other features of the colonization scheme than the one under particular investigation. One fact made prominent was that, as an investment, the scheme offers immediate returns from the stock raising branch of the enterprise. Indeed, there seems no necessity for diminishing the scale on which this is conducted, while thousands of acres are being reclaimed for sugar, rice and other cultivation. Also, it seems feasible, by turning water on some now desert stretches that will not be fit for agriculture for a long time to come, to create fresh pastures for herds, thus releasing lands now necessary for their sustenance, on the grassy foothill slopes, for a variety of agricultural operations by prospective settlers. Enough was seen to convince anybody that fruit-growing could be successfully prosecuted over a very large aggregate of ground, in rough and diversified sections, where ordinary agriculture would be attended with more or less difficulty.

A brief report of the expedition referred to, which is given below, will, we think, bear out the generalizations contained in the foregoing. As the lands have been previously described in detail by another member of our staff, in connection with a larger expedition, this narrative only requires to be a brief sketch, as much the record of a very agreeable few days' outing as anything else.

About 4 o'clock in the afternoon of March 9<sup>th</sup>, an equipage provided and driven by Mr. B. F. Dillingham, chief promoter of the Oahu Colonization Company,

rattled up the Ewa road bound for Honouliuli Ranch. It was a strong but not too heavy wagon, drawn by a large, well-fed span of mares, thoroughly trained roadsters. With an ample commissariat and light baggage, as befits an outing of the sort contemplated, and three passengers, the vehicle was snugly but not uncomfortably laden. Between the enthusiastic colonizer, the critical Bachelor or Engineering, and the journalist—supposed always to be on the seat for information on the public’s account—it may be imagined that not much of the works of either nature or art within the range of vision escaped notice and discussion by the way. This road—as everybody in Honolulu ought to know—affords one of the pleasantest drives in all the kingdom. The views of the city and harbor from Palama and Kalihi are superb pictures, while the scenery all the way to Pearl Harbor is full of majesty, with snatches of beautiful, but quiet—very quiet—pastoral vales and slopes. Health itself blows on us in the cool, pure mountain breezes: the road for the most part is easy; therefore, this stage of our journey may well be described as delightful. Branching off the main road a few miles from the ranch, a remarkable object looms up over the track. It is an immense piece of trestle-work, gossamer-like in the lightness of its material, but towering up, over the deepest part of the gulch it crosses, some 40 or 50 feet, and stretching away more than half a mile. This elaborate piece of engineering is on the property of Mr. Mark P. Robinson, carrying irrigation pipe from a pump over a steep hill to extensive banana fields. That soil is rich and promising of large returns, indeed, which justifies much costly works of irrigation as this. Shortly after sundown, the young moon lighting the now rather rugged way, Mr. James Campbell’s group of houses, local headquarters of the Honouliuli Ranch, is reached. After exhausting his lungs in vain on a tin horn in calling Charlie, our conductor, with the assistance of his guests, proceeds to get up a hot supper. His eminent success in that respect, if allowed as a token of his ability as “chief cook” of the colonization scheme, would leave no doubt of that project doing more than anything else to fulfill his Majesty’s motto, “Increase the nation.”

Early the next morning the much-wasted Charlie, the head driver of the ranch, a very active native man, had horses ready for a ride over the property. A short distance from the house a flowing excavated well was encountered, its troughs surrounded with cattle. Cantering off over very even ground, the slaughterhouse on the margin of Pearl Harbor is shortly reached and its unrivalled natural facilities for shipping are observed. A pipe line leads to a well dug through ragged coral, a little distance off, which, at an elevation of 20 feet, shows water 15 feet from the surface, which is pumped by one of the patent windmills supplied by the Pacific Hardware Co. Then, to horse again, and after going through large enclosed paddocks with a capacity of thousands of cattle, we ride for several miles over rich, alluvial soil, apparently of great depth. This part of the estate consists of almost imperceptible slopes from the foothills of the Waianae Mountains, divided at intervals by light gulches. Here and there are the beds of small lakes or large pools, now dry but affording evidence of large volumes running to waste from watersheds above in the rainy season.

After resting a few minutes, while Mr. Sproull takes bearing and notes on his map, on a knob 400 feet above the sea, we head or the top of the mountains. On a high but even slope, beside a vast gulch, a herd of wild goats is seen ahead, and Charlie is after them in a moment with his lasso. He makes a splendidly exciting chase, down and up the precipitous banks, and wheeling like lightning when the goats double on him. It was no use, however; the frisky creatures went through the flying snare and would not be caught. Onward and upward, now, the sure-footed cattle-driving horses are urged, and still it is "Excelsior." Inclines so steep are surmounted, ridges overlooking such awful depths are traversed, and a path so rugged in some places is climbed or descended as on stairs, that nobody who faces the difficulties for the first time would think it possible to get over them on horseback until he was the guide ahead actually performing the varied feats—or rather letting the horse do them. Once the writer's horse stopped at a descent of about four feet at one step,

over bare rocks, with a slope of about 45 degrees beyond, and both sides of the path tumbling down through the trees a thousand feet at an angle of 70. It looked prudent to get off, and horse and rider each choose his own way of climbing down. But the reckless brigands below shouted, "Let the reins loose and hit the horse." Not without apprehension this injunction was followed: the animal carefully felt for the notch beneath with his forefeet, then with a lurch brought down his posterior limbs, the saddle creaked and groaned, its bands giving a crack—the descent was made. We reached an altitude of 4,320 feet before returning by an equally difficult way to the plain. The scenery away up there was sublime in lofty peaks, awful gorges, and gaping notches: while beautiful with the foliage of a profuse growth of trees on the mountain sides, and bright green herbage away down in the valleys. Cattle swarmed out of the woods in countless number in answer to the peculiar "whoophoo" of the cowboy. They were rolling fat on the teeming rank grass and rich browsing. Going back over the plain we come to a well sunk over 300 feet at an elevation of 60 feet, in which the water is 20 feet from the surface. There is an engine and piping on the spot, but not in working order.

Next morning the road is taken for Waialua, the wagon having a smooth thoroughfare for several miles before getting off Honouliuli, traversing a magnificent stretch of heavily grassed land, containing hundreds more of well-favored cattle of good breed. At an elevation of 800 feet is a windmill, at the foot of the mountain, placed on a dug well 30 feet deep, in which there is 15 feet of water. Just on the border of Honouliuli ranch, close to Hon. C. H. Judd's ranch, at an elevation of 1,000 feet, is a flowing artesian well 80 feet deep, from which a perennial stream flows through a gulch presenting very favorable conditions for storing unlimited supplies of the essential element. It should be mentioned that we had been traveling all morning on the edge of gulches leading from the watershed, which would lend themselves easily and cheaply to a system of water storage. At the main road, the saddles were taken again

for a three or four miles' jaunt, to take a view of the Kaukoanahua and neighboring gulches, the one named being the source of the Waialua river. There could be vast reservoirs made almost anywhere here, and judging by the rain clouds bathing the distant mountain summits water would not be wanting to fill them. [Author then described Waialua headquarters of the Kawailoa and Waimea ranches.]

***The Daily Bulletin***

**Narrative of a Visit by Teachers to Ewa via the Oahu Railroad and Land Company Train Line – Development Described.**

**July 23, 1890 (page 4)**

**Teachers' Excursion.**

The national school bell rang at the depot of the O. R and L. Co., at ten o'clock Saturday morning and thereupon came hurrying and scurrying from all parts of the city, dominies and school marms galore, to the trysting place. Five passenger coaches with the band car in the rear were pulled up alongside the platform. At sharp ten, the Royal Hawaiian band struck up a merry air, the engine gave the usual screech and the train moved out leaving nothing but vain regrets for all "passengers aboard who had been left behind." A more highly delighted crowd than filled the coaches could hardly be imagined. As the train went rolling through the rice fields, the clatter of the wheels, the easy rocking of the coaches and the mountain breezes playing through the open windows, recalled to many present some pleasing recollections of home lands beyond the sea. At Pearl City a stop of twenty minutes gave groups of excursionists the opportunity of strolling through the streets and avenues of the Ewa metropolis. Whether any of them located corner lots for themselves deponent saith not. "All aboard" was called again, and the party was run through to Honouliuli, where track laying has been carried forward to within about a quart of a mile of the great artesian wells which have already solved the "water problem" of the

colonization scheme. Four wells have been sunk and the fifth is in progress. Most of the excursion party having gathered round, the fourth well was uncapped for their entertainment. A volume of water came rushing up through the ten-inch pipe from a depth of 450 feet, with a force that drove the column about a foot above the mouth of the pipe. Hard by, the brick layers are at work on the foundation of a building in which pumping machinery will be fixed with a capacity of raising six million gallons of water per day and delivering it over the adjacent bluff to irrigate the new plantation. The water is clear as crystal and has a barely perceptible brackish taste. On the return trip, a halt was called at Manana for refreshments. A splendid collation was provided in the grand pavilion, Mr. Johnson of the Hamilton House, caterer. In quantity, quality and variety, the bill of fare was first class. "Mine host" of the day, the Hon C. R. Bishop, personally supervised the serving of the large company and seemed to possess the facility of being everywhere at the same time seeing that no guest's timidity should prevent his wants being fully satisfied. After lunch, the teachers were grouped in the grove and photographed by Mr. J. A. Gonsalves and other operators. The assembly next came to order with the Inspector General standing under a big tree as chairman, when a resolution was read: "That the hearty thanks of all the teachers present are hereby tendered the Hon. C. R. Bishop, President of the Board of Education, for this delightful excursion and entertainment." The motion passed with a strong unanimous "aye," backed by three cheers and a tiger. The Hon. President responded in brief and cordial terms: "Ladies and gentlemen, if you have enjoyed the day as much as I have, I am satisfied." Then followed a return to the pavilion where the band struck up terpsichorean music, a large number of the guests took the floor and whirled through the mazes of the dance until the foot of the locomotive announced that it was time to return to town. The afternoon train from Honolulu, just arrived, let down one passenger and thereupon the fine physique of the Hon. Secretary of the Board of Education was seen moving toward the pavilion. The "late Mr. Smith" expressed himself well pleased on hearing about the fun that office

duties had prevented his sharing. At 3:30 P. M., the train arrived back at the depot, whence the excursionists disperse, all very grateful to the Honorable President of the Board for his kindness in providing them with such an exceedingly pleasant wind up of the past year's work.

**a. Development of the 'Ewa Sugar Plantation and O'ahu Railway & Land Company**

Henry M. Whitney's "Tourists' Guide..." provides an overview of sugar plantation development in Honouliuli and the larger 'Ewa District in 1890. At the time of writing, the OR&L had just opened with train service passing from Honolulu to the 'Ewa Court House (remaining track routes were laid shortly thereafter). With the development of the rail system, businesses began immediately expanding as rail access made the job of freight and livestock transport an easy task and the 'Ewa Plantation incorporated. Whitney's description of the inaugural service on November 15, 1889 (coinciding with King Kalākaua's birthday) and subsequent trips provides a description of the Pearl Harbor regions, documenting the continued change in the 'Ewa landscape, and the planned development of "Pearl City," setting the foundation for new homes and business opportunities.

Another part of the rail development focused on the wharf at Iwilei, by which crops, livestock and goods could be easily transported from the field to ships for transport across the sea.

**Oahu Railway and Land Co.**

**The story of its origin.**

...Within the past year Hawaii has started in the footsteps of America by projecting a railroad around the island of Oahu, and actually perfecting, within the period from April 1<sup>st</sup>, 1889, to January 1<sup>st</sup>, 1890, a well-equipped railroad in running order, extending from Honolulu along the southern shore of the island to a temporary terminus at Ewa Court House, a distance of twelve miles. It was five years ago that Mr. B. F. Dillingham advanced the idea of building a steam railroad that should carry freight and passengers, and conduct business

on the most improved American methods. A hundred men told him his scheme was infeasible where one offered encouragement. He believed he was right, and so put forth every endeavor to secure a franchise, which was granted to him only after vigorous legislative opposition to the measure. The incorporation of the Oahu Railway and Land Company with a capital stock of \$700,000 was the next step in the venture, but not an easy one by any means, as home capitalists were timid at that time, and few would believe that the soil of Oahu was worth developing to the extent of Mr. Dillingham's plans. A small number of gentlemen, notable among whom was Hon. Mark P. Robinson, came forward at the right time and purchased enough stock and bonds to set the enterprise on foot. With all the disadvantages that remoteness from the manufacturing centers of America offered, [page 155] Mr. Dillingham undertook the contract of building and equipping the railroad. Rails were ordered in Germany, locomotives and cars in America, and ties in the home market; rights of way were amicably secured, surveyors defined the line of road, and grading commenced. The work was prosecuted with the utmost speed consistent with stability and safety, and there was hardly a day's delay from the time grading commenced, in the spring of 1889, till September 4<sup>th</sup> following, when the first steam passenger train, loaded with excursionists, left the Honolulu terminus, and covered a distance of half a mile. It was the initial train, and the day was Mr. Dillingham's birthday, a period he had designated when he secured his franchise, exactly twelve months before, as the natal day of steam passenger traffic on Oahu. The little excursion was a success, as far as it went. On November 15<sup>th</sup>, his Majesty's birthday, the formal opening of the road took place. Trains ran to Halawa and back all day, carrying the public free. Following this event, which marked a significant epoch in the commercial history of this kingdom, the Oahu Railway & Land Company opened the doors of their commodious offices in the King Street depot for business.

#### **Developing the Country.**

Simultaneous with the commencement of business was the acquisition, by the O. R. & L. Co., of a fifty-year lease of the Honouliuli and Kahuku Ranch's 60,000 acres, and the purchase of 10,000 head of cattle running thereon. This vast area, hitherto utilized as a stock range, is, under the manipulation of the railroad people, becoming one of the garden spots of the Kingdom. Two new corporations of sugar planters,—the Ewa plantation and Kahuku plantation—capitalized at \$500,000 each, have each secured from the railroad leases of from 5,000 to 10,000 acres for sugar cultivation. Cane is now growing on a part of the lands. These two great agricultural enterprises, the direct outgrowth of the railroad movement, confer valuable pecuniary benefits on the business men and mechanics of Honolulu. Artesian wells, yielding a bounteous flow of water, supply the means of irrigation, and make possible in that section of the island what almost everyone but the promoter of the railroad formerly believed to be impossible—the culture of sugar cane on a large scale. This abundance of water, which is obtained by the mere sinking of wells, has stimulated [page 156] other agricultural pursuits on the railroad's lands. Ever since the day traffic was begun, the railroad people have been pushing forward in their good mission of banding the island with iron rails... [page 157]

#### **Colonization.**

It is patent to every resident of this Kingdom who is acquainted with Mr. Dillingham that his pet scheme is the industrial development of these islands through colonization. The railroad signalized the advancement of the scheme. It is now the purpose of the railroad company to bring out thrifty people from Europe and America who will take up land, cultivate the same, and establish their homes thereon. The railroad makes colonization possible, and is in itself an invitation to ranchers to engage in the different pursuits that are especially adapted to this soil and climate... [page 158]

#### **The Ewa Plantation.**

One of the direct results of the railroad enterprise is Ewa Plantation, now an accomplished fact. Over 5,000 acres of land have been leased, and a company organized with the following efficient officers, who are all experienced sugar men, thoroughly versed in all the ins and outs of sugar production on these islands: C. M. Cooke, President; J. B. Castle, Vice-President; E. D. Tenney, Secretary; J. B. Atherton, Treasurer; J. H. Paty, Auditor. The foregoing five officers constitute the Board of Directors. Castle & Cooke are agents, and William J. Lowrie is Manager. He has had a large experience as manager on plantations on Maui, and brings to this work the energy and business capacity that are needed. Sixty-five acres are planted with seed cane. The best of Lahaina top-seed is being used, which is considered much the best. Sixty men are now employed. Flumes have been constructed connecting with those from Mark Robinson's pumping works, which were already in operation when the company took possession. The young cane show a marvelous growth for this season of the year. This seed will plant six hundred acres, and that area will be seeded for the first crop, the planting to begin in August, 1890, and next year it is expected that one thousand acres will be planted. The best Fowler & Son's steam plows have been ordered from Scotland. The McCandless Bros. are already at work putting down artesian wells, and expect to have six wells in operation during 1890. The wells are ten inches in diameter, which is somewhat larger than is usual in this country. Carpenters are at work building laborers' houses, etc. A Baldwin locomotive, cars, rails, etc., are already ordered for the transportation of the cane. The pumping plant will be of the latest designs and the best patterns made. Five hundred workmen will be employed, and the planting of the first crop will be pushed forward as rapidly as possible. [page 165]

**Abundant water supply.**

One peculiarity of the Ewa Plantation which receives the unqualified endorsement of the manager is the source of the water supply. The main

dependence will be artesian wells, and as the water does not naturally rise to the required height, the cost of pumping must be taken into account, but notwithstanding that it is claimed to be the best, inasmuch as water can be had in sufficient quantities when it is most needed, which is not the case when the supply is from mountain streams; for when those streams are lowest is the particular time of the year when the most water is needed. Another thing in favor of the Ewa Plantation is the fact that one account of its low altitude and the corresponding warmth of its soils a crop of cane can be matured there in from six weeks to two months less time than in some places where cane is successfully raised on these islands.

From what we have learned from all sources we have greater faith than ever in the success of both the Oahu Railway and Land Company and the Ewa Plantation (Whitney 1890:155-166).

**b. Development of Water Resources at Honouliuli**

***The Hawaiian Gazette***

**Ewa's Pumps Graphically Described, Giving Their Cost and Capacity.**

**September 1, 1891 (page 2)**

On Wednesday a party of business men were enabled through the kindness of the O. R. & L. Co. and the plantation agents, to take a run down to the Ewa plantation. The mill which was made the first objective point, has already been described in these columns. It is being rapidly pushed on to completion, and will be ready long before the cane is. The whole party devoted itself principally to the examination of the pumps which are to put the water on the fields.

There are twenty-two ten-inch wells on the Ewa plantation, and three large pumping stations. The smallest of these pumps is used to raise the water from two finely flowing wells and is now watering 180 acres of cane. The pump if

worked twenty-two hours a day will raise from four to five million gallons of water sixty-eight feet. This is fifty per cent more than the average daily water consumption of Honolulu. The whole plant cost \$22,000 which includes building and foundation, piping and a small reservoir. The furnace consumes about two long tons of coal for each day of twenty-two hours, and the coal can be laid down at the furnace doors for about \$7 per ton. If this single pump—the smallest in the plantation were transplanted from Ewa to Honolulu, the water famine would be over, and people might water their gardens “twenty-five hours in the day.”

The above pump like all those on the Ewa plantation is the product of the Blake Manufacturing Co. It runs very smoothly, so smoothly that even the engineer one day forgot in a moment of absent-mindedness, that the powerful and noiseless engine was in motion. He got in the way—just with one finger—and did not notice the collision until he saw his finger—lying in the dripping pan!

Pumping Station No. 3 is now in process of construction, and, when complete, will be one of the “sights” of this island. There will be nothing to beat it on this side of the Rocky Mountains. Two large pumps will lift the water from twelve artesian wells—one to a height of 137 feet, the other to a height of 167 feet above sea level. Deducting 32 feet, the height of the natural flow, we have a straight lift in the two pumps of 105 and 135 feet respectively. The ordinary capacity of these pumps is, together, twenty million gallons per day, but they have a maximum capacity of about ten millions more. Yet the ordinary daily consumption of coal will probably not exceed seven tons. This very moderate consumption of coal will be due in a great part to the use of tubular boilers which, it is claimed will furnish about twice as much steam per pound of coal as the best boilers of any other pattern. These climax tubular boilers were made at the Clombrok Steam Boiler Works in Brooklyn, N. Y. The whole work of preparing the foundation and erecting the pumps is under the personal

## Existing Resources

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supervision of Mr. Bunge, a courteous gentleman as well as a skillful mechanic, who has been sent here by the Blake Manufacturing Company for this special purpose.

The total cost of this great pumping station, including the wells and the piping will be in the neighborhood of \$100,000.

The total capacity of the twenty-two artesian wells, with the four pumps working at their maximum capacity, will probably be not far from fifty million gallons per day. This is an astonishing figure, but it gives only a correct idea of the power of these splendid pumps. There will be water enough to irrigate, if necessary, 4,000 acres of cane, and at the ordinary working capacity of the pumps, there will be abundance of water for 3,000 acres. Enough water will flow in the once thirsty deserts of Honouliuli to supply a city of 200,000 people.

After doing more than justice to an exceedingly bountiful and generous repast, the party rode through the cane fields to convince themselves by personal inspection of the magnificent condition of the crop.

The condition of the plantation is a highly gratifying one and its prospects bright, even with sugar at the present low price. Everything which a favorable situation, a surpassingly fertile soil and appliances of the most approved efficiency can do for any plantation, nature and man have done for Ewa. The wells have not been in the smallest degree affected by the severe drought of the passing summer.

The plantation has passed the experimental stage, and the stockholders may lay, as a flattering unction to their souls, the observation of one of Honouliuli's leading business men—an observation made after careful personal inspection: "The plantation appears to be very carefully managed. Everything seems to

have been thought out beforehand.”

**c. ‘Ewa Plantation, An Overview of the New Plantation Operations and Railroad Access**

Little more than a year after the debut of the OR&L, the new ‘Ewa Plantation Mill at Honouliuli was up and running and major changes were under way in land use, population makeup, and cultural landscape depletion.

***The Hawaiian Gazette***

**Ewa Plantation.**

**Visited by a Number of Representative Sugar Men**

**A Brief Description Of The New Mill**

**Excursion Over the Oahu Railway and Land Co.'s Line**

**November 3, 1891 (page 4)**

At a quarter to nine on Saturday morning a party of about five and twenty gentlemen started by train for Ewa Plantation and Mill, at the invitation of Mr. J. N. S. Williams, manager of the Union Iron Works, to whom was assigned the contract for the whole machinery of the mill.

Amongst the invited guests were Senhor Canavarro, the Portuguese commissioner, Messrs. W. G. Irwin, Jos. Marsden, H. M. Whitney, H. T. Waterhouse, F. A. Schaefer, F. M. Swanzy, Austin, Chas. Cooke, Bowen, W. O. Smith, Holdsworth, Mist, May, Evans, Frear, J. O. Carter, Kluegel, and the Bulletin and Advertiser representatives, all interested in the sugar business of the country. Mr. Robert Moore, the superintendent of the Union Iron Works, was there too, and neither last nor least Mr. Dillingham, whose indefatigable energy has rendered possible such an undertaking as this which the party went to see.

Stopping for a minute at Moanalua the group was joined by Hon. S. M. Damon, and the train ran on to the Peninsula junction of the Pearl City station, where a

few minutes were spent looking at the work going on for an ornamental fish pond for the coming city.

Thence the train ran on to the Ewa station, where the company alighted and, passing through the large general store of the plantation, entered the mill building, a large business-like erection, walls and roof being all of corrugated iron, and here they were met by Mr. Lowrie, the manager, and Messrs. Kopke and Hughes, engineers, who showed the visitors through the works and answered the numerous questions put by observers in search of information.

To go through the mill and describe briefly the processes from the field to the sugar room, we begin with the spot where the cane is brought from the fields and passed direct into the cutting or slicing engine, which was running at full speed.

From here the cane now reduced to shreds is carried by an endless chain of rakes up an incline to the upper story of the building, where it is distributed by a series of hoppers into the diffusion battery of 28 huge vertical cells each of which will take 2 tons of sliced cane. Here it is treated with hot water and the necessary proportion of lime and passed on to the quadruple effect and then to the vacuum pans, one of the 10 tons capacity with 7 coils of steam pipe, the other with 20 tons capacity and 9 coils. After this the sugar descends to the 16 centrifugals where it is dried, the residuum being led into the tank from whence it is passed away as fertilizer.

Meanwhile the chips or slices of cane deprived of 97 per cent of their saccharine qualities, are dropped through the opening base of each diffusion cell on to another moving platform or endless chain, which takes them to a 4-roller mill which was running on Saturday where the water they may contain is thoroughly expressed and they become fit for fuel for the furnaces.

There are 6 boilers all leading into the same steam pipe whence the whole machinery is worked.

A chimney 110 feet high which took 125,000 bricks in its construction affords ample draught.

This, though it may be a mere sketch of a great industrial undertaking, may serve to show the work in outline of one of the newest as well as the greatest of the enterprises of our sugar men. Barons if you like—we hope that they may soon vindicate their title.

From the upper windows of the mill one looks over hundreds of acres of waving cane and other hundreds of acres all of virgin soil only awaiting the plow and the planter to be tuned to a like account.

The red volcanic soil enriched by centuries of neglected vegetation only needs invitation to produce whatever the ingenuity of man can demand from it. The three well-stations of the company will yield, it is estimated, 33,000,000 gallons of water a day, and it is not in hands which will waste it.

After viewing the mill in self-assorted groups, the visitors sat down to a pleasant lunch of salads and sandwiches, coffee and effervescent drinks, at tables presided over by Messrs. Dillingham, Williams and Lowrie, while Messrs. More and Hughes kept the waiters up to the mark and saw that their guests wanted for nothing.

Soon after noon the party started homeward-bound from Ewa, and stopping for a time at Pearl City Station were able to be present at the opening of the first store in Pearl City itself.

Thence the train ran on to Honolulu, reaching it in time to clear the 2:15 p.m. passenger train just ready to start out.

Many hearty handshakings did Mr. Williams receive as his guests left the train with earnest congratulations on the admirable way in which he and his coadjutors, Mr. More and their staff, had carried to success one of the greatest enterprises ever undertaken in these islands.

All of which would have been impracticable but for Dillingham and his railway!

The weather was delightful and the whole excursion most enjoyable.

***The Hawaiian Star***

**Labor Contracts at the Ewa Plantation Company**

**Cooperative Labor. How It May Supersede Contract Methods.**

**A Way Out for Sugar Men – How the New Method Works at Ewa Plantation.**

**April 22, 1893 (page 5)**

One way, and perhaps the best, to settle the cane planting question without contract labor, is to run the big sugar farms on the co-operative plan. This method has been tried at Ewa plantation with a measure of success which out to lead Hawaiian growers generally, as the opportunity comes, to give it a fair trial.

The details of the co-operative plan as it has been developed at Ewa are as follows:

This Agreement, made this...day of...189..., by and between the Ewa Plantation Company, a corporation, of the first part, hereinafter called the employer, and...,

of the second part, hereinafter called the planter, witnesseth:

That in consideration of the promises, terms and covenants herein below set forth from either party to the other moving, the said employer does hereby promise, covenant and agree to admit the planter as an agricultural laborer and share planter upon the Ewa Plantation, at Honouliuli, on the Island of Oahu and in furtherance of said object does hereby agree:

I. To give to the said above named planter for cultivation on the profit sharing system, as hereinbelow set forth...of that section of land now plowed and furrowed on the Ewa Plantation amounting to about...acres, and described in plantation map as follows: ... and also to advance not to exceed...dollars (\$...) for each month of service for food and other necessary uses of the planter which amount shall be returned by the planter without interest as hereinafter set forth.

II. The employer agrees: to furnish, without charge, lodgings sufficient for the planter, and also fuel for domestic use, which shall be cut and gathered by said planter for himself at such place as the employer shall designate; also tools for irrigating purposes shall be furnished in the first instance, after that all tools shall be furnished by the planter; also seed cane; also water in the main plantation ditches for irrigation, but taking water therefrom to the cane fields shall be done by the planter, and the water so furnished shall be used economically and without waste for each irrigation. Also, to place movable tracks through the fields at a distance of not over four hundred (400) feet apart.

And the planter on his own behalf, covenants and agrees in consideration aforesaid, to go to the Ewa plantation, on the island of Oahu, and there to labor in accordance with the terms of this agreement, to wit:

III. With such other planters as may be designated by the employer to cut and load the seed, prepare the land, make level ditches, put in gates and boxes, plant, irrigate, and cultivate in the best manner to maturity, and, when so required by the employer, to cut and deliver the cane to be so cultivated upon the cars of the employer whenever deemed necessary by the employer. In cutting, it shall be cut close to the ground and topped clean, and care shall be taken not to load any dead or sour cane upon the cars, and all unsound cane so loaded shall be separated at the cane carrier, weighed and deducted from the sound cane, and all expenses connected with separating and weighing such unsound cane, shall be charged to and deducted from the planter's share. All of the cane to be stripped at least twice, and in heavy places three times whenever so directed by the employer; and all roads and ditches running through said fields to be kept clean and free from weeds.

IV. It is likewise hereby agreed that all work, labor and service to be performed by the planter under this agreement, shall be subject to the supervision, and shall be done to the satisfaction of the employer in all cases; and if it shall seem necessary to employ extra labor to do the work satisfactorily, the employer shall so employ extra labor, and all costs of same shall be charged to and deducted from planter's share with interest at the rate of nine per cent, per annum, except such extra labor as may be necessary in cutting and loading seed, planting and first watering, making level ditches and putting in gates and boxes for which the planter shall be charged \$. . . per acre to be returned without interest; and the planter shall always be subject to the supervision or order of the employer.

V. For all labor performed under the terms of this agreement in cultivating and harvesting cane upon the land set off to said planter, he shall be paid at the rate of . . . per ton of two thousand (2,000) pounds of cane on all of the cane produced upon the land cultivated by himself in common with others as

aforesaid, such proportionate part as his labor bears to the entire amount of labor expended upon such premises by the planters, averaging the same between the total number of such planters.

VI. From the proceeds of his labor, as set forth in the last article, he shall return to the employer the advances set for in articles No. 1 and 4 afore said as therein set forth.

VII. This agreement may be terminated at any time by the employer, and upon two months' notice by the planter, the planter being entitled upon such settlement, to wages at the rate of . . . dollars per month for the term of his service rendered deducting there-from the advances as aforesaid under Articles No. 1 and 4.

VIII. In case of the death of the planter during the term of this agreement, the estate shall be entitled to an immediate settlement at the rate of . . . dollars (\$. . .) per month, deducting advances as aforesaid; or settlement may be deferred until the crop is harvested and then it shall be made upon the terms hereof for the proportionate time given by said planter hereunder. In case of accident to or sickness of said planter whereby he is prevented from performing the labor under this agreement, if he shall not supply labor in place of his own, the employer shall do so and a proportionate amount of said planter's share under this agreement shall be deducted for the time lost.

IX. The planter, together with his co-workers, shall have the right to inspect the weighing of their cane at any time.

X. This agreement shall terminate and be at an end when the last cane upon the fields to be cultivated hereunder, shall have been placed upon the cars and weighed, and settlement shall be made in full not later than one week

thereafter.

In witness whereof, the said employer has caused the execution of these presents, by the attachment of its corporate seal together with the names and seals of its President and Treasurer, and the said planter has hereunto set his hand and seal the day and year first aforesaid.

Signature of Planter. . . .

Ewa Plantation Co...

***The Hawaiian Gazette***

**Honouliuli Water Resources Capable of Supplying Honolulu  
Water Wanted.**

**August 17, 1894 (page 4)**

The water famine has brought down on the heads of the Government anathemas from all quarters. It must be confessed that these anathemas are not altogether undeserved. The Government has been somewhat dilatory in providing against the recurrence of the annual water famine. With the improvidence which is supposed to be the peculiar characteristic of the aboriginal race, they have enjoyed the moisture when wet, and folded their hands in a fatalistic apathy, when dry.

The curse of the Honolulu water works system has been the infatuation of the rulers with reservoirs and rain water. The study of elaborate maps and estimates and calculations has turned the head of one Government after another, and the result has been that, while Ministers were lapped in gorgeous visions of chains of reservoirs stringing Nuuanu Valley, and costing, fortunately only on paper, fabulous sums, the town has gone dry. Now, a pump has been ordered, and it is to be hoped that the long-tried and deeply discredited mud

pond system will yield to a more rational plan.

The wells of Ewa have been flowing for four years, and its pumps have poured out upon the thirsty plains of Honouliuli enough water daily to supply the wants of a city as large as San Francisco. With this example at the very door, what possible excuse can there be for any more water famines?

A tenth part of the power in the great pumps at Ewa, applied to a group of two or three artesian wells, will insure to Honolulu an abundant supply of pure, fresh water in the driest days of August no less than in the midst of the winter rains. The problem is a simple one, and there is no reason why there should ever be another water famine in Honolulu.

**d. Huakai Makaikai a na Poe Kakau Nupepa i ke Alahao Hou**

**(A Site Seeing Journey of the Newspaper Publishers on the New Railroad)**

The following 1895 article shares an account of the journey made by newspaper staff, landowners, rail executives, and dignitaries on the newly opened extension of the OR&L track to Pōkaī in Wai‘anae. While passing through the ‘Ewa District, the author (editor, W.H. Kapu) references several traditions of noted places seen along the way.

***Ka Makaainana***

**O.R. & L. Co.**

**Huakai Makaikai a na Poe Kakau Nupepa i ke Alahao Hou**

**Iulai 8, 1895 (aoao 1)**

E like hoi me ka mea i hoike mua ia, pela no hoi ia i hooko ia ae ai i kakahiaka Poalua iho la, hora 9:30. Ua akoakoa ae na poe kakau nupepa ma ke kahu kikowaena o ka Hui Alahao a Aina Oahu mamua ae o ka manawa i hoikeia maluna ae, a i ka hora 9:40 nae hoi i haalele iho ai ia Kuwili, no ka ulu niu o Pokai ka pahuhopu, kahi hoi i makaukau o ka hooloihi ana aku o ke alahao, e

hoopuni aku ai paha hoi ia Oahu nei ma keia mua aku, no ka lio hao e holo ai.

Malalo iho na lala o ka Papapai i holo aku F.J. Testa (Hoke), Puuku o ka Ka Makaainana nei; J. Nawahi, Aloha Aina; J.E. Buki, Ka Leo o ka Lahui; a me D.M. Punini o ka Oiaio; J.U. Kawainui, Kuoka, i kokuaia e G.P. Kamauoha, luna makaainana hoopili wale; Bihopa Wilisi no ka nupepa ekalesia oili hapaha, S.E. Bihopa, Hoa'loha; W.R. Farinetona, Pi Ki Adavataisa a me Kekake; G.C. Keniona, Kuokoa namu; E. Tause, Hoku; J.M. Vivasa. A Senetanela; G. Manasona, Buletina Ahiahi; J.D. Haine, Ka Hawaiiiana; J.D. Setaka, Ka Manawa; L.P. Linekona, nupepa ekalesia oili malama a ka Rev. A. Makinikoki; Ho Fona, Nu Hou Pake; C. Iakanama, Manawa Pake; H.M. Wini, nupepa malama a na poe mahiko; F. Godefere, aohe ana nupepa, aka he hoa kamaaina oia no ia oihana. Aohe mea o na nupepa Kepani i hiki ae, a me he la, o keia paha kekahi akoakoa nui loa ana o na poe o ka Papapai, koe nae hoi ke ano laulea like nui ole ae. A mawaho ae hoi, ua kau aku ma ke ano ohua o Hope Makai Nui Kelekona o Waianae a me kana wahine. O ke Ana aina Nui o ka Hui a me ka mea paa aelike no ka hoomoe alahao ana kekahi i kaa pu me na poe kakau nupepa.

Mai ka hoomaka ana aku e holo a hoea hou mai iluna nei, ua nana, malama, a hoomaopopo ia na mea a pau e Luna Nui F.C. Samita, a ua hookeleia hoi ka enegini mahu e ka Wiliki Nui H.D. Robata. I ka haalele ana iho ia Honolulu nei a mahope koke iho, ua hoolawaia mai kela a me keia me ua po-ke pua Pake poni a ulaula, a ma hope iho me na kika a me na mea inu mama. Hora 10:[0]9 i kaalo loa aku ai ia Kulanakauhale Momi me ka hoomaha ole, a ku i ka halewiliko o Ewa i ka hora 10:25, a aole no i loihi loa iho hoomau aku la i ke kamoe ana no ke kaha o Waianae, kahi i kaulana i ka moololo o Kamapuaa, a me Kaopulupulu i ke au o Kahahana ka Moi o Oahu nei, a pela no hoi me Hiiaka-i-ka-Poli-o Pele, ma kana huakai imi kane, ia Lohiau.

Ua like ka holo ana o ke kaa mahope iho o ka haalele ana i ka halewili me he

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“kai nehe i ka iliili,” a e “pahee ana i ka welowelo,” hookahi no hana, he hoolai wale no, i ka maikai a iliwai like o ke alanui a i ka laula ae paha hoi kahi o ke alahao. I ka hoea ana aku hoi keia i kahi papaakea o ke ala, i awili pu ia me ka lepo, aohe puehu a koe mai o ka lepo, a poino na maka o na poe ma ke kaa hamama mahope. Maika na mea ma ke ala i ka ikena aku a na maka, koe no ka uliuli mai o na pohaku on na pali. Komo aku la i Waimanalo, he ulu kiawe ma o a maanei, a aole i liuliu iho puka ana i ka aekai, ae waihoa hamama mai ana ka uliuli o ka moana i ka loa a me ka laula, a aohe nani aku a koe mai o ia wahi o ke ala. A hoea i Piliokahi, he wahi pa pohaku kahiko, a ilaila la, wahi a kamaaina, pale mai o Ewa a pale aku o Waianae, a e waiho lahalaha mai ana hoi mauka ae na awawa hanai holoholona o Nanakuli a me Mikilua...

...A pau no hou ka ai ana, ua hele hou aku kela a me keia e makaikai hou i ka halewili a me kahi mau wahi e ae...a haalele aku ke kaa ia Waianae i ka hora 2. Ma ke ala hou, ua ku ma ka halewili o Honouliuli e kali ai no ke kaa iho aku. A mai laila mai hoi, aohe no i holo nui loa mai, no ka ike e ia ana mai nae paha hoi kahi o kekahi kaa mamua i ke kamahele kaa ma Waiau, a nolaila, ua ku pokole ma Kalauao, a hoohiki loa iluna nei he mau minute mahope iho o ka hora 4...

### **Translation Summary:**

#### **A Site Seeing Journey of the Newspaper Publishers on the New Railroad.**

At 9:30 on Tuesday morning, newspaper editors and others gathered at the Honolulu station of the O’ahu Railway & Land Company. At 9:40 we departed on our trip past Kūwili on our way to the end of the route now at the Pōkaī in the coconut grove.

Having left Honolulu by 10:09 drew near to Pearl City, and then reached the ‘Ewa Sugar Mill at 10:25. We continued on our path [through Honouliuli] before us towards the shore of Wai’anae, passing the place made famous in the

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traditions of Kamapua‘a and Ka‘ōpuluhulu in the time of Kahanana, king of O‘ahu; also, in the tradition of Hi‘iaka-i-ka-poli-Pele, in her journey to fetch Lohi‘au...We entered into Waimānalo, where the kiawe trees grew here and there, and passed along the seashore, arriving at Piliokahi, where there is an ancient stone wall. This was pointed out by a native as being the boundary between ‘Ewa and Wai‘anae...

Reaching our destination, we ate and then left Wai‘anae at 2 o‘clock, traveling along the new track to the mill at Honouliuli where we waited for the passing of another train. From there, it was not long until we traveled to Waiau, then a short time to Kalauao, returning [to Honolulu] at 4 o‘clock.

#### 4. Additional Business Ventures in Honouliuli Ahupua‘a

##### a. Pa‘akai (Salt Making)

The making of pa‘akai (sea salt) was one of the significant traditional practices associated with the coastal lands of Honouliuli. There are a number of Māhele claims by native tenants of the larger Pu‘uloa land division for salt making sites. The formation of a salt works business at Pu‘uloa led to continuing residency along the Pākule, Keahi and Kupaka shoreline leading towards One‘ula. The Pu‘uloa Salt Works was in operation from the 1840s to the early 1900s. The narratives below provide an overview of the modern business venture.

##### *Daily Alta California*

##### **Puuloa Salt Works Advertisement**

##### **July 1, 1852 (page 4)**

Puuloa Salt Works—Sandwich Islands. These extensive works are situated at the mouth of Pearl river, Island of Oahu, within ten miles of Honolulu, and has the largest and safest harbor on the entire group of Islands. The entrance is

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half a mile wide, easily distinguished, with 12 feet of water over the bar at low tide. These works are capable of supplying the entire Pacific Ocean with the article of salt.

Shippers and masters of vessels may procure entire cargoes or smaller quantities of the above article, in bulk, matt bags or barrels at the works, or delivered on board their vessels in the harbor of Honolulu, by applying to:

C.W. Vincent, Honolulu,  
Corner of Mauna Kea and King Streets.

The following advertisements were published announcing the availability of ocean salt made at Pu'uloa:

### ***Ka Hae Hawaii***

#### **Ka Paakai o Puuloa.**

**lulai 25, 1860**

Mai ka wa kahiko mai ua ikea na kanaka maoli i ka hana ana o ka paakai; he mea ia e mikomiko ai ka ai; he mea kalepa no hoi; aoela one maikai loa ka paakai o Hawaii nei, aole pono loa ka hipi a me ka puaa i kopiia i keia paakai; ina e waiho liuliu, pilau no.

I keia manawa nae, ua hanaia ka paakai ma Puuloa a maikai loa, kaawale na mea awaawa oloko; a ua

#### **The Salt of Puuloa.**

**July 25, 1860**

From ancient time, the natives have known about and made salt; it is that with which food is seasoned, and is also an item of trade; but the salt of Hawaii is not very good, it is not the best for salting beef and salting pork. If it is left for long, it spoils.

But at this time, salt is made at Puuloa, and it is very good. The bitterness has been removed from within; a mill has

loaa hoi ka wili e wali ai e like me ka palaoa, a e like hoi me ka paakai no na aina e mai; nolaila, ua makemake loa ia ka paakai o Puuloa i keia wa; he mea lawe i ka aina e, a he mea no hoi e waiwai ka aina.

been gotten and the salt mixed like flour, and like the salt of other lands; therefore, at this time, the salt of Puuloa is greatly desired. It is taken to other lands and it is a thing that brings prosperity to the land.

***Honolulu Star Bulletin***

**Salt Works at Honouliuli Branching Out Into Shaker Salt Manufacture**

**Salt Works on Oahu to Branch Out Into Shaker Salt Field**

**March 11, 1922 (page 11)**

Following a policy of doing its share towards making the Hawaiian islands self-supporting—productive of all necessities of life possible—an industry few know exists on Oahu is being brought rapidly to a standard equal to the highest achieved by mainland plants.

By a limpid lagoon, just beyond Pearl Harbor where crystal waters are not contaminated by infusion of foreign substances, the Honouliuli salt works has been developing under the eyes of Honolulu yet few have seen.

Machinery is being installed now to take the industry out of its swaddling clothes—to graduate it from its infant drudgery of feeding ice-cream freezers and supplying demand for crystal and rock salt, into what is known in the trade as the shaker salt field.

Now the word shaker means, in the parlance of salt, something which will shake out of a shaker. So it is a step forward from ice cream freezers to the table.

The plant, producing crude salt is turning out some 55 tons weekly eight months

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of the year. The other four month overcast skies and rains minimize production. The product is largely due to the care taken in filling the tanks, which are washed, scrubbed and drained before pure sea waters are pumped in. The tanks are of cement. The element of dust and dirt eliminated by the scrubbing makes the product marketable for cruder uses immediately. A fleet of motor trucks is supplying island consumers.

The new machinery will convert part of this crude output into salt for table and kitchen uses, shaker and bag salt. The demand for coarser salt will not be slighted in expanding to enter the shaker salt filed. It is the intention of the men who have brought the industry into being, to increase its capacity as the consumption increases.



Photo 1. Pu'uloa Salt Works (USGS-Mendenhall Collection, No. mwc00802, 1909)

The new machinery is designed to shatter the crystals and process the salt so

that, in the moist climate of the island coasts, it will not cake—in fact it is the intention of the company to produce a Hawaiian product that will compare on all points with the imported article, with the added feature of ocean freight eliminated.

Expert supply surveys have been conducted in the island from time to time to determine just what imports are necessary to make up the difference between local production of any food article and demands of consumers. It is estimated that the salt works, when under full swing, would be able to eliminate this item from freight lists. The plant is on a branch of the railway. The new unit of the plant will be in operation before summer.

#### **b. Architectural Supplies**

Traditional Hawaiian architecture relied on stone or coral cobbles (readily available sources on the coral flats of Honouliuli), wood, and thatch materials. Foreign residents wanted more durable materials for houses and other structures. Although lumber and supplies were shipped in, the native stone and coral were used in the construction of a wide range of buildings. By 1820, sources of lime for construction were developed at various locations on the islands, and Honouliuli was one of these sources of material. As the plantation developed, lime produced from the coral plains was also used by plantations as a soil conditioner (Charvet-Pond and Davis, 1992).

#### **c. Sisal Cultivation**

Sugar was not the only crop on the Honouliuli landscape. The fiber plant sisal (*Agave sisalana*) was also planted in the ahupua'a, with a large track around Pu'uokapolei down to the in the Kalaeloa vicinity (see Figure 11). In February 1899, *The Hawaiian Gazette* reported that 75 acres had been planted, with intentions on planting 3,000 acres on land that had been leased from James Campbell.

***The Hawaiian Gazette***

**On a Sisal Farm – New Enterprise on Land Near Ewa Plantation. The Production of Hemp. Progress Made by the Hawaiian Fibre Company – Outlook for First Crop is Good.**

**February 21, 1899 (page 2)**

Twenty mile west of Honolulu there is today an infant industry, comparatively unknown, which at no very distant date will probably take a leading rank in the industries of the Islands.

Last April a company was formed, with Cecil Grown, president; Mark Robinson, vice president; W. C. Weedon, secretary and treasurer; A.H. Turner, manager. The object of the Hawaiian Fibre Co., as it was termed, was the cultivation and manufacture of all fibres. Sisal was the class of fibre principally thought of.

Now possibly everybody does not know what sisal is. Sisal is a fibre of the Agave family which flourished chiefly in Yucatan and the Bahama Islands.

The Hawaiian Fibre Co., upon its organization, leased from Jas. Campbell 3000 acres of land for the purpose of the cultivation of sisal. This tract of land is twenty miles west of Honolulu, being two mile beyond Ewa Mill and ten mile from Pearl City. It extends some distance mauka of the railroad track and on the other side clear to the sea.

It has not been many years since the first sisal plant was imported here with a view of another possible industry. Joseph Marsden imported a number form the Bahamas about five years ago and they were planted on a small piece of land this side [east] of Pearl City, where is a pond for one-half of the year and dried mud curing the other half. They did not thrive, and it was thought they needed

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more water, as much as sugar cane. Some were taken up and planted on one edge of Ewa plantation, near the railroad track by Mr. Lowrie. This lot forms the nursery for the present company.

Sisal is a peculiar plant. It will thrive and flourish where nothing else will live; where even a mountain goat could not live, sisal will grow like a green bay tree; when it get into soil that is rich and has depth, and where something else might possibly grow, it immediately declines and loses strength. It does not depend on the soil for nourishment. Given plenty of heat and sunlight a little moisture now and then, a stretch of rocky land and you have your model site for the cultivation of sisal.

The tract selected by the Hawaiian Fibre Co. is admirably suited for the purposes desired. It is rough, rocky and about as useless looking a place of ground as one could find. It is not to be thought of in connection with sugar.

Today about seventy-five acres of land are under sisal cultivation. The plant on an average is about three feet in circumference, that is the bulb itself, and has no roots to speak of. The branches or fronds from which the hemp is extracted, grow to a height of from three and a half to five and a half feet, tapering off to a small needle like barb, and in all direction and angles.

The perpendicular fronds are never taken. They are not ripe. As they ripen, they fall toward the ground and then they are ready to be cut and turned into hemp.

While the plant has no roots to speak of, it throws out numerous suckers, or feeders, in all directions, which turn into small plants. These take the life of the mother plant and are cut off. The small plants are used as nursery stock. It takes about three years for a plant to mature. From thirty-five to forty fronds can be cut from one plant twice a year, with an average weight of one and a half pounds

to the green frond. Take five percent of this amount and you have the amount of pure fiber obtained from one plant in a year.

The company has cleared and planted about seventy-five acres of land. A comfortable home for the manager has been built. Everything is well conducted and prosperous looking.

The main difficulty is to obtain the fiber from the plant. Extensive machinery is necessary, but the management intends to put up the machinery in time to reduce the first crop, which they expect to take off in about two years.

This is one of the new businesses of the Islands. The hemp industry is confined to a few places. It now seems that it will not be long before these island will take a leading, if not the leading place in the hemp industry.

Specimens of hemp which have been worked out by hand can be seen at this office.

In 1900, it was reported that 1,000 acres of Honouliuli were currently under cultivation, the goal being to make locally sourced sugar bags and other fiber products. *The Honolulu Republican* of July 28, 1900, reported:

***The Honolulu Republican***

**Sisal Fiber Plant Successfully Grown – Three Thousand Acre Farm Near Pearl City – Talk of a Factory Plant – Annual Cost of Sugar Bags an Incentive to Manufacturing.**

**Rumor That the Great Oakland, California, Jute Machinery May Be Moved Over Here.**

**July 28, 1900 (page 5)**

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Hawaii now expends nearly half a million dollars annually for jute bags, all of which ought to be manufactured here. The Republican is pleased to be able to say that the foundation has been laid for the establishment of works for the manufacture of sugar sacks, cordage and other products from fiber. The firm to carry out this work is the Hawaiian Fiber Company, Limited, which has a 3000-acre farm two miles west of the Ewa plantation...

The officers of this company are: Cecil Brown, president; M.P. Robinson, vice-president; W.C. Weedon, secretary and treasurer; and W G. Ashley auditor. B. F. Dillingham and other prominent businessmen, as well as the Ewa plantation, are largely interested in the company, which is experimenting with sisal, a fibrous plant well adapted to this climate and barren and unproductive lands of the Islands.

The Hawaiian Fiber Company planted 1000 of its 3000 acres which it secured from the railroad company. Six hundred acres are fenced in with a stone wall built from stone taken from the land. Three hundred and two acres are cleared; 80,000 plants, or 215 acres, have been planted, and a manager's house, and comfortable quarters for the laborers have been built. A well has been sunk and a good supply of water has been obtained. The work of clearing ground, laying out walks and erecting permanent stone fences is being pushed. The farm, or plantation, is called "Sisal Farm," after the name of the plant.

Sisal belongs to the aloes family. It is a desert plant and can be raised profitably on rough, rocky, coral flats, where a plow cannot be used—land unsuited and worthless for sugar growing or anything else. It can be grown without irrigation, although the fronds of the plant, from which the cordage is made, might be larger and plumper if the plants were irrigated. During the late dry and hot weather the 215 acres set to the plants have grown surprisingly well. Scarcely a plant was lost. It takes from two and a half to three years for the plants to

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mature from the suckers. From plants two and a half years old sisal fiber four feet in length has been obtained. The fiber was made by hand, and specimens of it were sent to experts on the mainland, who pronounced it unexcelled in quality by any sisal fiber grown elsewhere.

Sisal is different from Manila hemp. It is superior to hemp for marine or naval cordage. Two years ago prepared liber brought in the market from 3 to 3 ¼ cents: now it fetches from 6 ¾ to 8 ¼ cents a pound. The cutting of plants after they reach their growth occurs twice a year. When the lower fronds obtain a horizontal position they are ready for cutting. From sixteen to thirty fronds are taken from each plant. The process of poling continues for five to seven years. Each frond makes a separate fiber. After the fronds are cut the pulp is extracted and the fiber is washed and baled for the market. Here plants are set from nine to eleven feet apart. In Bermuda, they are set much closer. The fronds of the plants must not touch each other. There is a hard, thorn spike, sharp as a needle, on the end of each frond, and if they come in contact they scar and bruise and materially and injuriously affect the fiber. The company believes that this industry will become one of the most profitable industries of the Islands. Land valueless for any purpose can be utilized in growing sisal; the cost of production is nominal and no irrigation is necessary in its cultivation. There are many thousands of acres of land in the group that will grow sisal and nothing else.

The Hawaiian Fiber Company has now, reached a better than the experimental stage. The ability to grow sisal has been fully demonstrated, and the company is now considering the advisability of erecting a plant for the manufacture of the fiber. Persons who have given the subject study predict great things from this industry...

“...Sisal comes from the Bahamas and will grow here on any old worthless

lands” Mr. Taylor [Commissioner of Agriculture Forestry] said:

The Importance of this industry is shown by the fact that the sugar industry alone consumes 4,800,000 bags at a cost of not less than \$384,00. It is estimated that the crop for this year will reach 300,000 tons, requiring sixteen bags to a ton, at a cost of 8 cents a bag.

In 1903, the *Sunday Advertiser* published an article providing more details on the sisal plantation in Honouliuli, and identified the OR&L station situated near the mill site by the name “Sisal.” The article also included two photographs of the Honouliuli sisal mill and a plantation field.

***The Sunday Advertiser***

**Sisal One of Coming Island Industries. The Work of Building up the New Idea.**

**January 25, 1903 (page 3)**

“Bermuda sisal” they call it, although the best authorities assert that it is native to the Everglades of Florida, and it contains within its sword-shaped leaves something of the future of Greater Hawaii.

B.F. Dillingham, president of the Oahu Railway, took a party in his special car down over the road yesterday to Sisal station, just on the far side of the Ewa plantation, to see the beginning of the sisal industry in the Islands. It is but a beginning, although a most promising one. The special, leaving the city station at half past one in the afternoon, ran down fast through a rarely beautiful country—all the country hereabouts is beautiful—until the station for Oahu sugar plantation was reached, the station under the picturesque cocoanut tress that has been made famous because no amateur with a kodak has ever been known to pass it by without a shot.

The party was shown over the Oahu sugar mill first, and, although most of them were old residents of the Islands, some were there who had never seen the golden wealth of the land turned out as it is turned out there. Then a busy little plantation locomotive came along, puffing, and took the special car out over the plantation roads to one of the big pumping plants, where from 15,000,000 to 18,000,000 gallons of water are raised every day to the top of a bluff over 400 feet high, and to another station where the big steam pump has been sunk into the earth to meet the rising artesian water and that was a thing many of the party had not seen before.

The plantation locomotive went off about its regular business after that, and the special went whirling across the level land skirting Pearl Harbor, past the little Chinese rice fields and the great broad fields of waving cane, like oceans rustling with life, to Sisal. Presently the road led into a region of what seemed to be century plants, thousands and thousands of them standing stark upright in their thorny dignity, set out in straight rows and topping the weeds that they seemed to set themselves above as something exclusive and apart in the line

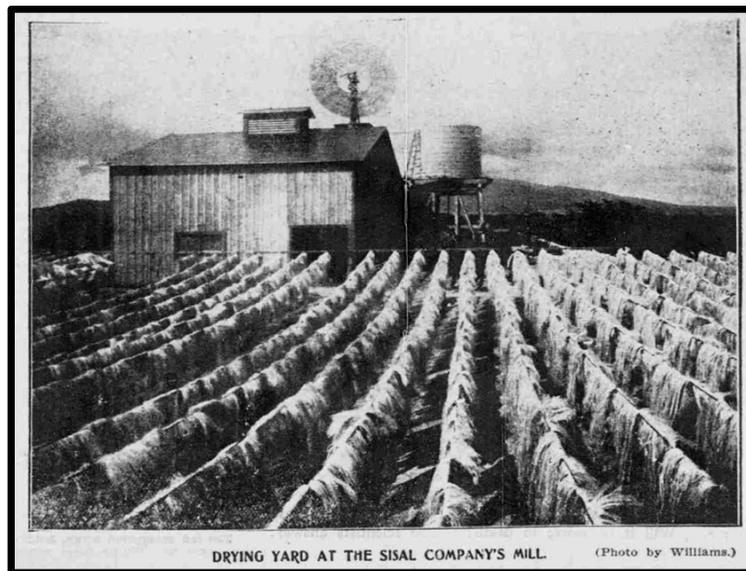


Photo 2. Drying Yard at the Sisal Company's Mill

of vegetation. And that was the sisal. Those spiny leaves, crushed for the fiber in them and dried, are worth just 8 ½ cents a pound in the market of San Francisco, and there is demand for all that can be produced. That is why the sisal holds in its heart a part of the future of Greater Hawaii, and probably a large part.

The sisal plantation and the small mill upon it are in charge of Superintendent A. B. Turner, and he is a man who knows his business and talks intelligently upon it. The little mill, the first of many large ones of the future, perhaps, was crushing the cut leaves of the plant, which were delivered at the door in carefully tied bundles of fifty by Japanese laborers. Each leaf went into the jaws of the crusher just as it came from the field. It came out in the form of bundles of glossy greenish fiber which out to hang on lines with thousands of its fellow, until the sun had bleached it white, when it would be spread on the ground for further bleaching, to finally gathered and baled, as hay is baled, in which form it will go to the ends of the earth to be made into ropes and cordage and binding twine and all the things for which tough giber is used in the hurry of modern life. For the sisal fiber is one of the toughest that is known, and ropes made from it might well be used to hold a weight for a man's life.



Photo 3. Workers Cutting Plants on the Sisal Plantation

“The sisal matures to the cutting stage in from three and a half to four years,” said Superintendent Turner, explaining the plant and the process to Mr. Dillingham’s guests yesterday. “The plant grows from six to fifteen years before it flowers, as the century plant does. It is one of the aloes. After it flowers it dies, but it gives birth to many bulbs in flowering, and has produced much fiber before it reached the stage of uselessness. We begin cutting it at the age of from three and a half to four years. Then, once we begin, the plant yields constantly. All the leaved are not taken at once, you understand. We take only those leaves from each plant that have reached the proper length, and then the remaining leaves on that plant take a straighter form until the time comes to cut that plant again. Thus, when a plant begins to yield fibre it keeps on producing until it dies. There is a constant succession of crops from i, and no cessation in the yield, because there are always plants in the cutting stage. A producing plantation produces all the time, and the men go about from plant to plant, always brining on a crop.

“The sisal has the further recommendation that it grows on land that is too poor to produce sugar. In fact, sisal does not do best on land that is too rich. The fiber is too coarse, the growth being rank. We have 600 acres in this plantation, that plants being set out about 580 to the acre. I figure that we have about 200,000 mother plants, and about one million coming on from bulbs and sprouts. So that we can replace all our plants that dies as fast as they succumb to age. Also, eventually we will have lots of plants to sell. We are getting, as the plants stand now, about 1,000 pounds of fiber to the acre, which is good for a second crop. We will produce, this year, 100 tons of fiber, and will double that next. At the present price of fiber, the income should come not far from \$18,000. Our mill has a capacity of 2,000 pounds daily, but is now handling only between 1,200 and 1,500 pounds per day.

“And we have solved the labor problem, incidentally, in this industry. At least, we have scored a point that will aid in its solution so far as we are concerned. The sisal fiber can be cut and left lying in the field for six months, and it makes as good, clean fiber at the end of that time as when first cut. It is a pretty strong strike that would outlast that. Also, a peculiarity of the sisal is that when the mother plant flowers, all the suckers from it send up flower stalks, no matter what their age. So these must be taken up if they are to be saved.”

In the party taken out by Mr. Dillingham yesterday were A. B. Wood, W. W. Hall, W. G. Cooper, E. E. Paxton, John F. Bowler, J. O. Carter, M.P. Robinson, Isaac Dillingham, Dan Logan, Albert Raas, and T. C. Miller and ex-Governor John E. Osborne of Wyoming.

In 1904, *The Pacific Commercial Advertiser* reported that “Five years ago the land near Barber’s Point was so dry and ‘waste’ that it was good for nothing but ‘bee pasture’ during the few rainy month of the year. Last year it yielded a crop of sisal that paid a profit of twenty-five per cent or more” (*The Pacific Commercial Advertiser*, 1904).

While there was great interest in the sisal industry, by the 1920s, new manmade fibers were replacing locally grown sisal, which required large amounts of water for processing. This, added with the military condemnation of lands in around Pearl Harbor, led to the demise of the business.

## **5. Condemnation and Military Base Development by the United States**

While it is described as a “free-trade agreement” between Hawai‘i and the United States, King Kalākaua was pushed into the agreement, officially enforced on September 9, 1876. The agreement granted the U.S. Navy the exclusive right to develop Pearl Harbor in exchange for the United States approving a Reciprocity Treaty with Hawai‘i, allowing Hawaiian sugar to enter the U.S. duty-free (Kuykendall, 1967). Following the treaty, the United States took no significant action on the harbor development. In 1888 it was reported that there were efforts to purchase the Waipi‘o Peninsula from the ‘I‘i Estate (*The Hawaiian Gazette*, 1888:5). Following the overthrow of the Hawaiian Monarchy and subsequent annexation of Hawai‘i to the United States in 1898, more serious actions were engaged. These actions were in part due to conditions in the Philippines where the Spanish American War was underway. In 1899 Lieutenant Pond, Commander of the Navy ship *Iroquois*, conducted a survey of island harbors, including Pearl Harbor (*Evening Bulletin*, 1899:1). In 1900, a Bill was written for the United States Congress to construct a naval Station at Pearl Harbor (*The Hawaiian Gazette*, 1900:6).

### **a. Huikau, Pohihihi ke Kuikahi Panai Like me ka uku Kaulele o Puuloa (Confusing and Bewildering, the Reciprocity Treaty with its Interest Charge of Pearl Harbor)**

The move by business men—many, the children of missionaries and other foreigners who had taken up residency in the Hawaiian Kingdom—to develop sugar plantations led to the movement towards “reciprocity.” The sugar growers sought a way to compete with southern sugar growers in the United States; through the Reciprocity Treaty which took effect on September 9, 1876, the Hawai‘i sugar growers were able to export their sugar and rice crops with relief from taxation on foreign imports. The treaty also set the foundation for American development of Pearl Harbor as a Pacific Base of military operations. In 1887, the re-

negotiation of the treaty was forced upon King Kalākaua through the “Bayonet Constitution” (cf. Kuykendall, 1967).

In the article below, Hawaiian historian Samuel M. Kamakau questioned the move towards the Kingdom relinquishing control of Pu‘uloa (Pearl Harbor) to the United States.

***Ko Hawaii Pono***

**Huikau, Pohihihi ke Kuikahi Panai Like me ka uku Kaulele o Puuloa.**

**August 20, 1876 (page 3)**

...About Ewa. Ewa and it’s many bays are surrounded by land on most sides. The entrance to the Harbor is at Puuloa. Its narrowest point is between Kapuaikaula and Kapakule. It is perhaps a little more or less than a furlong across. The rise (submerged hillock) outside of the entrance is Keaalii. There is a shallow place there, approximately 9 to 10 feet deep.

Here is a description: From Keaalii to the mound at the entrance of Puuloa harbor, there is a channel on the west, near Kapakule. Then [it runs] from Kapakule to Kepookala. From Kepookala one turns towards the estuary of Kaihuopalaai, and Kapapapuhi is on the west side. That is the branch of the estuary of Honouliuli. Amoe Haalelea is the chiefess, landlord of this section of the estuary, and the lesser landlords, who control the fishing boats.

From Keaalii and the channel to Kapakule, and to the east, to the tip of Mokuumeume, is the estuary channel of Komoawa. This branch of the estuary is now called the Halawa Branch. There are two titled landlords here, their highnesses Queen Emma and Ruth Keelikolani.

From Kepookala, along the sheltered western side of Mokuumeume, along the Halawa branch, and along the point of Paauau to Kalaehopu, Kupahu, and

Halaulani; this branch of the estuary is called Waipio and Waiawa. The titled land lords of this section of the estuary are Malaea li and the relatives of Ruth Keelikolani. This is an expansive place, not filled with thousands of boats and more, from the point of Pipiloa to Mokuumeume, and from there to Halawa. Turning north are the lands of along the sheltered bays of Manana, Waimano, Waiau, Waimalu, Kalauao, and Aiea. Waimalu is the land division to which Mokuumeume belongs.

What right does the government have in giving Puuloa and Ewa as payment for the Reciprocity Treaty? I know of no right that the government has...

**b. Overview of Government Use of Land in Coastal Honouliuli**

The following entry details the land acquisition plans of the United States, including securing the land on the “west side of channel,” being Pu’uloa. The article which is an informative read on the time—even with the errors in assumptions which came later—follows:

***The Pacific Commercial Advertiser***

**A Naval Station.**

**Report on Pearl Harbor’s Advantages.**

**June 27, 1900 (pages 1 & 3)**

The following is a report of the Board of Naval Officers convened last march for the purpose of examining into the best locations for a naval station at Pearl Harbor, as presented to the chairman of the committee of naval affairs of the House of Representatives by the Secretary of the Navy:

**Navy Department,**

**Washington, March 31, 1900...**

...Pearl Harbor can be successfully defended, rendering its anchorages safe from outside attack, and that it possesses a comparatively large deep-water

anchorage, capable of expansion, if needed. And it should also be borne in mind that it is the only defensible harbor within the entire Hawaiian group.

The board has, with careful consideration, approached the subject of improvement and reached its conclusions, keeping ever in mind the present and prospective needs of our country in this part of the world. The great expansion of American interests in the waters of the Pacific, as a result of recent events, has caused each point considered to be weighed carefully from every standpoint.

8. The board proceeds to answer the questions submitted by the Department's order, as follows:

(a) What land is it necessary and desirable to acquire in order to establish a naval station in Pearl Harbor, having in view the present and prospective needs of such a station.

The board recommends that for the purpose of establishing a naval station in Pearl Harbor, having in view the present and prospective needs of such a station, that the Government acquire the portion of the body of land shown on plan No. 1, accompanying, as Waipio peninsula, extending from the narrow neck marked with a blue line to the southernmost point of the peninsula, comprising to low water mark, about 820 acres: also the body of land shown on plan No. 1. As Mokuumeume or Ford's Island, comprising to low-water mark about 371 acres, including the adjacent islets and the intervening shoal water.

9. The board is of opinion that under the general term naval station must be included the following: Dry docks, work and repair shops, a coaling station of large capacity with sheds, coal pockets chutes, and sheltered anchorages or berthing space for tugs. lighters, etc., extensive grounds for marine barracks

parade grounds, and a still larger area for drilling large bodies of sailors or marines, to which must be added ample camping ground for any naval force that might be rendezvoused here in time of war. Considerable space will be needed for hospital accommodations with surrounding ground. Ample space, suitably selected, must be set apart for magazine purposes. All the above mentioned must be capable of expansion as our future naval needs may demand.

10. In selecting the two plots of ground above mentioned for naval purposes careful consideration has given to the present commercial needs with possible great expansion, and there has been left free for commerce the entire main shore line within the entrance, several miles in extent, and situated where it is most likely to be of the greatest use. It may also be stated that of the two bodies of land decided upon as required for naval purposes, the Waipio peninsula was from personal observation chosen by Rear Admirals Irwin and Miller and Commanders Nichols and Merry in past years, but the present developments had not then been reached, and the board is of opinion that the area recommended by it is not in excess of Government needs, present and prospective. The Waipio peninsula lands recommended are from ten to thirty feet high and covered with algaroba trees. The thin alluvial soil is reported to be incapable of growing sugar cane except in certain spots "of small area, and then only by copious irrigation."

To take this land would, therefore, cause little or no detriment to agricultural interests. For naval purposes this peninsula presents many advantages. Deep water channels surround it on nearly all sides, making it almost an island. It is, therefore, practically isolated from the mainland, and yet is connected with it by a narrow neck, assuring easy communication. The shores are clear of reefs, and bold water is found close to the shore line, thus minimizing the expense of probable wharf and dock construction and affording ample wharfage for a fleet

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of large and small vessels. The West Loch and Walker Bay [Waipi'o] would afford excellent shelter and anchorage for small vessels, while the middle channel and loch would give good anchorage for the largest ships.

The prevailing winds in this locality are from northeast to east, making the eastern shore of the peninsula a weather shore. The winds are never so strong, however, but that fairly smooth water exists at all times. The "konas," strong southerly and westerly gales, are said to occur at times in January and February, lasting from a few hours to two or three days, but never attaining a violence which would make anchorage in the harbor unsafe. The Oahu Railroad passes the head of the peninsula, and only a short spur would be required to reach the site of a dockyard over perfectly feasible ground. The neck of the peninsula, just above the sites recommended by Rear Admirals Irwin and Miller for a dry dock, are narrow enough to make it possible to locate repair shops and store houses near the probable dock site, convenient to vessels at the docks or anchorages on either side.

Ford's Island is chosen because of its proximity to deep water anchorages of the greatest area for large ships, and being an island, it is peculiarly available for barracks for a strong force of marines and as sites for magazine, hospital and coaling docks. Its shores, like those of Waipio Peninsula, are for the most part easily accessible for large ships in going alongside wharves, which latter can be constructed at small expense. Its leeward or westward shore is particularly suitable for the location of coal storage houses and coaling wharves or piers. Good potable water in sufficient quantity for all the above purposes is reported to have been found on this island by sinking an artesian well, and from the fact that great quantities of fresh water have been found on the northern part of Waipio

Peninsula and on the lands surrounding the harbor there is no reason to doubt that an all sufficient amount can be obtained by the same means on the lower or main part of the peninsula. Water options are held, furthermore, by the present owners of the Waipio lands for the supply of water for irrigation purposes.

11. “(b.) What land is it necessary and desirable to acquire for defensive purposes of the harbor, channel and station?”

“(c) What land, if any, is it necessary and desirable to acquire from private parties to obtain the requisite facilities of ingress and egress?”

The board is of opinion that for clear explanation the queries under b and c can best be answered under one heading, and in so doing invites attention to plan No. 1, whereon is shown, below the Waipio Peninsula and at the entrance proper to the harbor, a certain body of land embraced on each side of the channel by a blue dotted line extending down the channel, thence eastward and westward, respectively, to a fixed point on the shore line. These two tracts of land the board recommends be selected for defensive purposes of the harbor, channel and station, and also for securing requisite facilities for ingress and egress.

12. The land lying along the line of the channel is selected in order to prevent any possibility of interference with the ultimate channel of navigation, which may in the future extend from shore to shore in this part of the narrow pathway. The wide areas nearer the shore line are intended for the emplacement of batteries to guard the entrance, to keep an enemy at a distance from the shipping within, for covering the mine fields, etc. The total area thus recommended to be acquired comprises about 690 acres. It may not be necessary that the acquisition of any of this area should in anyway interfere

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with or cause the removal of any existing private improved properties lying within the boundaries; but the board desires to call attention to the very great importance of the Government acquiring an absolute title to the same and of holding it in fee simple forever. This done, permission may be granted for improvement, subject to war necessities as to their removal or destruction without damage to the Government, as is done within the reservation of Fortress Monroe.

13. For the purpose of securing easy and convenient access to all of the above land recommended to be purchased for Governmental use the board recommends that sufficient right of way, not less than 100 feet in width, should also be purchased for Government use, extending from the naval station to such [page 1] public roads and railroad as may be considered most desirable.

14. “(d) What are the best methods for acquiring the above-mentioned land?”

The board recommends that all of the above-mentioned lands be acquired by condemnation under the law of eminent domain of the civil laws of the Hawaiian Islands, a copy of which is appended, marked “C.”

...23. Regarding the value of the lands recommended to be acquired. —From the data placed before the board in the shape of reports, assessed values of land as given by the assessor in 1899, records of options offered, and taking into consideration the Hawaiian law of eminent domain, the board is of the following values should obtain:

- Waipio Peninsula, about 820 acres, assessed at \$25,000 in 1898, and adding 20 per cent .....\$30,000
- Ford’s Island, about 370 acres, assessed at \$20,000 in 1898, and adding 20 per cent..... 24,000

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- Land on east side of channel, about 305 acres, at \$20 per acre, plus 20 per cent [Hālawā] ..... 7,320
- Land on west side of the channel, about 385 acres, at \$50 per acre, plus 20 per cent [Pu'uloa]..... 23,100

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Total.....\$82,420

No accurate estimate can be made at this time of the amount of damages, if any, done to adjoining property through the condemnation of these lands, nor as to the value of fishing or riparian rights, or for the amount necessary to secure a right of way to highways and railroad, through lack of definite data bearing on these subjects. For these objects as well as to pay for improvements at present on some of the land recommended for purchase, it is thought that at least \$150,000 should be made available for acquiring ownership and for all rights and damages... [page 3]

The early Navy activities centered around development of a coaling and repair station for naval ships. Dillingham's Hawaiian Dredging Construction Company was awarded the contract to dredge the channel in 1901. In 1908, additional funding was released by Congress to deepen the channel and construct a dry dock and various support facilities (*The Hawaiian Gazette*, 1908:2) (Figure 13).

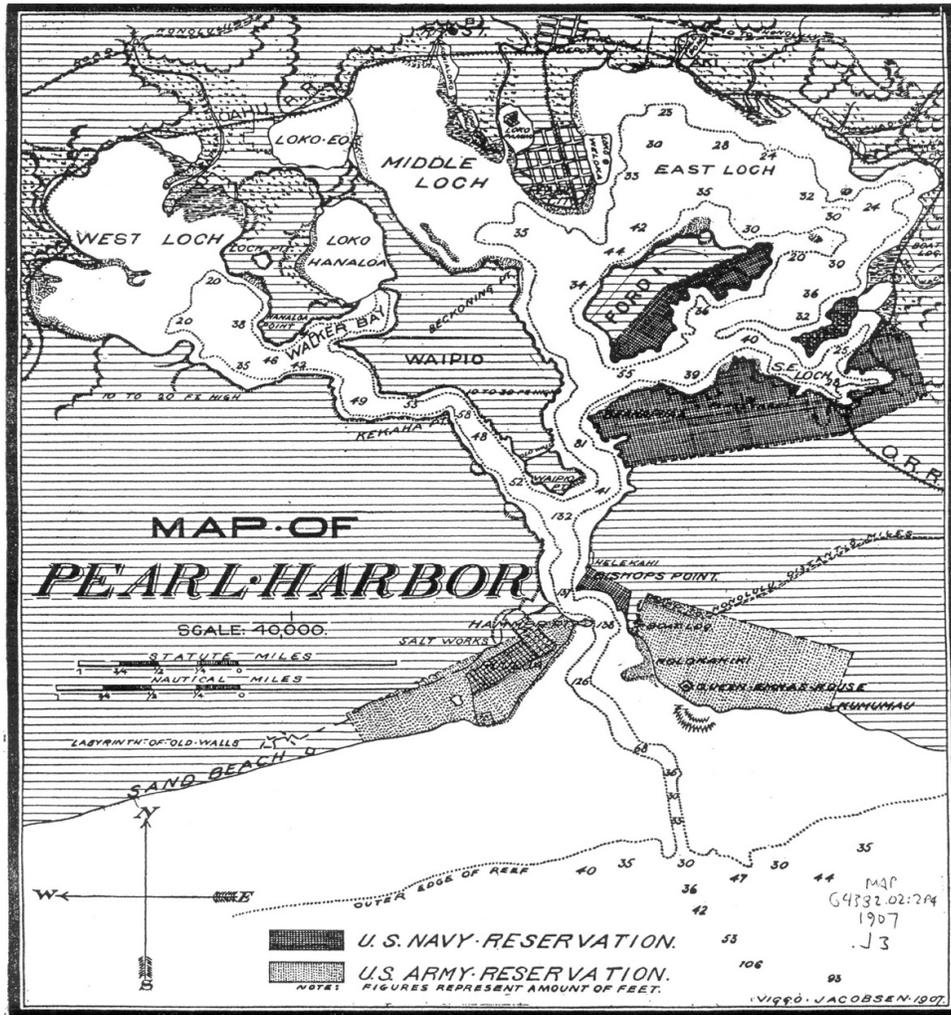


Figure 11. Map of Pearl Harbor (Hawaii State Archives, Map No. 416, 1907)

The Barbers Point Lighthouse, one of the first government structures in the area, was established by the Hawaiian Government in 1888 (Thrum, 1889:89). In 1937, emergency funds of the United States were used to construct c. 18 miles of road in the Barbers Point area. In late 1939 and early 1940, the U.S. Navy acquired over 3,500 acres of land from the Campbell Estate and built the first military installation in Honolulu, the ‘Ewa Marine Corps Air Station, Barbers Point. World War II accelerated the pace of construction at the Naval Air Station and it was already being heavily used before its completion on April 15, 1942. It was

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reported that by October of 1947, the Station had the largest landing mat in the Pacific and takeoffs averaged 1,500 planes daily during World War II (Kelly, 1985:175).

During World War II, the military also found use for the OR&L railway system; in 1944, the plantation manager reported:

We have continued to haul large quantities of ammunition over our railroad tracks and are continuing to supply the Armed Forces with buildings and electricity (Conde and Best, 1973:282).

The U.S. military did not engage in serious planning to develop Pearl Harbor until 1899, following the 1898 annexation of Hawai'i to the United States. Dredging of the harbor entrance and inlet began in 1901 and the U.S.S. *Iroquois* was the first naval ship to enter the harbor—it is for this naval vessel that the Pu'uloa point is now called "Iroquois Point." That same year, condemnation proceedings of lands along the harbor shoreline were also initiated. These lands included Hālawa side of the Pearl Harbor entrance (including Kuāhua Island), Ford Island, Bishop Point, and sections of the 'ili of Pu'uloa and Waipi'o Peninsula. In 1909, a new dredging contract for the inner lochs and construction of a massive drydock began. On December 14, 1911, dredging was officially completed on the interior lochs, and the flagship U.S.S. *California* steamed into the harbor.

On February 17, 1913, disaster struck when Drydock No. 1 collapsed and four years of work were lost. Native families of the 'Ewa District attributed the disaster to the shark god Kahi'ukā (the smiting tail). Engineers attributed the collapse to unstable earth and adjusted their plans, reengaging in construction of the drydock, which was completed in 1919.

The major facilities of the naval base and submarine base were constructed between 1910 and 1918. In 1921, a second stage of coastal defense began with the development of Fort Weaver in the Pu'uloa area, where gun embankments were installed and a larger section of land was integrated into the naval reservation. In the 1930s, lands of the Campbell Estate in

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Honouliuli were developed into naval magazine facilities. Similar development was initiated at Waikele and Kīpapa Gulch. An Army coastal defense battery was built at Pu‘uokapolei and shoreward of that Army and Marine training facilities, including an air field, were being constructed.

Following World War II, new heavy vehicles were being manufactured and use of the trains for hauling was becoming obsolete. In 1947, the plantation manager’s report observed “For over fifty years we have depended upon the reliable and efficient service of the O‘ahu Railway & Land Co to transport our sugar, molasses and supplies. We regret it has been necessary for them to terminate this service at the end of 1947” (Conde and Best, 1973:315).

The last load of sugar cane came in by rail from the fields on November 14, 1950. In an entry under “Harvesting,” the O‘ahu Sugar Company manager noted that by the end of 1951, “transportation of the entire crop from field to factory was done for the first time, the railroad being eliminated” (Conde and Best, 1973:316).

Today, the United States Military manages some 14 land areas in the ‘Ewa District. These include:

- NAS Barbers Point. Honouliuli
- Iroquois Point/Pu‘uloa Housing. Honouliuli
- NAVMAGPH West Loch. Honouliuli, Waikele
- NAVMAGPH Waikele (Waikākalaua-Kīpapa Gulch junction). Honouliuli, Waikele, Waipi‘o
- Ewa Drum Storage facility (between Pearl City & Waipahū). Waipi‘o, Waiawa
- Pearl City Housing. Waiawa, Mānana, Waimano
- Mānana Housing (Pearl City). Mānana
- PHNC, Ford Island (East Loch). Moku‘ume‘ume. Waimalu, Kalauao
- McGrew Point Housing. Kalauao
- PHNC Naval Shipyard. Hālawā

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- PHNC Submarine Based. Hālawā
- Hālawā Housing. Hālawā
- Red Hill Housing and Storage. Hālawā and Moanalua
- PWC Moanalua Housing (Moanalua – Makalapa). Moanalua

### C. Historic Sites

#### 1. Pu'uokapolei

Pu'uokapolei is a hill in Honouliuli where several gods, goddesses, and legendary figures were associated. The hill was the resting place of Hi'iakaikapoliopole (Hi'iaka), the sister of the volcano goddess Pele, and Lohi'au, Pele's lover, after Hi'iaka returned from Kaua'i with Lohi'au (Fornander, 1919 Vol. V: 188, note 6). The hill was also the location where Kamapua'a established his grandmother as queen after conquering most of O'ahu from King 'Olopana (Pukui et al., 1974:203; Sterling and Summers, 1978:33).

Native historian Samuel M. Kamakau penned hundreds of articles as letters and in serial form, in which he documented Hawaiian history through traditions, personal experience and in observations of the history unfolding around him. On February 10, 1870, Kamakau explained the history and reckoning of periods of time through the ancient Hawaiian year. In this account, he shares that Pu'uokapolei and Mahinaona on the kula lands of Honouliuli were the markers of the changing seasons. The original Hawaiian texts follow, with a new translation adapted from the translation of Mary Kawena Pukui (Kamakau, 1976:14).

#### *Ke Au Okoa*

**Ka Moolelo Hawaii. Na S.M. Kamakau. Helu 17.**

**No ka mahele ana i na wa o ka makahiki.**

#### **Feberuari 10, 1870 (aoao 1)**

...O ka poe helu a hooponopono i na malama o ka makahiki, o ko Oahu poe kilohoku a me ko Kauai ka poe akamai loa i ka hooponopono ana, a me ka mahele pono ana i ke ano o ka la, o ka mahina a me na hoku, a me ka papa

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hulihouna o ka aina, a me na hoku, a ua kapa ia ia poe o ka poe kuhikuhi puuone, a me poe kilo hoku holo moana, a o ka poe helu e noho ona ma Waimea i Kauai.

I ke kupono ana o ka la ma ke alanui polohiwa a Kane, a nee ka la i ka akau a paupono ka la i Kaula, a nee ka la a kau i Kawaihoa, a no ke kau ana o ka la ma Kaula a kau i Kawaihoa, a nolaila i kapaia aku ai kekahi inoa o Makalii o ke Kau, a no Kaulana a Kane kekahi ikapaia aku ao o ke Kau, a no ke kau ana o ka la i Kaula a nee ka la i ka hema, a ua kapaia o ke Kau Hooilo, a pela ko Oahu poe helu, no ke kau ana o ka la i Puuokapolei, a kau ka [la] i ke kawaha o Mahinaona, ua kapa ia o ke Kau, a mai Puuokapolei a nee ka la i ka hema, a no ke kau o ka la i ka hema, a no ka hiki ana mai o ke anu, a no ka hoolio ana o ke kupu o na oliko o na mea ulu he oilo ia, ua kapaia ke kau o ka hooilo, a nolaila, elua no kau o ka makahiki. O ke Kau Makalii, a o ke kau Hooilo...

### Translation

...Of the people who kept administered the accounting of the seasons of the year, those observers of the heavens from Oahu and Kauai were extremely knowledgeable in reckoning, and the correct division of the character of the sun, the moon, and the stars, also in the study of the earth and stars. These people were known as the experts in discerning the nature of the land, the navigators and observers of the stars. They were the observers who went and resided at Waimea, Kauai.

When the sun reached ke alanui polohiwa a Kane (the equator), and the sun traveled to north and stopped right over the islet of Kaula, moving above Kawaihoa, it was then known by the names “Makalii o ke Kau” or “Kaulana a Kane,” others called it “Kau,” for the setting of the sun at Kaula. When it moved to the south, it was called Kau Hooilo. When the observers of Oahu saw the sun above Puuokapolei, the sun set above the mouth of Mahinaona, it was called

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Kau. When the sun moved south, and set in the south; when the cold arrived, and the sprouting of the shoots and reddning buds of growing things sprouted, it was called Kau o ka Hooilo. Therefore there were two seasons in the year, the Makalii (summer) season, and the Hooilo (winter) season...

Later in Kamakau's series on Hawaiian history, he described traditions associated with care for the dead (kupapa'u), respect of the graves (ilina), and traditions associated with the spirit after death, all subjects that are of great significance to Hawaiians. In the account, he identified some of the places of importance in these practices. The narratives are of particular importance to lands and specific wahi pana of Honouliuli, and also connected to places that span the 'Ewa District, all the way to Moanalua.

Pu'uokapolei is an important feature of the Honouliuli landscape and is clearly visible from the current APE, but the project is not expected to have an adverse impact on the historic hill.

## 2. 'Ewa Sugar Plantation Villages

The current APE is situated within the 'Ewa Sugar Plantation Villages (SIHP #50-80-12-9786), which was placed on the Hawai'i register of Historic Places in 1995 and is the only residential district listed in Hawai'i. The historic district encompasses all but the western extent of the APE. Several historic properties in the immediate vicinity (directly north of the APE) are part of the 'Ewa Sugar Plantation Villages, including sites associated with Varona Village, which is the most western village part of the Historic District. The residential development currently consists of approximately 45 plantation-era houses in various states of repair. Several houses are abandoned and many have been torn down. Previously documented historic properties in the village include two dilapidated houses (SIHP # -7129 and -7130), two concrete house foundations (SIHP # -7131 and -7132), and a partially intact historic streetlamp (SIHP # -7133). The streetlamp is located on the north side of Renton Road, adjacent to the APE. These sites are not located directly within the APE and are not expected to be affected by the project; the historic streetlam will be avoided and should not be affected by the proposed project.

### 3. 'Ewa Plain Battlefield

The 'Ewa Plain Battlefield (SIHP # 50-80-12-8025) is located approximately 230 feet south of the project area and was listed on the National Register of Historic Places (#16000273) on May 23, 2016. The Battle of 'Ewa Plain occurred on December 7, 1941 as part of the surprise attack by the Imperial Japanese Navy on Pearl Harbor. According to the Registration Form, the battlefield “retains sufficient architectural, archeological, and/or landscape integrity to convey its historic significance. This includes retaining its integrity of location, setting, design, and association” (Frye and Resnick, 2013). The battlefield shows evidence of its association with battle by the “presence of aircraft burn areas and strafing marks (cannon/machine gunfire) from Japanese aircraft on the former warm-up platform and there is the likelihood of spent bullets from the attack imbedded in the original pavement of the other attack areas” (Frye and Resnick, 2013). The 'Ewa Plain Battlefield is representative of an extremely important event in Hawai'i's (and the United States') history, but the project is not expected to have an adverse effect on the historic site as it is outside of the APE.

### 4. Heiau

Several early writers undertook surveys of cultural sites and heiau on O'ahu. In the *Hawaiian Annual and Almanac* (Thrum, 1907a), it was reported that a heiau had been located on or near Pu'uokapolei. Thrum observed “heiau on Kapolei hill, 'Ewa - Size and class unknown. Its walls thrown down for fencing” (1907a:46).

In the early 1930s, J.G. McAllister undertook an archaeological-ethnographic survey on the island of O'ahu for the Bishop Museum. Regarding the heiau at Pu'u o Kapolei, McAllister (1933) reported:

Pu'u Kapolei Heiau (Destroyed) Site 138, on Pu'u Kapolei hill. The stones from the heiau supplied the rock crusher which was located on the side of this elevation, which is about 100 feet away on the sea side. There was formerly a large rock shelter on the sea side where Kamapua'a is said to have lived with his grandmother (McAllister, 1933:108).

## 5. 'Ewa Coral Plains

McAllister also summarized how the coral plains of Honouliuli may have been used in earlier times:

Site 146. Ewa coral plains, throughout which are remains of many sites. The great extent of old stone walls, particularly near Puuloa Salt Works, belongs to the ranching period of about 75 years ago. It is probable that the holes and pits in the coral were formerly used by the Hawaiians. Frequently the soil on the floor of the larger pits was used for cultivation, and even today one comes upon bananas and Hawaiian sugar cane still growing in them. They afford shelter and protection, but I doubt if previous to the time of Cook there was ever a large population here (McAllister, 1933:109).

## D. Natural Resources

### 1. Flora

In the Botanical Assessment conducted within the project area, numerous foreign and invasive plant species were discovered. The assessment reported that the project area is characterized as a weedy grass land with scattered trees. 56 total species were recorded during the survey, 54 of which are introduced and two of which are indigenous. The dominant plant species recorded are non-native, including opiuma (*Pithecellobium dulce*), kiawe (*Prosopis pallida*), koa haole (*Leucaena leucocephala*), buffelgrass (*Cenchrus ciliaris*), Guinea grass (*Panicum maximum*), castor bean (*Ricinus communis*), common sandbur (*Cenchrus echinatus*), and Australian saltbush (*Atriplex semibaccata*). The indigenous plant species discovered near the project area include 'uhaloa (*Waltheria indica*) and a few 'ilima (*Sida fallax*) at the western end near Ka Makana Ali'i (LeGrande, 2019). Neither 'uhaloa nor 'ilima are currently identified as of environmental or conservation concern.

'Uhaloa is primarily a medicinal plant. The leaves, stems and roots were pounded, strained and used as a gargle for sore throats, which is a practice that continues today (Abbott, 1992).

## Existing Resources

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‘Uhaloa was also combined with other plants to create a tonic for young and older children, and seldom adults (Krauss, 1993). Canoe builders would also occasionally add the sap of ‘uhaloa to a concoction of kukui root, ‘akoko, and banana inflorescence to create a paint that would stain the hull (Krauss, 1993). This native weed remains abundant throughout the Hawaiian Islands, and is still treasured as a natural and safe tonic for bodily ailments today.

‘Ilima is a small to large native shrub that flowers in varying colors, including yellow, orange, green or red, and grows from near sea level to more than 6,000 feet. The flowers are roughly an inch across and are five-parted, growing solitary or in twos or threes together (Krauss, 1993); the flowers are very delicate and once picked, only last one day. The ‘ilima flower is primarily used to create lei, namely the ku‘i (sewn, joined) style, and is highly valued and prized. It takes 1,000 flowers to produce a single lei in the ku‘i style and the flowers are picked early in the morning when still unopened; these lei were once reserved only for royalty (Krauss, 1993). Ma‘o (*Abutilon grandifolium*) fruit, when green and soft, are used to form the ends of the ‘ilima lei. Lei makers may also use the calyx of the ‘ilima flower itself to form these ends on the lei. Additionally, the flowers are also used for medicinal purposes. In lā‘au lapa‘au, ‘ilima is used to make kanakamaika‘i, which can be used as a mild laxative for babies. In 1923, the Territorial Legislature named the ‘ilima the flower of O‘ahu and it is referenced in numerous songs and chants (Pukui and Elbert, 1986).

## 2. Fauna

An avifaunal field survey was conducted within the project area and a total of 629 individual birds were recorded during point counts, representing 22 species and 13 separate families. The only native species recorded during the survey was the kōlea or Pacific Golden-Plover (*Pluvialis fulva*) which is an indigenous migratory shorebird. No other native seabirds or land birds were discovered, although the native pueo (*Asio flammeus sandwichensis*) and several seabird species have the potential to overfly the site on occasion. The remaining 21 species are alien or feral (David, 2019).

## Existing Resources

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The kōlea is commonly found throughout Hawai‘i and is not threatened or endangered. The kōlea is a shorebird indigenous to the Hawaiian Islands. This long-distance travelling plover winters on the Main Hawaiian Islands from August through April, then migrates to Siberia and western Alaska to breed from April through early August (Mitchell et al., 2005). In the winter, kōlea resides on a variety of habitats including crop fields, coastal salt marshes, beaches, pastures, and grassy areas on both urban and undeveloped lands, so the project area can be ideal for the kōlea’s habitat needs.

Kōlea, among other birds, play an important role in many myths:

Birds are notably potential gods or spirit beings. In the machinery of romance migratory birds or those which nest in high cliffs are messengers for the high chiefs in the story. Thus plover (kōlea), wandering tattler (‘ūlili), tropic bird (koa’e), turnstone (‘akekeke) are sent by the divine chiefs of the story, generally in pairs, to act as scouts or to carry messages from island to island. The plover, accompanied by the tattler, remains in Hawaii or flies on south from August until the following May or June, when it migrates to Alaska for nesting, leaving behind immature birds and cripples (Beckwith, 1970:90).

The role of kōlea as messengers to the gods and divine chiefs is further outlined in the Kana mo’olelo, where the kōlea and ulili are sent by the Moloka‘i chief Kapepe‘ekauila to reconnoiter before battle (Beckwith, 1970:464).

Beckwith further explains the cultural importance of kōlea in the myth of Kolea-moku, “a man of ancient days who was taught the medicinal arts by the gods and was himself deified after death and worshipped in the heiau at Kailua”<sup>10</sup> (Beckwith, 1970:119). Beckwith clarifies that Kolea-moku may be another name for the ‘aumākua (family gods) of kōlea birds that are elsewhere referred to as Kumukahi, who “was able to take the form of a man or of a kolea bird at will” (Beckwith, 1970:120). One mo’olelo details the bird hunter Kumu-hana recklessly

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<sup>10</sup> This heiau referred to by Beckwith is believed to be located in Kailua, Kona on Hawai‘i Island rather than the Kailua that lies in the Ko‘olaupoko District of O‘ahu.

## Existing Resources

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killing the kōlea for sport, to which his neighbor, who worships Kumukahi, warns about the sacrilege. Kumu-hana does not heed his neighbor's warning, so Kumu-hana is attacked by a flock of plover, "who enter his house and peck and scratch him to death. The place where he lived is called Ai-a-kolea to this day" (Beckwith, 1970:137-138).

Although the kōlea has the potential to occur within the project area, its extremely large range and population size prevents it from entering Vulnerable status. Kōlea are protected under the Migratory Bird Treaty Act, which prohibits the taking, possessing, importing, exporting, transporting, selling, purchasing, bartering or any such offers of parts, nests or eggs of any bird listed under the Act.

A mammalian field survey was conducted concurrently with the avifaunal survey and only three terrestrial mammalian species were detected over the course of the survey: dogs (*Canis familiaris*), Indian mongoose (*Herpestes auropunctatus*), and cats (*Felis catus*). The sole endemic terrestrial mammal species of O'ahu is the Hawaiian hoary bat (*Lasiurus cinereus semotus*) or 'ōpe'ape'a, and this species was not detected during the survey (David, 2019).

### 3. Other Environmental Features

#### a. Rain Names

Akana and Gonzalez in *Hānau Ka Ua: Hawaiian Rain Names* explain the significance of the wind and rain in Native Hawaiian culture:

In the mind... of our Hawaiian kūpuna [ancestors], every being and every thing in the universe was born. Our kūpuna respected nature because we, as kānaka, are related to all that surrounds us – to plants and creatures, to rocks and sea, to sky and earth, and to natural phenomena, including rain and wind. This worldview is evident in a birth chant for Queen Emma, "Hānau ke ali'i, hānau ka ua me ka makani" (The chiefess was born, the rain and wind, too, were born). Our kūpuna had an intimate relationship with the elements. They were keen observers of their environment, with all of its life-giving and life-taking forces.

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They had a nuanced understanding of the rains of their home. They knew that one place could have several different rains, and that each rain was distinguishable from another. They knew when a particular rain would fall, its color, duration, intensity, the path it would take, the sound it made on the trees, the scent it carried, and the effect it had on people (Akana and Gonzalez, 2015:xv).

To the Native Hawaiians, no two rains are ever the same. Rain can be distinguished based on its intensity, the way it falls, and its duration, among other things. The following are a collection of rains that occur within Wailuku moku. Mo'olelo, 'ōlelo no'eau (traditional sayings), mele, oli (chants), etc., associated with the particular rain name are also provided to give insight into the importance and cultural significance that the different types of rains have to the Native Hawaiian people.

### ***i. Wa'ahila Rain***

Wa'ahila rain is associated with Nu'uaniu, O'ahu and is also found on other parts of O'ahu, including 'Ewa. Wa'ahila is also the name of a wind and ridge between Mānoa and Pālolo.

#### Rain of Hālawa, O'ahu

No laila, 'o mākou o ka Ahahui Hooikaika Kristiano holo'oko'a o ka ua Wa'ahila o Hālawa, 'Ewa, ma o ko mākou kōmike lā, ke komo pū aku nei e ka'ana pū i nā 'īnea o kēia mau lā 'eha'eha me nā mākua i ho'onele 'ia i ka lei 'ole, ka 'ohana a me nā pilikana me ke kau nui aku i maluhia mai ko kākou pu'uhonua a me ka ikaika mai.

*Therefore, we, on behalf of the entire Ahahui Hooikaika Kristiano of the Wa'ahila rain of Hālawa, 'Ewa, through our committee, join in sharing the hardships of these tragic days with the parents, family, and relatives who have been deprived of their children, with hopes for peace and strength from our refuge.*

## Existing Resources

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From a message of condolence from members of the Christian Endeavor Society. Note: “Pu’uhonua” or “refuge” probably refers to Jesus Christ (Akana and Gonzalez, 2015:272).

**Nani Hālawā i ka ua Wa’ahila**      *Hālawā is beautiful in the Wa’ahila rain*  
**Ke kīpū maila i luna o ‘Aiea**      *Remaining above ‘Aiea*

From George M. K. Aekai o Kuloloia’s response to a name, or riddle, printed in the newspaper *Kuokoa Home Rula* (Akana and Gonzalez, 2015:272).

### **ii. Kuahina Rain**

Kuahine or Tuahine is the rain primarily associated with Mānoa, O’ahu. However, it is also found in other parts of O’ahu, including ‘Ewa.

#### Rain of Kahui, Central O’ahu

He aha lā ka mea lena i uka o Kahui?  
He Kuahine lāua me ke Ki’owao

*What is expanding in the uplands of Kahui?*  
*The Kuahine and the Ki’owao.*

From a mele inoa, or name chant, for chiefs (Akana and Gonzalez, 2015:114).

The Ki’owao is a cool mountain rain that also brings wind and fog with it. Kahui, the place name mentioned in the mele inoa above, is located in Kalauao, ‘Ewa.

### **iii. Nāulu Rain**

Nāulu is a sudden shower that is associated with places throughout Hawai’i, including Kaupe’a, ‘Ewa. Nāulu is also the name of a shower cloud and a wind. In Hawaiian

epistemology, sudden showers are associated with the akua Lono, whose domain is that of agriculture.

#### Rain of Kaupe‘a, O‘ahu

‘A‘ole au e hele i ke kaha o Kaupe‘a	<i>I shall not tread Kaupe‘a’s expanse</i>
Kēlā kaha kūpā koili a ka lā i ke kula	<i>That stretch where the sun beats down on the plain</i>
Ua kūpono a‘ela ka lā i ka piko o Wākea	<i>The sun is right overhead, at the navel of Wākea</i>
Ola i ke ahe a ka makani māunuunu	<i>I am spared by the Māunuunu wind</i>
I ka hapahapai mai a ka makani ‘Ao‘aoa	<i>By the uplifting ‘Ao‘aoa breeze</i>
Ke koi lā i ke ao o ka Nāulu e hanini i ka wai	<i>Urging the Nāulu storm clouds to pour down their waters</i>
Ola ihola nā kupa kama‘āina i ka wai a ka ‘ōpua	<i>The natives here survive on water from the clouds</i>
Ke halihali a‘ela nā ‘ōpua i ke awa lau	<i>Which billowing clouds carry along to the branching lochs</i>

From a mele by Hi‘iakaikapoliopole as she traveled over the hot stretch of land near Pu‘uloa, O‘ahu (Akana and Gonzalez, 2015:195).

#### **b. Wind Names**

According to ancient Hawaiian legend, the descendants of La‘amaomao, the wind god, used his gourd to control the winds and cause the demise of their enemies. Pāka‘a and his son Kūapāka‘a, L‘amaomao’s descendants, control the winds by chanting the wind name, which recalls that particular wind from the gourd; each wind name is associated with an ahupua‘a or place. Pāka‘a passed on his knowledge of the wind names and gourd to Kūapāka‘a, who

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called on all of the winds to destroy the canoe fleet of Pāka‘a’s enemies in the Kaiwi Channel separating O‘ahu and Moloka‘i.

The following is an excerpt from the chant naming the winds of O‘ahu, focusing particularly on the wind names of ‘Ewa:

Moa‘e-ku is of ‘Ewaloa,  
Kēhau is of Wai‘ōpua,  
Waikōloa is of Līhu‘e,  
Kona is of Pu‘uokapolei,  
Māunuunu is of Pu‘uloa... (Nakuina, 1901)

According to this account, Moa‘e kū, Kona, and Māunuunu are the winds typically found in the ‘Ewa moku, particularly Honouliuli. Moa‘e kū is considered to be a foreign wind that blows from another land (He makani mai Kahiki mai). Moa‘e are trade winds and the Moa‘e kū is considered to be a very strong trade wind. Kona is the name of the wind associated with Pu‘uokapolei and this a famous leeward wind. Māunuunu is the name of a strong, blustering wind typically associated with Wai‘alae and Pu‘uloa.

In the epic tale, “Ka Mo‘olelo o Hi‘iakaikapoliopole,” Hi‘iaka offers a mele while traveling through the hot plains of Kaupe‘a in ‘Ewa:

‘A‘ole au e hele i ke kaha o Kaupe‘a	<i>I shall not tread Kaupe‘a’s expanse</i>
Kēlā kaha kūpā koili a ka lā i ke kula	<i>That stretch where the sun beats down on the plain</i>
Ua kūpono a‘ela ka lā i ka piko o Wākea	<i>The sun is right overhead, at the navel of Wākea</i>
Ola i ke ahe a ka makani māunuunu	<i>I am spared by the Māunuunu wind</i>
I ka hapahapai mai a ka makani ‘Ao‘aoa	<i>By the uplifting ‘Ao‘aoa breeze</i>



Thus, Hawaiian culture does not have a clear dividing line of where culture ends and nature begins” (Maly, 2001:1).

### 1. ‘Ōlelo No‘eau

‘Ōlelo no‘eau are another source of cultural information about the area. ‘Ōlelo no‘eau literally means “wise saying,” and they encompass a wide variety of literary techniques and multiple layers of meaning common in the Hawaiian language. Considered to be the highest form of cultural expression in old Hawai‘i, ‘ōlelo no‘eau bring us closer to understanding the everyday thoughts, customs, and lives of those that created them.

The ‘ōlelo no‘eau presented here relate to Honouliuli, Pu‘uloa, and the larger moku, ‘Ewa. These ‘ōlelo no‘eau are found in Pukui’s *‘Ōlelo No‘eau: Hawaiian Proverbs & Poetical Sayings* (1983). The number preceding each saying is provided.

80 ‘Āina koi ‘ula i ka lepo.

*Land reddened by the rising dust.*

Said of ‘Ewa, O‘ahu.

105 Alahula Pu‘uloa, he alahela na Ka‘ahupāhau.

*Everywhere in Pu‘uloa is the trail of Ka‘ahupāhau.*

Said of a person who goes everywhere, looking, peering, seeing all, or of a person familiar with every nook and corner of a place. Ka‘ahupāhau is the shark goddess of Pu‘uloa (Pearl Harbor) who guarded the people from being molested by sharks. She moved about, constantly watching.

123 Anu o ‘Ewa i ka i‘a hāmau leo e. E hāmau!

*‘Ewa is made cold by the fish that silences the voice. Hush!*

A warning to keep still. First uttered by Hi‘iaka to her friend Wahine‘oma‘o to warn her not to speak to Lohi‘au while they were in a canoe near ‘Ewa.

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274 E hāmau o makani mai auane'i.

*Hush, lest the wind arise.*

Hold your silence or trouble will come to us. When the people went to gather pearl oysters at Pu'uloa, they did so in silence, for they believed that if they spoke, a gust of wind would ripple the water and the oysters would vanish.

493 Haunāele 'Ewa i ka Moa'e.

*'Ewa is disturbed by the Moa'e wind.*

Used about something disturbing, like a violent argument. When the people of 'Ewa went to gather *pipi* (pearl oyster), they did so in silence, for if they spoke, the Moa'e breeze would suddenly blow across the water, rippling it, and the oysters would disappear.

1014 Ho'ahewa na niuhi ia Ka'ahupāhau.

*The man-eating sharks blamed Ka'ahupāhau.*

Evil-doers blame the person who safeguards the rights of others. Ka'ahupāhau was the guardian shark goddess of Pu'uloa (Pearl Harbor) who drove out or destroyed all the man-eating sharks.

1023 Ho'i aku la ka 'ōpua i ke awa lau o Pu'uloa.

*The horizon cloud has gone back to the lochs of Pu'uloa.*

He has gone home to stay, like the horizon clouds that settle in their customary places.

1126 Huhui na 'ōpua i Awalau.

*The clouds met at Pearl Harbor.*

Said of the mating of two people.

1330 Ka i'a hali a ka makani.

*The fish fetched by the wind.*

## Existing Resources

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The *'anaeholo*, a fish that travels from Honouliuli, where it breeds, to Kaipāpa'u on the windward side of O'ahu. It then turns about and returns to its original home. It is driven closer to shore when the wind is strong.

1331 Ka i'a hāmau leo o 'Ewa.

*The fish of 'Ewa that silences the voice.*

The pearl oyster, which has to be gathered in silence.

1686 Ke awa lau o Pu'uloa.

*The many-harbored sea of Pu'uloa.*

Pu'uloa is an early name for Pearl Harbor.

1698 Ke ho'i a'e la ka 'ōpua i Awalau.

*The rain clouds are returning to Awalau.*

Said of a return to the source.

1721 Ke kai he'e nehu o 'Ewa.

*The sea where the nehu come in schools to 'Ewa.*

*Nehu* (anchovy) come by the millions into Pearl Harbor. They are used as bait for fishing, or eaten dried or fresh.

2152 Mehameha wale no o Pu'uloa, i ka hele a Ka'ahupāhau.

*Pu'uloa became lonely when Ka'ahupāhau went away.*

The home is lonely when a loved one has gone. Ka'ahupāhau, guardian shark of Pu'uloa (Pearl Harbor), was dearly loved by the people.

## 2. Mele

## Existing Resources

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Honua Consulting completed a search of mele written about the ahupua'a of Honouliuli and its moku of 'Ewa.<sup>11</sup> Maui historian Inez Ashdown wrote in 1976 about the importance of mele:

The natives of Hawai'i Ne'i saw the Creator in everything and the Haku Mele or Music Masters delighted in presenting the chants and songs, mele and oli, to inspire the people. Such mele tell of God's assistant spirits which, to the imaginative natives, represented the winds, rains, and so on. Each spirit of creation was depicted as male or female and was given a personality and a name indicative of purpose. Hence the name of the volcanic action creating and cleansing the earth. She is beautiful, alluring, desirable. She also is unpredictable because she is temperamental and usually full of fiery emotions. She is an old woman asking help when she lies to test mortals, and woe betide anyone who is rude or inconsiderate of this form of an older person to whom respect and Aloha must be given (Ashdown, 1976:3).

### a. Pa'ahana

The following is a traditional mele and hula that tells the story of a young girl mistreated by her stepmother. She ran away from home to the hills above Waihawā where she lived on river shrimp and guava until she was found by a cowboy. She was taken to Mānana, the present site of Pearl City, located within the moku of 'Ewa (Elbert and Mahoe, 1970).

#### Pa'ahana (Busy) – Traditional

He inoa kēia nō Pa'ahana	This is a name song for Pa'ahana
Kaikamahine noho kuahiwi	The girl who lived in the hills
Mele he inoa no Pa'ahana	Namesong for Pa'ahana
Na'u i noho aku ia wao kele	I lived in the rain forests in

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<sup>11</sup> It should be noted that there are numerous mele about the larger 'Ewa area that have not been included in this assessment as they did not yield information closely associated with the project area.

Existing Resources

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<p>Ia uka 'iu'iu Waiawā Mele he inoa no Pa'ahana</p>	<p>The distant uplands of Waiawā Namesong for Pa'ahana</p>
<p>'Ōpae 'oeha'a o ke kahawai 'O ka hua o ke kuawa ka'u 'ai ia Mele he inoa no Pa'ahana</p>	<p>Clawed shrimps of the streams and Guava fruits my food Namesong for Pa'ahana</p>
<p>Mai kuhi mai 'oe ka makuahine A he pono kēia e noho nei Mele he inoa no Pa'ahana 'O kahi mu'umu'u pili i ka 'ili 'O ka lau lā' ko'u kapa ia Mele he inoa no Pa'ahana</p>	<p>Don't think about the mother I live here and am glad Namesong for Pa'ahana A single mu'umu'u clings to my skin My blankets are ti leaves Namesong for Pa'ahana</p>
<p>Pīlali kukui kau lā'au Lau o ke pili ko'u hale ia Mele he inoa no Pa'ahana</p>	<p>Kukui gum on the trees And pili grass my home Namesong for Pa'ahana</p>
<p>I hume iho au ma ka pūhaka I nalo iho ho'i kahi hilahila Mele he inoa no Pa'ahana</p>	<p>I bind my loins And hide my private parts Namesong for Pa'ahana</p>
<p>I ho'i iho ho'i au e pe'e 'Ike 'ē 'ia mai e ka 'enemi Mele he inoa no Pa'ahana</p>	<p>I came and hid but was Seen by the enemy Namesong for Pa'ahana</p>
<p>Lawe 'ia aku au a i Mānana Māka'ika'i 'ia e ka malihini Mele he inoa no Pa'ahana</p>	<p>I was taken to Mānana And visited by strangers Namesong for Pa'ahana</p>

	Tell the refrain
Ha'ina 'ia mai ana ka puana	A song, a name for Pa'ahana
He mele he inoa no Pa'ahana	Namesong for Pa'ahana
Mele he inoa no Pa'ahana	

**b. Pā'au'au Hula**

This mele was written by John U. Iosepa (lyrics) and Charles King (music) and dedicated to Hon. John F. Colburn, cousin of Lahilahi Webb, whose home was called Pā'au'au in remembrance of the pool in 'Ewa. Kūliaikanu'u is the motto of Queen Kapi'olani and the name of Mrs. Colburn. According to scholar Mary Kawena Pukui, the "neck lei" referred to in Verse 8, Stanza 2 means a "beloved child" (King, 1942).

**Pā'au'au Hula – by John U. Iosepa (Words) and Charles King (Music)**

Aia i ka i'a ha mau leo	There, where the silent fish is found
Ka 'i'ini, ka hali'a, ka ha'upu 'ana ka	The desire, the interest, the remembrance
Ha'upu a'e ana ka mana'o e 'ike	I yearn once more to see
E 'ike i ka nani o Pā'au'au o, Pā'au'au	To see the beauty of Pā'au'au, of Pā'au'au
E 'au'au ia wai kamaha'o	To bathe in that wondrous pool
Ia wai ho'oheno a ka malihini	The pool that delights visitors
Malihini ho'i ku'u 'ike ia 'oe	I was a stranger when I first saw it
Kama'āina no na'e i ke aloha	But became acquainted through friendliness
'O mai ka wahine nona ka lei	Answer, o lady whose lei song this is
Kūliaikanu'u e o mai	Kūliaikanu'u, answer
A Pā'au'au au 'ike i ka nani	At Pā'au'au I saw the beauty

## Existing Resources

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Ka waiho kāhela mai i ka la'i	Lying before me in the calm
I laila ho'ola'i ai nā manu la	There the birds paused
Miki'ala i ka nani o nā pua	Enthralled by the beauty of the flowers
He ua no 'oe ua ona ia	You are a very attractive flower
He lei 'ā'i no ke kūpuna	A neck lei for your ancestors
Ha'ina 'ia mai ana ka puana	This is the end of our song
Kūlia ka wahine noho i ke kapu	Kūlia is a woman who swells with kapu

### c. Pā'au'au Waltz

The following mele, written by John U. Iosepa, is also dedicated to Pā'au'au in reference to the home and pond on the Pearl City peninsula. "Moa'e," which appears in Verse 1, Stanza 2, is the ancient name for the trade winds; "i'a hāmau leo" (Stanza 4) was the way ancient Hawaiians searched for and harvested oysters (King, 1923).

#### Pā'au'au Waltz – by John U. Iosepa

Ha'aeo Pā'au'au i ka nani	Proud is Pā'au'au in its beauty
Kilikila i ka pai a ka Moa'e	Majestic is the stirring of the trade winds
E walea ana paha i ka 'olu	Delighting in the pleasant comfort
I ka ho'oheno a ka i'a hāmau leo	Cherished for the pearl oyster sought in silence
Pau 'ole ko'u ho'ohihi	My delight is boundless
I ka nani o Pā'au'au	For the beauty of Pā'au'au

## Existing Resources

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Na wai e 'ole ka 'i'ini	Who would not be desirous
Ua noho a kupa i laila	Having lived as a familiar of that place

Uluwehi wale ia home	That home is verdant and lush
Maka'ala i ke kai o Pōlea	Surrounded by the sea of Pōlea
Ho'olale a'e ana e ike i ka nani	Urging one to witness the beauty
O Pā'au'au	Of Pā'au'au

### d. Pūpū o 'Ewa

This final mele was written in honor of 'Ewa by an unknown composer. The mele was described in Elbert and Mahoe's *Nā Mele o Hawai'i Nei*:

...[it] is said to have been composed as part of a fund-raising campaign for the Ka-hiku-o-ka-lani Church (the seventh of the kings) at Pearl City. Ka-lā-kaua, the seventh monarch, for whom the church was named, helped build it.

The “news of the land” is the discovery of pearl oysters at Pu'u-loa, the Hawaiian name for Pearl Harbor. Ka-ahu-pāhau is the shark goddess who protected Pearl Harbor. Ka'ala, in the Wai-anae range, is the highest mountain on Oahu. Polea is a place at 'Ewa. In the chorus, *nu'a* and *naue* are sometimes replaced by *nuku* (mouth) and *lawe* (bring) (1970:87-88).

### Pūpū o 'Ewa (Shells of 'Ewa) – Traditional

<b>Hui:</b>	<b>Chorus:</b>
Pūpū (a'o 'Ewa) i ka nu'a (nā kānaka)	Shells of 'Ewa throngs of people
E naue mai (a e 'ike)	Coming to learn
I ka mea hou (o ka 'āina)	The news of the land
Ahe 'āina (ua kaulana)	A land famous
Mai nā kūpuna mai	From the ancient times

## Existing Resources

Alahula Pu'uloa he ala hele nō Ka'ahupāhau, (Ka'ahupāhau)	All of Pu'uloa, the path trod upon by Ka'ahupāhau
Alahula Pu'uloa he ala hele nō Ka'ahupāhau, Ka'ahupāhau	All of Pu'uloa, the path trod upon by Ka'ahupāhau
Nani Ka'ala hemolele i ka mālie Kuahiwi kaulana a'o 'Ewa E ki'i ana i ka makani o ka 'āina Hea ka Moa'e eia au e ke aloha	Beautiful Ka'ala, sublime in the calm Famous mountain of 'Ewa That fetches the wind of the land The tradewind calls, "here I am, beloved"
Kilakila 'o Polea noho i ka 'olu Ia home ho'ohihi a ka malihini E walea ana i ka 'olu o ke kiawe I ka pā kolonahe a ke Kiu	Majestic Polea in the coolness Home delighted to visitors Relaxing in the coolness of the kiawe And the soft blowing of the Kiu wind

### e. 'O Wau e Hele i ke Kaha o Pu'uloa

This mele was offered by Hi'iakaikapoliopole as she traveled through Pu'uloa in the story of Hi'iakaikapoliopole. This chant is used today by different organizations in 'Ewa in order to honor the traditions and places of Pu'uloa (*Ka Hoku o Hawaii*, 1927; translated by Kepā Maly).

O wau e hele i ke kaha o Puuloa I ka ohai o Kaupea la I ka la hoanoano-e, ua ike Ua ike aku la ka hoi au I ke kuahiwi mauna pali O Puukuua i Halehau O ke oho o ke kukui ehu I haa i ka la o Kanehoa Aloha wale na hoa-e	It is I who travel across the lowlands of Pu'uloa, Where the 'ōhai plants grow at Kaupe'a. A day of solitude, when one sees, I have indeed seen, The mountains and the cliff sides Of Pu'uku'ua at Halehau With the reddish budding leaves of kukui trees Dancing in the sun of Kānehoa Aloha to you, my companions.
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## F. Cultural Practices

### 1. Na Ala Hele (Traditional Trails)

#### a. The Path Traveled by Kamehameha I from Honolulu to Pu'uloa

When Kahekili died in ca. 1794, his son Kalanikūpule succeeded in rule. By May 1795, however, Kamehameha I and his forces invaded O'ahu and killed Kalanikūpule, taking control of all the islands except for Kaua'i and Ni'ihau (Chronology in *The Friend*, January 1878). The article below, published in 1883, describes events around a visit of Kamehameha I to Pu'uloa.

#### *The Daily Bulletin*

#### **Treason & Magnanimity, An anecdote of Kamehameha the Great.**

#### **September 3, 1883 (page 2)**

When Kamehameha conquered Oahu though he had firmly established himself all the chiefs had not reconciled themselves to his rule. Kamehameha however adopted the plan of making the women chiefs and not allowing their husbands to receive the taxes. He also selected the handsomest and smartest women as spies who used to report to him all that went on in their districts. One of these female spies reported to him that the chiefs of *Ewa*, *Waianae*, and *Waialua*, were conspiring against him and were to meet on a given night at *Puuloa* (Pearl River), then the favorite spot with the chiefs of those districts, to finally settle on their plans.

Kamehameha was then living at *Pulaholaho*, afterwards known as Charlton Square, the block now bounded by Merchant, Kaahumanu, Queen, and Nuuanu Street. It was then supper-time and he excused himself from supper and, taking his famous spear of peculiar make, *Ka ihe o Kamehameha*, the like of which no other Hawaiian had, he started off striking across the harbor at *Kapuukolo*

(near Emmes boat-building establishment,) to *Koholaloa*, along a fishpond wall to *Kulaokaiwiula*, (the plains near Kalihi), then swimming the *Kalihi* passage and wading till he came to *Ahua* (the sand beach below *Moanalua*), then to the Pearl River and swimming across to *Puuloa*. He thus made a bee-line from E. to W. over land and sea alone without a single attendant. Nothing stopped him. Here he went from *halau* to *halau*, (the *halau* is a large meeting house), until he came to the place where all the Chiefs were inside plotting treason against him. After listening long enough to learn all their plans he stuck his spear point downwards, in the sand about 4 feet from the door and returned as he came alone.

When the chiefs awoke next morning and went out they saw the spear. Said they, "The great chief has been here. Here is his spear. He knows all." So in accordance with the ancient Hawaiian custom of those who feared for their lives, they went to Honolulu and crawled in on their hands and knees into the presence of Kamehameha saying "*E ola au.*" (Let me live.) And Kamehameha granted their prayer and had the satisfaction of knowing ever after that they were faithful to him.

## 2. Fishing Traditions

### a. Fishing Right of Honouliuli in Pearl Loch

The following is excerpted from the Boundary Commission testimonies regarding the boundaries of the Honouliuli and Hō'ae'ae ahupua'a (Volume 1, 1873-1874). This passage details the Fishing Right within Honouliuli.

For reasons set forth at large in the record of the Commissioner, the Fishing Right is not awarded in the body of the Certificate of boundaries, but the finding of the Commissioner on the testimony presented, as well as by the assent of parties adjacent and in interest is set forth in this Supplement as follows, to wit.

The Fishing Right of Honouliuli covers the whole of “West Loch,” with the reservation to Hoaeae, Waikele (Exhibit the Ili of Auiole) and Waipio of the fishing opposite each to where the water is “chin deep” to a man, say five and one half feet deep, also cutting off the bight or inlet where the boundary of Waipio and Waikele cuts across from to **Kaulu** constituting the “Fishery of **Hoomakaia**.” The channel at the entrance of the Loch, as far up as **Pookela** point is divided equally between Honouliuli & Halawa.

Note: The map of survey presented [page 250] by the petitioner is the one executed by Prof. W.D. Alexander in the year 1873, and the award made conforms to said map.

In witness whereof I have hereunto set my hand at Honolulu, this 22d day of January A.D. 1874.

Lawrence McCully  
Commissioner of Boundaries, Oahu.

Honolulu, November 5<sup>th</sup> 1874

The petitioner in this case further asking that “Puuloa” a part or ili of this land, sold from it to Isaac Montgomery be included in this certificate and the proofs for this purpose being already of record, and this original certificate not yet issued.

I do hereby supplement the same, as follows

viz. Instead of Course 31 as above, read thus

31. Oneula to Puuloa trig Station, at windmill N. 69° 41’ E. 18720 ft; thence along shore to stone pillar at Kahuka N. 22° 20’ W. 10010 ft.

Area of Puuloa 2610 acres

Total area of Honouliuli 43,250 acres

Lawrence McCully

Comr. of Boundaries. [page 251]

**Hō‘ae‘ae Ahupua‘a (with Honouliuli)**

[From boundary of Honouliuli]

1. The boundary between this land and Hoaeae was first surveyed by J. Metcalf May 29, 1848, and the “Kula” of Hoaeae was awarded to L. Rees by this survey.

See Award 193, Volume 1, p. 536.

...Fishery of Hoaeae. The testimony of the kamaainas is that the fishery extends to the depth of a man’s chin, opposite this land. Mr. Robinson & Mr. Coney agree to this and that outside of that the fishery belongs to Honouliuli. The award of Hoaeae does not include the Kai. The makai, cultivated part of Hoaeae and the Kai or fishery were granted to Namaau by R.P. 4490 for M. Kekuanaoa. The survey by A. Bishop is not copied into the R. Patent; the Patent being without metes & bounds. [page 244]

The red line indicating the fishery of Hoaeae, conforms to Mr. Bishop’s survey, and is agreed to by Mr. Robinson as representing their rights of fishing... [page 245]

[From Boundary of Waikele]

Ap. 1 – he aina Kalo me ke kula ma Apokaa.

Par. 1. – a Taro land on the flats of Apokaa.

Aia i ke kihi Komohana o keia aina pili ana me “Hoaeae”, ma ka 4 o na pohaku e waiho lalani ana ma kahakai ua hoailona mua ia pea X. Alaila e kuhikuhi i ka palena kai hema 66° 3/4 Hikina e au iho ana i kai ma **Aole i pau kuu loa** me ka palena kai o Honouliuli a hiki i kahi i kapa ia o **Pau Kuu Loa** e pili ana me ka palena kai o Honouliuli. Alaila, ma kela pohaku X, Akau Kom. kaulahao ma Hoaeae a hiki i ka **poh. Moko-moko** ma ke alanui Aupuni. ... [page 156]

The Western corner of this land is there adjoining with “Hoaeae,” where four stones form a line situated on the shore, with the first boundary marked X. Then the boundaries are pointed out from the shoreline South 66 ° 3/4 East jutting out in the fishery of Honouliuli to the place called Pau Kuu Loa, adjoining with the shore boundary of Honouliuli. Then from that stone marked X, North West xx chains along Hoaeae to the stone Mokomoko along the Government road...

#### **b. Honouliuli-Pu’uloa Fisheries**

The fisheries—those along the shore of the open ocean and in Keawalau o Pu’uloa (now Pearl Harbor) and along the shoreline—were among the highly valued resources of Honouliuli Ahupua’a. With the transition in land tenure and land use that occurred following 1848, native residents of Honouliuli were steadily denied access to the traditional fisheries. Conflicts arose between Hawaiians seeking to maintain customary practices and the restricted access imposed by new land owners.

##### ***i. Poino! (Distress!) – Hawaiians Denied Access to the Honouliuli-Pu’uloa Fisheries***

Mose, a native of Honouliuli, presented a public account of the distress that he, Isaaka and Makahanohano endured in being denied access to the shore along Ke Awalau o Pu’uloa by a foreign tenant of the land, and ask the King if this action was authorized by him.

#### ***Ka Hae Hawaii***

**Nowemapa 25, 1857 (aoao 139)**

E ka Hae Hawaii e. Aloha oe:— Ka mea e holo ana ma na kahi eha o ke aupuni Hawaii, he hoa kuili oe o ka poe imi noonoo, he ipo manuahi oe o ka poe ike. He wahi mea ka'u e hai aku nei ia oe, a nau ia e hai aku i ka poe imi noonoo a pau o ke aupuni Hawaii.

Eia ua wahi mea la. la makou i hoomaka ai e holo maluna o ka waapa mai Honouliuli aku a hiki i kahi i kapaia o Keawalau o Puuloa, pa mai la kahi makani ma kai mai, he maunuunu ko ke kaha, he olauniu ko Waikiki, he kukalahale ko Honolulu, hoohuli pono ae la makou i ka ihu o ka waapa me ka manao e holo aku i Honolulu i ke kuai ia, loa ia iho la makou i ka poino. Eia no ia, ninau mai la kekahi haole ia makou, o Aigate kona inoa, Owai keia waapa? Hai aku la makou, O makou no. Ninau hou kela ia makou, Owai ka inoa? Hai hou aku la makou, O Mose, Isaaka, Makahanohano. Pane hou mai kela ia makou, Go way; be off kanaka. O ke kani koke mai la no ia o ka pu, a pee iho la makou i ka waha o ka waapa, hehelei iho la ka lu iluna o makou, kani hou mai la ka pu, hehelei hou iho la ka lu. Kena aku la au i ko'u mau hoa e hoe aku i ka waapa, aka, aole e hiki; no ka mea, ua loa makou i ka pilikia; aka, no ka ikaika ana mai o ka makani ma kai mai, huki pono mai la makou i ke kaula, pei mai la i ka pei, poho aku la ka pea i ka makani, o ka holo aku la no ia o makou, a pakele makou i keia pilikia.

E! nani ke aloha o ko kakou Haku i ka lani, ka mea kokua i ka poe poino, nana no i hoopakele mai ia makou mai loko mai o keia popilikia.

Ninau.

Ina ua ae ia e ka Moi a me kona lalo iho, a i ole ia, e na makaainana paha e noho ana malalo iho o ka Moi, kona ki wale ana aku i kela kanaka keia kanaka, alaila ua pono; aka, ina aole, e hiki no ia'u ke hoopii e like me ke kanawai o ka aina.

Mose.

Honouliuli, Ewa, 18 Nov., 1857

**Summary – Poino! (Distress)**

We departed from Honouliuli in our boat and arrived at the place called Keawalau o Pu'uloa, when a wind arose from the shore. It was the māunuunu of the coastal region – the 'ōlauniu is of Waikīkī, and the kūkalahale is of Honolulu. We turned the bow of our boat, intending to go to Honolulu to sell our fish, that is when we ran into trouble. A foreigner came up to us and asked whose boat is this, his name was Isaac<sup>12</sup>. We told him it was ours. He then asked our names and we told him, Mose, Isaaka and Makahanohano. He then told us, “Go away, be off, Hawaiians. He then shot at us, and we quickly tried to hide in the bow of our boat. We tried to push off, but because of the wind from the sea, we had a difficult time. We finally got the sail up and we were able to get away from the trouble.

Say, the love of our Lord is beautiful, the one who helps those in need, and who rescues us from our troubles.

Question.

Did the King agree to this being done by those below him, or not. The commoners live below the King, and it is he who determines what is right for each man. I will seek to prosecute this pursuant to the law of the land.

Mose.

Honouliuli, 'Ewa. Nov. 18, 1857.

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<sup>12</sup>Isaac Montgomery purchased the 'ili of Pu'uloa from chiefess M. Kekau'ōnohi in 1849. Later in 1858, Levi Ha'alelea brought suit against Daniel Montgomery (brother of Isaac) in the matter of fishery rights at Honouliuli (Hawaiian Supreme Court Report, 1857-1865:62).

*ii. Supreme Court Proceedings (1858)*

**The Puuloa Fishery of Honouliuli  
Supreme Court—In Banco  
January Term—1858  
Levi Haalelea vs. Daniel Montgomery**

By the laws of 1839, as subsequently amended by the organic acts of 1846, the entire fishing ground, lying between low water mark and the outer edge of the coral reef, or kuanalu, along the seaward front of an ahupuaa of land, is the private property of the landlord or konohiki, subject always to certain piscatorial rights of the tenants or hoaainas.

The defendant's brother having received from the konohiki a conveyance of a portion of land of the ahupuaa of Honouliuli, by metes and bounds, but not including any portion of the fishing ground adjacent; it was held, that he acquired a common right of piscary as a tenant or occupant of the ahupuaa, appurtenant to the land purchased, and subject always to the rights of the grantor.

It would not have been in the power of the landlord to grant an exclusive right of fishery in the fishing ground, adjoining the land in question, and it [page 62] was doubtful said landlord could, convey her rights therein, so as to divide the fishery into two or more parts. without infringing on the rights of the tenants.

Where the exact legal signification of the terms of a deed could not be expressed in Hawaiian without great deal of difficulty, recourse was had to the English original.

Justice Robertson delivered the decision of the Court as follows:

The plaintiff brings his action for the purpose, of determining certain rights of fishery, now in dispute between him and the defendant, and also to recover damages from the defendant for having prohibited and prevented the plaintiff and his people, and others occupying certain lands under him, from taking fish on the fishing ground lying to seaward of defendant's land, at Puuloa, on this island.

It appears, from the evidence presented to the Court, that the land now held by the defendant, is a portion of the large ahupuaa of "Honouliuli," and was purchased, in the year 1849, by defendant's brother, Isaac Montgomery, from the late high chief, M. Kekauonohi, then a widow, who died in the year 1851, leaving the land of "Honouliuli," together with other property by will, to her second husband, the plaintiff in this action. The conveyance from M. Kekauonohi to Isaac Montgomery, was executed in the Hawaiian and English languages, and reads as follows in English:

"Warranty Deed.

Know all men, by these presents, that I, Kekauonohi, of Honolulu, Island of Oahu, for and in consideration of the sum of eleven thousand dollars, to me this day paid in hand by Isaac Montgomery, also of Honolulu, Island of Oahu, the receipt of which is hereby acknowledged, do grant, bargain, sell, and by these presents convey unto him, the said Isaac Montgomery, and to his heirs, executors, administrators and assigns, forever, all that certain lot of land, situated in the Island of Oahu, aforesaid, and described as follows:

Commencing at mauka north corner or point of this land at place called Lae Kekaa, at bend of Pearl River, and running along edge of Pearl River, makai side, taking in three fish ponds called Pamoku, Okiokilipi and Paakule to open sea, thence following [page 63] along the edge of the sea (reserving all the reef

in front) to end of stone wall by sea, in land called Kupaka, at the makai west comer of this land, thence running north 25° E. 283, direct to place of commencement, including an area of acres 2,244 as per plot hereto annexed.

“To have and to hold, the above conveyed premises and all the tenements and hereditaments situate thereon, with this my covenant and warranty and lawful seizers, unto the said Isaac Montgomery, his-heirs, executors and administrators and assigns forever.

“In witness whereof, the said party, Kekauonohi, has hereunto set her hand and seal at Honolulu, this 7th day of September, A.D. 1849.

“M. Kekauonhi. [L. S.]

Executed in the presence of Frank Manini."

It is admitted that defendant is now the owner of the property, originally conveyed to his brother by the foregoing deed. The Court also understood the defendant to admit that he had prohibited the plaintiff and his people from taking fish on the place in controversy. And it is admitted by the plaintiff that, from and after the execution of the deed by M. Kekauonohi, she withdrew her Luna from Puuloa, and ceased to take or taboo any fish on the reef opposite defendant's land, up to the time of her death, and that, until recently, Haalelea never asserted, any right or claim to take fish on said reef.

Upon this state of facts, the defendant claims to have, under a proper construction of the conveyance before recited, and the statutes of this Kingdom, an exclusive right of piscary, in the fishing ground lying opposite the land embraced in the deed; and the plaintiff on his part, claims the same exclusive right for himself and his tenants living on "Honouliuli" as against the defendant and all others living on the land covered by the conveyance, or in

other words, that the defendant did not acquire by his purchase, a right to take fish anywhere outside of the boundaries of the land conveyed to him, and that the people living on that land after the date of the deed, ceased to be tenants of the Ahupuaa of "Honouliuli," and so lost their rights to piscary, under the laws of the land.

In order to a right decision of this controversy it would seem [page 64] to be necessary in the first place, to ascertain and define what were the rights of piscary possessed by M. Kekauonohi, as Konohiki of the Ahupuaa of "Honouliuli," at the time she made the conveyance, to Isaac Montgomery. To do this it is unnecessary to inquire what were the respective rights of piscary enjoyed by the Konohiki and the common people, in ancient times, because since the year 1839 those rights have been regulated and defined by written laws,

At page thirty-six of the English version of the old laws, will be found an enactment on this subject, which commences in the following words: "His Majesty the King, hereby takes the fishing grounds from those who now possess them, from Hawaii to Kauai, and gives one portion of them to the common people, another portion to the landlords, and a portion he reserves to himself.

These are the fishing grounds which His Majesty the King takes and gives to the people: the fishing grounds without the coral reef, viz: the Kilohee grounds, the Luhee ground, the Malolo ground, together with the ocean beyond.

But the fishing grounds from the coral reefs to the sea beach are for the landlords, and for the tenants of their several lands, but not for others."

This is the point at which the existing piscatory regulations of the Kingdom had

their commencement, and since which, ancient custom ceased to govern the subject. His Majesty Kamehameha III, as supreme lord of the islands, and having in himself the allodium of all the lands in the Kingdom, did at that time, with the concurrence of the Chiefs, resume the possession of all the fishing grounds within his dominions, for the purpose of making a new distribution thereof, and of regulating the respective rights of all parties interested therein, according to written law.

The fishing rights of both the Konohikis and the hoainas were defined and regulated by the law of 1839, which was at different times amended in some particulars, until the passage of the organic Acts in 1846, when those rights were again defined by article 5th, of chapter 6th, part first, of the Act to organize the Executive Departments. (See 1st Vol. Stat. Laws, pp. 90 to 92, Secs. 1 to 7.)

The part of the law to which it is [page 65] necessary to have reference more particularly in the present case, reads as follows:

"Section 2. The fishing grounds from the reefs, and where there happen to be no reefs from the distance of one geographical mile from the beach at low water mark, shall in law be considered the private property of the landlords whose lands, by ancient regulation, belong to the same, in the possession of which private fisheries, the said landlords shall not be molested except to the extent of the reservations and prohibitions hereinafter set forth.

"Section 3. The landholders shall be considered in law to hold said private fisheries for the equal use of themselves and of the tenants on their respective lands; and the tenants shall be at liberty to use the fisheries of the landlords, subject to the restrictions in this article imposed."

The four succeeding sections of this law, which we deem it unnecessary to cite at length, define and guard the rights of the konohikis, in relation to their reserved or tabooed fish, and contain certain provisions to protect the rights of the tenants or hoainas, from unjust restrictions and exactions.

Under this statute, as we, understand it, the entire fishing ground, lying between low water mark and the outer edge of the coral reef, (or Kuanalu, as it is called in the Hawaiian version) along the seaward front of the Ahupuaa of "Honouliuli," was private property of M. Kekauonohi, possessed and held by her as such, subject to the piscatorial rights of the tenants living on that Ahupuaa. On this ground she had a common right of piscary with the tenants of "Honouliuli," or she was at liberty, if she saw fit, to taboo or set apart annually, one particular species of fish for her own private benefit, as provided in section 4th, or in lieu of this, she might on consultation with the tenants, as provided in section 7th, make an arrangement whereby she would be entitled to receive one third part of all the fish caught on the ground.

Such were the rights of M. Kekauonohi in the premises at the time when she executed the deed to Isaac Montgomery, and the next question is, what portion, if any, of those rights did she thereby convey to him, or did he, by operation of law, acquire any rights of piscary on the ground in question, upon receiving that conveyance? [page 66]

It is contended, on the part of the defendant, that by a fair construction of the descriptive part of the deed, it must be held to extend to deep water at the outer edge of the reef, thereby including all that part of the Konohiki's fishing ground lying opposite to the land conveyed to Isaac Montgomery. It is said that the expression, "to open sea," must be understood to mean, "to deep water outside of the reef," in contradistinction to the shallow water upon the reef, between the breakers and low water mark, and that the expression, "following along

edge of sea,” means following along the edge of deep water, outside of the reef. If this is correct, then unquestionably, the grantor conveyed away all her right and title to the fishing grounds, as well as to the dry land. But it seems very clear that this construction cannot stand without falsifying the obvious meaning of the descriptive language which follows. For if “open sea” means the deep water outside of the reef, and “edge of the sea” means the edge of such deep water, the stone wall which is described as being by sea, in land called Kupaka, must have extended out to the seaward edge of the reef, a proposition which has not been asserted in argument, and which, on reference to the plan annexed to the deed, appears to be conclusively negative. So the expression “reserving all the reef in front,” would seem to be inconsistent with the idea that the line ran along the outer edge of the reef, for in that case there would be no reef in front of the line. That the line ran along the inside of the coral reef, seems to us clear from the language used in the Hawaiian version of the deed, which reads as follows: “Aole nae e hookomo ana i ka papa koa mawaho.” We should translate this expression, “not including, however, the coral reef outside.” Again, the last line of the survey is described as running from the end of the stone wall, north 25 ° east, by compass, 283 chains, to the place of commencement, and it is not pretended that this line extended out to the outer edge of the reef. If such is the case, it is a fact that could be readily ascertained by measurement. But the surveyor’s plan clearly indicates the reverse. It is very evident, then, that no part of the fishing ground is included within the surveyed metes and bounds of the property conveyed to Isaac Montgomery. [page 67]

But, it is argued by defendants. counsel, that M. Kekauonohi’s right of piscary in the fishing ground in question, passed to Montgomery as an appurtenance to the land, by virtue of the clause which, in the Hawaiian version of the deed, reads thus: “A me na mea paa a pau e waiho ana maluna iho, a me na mea e pili pono ana,” and in the English version, thus: “And the tenements and hereditaments situate thereon.” It is said that the words, “a me na mea e pili

pono ana,” are sufficiently broad in their signification to carry everything appurtenant to the land embraced In the conveyance, and that the Court ought to regard the Hawaiian version of the deed as controlling, wherever their appears a difference between that and the English for two reasons: First— Because the grantor herself was a native, and a person of intelligence, and must, therefore, be presumed, to have intended to convey whatever would pass under the words of the deed, as expressed in her own language; and, secondly, because the Court has decided in several previous cases that, in construing the statutes of the Kingdom, which are enacted in both languages, wherever an irreconcilable difference exists between the two versions, the Hawaiian must govern. On the other hand, it is argued that the grantee, who is an Englishman, received the deed in both languages, thus accepting the English version as the exact counterpart of the Hawaiian; and that, therefore, he and, those claiming under him, should be bound by the English version; that the deed in both versions form but one instrument, and that if the language of: the one is altogether inconsistent with that of the other, which, however, is not conceded, the proper course would . be to declare the instrument void for uncertainty.

This involves a question of considerable magnitude, the decision of which may affect the rights and interests of many individuals throughout, the Kingdom. After careful reflection upon the point, we are of the opinion that it would be both unsafe and unreasonable, for the Court to hold that the Hawaiian, and not the English version, should control in this instance, if the difference contended for by the defendant does really exist, which, we think, is not clear. It is true this Court has repeatedly ruled, as stated by the defendant, that, in the case of an, irreconcilable difference between the Hawaiian and [page 68] English versions of a statute, the former shall control (See Metcalf vs. Kahai, 1st Haw. Rep., p. 225; Hardy vs. Ruggles et als., ibid, o. 255.) But it seems to us that the same considerations which constrained the Court so to decide in that case, do not exist in the present instance. The deed before us, with the exception of those

parts of it which are descriptive, consists of a printed formula, in the two languages, which has been extensively used here, in dealings between natives and foreigners, since the enactment of laws requiring conveyances of real estate to be made in writing. The English version of this formula is, of course, the original, and the Hawaiian merely a translation. There do not exist in the Hawaiian language, two words which would exactly represent the two English words tenements and hereditaments. The exact legal signification of those terms could not be expressed in Hawaiian without great difficulty, and therefore words, which if used in some other connection, or under other circumstances would convey a widely different meaning, have, when used in the printed formula of conveyance now before us, been accepted by the general consent of natives and foreigners using such formula, as meaning precisely the same things, and neither more or less than those two legal terms. So far then as purely legal phraseology, or words or technical import, are concerned, it would seem to us both unsafe and unreasonable, to hold that the Hawaiian translation, and not the English original, should govern, when a question arises upon the construction of any part of the deed, where such legal or technical language is used. Such a course would unbar the door to endless litigation and fraud, and involve our courts in a maze of uncertainty.

It is contended, further, on the part of the defense, that the conduct of the grantor, in withdrawing her luna from Puuloa, at the time of her execution of the conveyance, and in subsequently, up to the time of her death, forbearing to take or taboo any fish on the reef opposite the land sold to Montgomery, and the like forbearance on the part of the plaintiff, for several years, afterwards, are strong evidence in favor of the defendant, and facts from which it may be fairly inferred that M. Kekauonohi intended to grant away tile fishing ground, or, at least, all her rights in the fishery. To this it is replied, that such a [page 69] grant cannot be inferred from circumstances, or from the conduct of the grantor, but must be found, if at all, in the express language of the deed.

As to the fact of her withdrawing her luna from Puuloa, after the sale of that land to Isaac Montgomery, we consider it a natural consequence of the sale, and of slight significance as to any bearing it may be supposed to have upon the disputed question of the fishery. If, however, there was any doubt as to the grantor's intentions, arising from the use of unusual or ambiguous language, then, the fact of her subsequent forbearance to take or taboo fish; upon the place in question, might be regarded as evidence tending to sustain the construction contended for by the defendant. But, it is clear to our minds, for the reasons already stated in remarking upon the descriptive part of the deed, that she did not intend to include therein, or to convey thereby, any part of the fishing ground to Montgomery; nor did she convey to him her individual rights of piscary, under the words, "tenements and hereditaments situate thereon."

None of the rights of piscary possessed by M. Kekauonohi as owner of the fishery, could have passed as a mere appurtenance to the piece of land conveyed to Isaac Montgomery. She could have transferred the fishery, or her right therein, only by an express grant, eo nomine. Had she made a deed even of the whole Ahupuaa, by metes' and bounds, not including the fishery, nor expressly naming it in the conveyance, it is doubtful if either the fishery or her right therein would have passed to the grantee.

Again, if the grantor had conveyed the fishery, or her individual rights therein, by name, to Isaac Montgomery, that would not have conferred upon him the exclusive right which is now set up by the defendant, because M. Kekauonohi herself was not possessed of an exclusive right. It may even be doubted whether she could have conveyed away the portion of the fishing ground lying opposite to Puuloa, or her special rights therein, so as to divide the fishery, without infringing on the rights of the tenants living on "Honouliuli." Certainly if her grantee had tabooed one kind of fish, on his part of the ground, while she

tabooed another kind upon the other part, the rights [page 70] of the tenants would have been violated. And if she could have divided the fishing ground into two parts she could have divided into twenty, and so have rendered the rights of the tenants worthless.

But, while we are clearly of the opinion that M. Kekauonohi did not convey any part of the fishing ground, or of her individual rights therein, to Isaac Montgomery, we are also of opinion that, when he received a conveyance of a portion of the Ahupuaa of "Honouliuli," he acquired along with it a common right of piscary in the fishing ground adjacent. That is to say, he became, for the purposes of the law, governing this subject, a tenant of the Ahupuaa, and as such entitled to take fish in the sea adjoining. We understand the word tenant, as used in this connection, to have lost its ancient restricted meaning, and to be almost synonymous, at the present time, with the word occupant, or occupier, and, that every person occupying lawfully, any part of "Honouliuli," is a tenant within the meaning of the law. Those persons who formerly lived as tenants under the Konohikis but who have acquired fee simple title to their kuleanas, under the operation of the Land Commission, continue to enjoy the same rights of piscary that they had as hoainas under the old system. (See Joint Resolution on the subject of rights in lands, etc., Vol. 2, Statute Laws, p. 70.) If any person who has acquired & kuleana on the Ahupuaa of "Honouliuli," should sell and convey his land, or even a part of it, to another, a common right of piscary would pass to the grantee, as an appurtenance to the land. In that case it would not be necessary, we apprehend, to mention the right of piscary in the conveyance—it would pass as an incident. (See Kent's Com., Vol. 4, p. 517; Comyns's Digest, Vol. 4, title Grant E. 11.) Here, we think, is the great distinction between the rights of the Konohiki, and those of the tenant or occupant, for, while the former holds the fishery as his private property, the latter has only a right of piscary therein, as an incident to his tenancy. This marked distinction in their respective rights must create a corresponding

difference in regard to the transfer of those rights.

As the conveyance, by the owner of a kuleana, of a part of his land to another, would create such a tenancy in the grantee [page 71] as would entitle him to a common right of piscary, so, in our opinion, the conveyance to Isaac Montgomery, by M. Kekauonohi, of a part of the Ahupuaa, created such a tenancy, as carries with it, as an appurtenance thereto, under our laws, a common right of piscary; subject, always, to the rights of the grantor, and her legal representatives.

No specific damage having been proved by the plaintiff we think he is only entitled to recover nominal damages.

Let judgment be entered for the plaintiff, as of the last day of term, in the sum of five dollars damages, together with the costs of suit.

A. B. Bates, Esq., for the plaintiff.

J. Montgomery, Esq., for the .defendant.

January, 1858. [page 72]

### ***Ka Hae Hawaii***

**Olelo Hooholo a ka Ahakiekie. O Levi Haalelea kua Daniel Montgomery.**

### **Apelila 14, 1858 (aoao 6)**

Hoakaka ae la ka Lunakanawai o Robertson i ka manao hooholo o ka Aha, penei:

Ke hoopii mai nei o Haalelea, i mea e maopopo ai ke kuleana o ka honu ia ana i hoopaapaia e ka mea kua e D. Montgomery, a e loa paha ia ia kona poino

no kona hoole ia aole make hopu ia ma kauwahi o Montgomery, ma Puuloa i Oahu nei.

Mamuli o ka hoike ana, o ka aina o D. Montgomery, ka mea kue, he wahi apana ia o ka ahupuaa o “Honouliuli,” a ua kuaiia e Isaac Montgomery ke kaikuana o ka mea kue, i ka makahiki 1849, no M. Kekauonohi mai, ia manawa, he wahine kane make oia. a mahope iho, i ka makahiki 1851, make oia, me ka waiho ana i ka aina o “Honouliuli” a me na waiwai e ae i kana kane mare hou a oia ka mea hoopii ma keia hookolokolo ana, O ka palapala hoolilo aina a M. Kekauonohi ia Isaac Montgomery, ua kakauia ma na olelo Hawaii a me ka Beritania, a o Frank Manini ka hoike.

Eia na mea i aeia e na aoao elua:

Ua aeia o D. Montgomery, oia ka mea nona ka aina i keia wa e noho nei.

Ua ae mai hoi o D. Montgomery, ua hookapu oia ia Haalelea a me kona poe, aole make hopu i ka ia ma kahi i hoopaapaia.

Ua ae mai noi o Haalelea, mai ka wa i kakauia i ka palapala hoolilo aina e M. Kekauonohi, ua pau ka noho ana o kona luna ma Puuloa, a hooki hoi i ka lawaia a e hookapu ia ma ke kohola e ku pono ana i ka aina o D. Montgomery, a make o M. Kekauonohi. a o Haalelea hoi, aole oia i hoike mai i kona manao e hopu i ka ia ma ia wahi, a i keia manawa iho nei.

A mamuli o keia mau mea, manao ae la o D. Montgomery ia ia pono wale iho no ke kuleana hopu ia ma kahi e ku pono ana i kona aina. A manao ae la hoi o Haalelea ia ia pono wale iho no a me kona poe e noho ana ma “Honouliuli” ke kuleana e hopu ia ma ia wahi; no ka mea, i kona manao, aole i loa ia D. Montgomery ke kuleani hopu ia mawaho ae o na mokuna o ka aina ana i kuai ai me Kekauonohi.

I ko kakou hoomaopopo ana i ka mea nona ka pono a me ke kuleana o ka hopu ia ana. he pono ke heluhelu i ke kanawai.

Ma ka aoao 36 o ka buke Kanawai mua, olelo Beritania, penei ke kakauia ana: “Ke lawe nei ka Moi o ke Alii nui i na wahi ia noloko ae o ka lima o ka poe i loa, mai Hawaii a Kauai, a. Ke haawi hou aku i kekahi hapa na na kanaka, a i kekahi hapa na na konohiki, a i kekahi apa hoi nana pono no.

Eia na wahi ia a ka Moi e haawi nei na na kanaka, o na wahi mawaho ae o ka Puukoa, penei, o na wahi Kilohee, o na wahi Luhee o na wahi Malolo, a me ka moana mawaho ae.

A o na wahi ia mawaena ae o ka Puukoa a me ke kahakai, na na konohiki ia a me na kanaka o ko lakou aina aole no na mea e ae.”

A mai ia wa mai o ke kuleana hopu ia o ka wa kahiko, ua pau i keia manawa he kanawai i kakauia.

Ma ke kanawai o ka makahiki 1839, o ke kuleana o na konohiki a me na hoaina ua hooonoponoia ma kauwahi, a pela no a hiki i ka makahiki 1846, a malaila ua hooonopono hou ia. E nana i ka buke mua aoao 90 a hiki 92. pauku 1 a hiki 7. Eia na pauku pili pono:

“PAUKU 2 O na wah ia, no na puukoa aku, a ina aohe puukoa, hookahi no mile no ke kahakai aku, ma ke hapawai, oia no ke kuleana pono no o na konohiki no na ka aina e pili ana ma ke ano kahiko, aole e mea ia i na konoliiki i ko lakou kuleana hopu ia, aia mamuli o na kanawai e kau ia mahope.

“PAUKU 3. I ka mamio o ke kanawai, no na konohiki no ka hopu ia ana no lakou

iho a me na hoaina ma ko lakou aina iho; a e hopu no na hoaina i ka ia o na konohiki malalo nae o na mea i oleloia ma keia kanawai.”

Mamuli o keia kanawai, o na wahi hopu ia a pau, e moe ana mawaena o kahakai a me kuanalu makai aku o ka ahupuaa o “Honouliuli,” oia no ke kuleana pono o M Kekauonohi, nona no malalo nae o na kuleana o na hoaina e noho ana ma ia ahupuaa

Oia na kuleana o M. Kekauonohi i kona wa i kekauia‘i ka palapala hoolilo aina ia Isaac Montgomery; a eia ka ninau ua loa anei ia ia, ia L Montgomery, kahi kuleana hopu ia ma ia wahi, i kela palapala hoolilo aina?

Ma ka aoao o ka mea kua, o D. Montgomery, manao oia e holo ana kona aina a i ke kai hohonu mawaho ae o ka papakoa e hookomo ana i kauwahi ia a pau o ke konohiki e kupono ana i ka aina i lilo ia Isaac Montgomery. Ua oleloia, okoa ke kai hohonu, okoa hoi ke kai papau mawaena o ke kuanalu a me kahakai. Aka, ua maopopo aia ka mokuna oia aoao, aia no maloko ae o ka papakoa; no ka mea, penei ka olelo ana: “aole nae e hookomo ana i ka papakoa mawaho.” Nolaila, ua maopopo ia makou aole i komo kauwahi hopu ia iloko o ka aina i ana ia a i hooliloia ia Isaac Montgomery.

A olelo mai la ka loio o D. Montgomery. Ua lilo ae la ke kuleana ia o M. Kekauonohi ia D. Montgomery me he mea apana la o ka aina ma keia olelo ana, a me na mea paa a pau e waiho ana. maluna iho, a me na mea e pili pono ana, aka, a ko‘u manao, aole e pili pono kela mau huaolelo i kauwahi o ke kai.

Ua olelo ia hoi, o ka hoopau ana o M Kekauonohi i kona luna ma Puuloa i ka wa i lilo ai ka aina a hiki i ka manawa i make ai, aole i hopu i ka ia, ma ka puu koa kupono i ka aina i lilo ia Montgomery, a pela no kana kane o Haalelea no kekahi mau makahiki, oia na mea e maopopo ai ka manao o M. Kekauonohi, a

## Existing Resources

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o kona manao ia e hoolilo loa aku i kela wahi ia, a i kona kuleana a pau iloko olaila. Aka, aole e pono ke manao wale aku ma ia mea, i ole e kakauia ma ka palapala hoolilo, aole e maopopo.

Aole i lilo kekahi kuleana ia o M. Kekauonohi me he mea apana la o ka aina i kuai ia ia Isaac Montgonery. Ma ka olelo maoli wale no i lilo ai. Ina paha ma ka palapala hoolilo, i hoolilo ai oia i ka ahupuaa a pau ma na mokuna i anaia a puni me ke komo olelo kauwahi ia ma ka olelo, aohe maopopo ka lilo ana o kauwahi ia a o kona kuleana malaila.

I ko makou manao, aole i hoolilo o M Kekauonohi i kekahi apana o kahi ia, a i kekahi o kona kuleana pono ia Isaac Montgomery; a eia hoi ko makou manao, i ka wa i loa'a i ia I. Monthomerv ke kuleana o kauwahi o ka ahupuaa o "Honouliuli," ua loa'a ia ia no hoi kekahi kuleana hopu ia me he hoaina la, e like me na kanaka e ae e noho ana ma ia ahupuaa. (E nana i na Olelo ae Like, Vol 2, Statute Laws, pahe 70).

No ka maopopo ole o ka poino i loa'a ia Haalelea, nolaila, o ka poino i manao wale ia ka pono.

E hooholoia na ka mea hoopii ke ko i ka la hope o ke kau hookolokolo. Elima dala ka poino me ke koina.

A. B. Bates, loio no L. Haalelea.

J. Montgomery, loio no D. Montgomery.

## **VI. Impact Assessment**

### **A. Impacts to Flora**

There is no endangered flora in the area. The impact to flora is additionally covered in the EA and there are no anticipated impacts to rare floral of cultural significance.

Nonetheless, the project should make an effort to plant native flora in their landscaping to repopulate the area with indigenous, endemic, and native species within the project area.

### **B. Impacts to Fauna**

There is unlikely to be any impacts to candidate, threatened, or endangered fauna over the course of this project.

### **C. Impacts to Historic Sites**

Impacts to historic sites and properties are being assessed by Honua Consulting in a Literature Review and Field Inspection of the project area TMKs.

### **D. Impacts to Intangible Cultural Resources**

Intangible cultural resources refer to those resources without physical form, such as hula or mele. As there are no known or identified cultural practices currently taking place on the property, it is unlikely the proposed project would adversely impact intangible cultural resources on the property or in adjacent areas.

### **E. Impacts to Cultural Practices**

The assessment did not identify any cultural practices currently taking place in the project area.

## **F. Cumulative and Indirect Impacts**

Adverse cumulative and indirect impacts to cultural resources are often overlooked in CIAs, as they are difficult to assess. Cumulative impacts are cultural impacts that result from the incremental impacts of an activity when added to past, present, and reasonably foreseeable future actions and activities. Indirect impacts are impacts on cultural resources which are not a direct result of the project, but a secondary or tertiary result of the project.

The land within the APE and its immediate vicinity have been extensively developed, so this project is unlikely to result in any adverse impacts. There are no further anticipated cumulative or indirect cultural impacts to the area.

## VII. Conclusion

Contrary to popular practice, it is not the role of the CIA to simply rehash an analysis of historic sites, nor it is the role of the CIA to analyze recreational activities. The role of the CIA is to:

- 1) Identify 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) Identify the extent to which those resources—including traditional and customary Native Hawaiian rights—will be affected or impaired by the proposed action; and
- 3) Identify feasible action, if any, to be taken to reasonably protect Native Hawaiian rights if they are found to exist.

In order to complete a thorough CIA that complies with statutory and case law, it is necessary to consult with Native Hawaiian cultural practitioners and lineal and cultural descendants from the project area and have meaningful dialogues with them that result in data that speaks to the intent of building a strong cultural impact analysis. From thorough interviews and research, data was extrapolated that provides an unprecedented comprehensive look at cultural resources on this 'āina.

The Honouliuli region is rich with both pre-contact and post-contact histories. While the project is unlikely to have any adverse impact on pre-contact historic properties or Hawaiian cultural practices, the project has an opportunity to enrich the area through interpretive botanical, cultural and historical programs. This study looked comprehensively at all historical records for the region and did not identify any current cultural practices or customs that would potentially be impacted by the project activity. This find was supported by the interviews conducted with cultural practitioners from the area.

Based on this extensive identification effort and thorough analysis, there is a negligible potential for the project to have a direct, adverse impact on valued cultural, historical, or

## Conclusion

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natural resources in the project area or larger geographic extent. Additionally, there is no potential for the project to have a direct, adverse impact on traditional or customary Native Hawaiian rights in the project area or in the larger geographic extent. Cultural resources that may have once existed in the project area were likely irreparably destroyed by decades of industrial and agricultural use.

While there are no known cultural resources or cultural practices in the project area, the project should nonetheless embrace all opportunities to honor both the traditional history and modern history of the region, which local residents take great pride in perpetuating.

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**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).

Ahupua'a	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 (pua'a), or because a pig or other tribute was laid on the altar as tax to the chief.
'Āina	Land, earth.
Akua	1. God, goddess, spirit, ghost. 2. Divine, supernatural, godly.
Ali'i	1. Chief, chiefess, ruler, monarch. 2. Royal, regal. 3. To act as chief, reign.
'Ānae	Full-sized 'ama'ama mullet fish.
'Ānae holo	The annual mullet migration around the island of O'ahu.
'Aumakua	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 'aumakua warned or reprimanded mortals in dreams, visions, and calls.
'Aumākua	Plural of 'aumakua.
'Auwai	Irrigation ditch, canal.
Hālau	1. Long house, as for canoes or hula instruction; meeting house. 2. Large, numerous; much.
Heiau	Pre-Christian place of worship, shrine. Some heiau were elaborately constructed stone platforms, other simple earth terraces.
Heiau waihou	A heiau where hogs, bananas, and coconuts were sacrificed, but not human beings; a heiau for mo'o spirits.
Ho'oilō	Winter, rainy season.
Hōlua	Sled, especially the ancient sled used on grassy slopes; the sled course.
Hula	A Polynesian dance form accompanied by chant or song.

## Appendix I: Glossary of Hawaiian Terms

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'Ike	To see, know, feel, greet, recognize, perceive, experience, be aware, understand.
'Ili	Land section, next in importance to ahupua'a and usually a subdivision of an ahupua'a.
'Ili kūpono	A nearly independent 'ili land division within an ahupua'a, paying tribute to the ruling chief and not to the chief of the ahupua'a. Transfer of the ahupua'a from one chief to another did not include the 'ili kūpono located within its boundaries.
Iliina	Grave, tomb, sepulcher, cemetery, mausoleum, plot in a cemetery.
'Iole	Hawaiian rat ( <i>Rattus exulans</i> ); introduced rat, mouse.
Kalo	Taro ( <i>Colocasia esculenta</i> ), a kind of aroid cultivated since ancient times for food, spreading widely from the tropics of the Old World. In Hawai'i, taro has been the staple from earliest times to the present, and here its culture developed greatly, including more than 300 forms. All parts of the plant are eaten, its starchy root principally as poi, and its leaves as lū'au.
Kama'āina	1. Native-born, one born in a place, host. 2. Native plant. 3. Acquainted, familiar.
Kānāwai	1. Law, code, rule, statute, act, regulation, ordinance, decree, edict. 2. Legal, to obey a law, to be prohibited, to learn from experience.
Kapu	1. Taboo, prohibition. 2. Special privilege or exemption from ordinary taboo. 3. Sacredness, prohibited, forbidden, sacred, holy, consecrated. 4. No trespassing, keep out.
Kino lau	Many forms taken by a supernatural body, as Pele, who could at will become a flame of fire, a young girl, or an old hag.
Ko'a	1. Fishing ground, usually identified by lining up with marks on shore. 2. Shrine, often consisting of circular piles of coral or stone, built along the shore or by ponds or streams, used in ceremonies as to make fish multiply; also built on bird islands, and used in ceremonies to make birds multiply. 3. Coral, coral head.

## Appendix I: Glossary of Hawaiian Terms

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Konohiki	Headman of an ahupua'a land division under the chief; land or fishing rights under control of the konohiki; such rights are sometimes called konohiki rights.
Kula	Plain, field, open country, pasture.
Kuleana	Right, privilege, concern, responsibility, title, business, property, estate, portion, jurisdiction, authority, liability, interest, claim, ownership, tenure, affair, province.
Kumu	Teacher, tutor, manual, primer, model, pattern.
Kumu hula	Hula teacher.
Kūpalu manō	To chum sharks; shark bait (said also of human taboo breakers thrown into the sea).
Kupapa'u	Corpse, cadaver, dead body, carcass.
Kūpua	Demigod or culture hero, especially a supernatural being possessing several forms.
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.
Lo'i	Irrigated terrace, especially for taro, but also for rice and paddy.
Loko i'a	Traditional Hawaiian fishpond.
Māhele 'Āina	Land division.
Māla 'uala	Sweet potato field.
Mana	Supernatural or divine power.
Manō	Shark.
Manō i'a	Ordinary shark.
Manō kanaka	Shark thought to be born of a human mother and sired by a shark god, or by a deified person whose spirit possesses a shark or turns into a shark.

## Appendix I: Glossary of Hawaiian Terms

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Mele	1. Song, anthem, or chant of any kind. 2. Poem, poetry. 3. To sing, chant.
Mele inoa	Name chant, i.e., chant composed in honor of a person, as of a chief.
Moku	1. District, island, islet, section, forest, grove, clump, fragment. 2. To be cut, severed, amputated, broken in two.
Mo‘o	Lizard, reptile of any kind, dragon, serpent.
Mo‘olelo	Story, tale, myth, history, tradition, literature, legend, journal, log, yard, fable, essay, chronicle, record, article.
Mo‘owahine	Female lizard deity.
‘Ōlelo no‘eau	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.
Pipi	Hawaiian pearl oyster ( <i>Pinctada radiata</i> ); in songs this is known as the i‘a hāmau leo o ‘Ewa, ‘Ewa’s silent sea creature [it was believed that talking would cause a breeze to ripple the water and frighten the pipi].
Poi	The Hawaiian staff of life, made from cooked taro corms, or rarely breadfruit, pounded and thinned with water.
Pueo	Hawaiian short-eared owl ( <i>Asio flammeus sandwichensis</i> ), regarded often as a benevolent ‘aumakua.
Pu‘u	Any kind of protuberance from a pimple to a hill: hill, peak, cone, hump, mound, bulge, heap, pile, portion, bulk, mass, quantity, clot, bunch, knob.
‘Uala	The sweet potato ( <i>Ipomoea batatas</i> ), a perennial, wide-spreading vine, with heart-shaped, angled, or lobed leaves and pinkish-lavender flowers. The tuberous roots are a valuable food, and they vary greatly in many ways, as in color and shape.
Wahi pana	A sacred and celebrated/legendary place.
Wai	Water, liquid or liquor of any kind other than sea water.
Wao	1. Realm. 2. A general term for inland region usually forested but not precipitous and often uninhabited.



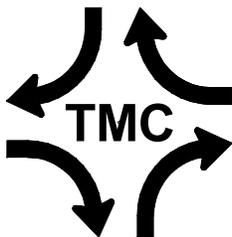
## Appendix C

*Draft Transportation Assessment Report for the Proposed West Loch Affordable Housing, Ewa Beach, Oahu, Hawaii, Tax Map Key: 9-9-122: 004.*  
The Traffic Management Consultant

**TRANSPORTATION ASSESSMENT REPORT**  
**FOR THE PROPOSED**  
**WEST LOCH AFFORDABLE HOUSING**  
**EWA BEACH, OAHU, HAWAII**  
**TAX MAP KEY: 9-1-122:004**

**PREPARED FOR**  
**STANFORD CARR DEVELOPMENT, LLC**

**APRIL 29, 2022**



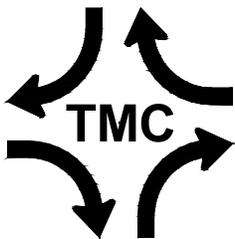
**PREPARED BY**

**THE TRAFFIC MANAGEMENT CONSULTANT**

**TRANSPORTATION ASSESSMENT REPORT**  
**FOR THE PROPOSED**  
**WEST LOCH AFFORDABLE HOUSING**  
**HONOLULU, HAWAII**  
**TAX MAP KEY: (1) 1-10-07:038**

**PREPARED FOR**  
**STANFORD CARR DEVELOPMENT, LLC**

**APRIL 29, 2022**



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**TRANSPORTATION ASSESSMENT REPORT**  
**FOR THE PROPOSED**  
**WEST LOCH AFFORDABLE HOUSING**  
**EWA BEACH, OAHU, HAWAII**  
**TAX MAP KEY: 9-1-122:004**

**I. Introduction**

**A. Project Description**

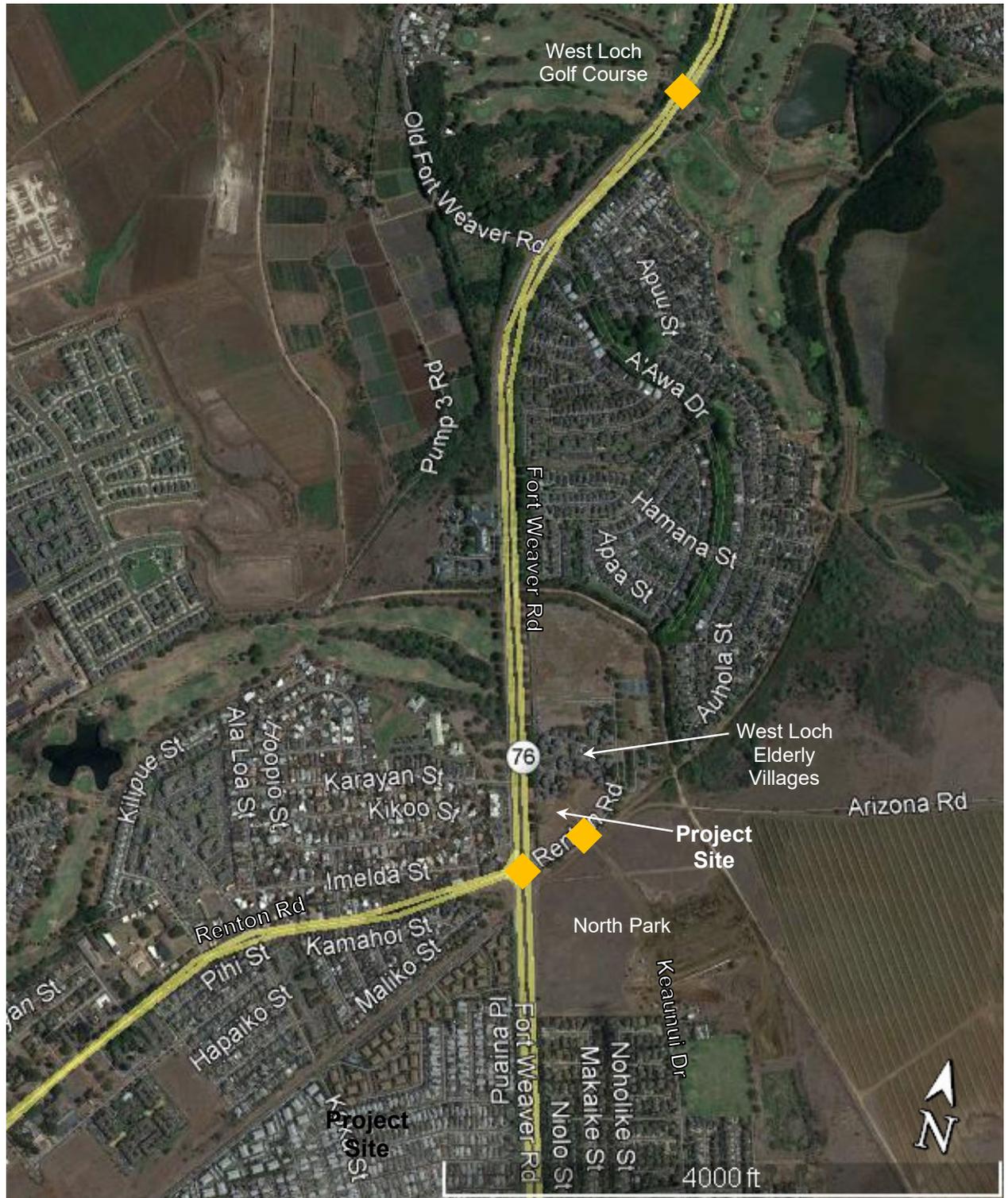
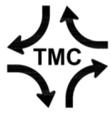
The proposed West Loch Affordable Housing Project is a planned 127-unit low-rise multi-family development at 91-1400 Renton Road in Ewa Beach, Oahu, Hawaii. The 3.704-acre site is identified as Tax Map Key: 9-1-122:004. The proposed project will consist of one-, two-, and three-bedroom multi-family units and 136 parking stalls. The project site is located on the northeast corner of the intersection of Fort Weaver Road and Renton Road. The proposed project is located immediately south of the West Loch Elderly Villages. Figure 1 depicts the project location and vicinity map.

Site access will be provided by three existing driveways. Full access will be provided at an existing median opening on Renton Road, which is located about 450 feet east of Fort Weaver Road. An existing right-turn-in/right-turn-out driveway, which is located approximately 300 feet east of Fort Weaver Road, provides an easement through the project site for access between the West Loch Elderly Villages and Renton Road. A second right-turn-in/right-turn-out driveway on Renton Road is located about 800 feet east of Fort Weaver Road. The project site plan is depicted on Figure 2. For the purpose of this Transportation Assessment Report, the Year 2025 is selected as the first year of full buildout and occupancy of the West Loch Affordable Housing Project.

**B. Purpose and Scope of the Study**

The purpose of this study is to assess the transportation impacts resulting from the development of the proposed West Loch Affordable Housing Project. This report presents the findings and recommendations of the study, the scope of which includes:

1. A description of the proposed project.
2. An evaluation of existing roadway and transportation conditions.
3. The analysis of the future transportation conditions without the proposed project.



◆ Traffic Count Locations

Figure 1. Location and Vicinity Map

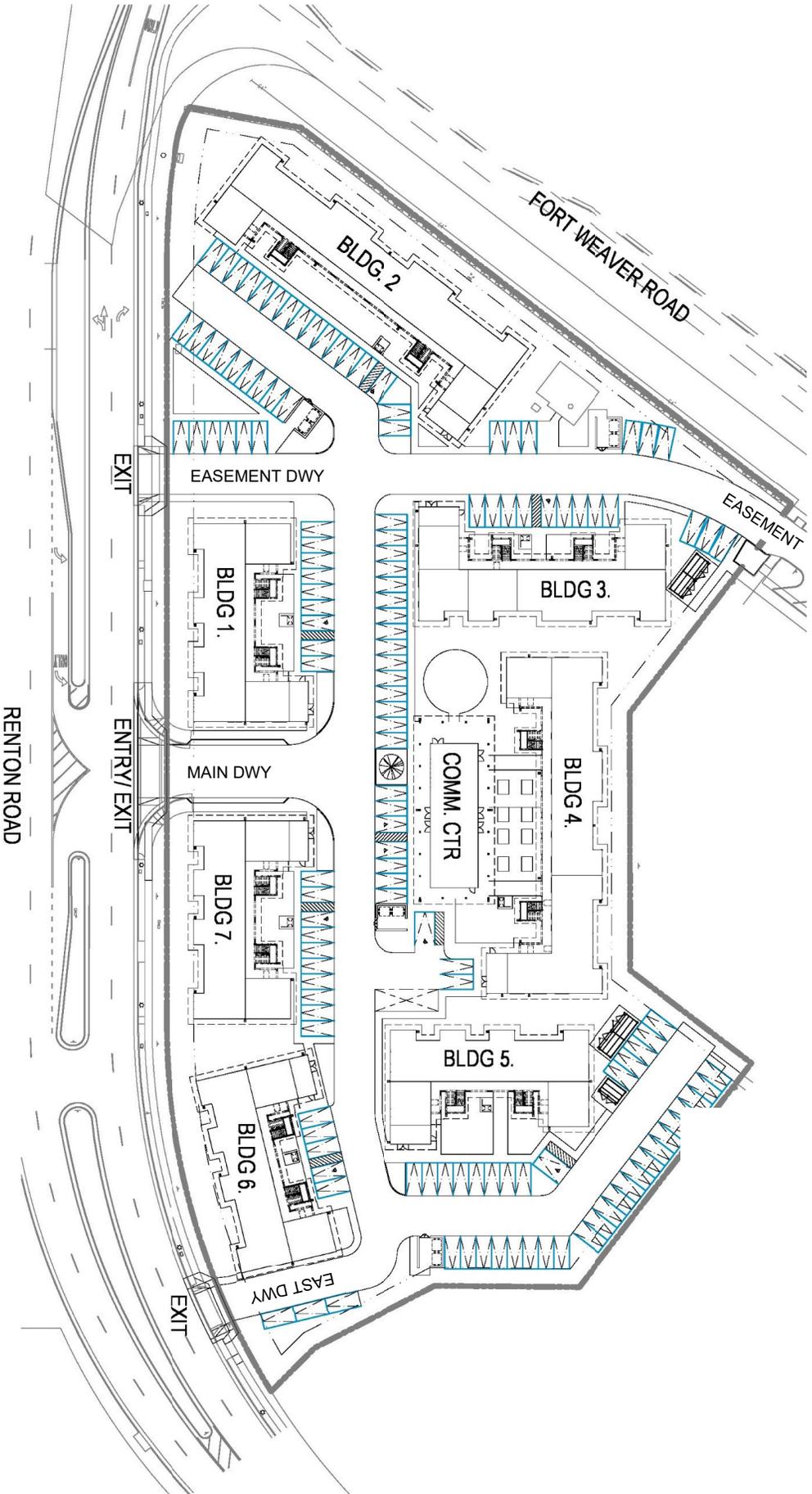


Figure 2. West Loch Affordable Housing Site Plan

4. The development of trip generation characteristics of the proposed project.
5. The identification and analysis of the transportation impacts resulting from the development of the proposed project.
6. The recommendation of improvements, as necessary, which would mitigate the transportation impacts identified in this study.

## C. Methodologies

### 1. Capacity Analysis

The highway capacity analysis, performed in this study, is based upon procedures presented in the Highway Capacity Manual 6<sup>th</sup> Edition (HCM), published by the Transportation Research Board. HCM defines the Level of Service (LOS) as “a quantitative stratification of a performance measure or measures representing quality of service.” HCM defines the six (6) Levels of Service from the traveler’s perspective, ranging from the best LOS “A” to the worst LOS “F”. LOS translates the complex mathematical results of highway capacity analysis into an A through F grading system for the purpose of simplifying the roadway performance for decision-makers.

LOS’s “A”, “B”, and “C” are considered satisfactory Levels of Service. LOS “D” is generally considered a “desirable minimum” operating Level of Service. LOS’s “E” and “F” are undesirable conditions. Intersection LOS is primarily based upon average delay (d) in seconds per vehicle (sec/veh). The delays at unsignalized intersections, which includes stop-controlled intersections, are generally shorter than signalized intersections, due to the drivers’ expectation and acceptance of longer delays at higher-volume signalized intersections. Table 1 summarizes the HCM LOS criteria.

<b>Table 1. Intersection Level of Service Criteria (HCM)</b>			
<b>LOS</b>	<b>Signalized Control</b>	<b>Unsignalized Control</b>	<b>Description</b>
	<b>Delay d (sec/veh)</b>		
A	$d \leq 10$	$d \leq 10$	Control delay is minimal.
B	$10 < d \leq 20$	$10 < d \leq 15$	Control delay is not significant.
C	$20 < d \leq 35$	$15 < d \leq 25$	Stable operation. Queuing begins to occur.
D	$35 < d \leq 55$	$25 < d \leq 35$	Less stable condition. Increase in delays, decrease in travel speeds.
E	$55 < d \leq 80$	$35 < d \leq 50$	Unstable operation, significant delays.
F	$d > 80$	$d > 50$	High delays, extensive queuing.

Synchro is a traffic analysis software that was developed by Trafficware. Synchro is an intersection analysis program that is based upon the HCM 6<sup>th</sup> Edition methodology. Synchro was used to calculate the Levels of Service for the intersections in the study area. Worksheets for the capacity analysis, performed throughout this report, are compiled in the Appendix.

## **2. Trip Generation**

The trip generation methodology is based upon generally accepted techniques developed by the Institute of Transportation Engineers (ITE) and published in Trip Generation Manual, 11<sup>th</sup> Edition. The ITE trip rates were developed by correlating the vehicle, transit, bicycle, and person trip generation data with various land use activities/ characteristics, such as the peak hour trips per dwelling unit (DU). The ITE trip generation rates for a low-rise multi-family housing were used to estimate the trip generation from the proposed West Loch Affordable Housing Project.

## **II. Existing Conditions**

### **A. Roadways**

Fort Weaver Road is the major north-south collector roadway for Ewa Beach. Fort Weaver Road is a six-lane, divided, State of Hawaii highway. Fort Weaver Road is signalized at its intersection with Renton Road. Fort Weaver Road provides exclusive left-turn and right-turn lanes in both directions at Renton Road.

Renton Road is an east-west collector roadway for Ewa Villages between Kapolei Parkway and Kamokila Boulevard to the west and Fort Weaver Road to the east. In the vicinity of the project, Renton Road is a two-way, four-lane divided City & County of Honolulu roadway. Eastbound Renton Road provides an exclusive left-turn lane, a shared left-turn/through lane, and right-turn lane at Fort Weaver Road. Westbound Renton Road provides a shared left-turn/through lane and an exclusive right-turn lane at Fort Weaver Road. Renton Road extends to the east of Fort Weaver Road and terminates at the West Loch Elderly Villages and Asing Community Park.

The project site access is provided at an existing unsignalized Tee-intersection on Renton Road. An exclusive left-turn lane is provided on eastbound Renton Road at the Project Site Access Driveway. Project site access also will be provided by an existing driveway on Renton Road, between the Project Site Access Driveway intersection and Fort Weaver Road, hereinafter referred to as the Easement Driveway, and an existing driveway along the east boundary of the site, hereinafter referred to as the East Driveway. The raised median restricts the Easement Driveway and the East Driveway to right-turn-in and right-turn-out movements only.

## **B. Public Transit**

TheBus stops are located in both directions on Fort Weaver Road at Renton Road. TheBus Routes 42, PH7 Express, 91 Express, W1, 101 Express, and E Country Express provide public transit service to Ewa Beach. TheBus stops also are located on both sides of the west leg of Renton Road. TheBus Route 44 provides public transit service to Ewa Villages.

## **C. Existing Peak Hour Traffic Volumes and Operating Conditions**

### **1. Field Investigation and Data Collection**

Turning movement traffic count surveys were conducted at the intersection of Fort Weaver Road and Renton Road from 5:00 AM to 9:00 AM and from 3:00 PM to 7:00 PM from May 11, 2021 through May 13, 2021. Traffic count surveys were conducted on the existing easement driveway on Renton Road from 6:00 AM to 8:00 AM and from 3:30 PM to 6:30 PM on May 11, 2021 through May 13, 2021. The higher peak hour traffic volumes on the survey days at the study intersections were selected for the analysis to establish the existing conditions.

Traffic count surveys also were conducted on Fort Weaver Road at the West Loch Golf Course underpass, north of Old Fort Weaver Road/A`awa Drive, from 6:00 AM to 8:00 AM and from 3:30 PM to 6:30 PM on May 11 & 13, 2021. Pre-pandemic (2019) traffic count data on Fort Weaver Road at the West Loch Golf Course underpass were obtained from the Hawaii State Department of Transportation (DOT). The DOT traffic count data were collected on September 18-19, 2019, and November 4-5, 2020.

### **2. Existing AM Peak Hour Traffic**

The existing AM peak hour of traffic occurred from 6:45 AM to 7:45 AM. Fort Weaver Road carried approximately 5,000 vehicles per hour (vph), total for both directions. The AM peak direction of traffic on Fort Weaver Road was in the northbound direction, carrying about 3,600 vph. Fort Weaver Road carried two (2) bicycles, during the existing AM peak hour of traffic. The west leg of Renton Road carried about 900 vph, total for both directions, while the east leg of Renton Road carried 40 vph. Six (6) vph entered the easement driveway on Renton Road, while zero (0) vph exited the driveway, during the existing AM peak hour of traffic.

Table 2 compares the DOT AM peak hour traffic count data with current AM peak hour traffic count data on Fort Weaver Road at the West Loch Golf Course golf cart underpass. The pre-pandemic 2019 and the pandemic 2020 AM peak hour traffic count data indicated minimal change, while the 2021 AM peak hour traffic count data, collected for this study, increased significantly.

<b>Date</b>	<b>Northbound</b>	<b>Southbound</b>	<b>Totals</b>
9/18/2019	2,229	1,102	3,331
9/19/2019	2,351	1,013	3,364
11/4/2020	2,392	1,006	3,398
11/5/2020	2,236	1,072	3,308
5/11/2021	3,851	1,372	5,223
5/13/2021	3,725	1,426	5,151

During the existing AM peak hour of traffic, the intersection of Fort Weaver Road and Renton Road operated at an overall LOS “D”. The through movement on northbound Fort Weaver Road operated at LOS “D”. The left-turn movements in both directions on Fort Weaver Road operated at LOS “F”. The left-turn and through movements in both directions on Renton Road also operated at LOS “F”. The other traffic movements at the intersection operated at satisfactory Levels of Service, i.e., LOS “C” or better. Figure 3 depicts the existing AM peak hour traffic volumes.

### 3. Existing PM Peak Hour Traffic

The existing PM peak hour of traffic occurred from 3:45 PM to 4:45 PM. Fort Weaver Road carried approximately 5,200 vph, total for both directions. The PM peak direction of traffic on Fort Weaver Road was in the southbound direction, carrying about 3,300 vph. Fort Weaver Road carried two (2) bicycles, during the existing PM peak hour of traffic. The west leg of Renton Road carried about 1,000 vph, total for both directions, while the east leg of Renton Road carried about 170 vph. Eight (8) vph entered the easement driveway on Renton Road, while two (2) vph exited the driveway, during the existing PM peak hour of traffic.

Table 3 compares the DOT PM peak hour traffic count data with current peak hour traffic count data on Fort Weaver Road at the West Loch Golf Course golf cart underpass. The pandemic 2020 PM peak hour traffic count data declined over pre-pandemic 2019 PM peak hour conditions, while the 2021 PM peak hour traffic count data increased significantly over pre-pandemic conditions.

<b>Date</b>	<b>Northbound</b>	<b>Southbound</b>	<b>Totals</b>
9/18/2019	1,298	2,626	3,921
9/19/2019	1,358	2,640	3,998
11/4/2020	1,362	2,300	3,662
11/5/2020	1,255	2,554	3,809
5/11/2021	1,997	3,470	5,467
5/13/2021	2,165	3,394	5,559

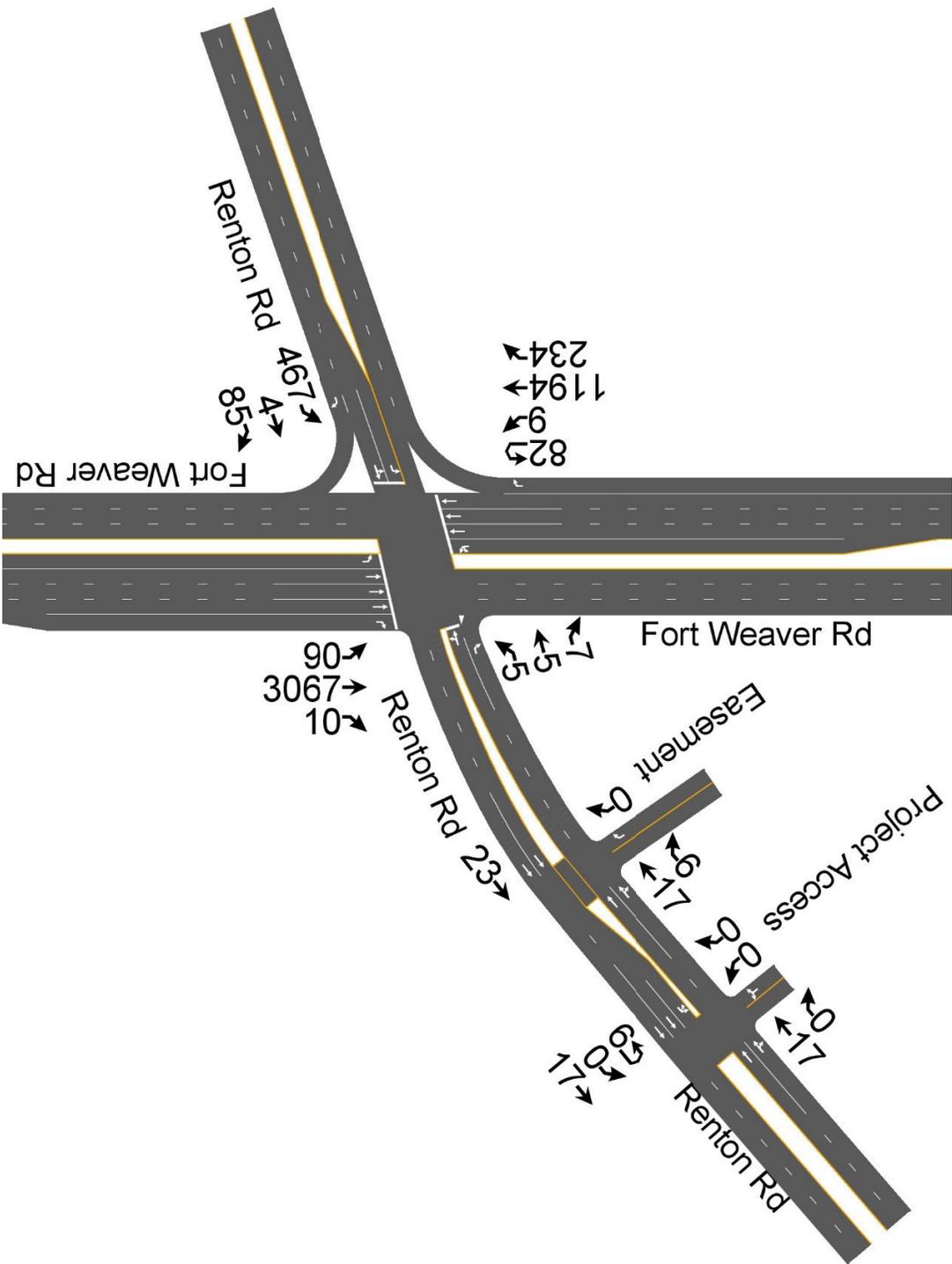


Figure 3. Existing AM Peak Hour Traffic

The intersection of Fort Weaver Road and Renton Road operated at an overall LOS “D”, during the existing PM peak hour of traffic. The through movement on southbound Fort Weaver Road operated at LOS “D”. The left-turn movements in both directions on Fort Weaver Road operated at LOS “F”. The left-turn and through movements in both directions on Renton Road also operated at LOS “F”. The other traffic movements at the intersection operated at satisfactory Levels of Service. The existing PM peak hour traffic volumes are depicted on Figure 4.

### **III. Future Traffic Conditions**

#### **A. North Park by Gentry**

North Park by Gentry is identified as Areas 31 and 32 in the Ewa by Gentry Master Planned Community. North Park is located at the north terminus of Keaunui Drive and is under construction at this writing. Traffic Evaluation Ewa by Gentry–Keaunui Drive was prepared by Parsons Brinckerhoff, Inc. (PB), dated March 2017. The purpose of the PB study was to analyze the traffic impacts of North Park on the existing roadways. The PB study estimated that North Park would generate a total of 273 vph, during the AM peak hour of traffic, and a total of 346 vph, during the PM peak hour of traffic. The PB trip generation and trip distribution for North Park was included in the future peak hour traffic conditions without the proposed West Loch Affordable Housing Project.

The PB study also estimated the number of vehicle trips that would be diverted to Renton Road, if Keaunui Drive were extended to Renton Road. The PB study estimated that a total of 229 vph and 310 vph would be diverted to Renton Road via the extension of Keaunui Drive, during the AM and PM peak hours of traffic, respectively. The extension of Keaunui Drive would cross the historical Oahu Railway & Land Company (OR&L) right-of-way, which is located along the makai (south) side of Renton Road, and intersect Renton Road, opposite the Project Access Driveway. Discussions between PB and DOT indicated that crossing the OR&L right-of-way would be subject to a “rigorous federal evaluation process.” The PB study concluded that the approval of crossing the OR&L right-of-way would be “highly unlikely”. Recent communications with Gentry Homes indicated that while the right-of-way has been reserved for the future road construction, the extension of Keaunui Drive to Renton Road is not included in the development of North Park by Gentry. Therefore, the extension of Keaunui Drive to Renton Road is not included in this Transportation Assessment Report.

#### **B. Background Growth in Traffic**

Table 4 compares the existing (2021) peak hour traffic data with the traffic count data collected for the PB study (2016) at the intersection of Fort Weaver Road and Renton Road. Over the 5-year period, the total AM and PM peak hour traffic demands at the intersection increased by 3.5 percent and 3.9 percent, respectively.

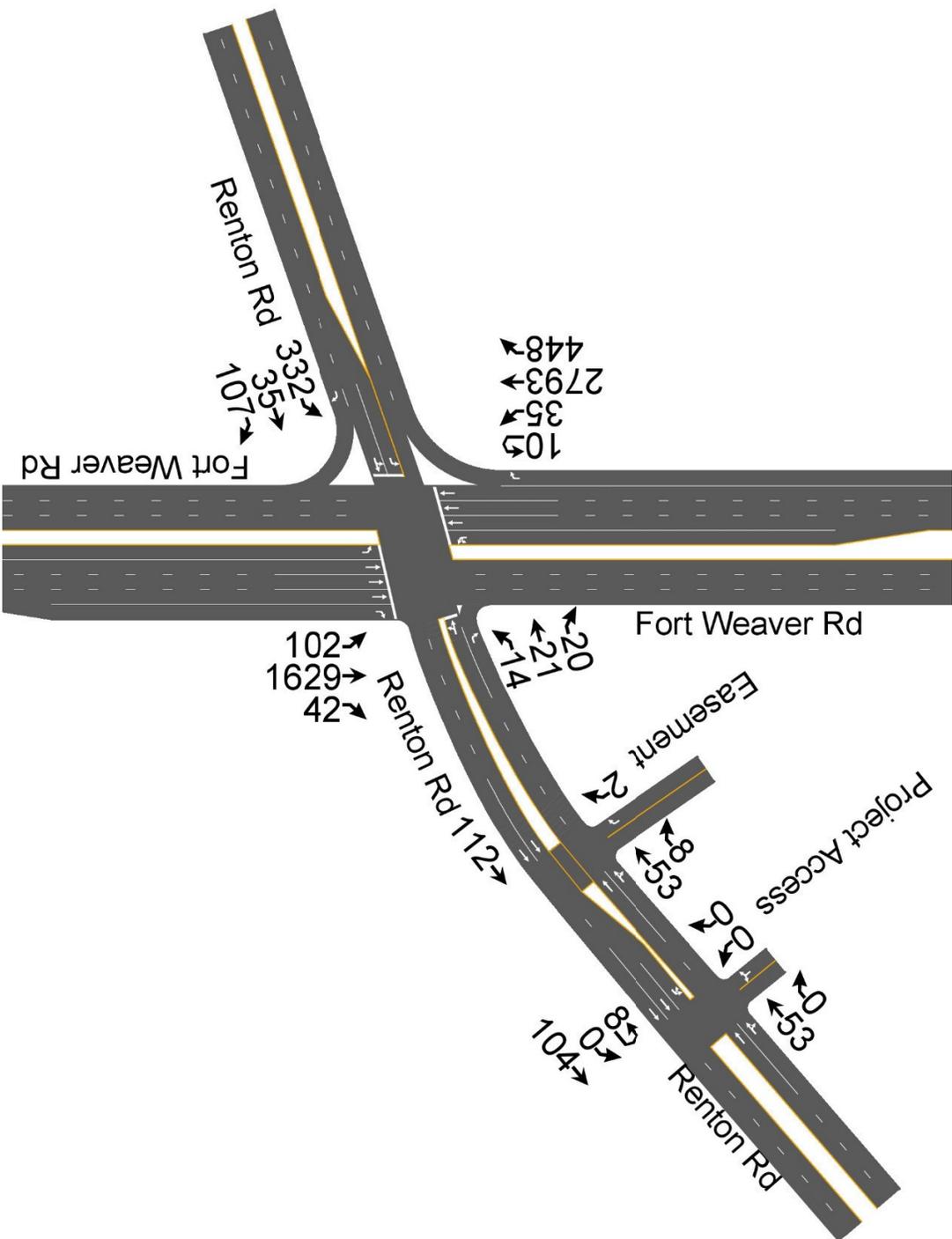
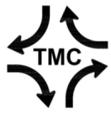


Figure 4. Existing PM Peak Hour Traffic



Year (Source)	Peak Hour	Approach				Total
		NB	SB	EB	WB	
<b>PB (2016)</b>	<b>AM</b>	2,791	1,651	616	25	5,083
	<b>PM</b>	1,587	3,184	552	55	5,378
<b>TMC (2021)</b>	<b>AM</b>	3,167	1,519	556	17	5,259
	<b>PM</b>	1,773	3,284	474	55	5,586
<b>Change (%)</b>	<b>AM</b>	13.5%	-8.0%	-9.7%	-32.0%	3.5%
	<b>PM</b>	11.7%	3.1%	-14.1%	0.0%	3.9%

For the purpose of this Transportation Assessment Report, the average annual growth in traffic over the past five years of 0.7 percent, during the AM peak hour of traffic, and 0.8 percent, during the PM peak hour of traffic, were extrapolated to the Year 2025 to estimate the future peak hour traffic demands without the proposed project.

### **C. Peak Hour Traffic Analysis Without Project**

#### **1. AM Peak Hour Traffic Without Project**

The northbound and southbound through movements on Fort Weaver Road are expected to operate at LOS “E” and LOS “C”, respectfully, during the AM peak hour of traffic without the proposed project. The other traffic movements at the intersection of Fort Weaver Road and Renton Road are expected to operate at the same Levels of Service as during the existing AM peak hour of traffic. Figure 5 depicts the AM peak hour traffic volumes without the proposed project.

#### **2. PM Peak Hour Traffic Without Project**

During the PM peak hour of traffic without the proposed project, the intersection of Fort Weaver Road and Renton Road is expected to operate at the same Levels of Service as during the existing PM peak hour of traffic. The PM peak hour traffic volumes without the proposed project are depicted on Figure 6.

## **IV. Transportation Impact Analysis**

### **A. Trip Generation Characteristics**

The trip generation characteristics were based upon the ITE trip generation methodology for a low-rise multi-family housing. The ITE trip generation rates were used to derive the person trips, transit trips, bicycle trips, and vehicle trips, during the weekday AM and PM peak hours of adjacent street traffic.

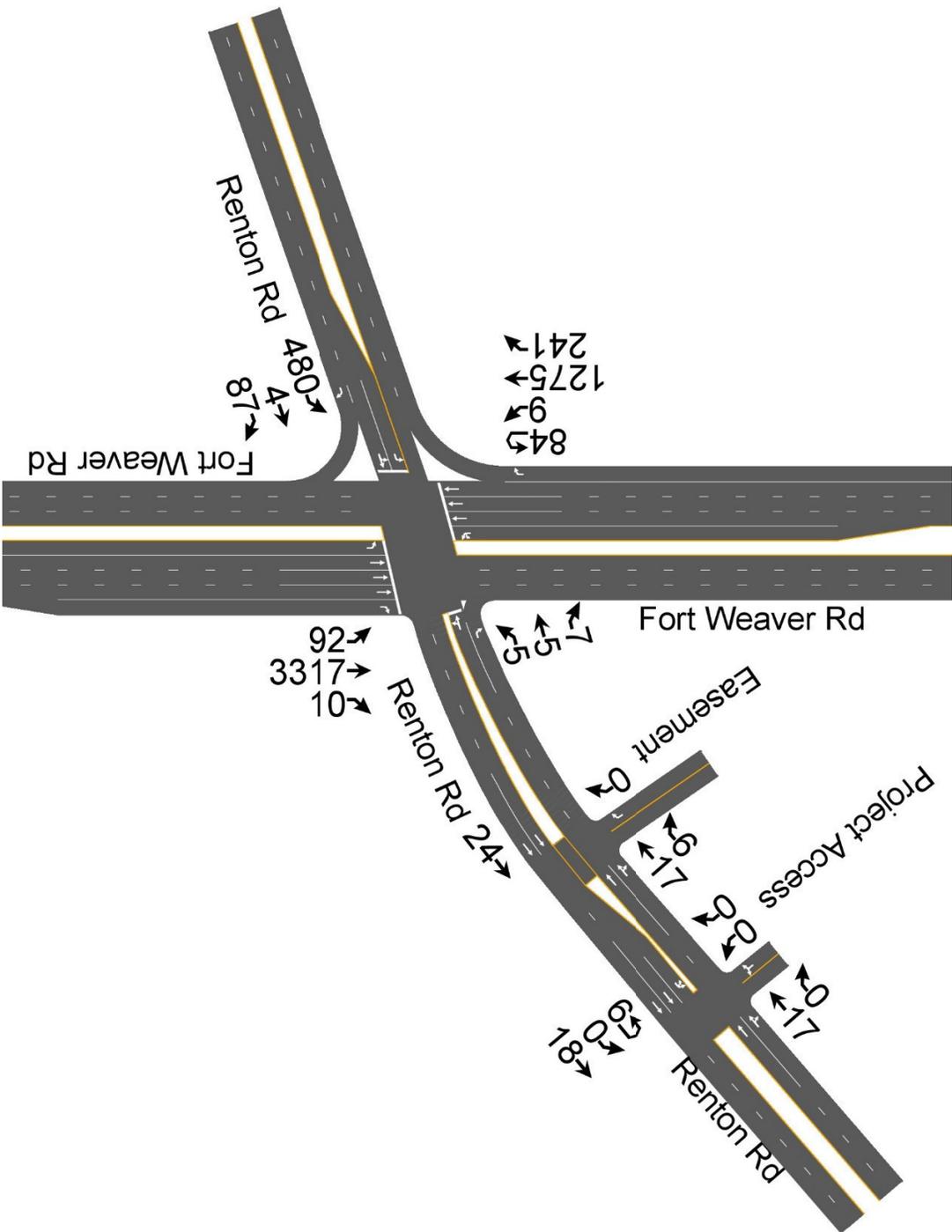


Figure 5. AM Peak Hour Traffic Without Project

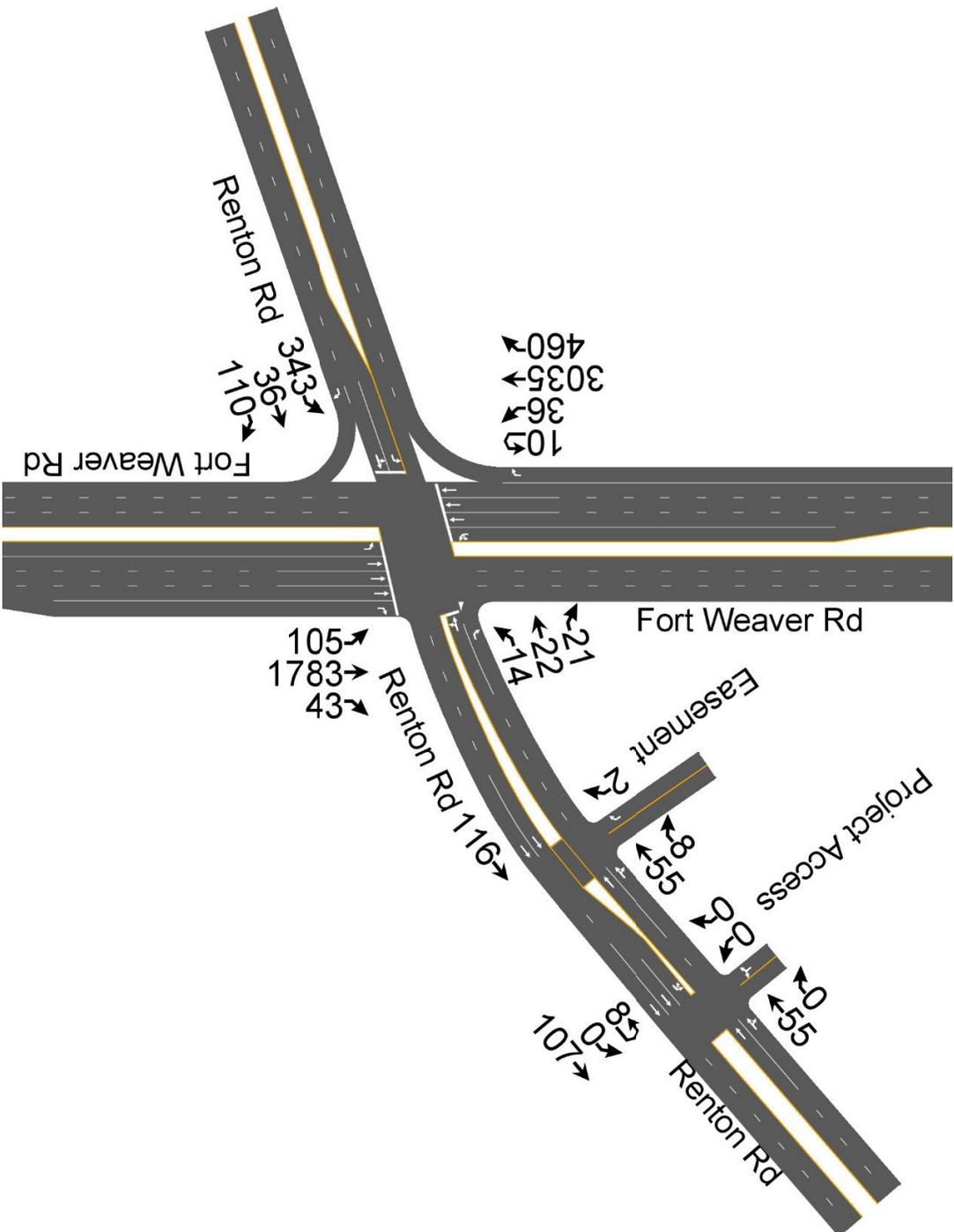


Figure 6. PM Peak Hour Traffic Without Project

The proposed project is expected to generate 61 person trips per hour and 83 person trips per hour, during the AM and PM peak hours of traffic, respectively. The proposed project is expected to generate zero (0) transit trips, during the AM and PM peak hours of traffic. The proposed project is also expected to generate zero (0) bicycle trips, during the AM and PM peak hours of traffic. The proposed project is expected to generate 62 vehicle trips per hour and 75 vehicle trips per hour during the AM and PM peak hours of traffic, respectively. The trip generation characteristics for the proposed project are summarized in Table 5.

<b>Peak Hour</b>	<b>Direction</b>	<b>Person Trips/Hour</b>	<b>Transit Trips/Hour</b>	<b>Bicycle Trips/Hour</b>	<b>Vehicle Trips/Hour</b>
<b>AM</b>	<b>Enter</b>	13	0	0	15
	<b>Exit</b>	48	0	0	47
	<b>Total</b>	61	0	0	62
<b>PM</b>	<b>Enter</b>	52	0	0	47
	<b>Exit</b>	31	0	0	28
	<b>Total</b>	83	0	0	75

## **B. Traffic Assignment**

The traffic assignments were based upon the existing traffic patterns at the intersection of Fort Weaver Road and Renton Road. Figures 7 and 8 depict the AM and PM peak hour site traffic assignments, respectively.

## **C. AM Peak Hour Traffic Analysis With Project**

The intersection of Fort Weaver Road and Renton Road is expected to operate at an overall intersection LOS “E”, during the AM peak hour of traffic with the proposed project. The right-turn movement from westbound Renton Road is expected to operate at LOS “B” at Fort Weaver Road. The other traffic movements at the intersection of Fort Weaver Road and Renton Road are expected to operate at the same Levels of Service as during the AM peak hour of traffic without the proposed project. The Project Access Driveway, the Easement Driveway, and the East Driveway are expected to operate at LOS “A” at Renton Road. The AM peak hour traffic volumes with the proposed project are depicted on Figure 9.



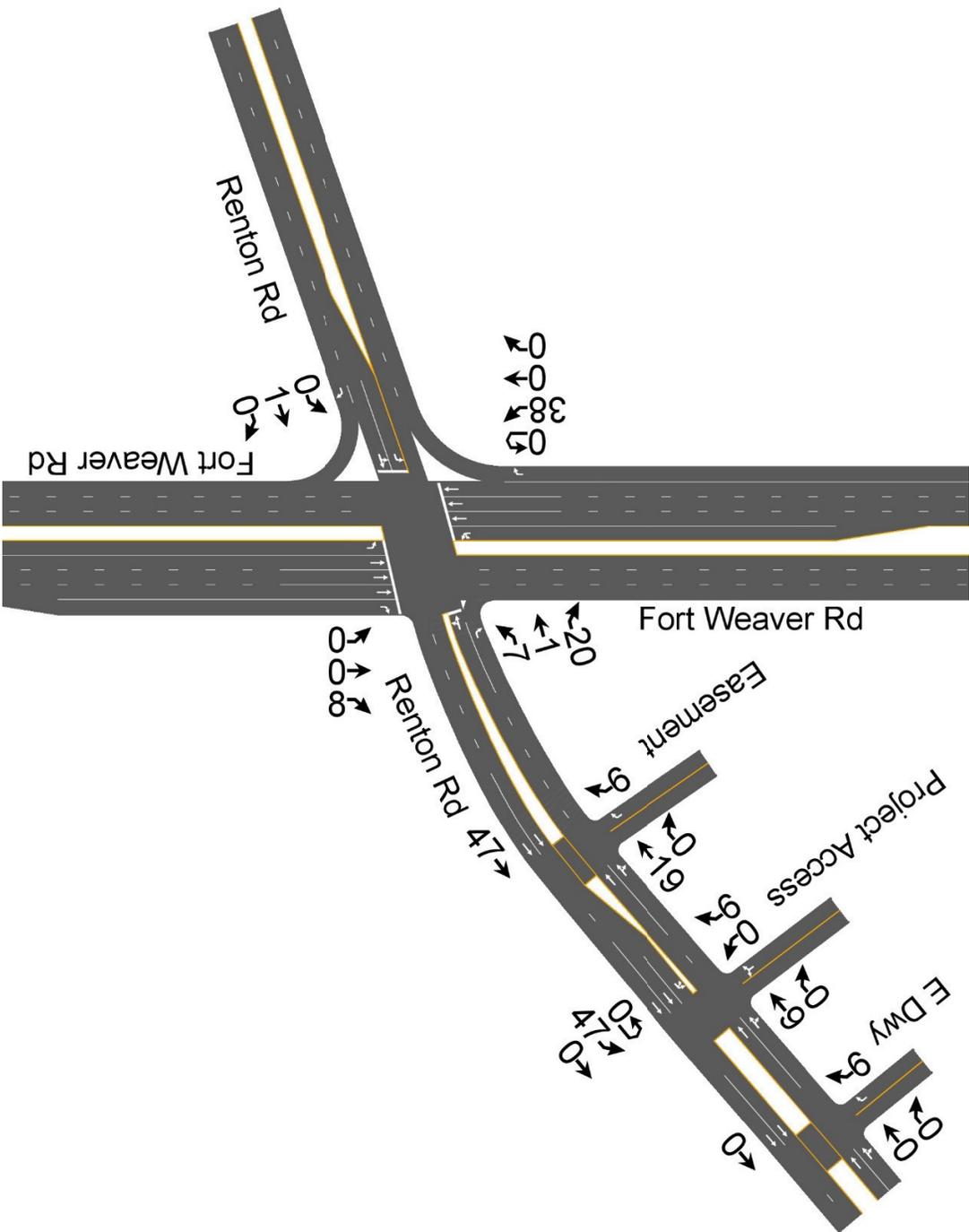


Figure 8. PM Peak Hour Site Traffic



#### **D. PM Peak Hour Traffic Analysis With Project**

The through movement on northbound Fort Weaver Road is expected to operate at LOS “C”, during the PM peak hour of traffic with the proposed project. The right-turn movement on westbound Renton Road is expected to operate at LOS “B”. The other traffic movements at the intersection are expected to operate at the same Levels of Service as during the PM peak hour of traffic without the proposed project. The Project Access Driveway, the Easement Driveway, and the East Driveway are expected to operate at LOS “A” at Renton Road. The PM peak hour traffic volumes with the proposed project are depicted on Figure 10.

#### **V. Recommendations and Conclusions**

##### **A. Recommendations**

The extension of Keaunui Drive from North Park by Gentry would divert about four times the traffic generated by the West Loch Affordable Housing Project to Renton Road. It is recommended that the traffic impact analysis of the extension of Keaunui Drive to Renton should be updated to account for the development of the West Loch Affordable Housing Project.

##### **B. Conclusions**

The existing peak hour traffic count data, collected on Fort Weaver Road, has significantly increased over the historical pre-pandemic traffic conditions. The recent growth in peak hour traffic at the intersection of Fort Weaver Road and Renton Road is consistent with historical growth in traffic in Ewa Beach.

Based upon the ITE methodology, the proposed project is expected to generate zero (0) transit trips and bicycle trips, during the peak hours of traffic. The proposed West Loch Affordable Housing Project is expected to generate 62 vph and 75 vph, during the AM and PM peak hours of traffic, respectively.

The proposed project is expected to increase the traffic demands at the intersection of Fort Weaver Road and Renton Road by about 1.1 percent and 1.2 percent, during the AM and PM peak hours of traffic, respectively. During the peak hours of traffic with the proposed project, the individual traffic movements at the intersection of Fort Weaver Road and Renton Road are expected to operate at satisfactory Levels of Service, or at the same Levels of Service as during the peak hours of traffic without the proposed project. The Project Access Driveway, the Easement Driveway, and the East Driveway are expected to operate at LOS “A” during the AM and PM peak hours of traffic. The development of the proposed West Loch Affordable Housing Project is not expected to result in significant transportation impacts. Table 6 summarizes the capacity analysis for this Transportation Assessment Report.

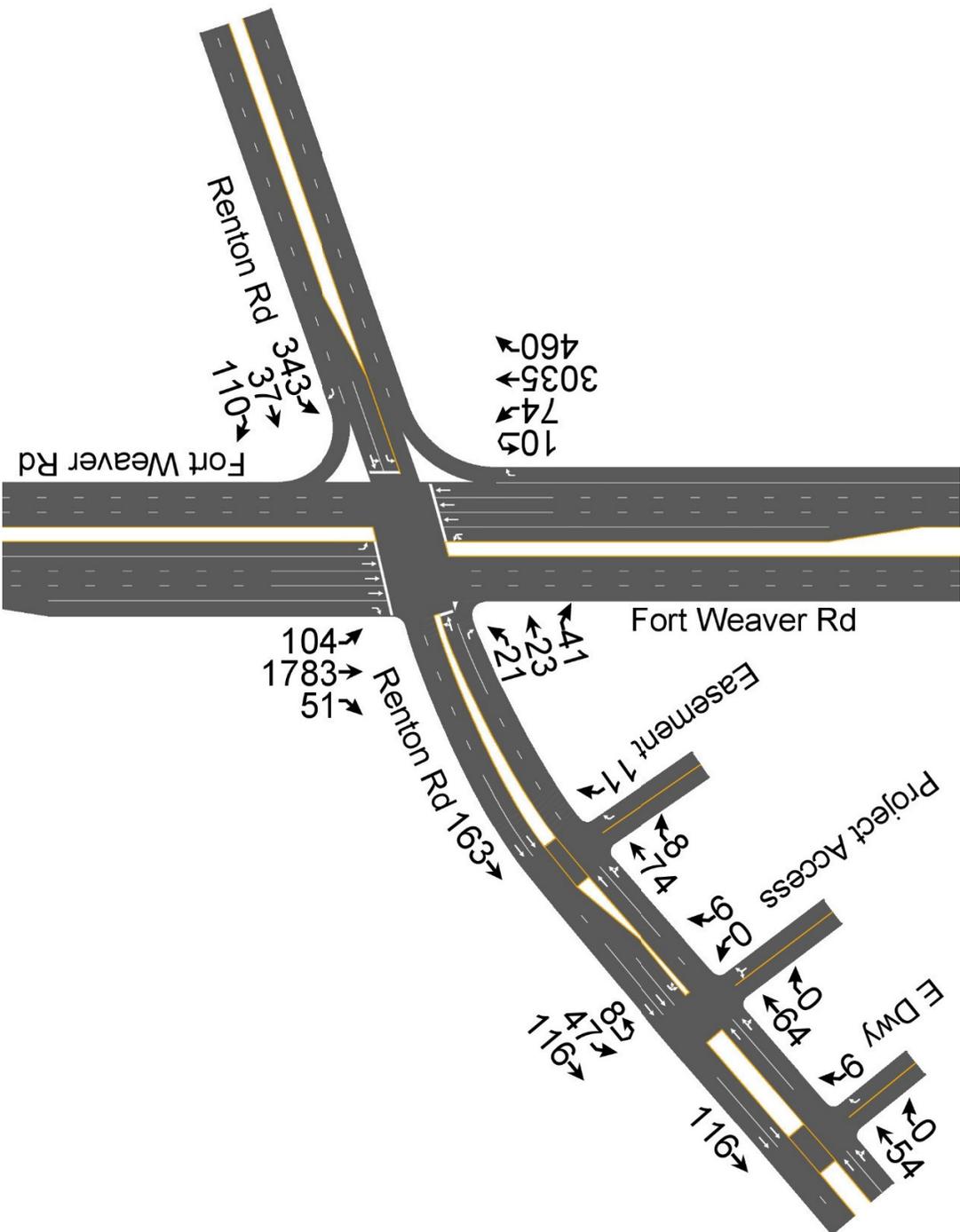


Figure 10. PM Peak Hour Traffic With Project

Table 6. Summary of Capacity Analysis

Scenario	Intersection		MOE	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
Existing AM Peak Hour Traffic	Fort Weaver Rd & Renton Rd	LOS	F	F	C	F	A	A	F	D	A	F	B	A	D	
		Delay	127.6	129.4	21.4	121.7	1.0	140.4	40.7	0.0	152.6	19.6	2.2	45.4		
		v/c	0.88	0.89	0.29	0.19	0.06	0.74	0.92	0.01	0.82	0.37	0.22	0.92 (Max)		
Existing PM Peak Hour Traffic	Fort Weaver Rd & Renton Rd	LOS	F	F	B	F	A	F	B	A	F	D	A	D		
		Delay	126.3	125.8	14.4	164.7	3.1	140.0	17.3	1.3	138.9	35.2	2.2	36.1		
		v/c	0.82	0.82	0.36	0.69	0.17	0.77	0.47	0.04	0.59	0.85	0.40	0.85 (Max)		
AM Peak Hour Traffic Without Project	Fort Weaver Rd & Renton Rd	LOS	F	F	C	F	A	A	F	E	A	F	C	A	D	
		Delay	127.2	129.0	22.1	121.7	1.0	139.4	55.6	0.0	148.9	20.6	2.2	53.9		
		v/c	0.88	0.89	0.29	0.19	0.06	0.74	1.01	0.01	0.83	0.40	0.23	1.01 (Max)		
PM Peak Hour Traffic Without Project	Fort Weaver Rd & Renton Rd	LOS	F	F	B	F	A	A	F	B	A	F	D	A	D	
		Delay	125.8	124.6	18.7	167.2	4.6	130.4	19.6	1.4	138.5	46.3	2.2	42.0		
		v/c	0.83	0.82	0.37	0.70	0.21	0.74	0.53	0.04	0.58	0.95	0.42	0.95 (Max)		
AM Peak Hour Traffic With Project	Fort Weaver Rd & Renton Rd	LOS	F	F	C	F	B	A	F	E	A	F	C	A	E	
		Delay	126.8	129.2	22.1	136.3	12.7	139.4	71.8	0.0	152.6	22.5	2.3	64.0		
		v/c	0.88	0.90	0.29	0.36	0.40	0.74	1.05	0.01	0.86	0.41	0.24	1.05 (Max)		
Project Access Dwy & Renton Rd	East Driveway & Renton Rd	LOS	A	-	N/A	N/A	-	N/A	N/A	N/A	N/A	N/A	A	A	A	
		Delay	7.4	-	N/A	N/A	-	N/A	N/A	N/A	N/A	N/A	8.4	8.4	3.6	
		v/c	0.01	-	N/A	N/A	-	N/A	N/A	N/A	N/A	N/A	0.02	0.02	N/A	
Easement & Renton Rd	East Driveway & Renton Rd	LOS	N/A	-	N/A	N/A	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	
		Delay	N/A	-	N/A	N/A	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8.5	
		v/c	N/A	-	N/A	N/A	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.2	
Volume	East Driveway & Renton Rd	Volume	N/A	-	N/A	N/A	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8.4	
		Delay	N/A	-	N/A	N/A	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8.4	
		v/c	N/A	-	N/A	N/A	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.02	
Fort Weaver Rd & Renton Rd	East Driveway & Renton Rd	LOS	F	F	B	F	A	A	F	C	A	F	D	A	D	
		Delay	125.1	124.4	14.9	196.1	9.0	132.1	22.6	1.0	139.4	45.9	2.2	43.4		
		v/c	0.82	0.82	0.36	0.85	0.36	0.75	0.55	0.05	0.72	0.95	0.42	0.95 (Max)		
Project Access Dwy & Renton Rd	East Driveway & Renton Rd	LOS	A	-	N/A	N/A	-	N/A	N/A	N/A	N/A	N/A	A	A	A	
		Delay	7.5	-	N/A	N/A	-	N/A	N/A	N/A	N/A	N/A	N/A	8.5		
		v/c	0.04	-	N/A	N/A	-	N/A	N/A	N/A	N/A	N/A	N/A	2.0		
Easement & Renton Rd	East Driveway & Renton Rd	LOS	N/A	-	N/A	N/A	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	
		Delay	N/A	-	N/A	N/A	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.4	
		v/c	N/A	-	N/A	N/A	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Volume	East Driveway & Renton Rd	Volume	N/A	-	N/A	N/A	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8.5	
		Delay	N/A	-	N/A	N/A	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8.5	
		v/c	N/A	-	N/A	N/A	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.01	

**TRANSPORTATION ASSESSMENT REPORT**  
**FOR THE PROPOSED**  
**WEST LOCH AFFORDABLE HOUSING**  
**EWA BEACH, OAHU, HAWAII**  
**TAX MAP KEY: 9-1-122:004**

**APPENDIX A**  
**TRAFFIC COUNT DATA**

**Fort Weaver Rd Renton Rd - TMC**

Tue May 11, 2021

Full Length (5 AM-9 AM, 3 PM-7 PM (+1))

All Classes (Motorcycles, Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 836913, Location: 21.347931, -158.026889, Site Code: West Loch Hsg



Provided by: The Traffic Management Consultant  
1188 Bishop Street, Suite 1907,  
Honolulu, HI, 96813, US

Leg Direction	Renton Rd Eastbound						Renton Rd Westbound						Fort Weaver Rd Northbound						Fort Weaver Rd Southbound						Int
	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	
2021-05-11 5:00AM	5	1	80	0	86	0	0	0	0	0	0	1	0	523	5	0	528	1	11	47	1	12	71	0	685
5:15AM	4	2	56	0	62	3	3	1	0	0	4	4	2	667	13	0	682	3	13	79	0	13	105	0	853
5:30AM	14	2	119	0	135	3	1	2	0	0	3	6	1	714	19	0	734	6	27	99	2	19	147	0	1019
5:45AM	12	3	98	0	113	5	2	0	1	0	3	5	5	789	11	0	805	6	28	123	3	20	174	0	1095
Hourly Total	35	8	353	0	396	11	6	3	1	0	10	16	8	2693	48	0	2749	16	79	348	6	64	497	0	3652
6:00AM	4	7	99	0	110	4	5	3	5	1	14	5	10	828	8	0	846	4	38	198	3	9	248	0	1218
6:15AM	8	2	95	0	105	6	6	8	2	0	16	7	3	770	17	0	790	6	52	288	6	26	372	0	1283
6:30AM	15	2	137	0	154	3	2	4	1	0	7	8	3	745	12	1	761	4	57	267	9	26	359	0	1281
6:45AM	20	1	149	0	170	2	0	1	0	0	1	2	0	774	14	1	789	3	41	258	5	32	336	0	1296
Hourly Total	47	12	480	0	539	15	13	16	8	1	38	22	16	3117	51	2	3186	17	188	1011	23	93	1315	0	5078
7:00AM	14	1	95	0	110	3	3	0	3	0	6	3	4	806	14	0	824	4	63	265	2	13	343	0	1283
7:15AM	21	1	114	0	136	3	2	0	0	0	2	7	2	801	25	1	829	7	64	317	2	15	398	0	1365
7:30AM	30	1	109	0	140	2	2	4	2	0	8	2	4	686	33	2	725	5	66	354	0	22	442	0	1315
7:45AM	34	3	107	0	144	1	3	1	0	0	4	6	3	659	43	0	705	6	54	263	4	11	332	0	1185
Hourly Total	99	6	425	0	530	9	10	5	5	0	20	18	13	2952	115	3	3083	22	247	1199	8	61	1515	0	5148
8:00AM	19	1	69	0	89	3	3	2	4	0	9	3	3	596	29	0	628	4	58	307	6	9	380	0	1106
8:15AM	9	2	87	0	98	3	6	1	2	0	9	3	4	588	17	0	609	5	49	267	7	13	336	0	1052
8:30AM	20	4	72	0	96	1	4	1	1	0	6	4	5	555	16	1	577	5	43	247	6	12	308	0	987
8:45AM	22	3	76	0	101	0	2	3	1	0	6	2	3	452	14	1	470	2	49	250	6	2	307	0	884
Hourly Total	70	10	304	0	384	7	15	7	8	0	30	12	15	2191	76	2	2284	16	199	1071	25	36	1331	0	4029
3:00PM	26	2	82	0	110	1	5	2	1	0	8	0	3	398	24	1	426	0	95	712	2	1	810	0	1354
3:15PM	36	2	85	0	123	1	8	4	1	0	13	8	0	339	27	0	366	5	89	672	1	2	764	0	1266
3:30PM	24	3	108	0	135	2	6	3	4	0	13	2	4	460	40	1	505	5	85	584	4	6	679	0	1332
3:45PM	32	3	98	0	133	1	6	3	1	0	10	3	7	432	18	1	458	1	108	753	4	3	868	0	1469
Hourly Total	118	10	373	0	501	5	25	12	7	0	44	13	14	1629	109	3	1755	11	377	2721	11	12	3121	0	5421
4:00PM	20	7	66	0	93	3	4	2	2	0	8	1	6	381	22	0	409	2	109	754	7	4	874	0	1384
4:15PM	23	17	77	0	117	3	5	7	6	0	18	1	15	427	36	0	478	1	119	637	9	2	767	0	1380
4:30PM	32	8	91	0	131	2	5	9	5	0	19	3	14	389	25	0	428	2	110	649	15	1	775	0	1353
4:45PM	33	7	78	0	118	5	6	5	6	0	17	5	10	308	20	2	340	5	96	697	1	2	796	0	1271
Hourly Total	108	39	312	0	459	13	20	23	19	0	62	10	45	1505	103	2	1655	10	434	2737	32	9	3212	0	5388
5:00PM	21	3	49	0	73	0	4	3	6	0	13	2	1	351	21	1	374	0	101	755	7	3	866	0	1326
5:15PM	17	2	90	0	109	3	3	5	3	0	11	6	8	273	27	2	310	5	109	642	4	4	759	0	1189
5:30PM	35	3	62	0	100	2	0	4	0	0	4	4	7	344	17	1	369	2	129	689	8	4	830	0	1303
5:45PM	12	5	53	0	70	0	5	0	3	0	8	4	11	314	22	0	347	0	95	791	8	4	898	0	1323
Hourly Total	85	13	254	0	352	5	12	12	12	0	36	16	27	1282	87	4	1400	7	434	2877	27	15	3353	0	5141
6:00PM	26	4	38	0	68	5	1	1	4	0	6	3	4	278	10	0	292	4	96	793	7	4	900	0	1266
6:15PM	31	3	64	0	98	1	4	5	3	0	12	4	9	282	31	0	322	2	99	667	5	3	774	0	1206
6:30PM	37	6	50	0	93	4	17	14	19	0	50	2	1	293	26	0	320	3	69	517	5	3	594	0	1057
6:45PM	26	9	77	0	112	3	6	5	2	0	13	4	5	230	25	0	260	1	81	529	6	0	616	0	1001
Hourly Total	120	22	229	0	371	13	28	25	28	0	81	13	19	1083	92	0	1194	10	345	2506	23	10	2884	0	4530
2021-05-12 5:00AM	3	0	69	0	72	1	0	1	0	0	1	3	3	539	4	0	546	1	4	69	0	9	82	0	701
5:15AM	7	2	71	0	80	2	0	2	0	0	2	5	0	674	11	0	685	5	23	81	0	12	116	0	883
5:30AM	12	0	77	0	89	0	0	1	3	0	4	0	4	751	10	0	765	0	24	124	2	11	161	0	1019
5:45AM	8	3	105	0	116	5	1	1	1	0	3	5	1	770	20	1	792	5	20	164	5	23	212	0	1123
Hourly Total	30	5	322	0	357	8	1	5	4	0	10	13	8	2734	45	1	2788	11	71	438	7	55	571	0	3726
6:00AM	15	5	97	0	117	2	6	7	5	0	18	7	12	781	13	0	806	2	28	178	2	19	227	0	1168
6:15AM	9	1	100	0	110	7	6	0	1	0	7	9	2	811	14	1	828	9	49	249	2	17	317	0	1262
6:30AM	16	1	121	0	138	2	3	3	0	0	6	7	2	700	9	2	713	7	50	258	10	33	351	0	1208
6:45AM	16	0	121	0	137	5	1	1	2	0	4	6	1	751	8	0	760	4	51	225	3	17	296	0	1197
Hourly Total	56	7	439	0	502	16	16	11	8	0	35	29	17	3043	44	3	3107	22	178	910	17	86	1191	0	4835
7:00AM	14	1	108	0	123	1	2	2	1	0	5	6	0	821	10	1	832	3	53	260	0	15	328	0	1288
7:15AM	17	1	96	0	114	2	1	1	0	0	2	5	1	823	19	0	843	4	67	319	0	14	400	0	1359
7:30AM	29	2	88	0	119	5	7	2	3	0	12	2	3	714	36	1	754	2	73	331	2	18	424	0	1309
7:45AM	33	1	105	0	139	0	4	1	1	0	6	2	2	625	42	0	669	2	54	249	4	13	320	0	1134
Hourly Total	93	5	397	0	495	8	14	6	5	0	25	15	6	2983	107	2	3098	11	247	1159	6	60	1472	0	5090
8:00AM	13	2	106	0	121	3	3	2	2	0	7	5	3	600	15	2	620	4	61	308	3	12	384	0	1132
8:15AM	16	3	63	0	82	1	6	0	1	0	7	6	1	599	24	0	624	3	34	245	1	5	285	0	998
8:30AM	17	3	77	0	97	3	3	1	0	0	4	7	2	563	22	1	588	5	37	286	3	7	333	0	1022
8:45AM	18	3	71	0	92	2	4	3	3	0	10	6	0	448	19	0	467	5	41	234	8	5	288	0	857
Hourly Total	64	11	317	0	392	9	16	6	6	0	28	24	6	2210	80	3	2299	17	173	1073	15	29	1290	0	4009
3:00PM	16	0	57	0	73	0	4	1	2	0	7	5	3	417	28	1	449	1	86	693	4	2	785	0	1314
3:15PM	27	3	91	0	121	2	14	3	0	0	17	5	1	331	19	0	351	6	89	627	1	3	720	0	1209
3:																									

Leg Direction	Renton Rd Eastbound						Renton Rd Westbound						Fort Weaver Rd Northbound						Fort Weaver Rd Southbound						Int	
	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*		
Time	3:45PM	25	7	65	0	97	0	4	2	1	0	7	0	3	396	23	0	422	1	112	716	1	2	831	0	1357
Hourly Total	96	13	303	0	412	5	27	9	5	0	41	11	10	1542	92	1	1645	11	377	2680	13	12	3082	0	5180	
4:00PM	34	4	66	0	104	1	1	3	5	0	9	2	7	399	31	0	437	2	130	724	5	6	865	0	1415	
4:15PM	38	16	71	0	125	1	4	5	5	0	14	2	13	365	42	0	420	0	94	652	11	4	761	0	1320	
4:30PM	46	7	94	0	147	0	7	4	5	0	16	2	9	374	30	1	414	0	98	623	5	4	730	0	1307	
4:45PM	37	5	94	0	136	2	3	6	1	0	10	1	6	332	17	1	356	4	113	729	1	2	845	0	1347	
Hourly Total	155	32	325	0	512	4	15	18	16	0	49	7	35	1470	120	2	1627	6	435	2728	22	16	3201	0	5389	
5:00PM	25	5	62	0	92	2	3	6	1	0	10	4	3	336	22	1	362	1	93	728	7	7	835	0	1299	
5:15PM	35	2	73	0	110	1	5	2	1	0	8	4	3	312	21	0	336	0	112	701	3	3	819	1	1273	
5:30PM	21	7	61	0	89	1	2	2	2	0	6	2	4	366	31	0	401	0	91	706	7	5	809	0	1305	
5:45PM	34	5	65	0	104	2	2	3	2	0	7	5	12	265	19	2	298	0	90	708	5	3	806	0	1215	
Hourly Total	115	19	261	0	395	6	12	13	6	0	31	15	22	1279	93	3	1397	1	386	2843	22	18	3269	1	5092	
6:00PM	31	2	38	0	71	6	6	3	2	0	11	6	5	340	27	0	372	1	73	737	6	2	818	0	1272	
6:15PM	25	8	53	0	86	2	5	8	2	0	15	3	7	283	21	0	311	2	107	686	4	1	798	0	1210	
6:30PM	24	2	42	0	68	1	12	20	11	0	43	2	4	284	42	0	330	1	94	681	3	2	780	0	1221	
6:45PM	28	4	69	0	101	2	7	2	5	0	14	1	1	294	17	1	313	3	79	605	1	5	690	0	1118	
Hourly Total	108	16	202	0	326	11	30	33	20	0	83	12	17	1201	107	1	1326	7	353	2709	14	10	3086	0	4821	
2021-05-13 5:00AM	7	0	78	0	85	0	1	0	0	1	2	0	1	524	10	2	537	0	8	57	0	18	83	0	707	
5:15AM	3	0	69	0	72	3	1	0	0	0	1	1	0	685	12	1	698	1	13	79	1	15	108	0	879	
5:30AM	6	0	104	0	110	2	0	1	1	0	2	5	1	726	19	0	746	5	25	111	3	13	152	0	1010	
5:45AM	6	3	102	0	111	6	0	2	2	0	4	8	5	732	16	0	753	8	29	136	2	18	185	0	1053	
Hourly Total	22	3	353	0	378	11	2	3	3	1	9	14	7	2667	57	3	2734	14	75	383	6	64	528	0	3649	
6:00AM	12	6	87	0	105	3	8	5	3	0	16	13	8	845	10	0	863	9	33	208	3	9	253	0	1237	
6:15AM	9	1	106	0	116	4	5	5	3	0	13	6	2	771	18	0	791	5	43	261	5	18	327	0	1247	
6:30AM	13	2	119	0	134	1	1	1	1	0	3	5	3	755	13	0	771	6	32	242	5	27	306	0	1214	
6:45AM	13	1	116	0	130	6	3	0	1	0	4	4	2	771	12	0	785	5	55	275	8	14	352	0	1271	
Hourly Total	47	10	428	0	485	14	17	11	8	0	36	28	15	3142	53	0	3210	25	163	986	21	68	1238	0	4969	
7:00AM	20	2	92	0	114	3	1	2	1	0	4	6	2	789	20	0	811	2	65	292	2	11	370	0	1299	
7:15AM	21	0	92	0	113	2	1	0	0	0	1	7	3	784	34	0	821	4	74	357	0	21	452	0	1387	
7:30AM	37	1	112	0	150	2	5	3	0	0	8	5	2	630	32	0	664	5	78	304	2	12	396	0	1218	
7:45AM	30	1	104	0	135	1	3	1	2	0	6	5	4	642	39	0	685	4	57	281	2	15	355	0	1181	
Hourly Total	108	4	400	0	512	8	10	6	3	0	19	23	11	2845	125	0	2981	15	274	1234	6	59	1573	0	5085	
8:00AM	23	3	88	0	114	2	6	5	0	0	11	4	3	555	23	0	581	2	57	300	0	12	369	0	1075	
8:15AM	18	2	68	2	90	1	3	0	2	0	5	3	3	615	15	1	634	3	43	304	5	13	365	0	1094	
8:30AM	15	3	60	0	78	1	3	0	0	0	3	6	1	513	21	1	536	4	44	268	3	9	324	0	941	
8:45AM	12	3	71	0	86	0	2	2	3	0	7	2	2	472	16	2	492	0	51	257	3	6	317	0	902	
Hourly Total	68	11	287	2	368	4	14	7	5	0	26	15	9	2155	75	4	2243	9	195	1129	11	40	1375	0	4012	
3:00PM	30	4	74	0	108	2	1	2	0	0	3	2	4	459	29	0	492	1	95	690	6	0	791	0	1394	
3:15PM	22	2	107	0	131	4	16	3	4	0	23	3	4	331	24	0	359	3	111	607	3	2	723	0	1236	
3:30PM	29	3	109	0	141	5	8	8	6	0	22	4	2	478	17	0	497	2	98	633	4	0	735	0	1395	
3:45PM	30	6	78	0	114	2	2	1	2	0	5	0	3	417	17	0	437	2	101	719	1	4	825	0	1381	
Hourly Total	111	15	368	0	494	13	27	14	12	0	53	9	13	1685	87	0	1785	8	405	2649	14	6	3074	0	5406	
4:00PM	39	2	74	0	115	6	2	2	3	0	7	2	11	442	25	0	478	1	164	694	5	5	868	0	1468	
4:15PM	30	11	87	0	128	0	2	7	2	0	11	2	13	396	34	1	444	2	109	623	9	3	744	0	1327	
4:30PM	33	5	85	0	123	1	5	10	4	0	19	7	14	402	33	0	449	2	105	618	7	4	734	0	1325	
4:45PM	37	4	73	0	114	1	7	2	1	0	10	0	5	326	31	0	362	0	91	694	5	5	795	0	1281	
Hourly Total	139	22	319	0	480	8	16	21	10	0	47	11	43	1566	123	1	1733	5	469	2629	26	17	3141	0	5401	
5:00PM	33	4	51	0	88	1	3	5	2	0	10	1	3	348	14	1	366	2	111	785	2	5	903	0	1367	
5:15PM	32	6	72	0	110	3	0	1	5	0	6	5	3	364	39	1	407	3	90	639	5	3	737	0	1260	
5:30PM	34	7	71	0	112	0	2	4	2	0	8	3	7	342	30	2	381	5	90	651	5	3	749	0	1250	
5:45PM	41	11	63	0	115	0	6	9	4	0	19	0	3	294	18	0	315	1	85	731	3	4	823	0	1272	
Hourly Total	140	28	257	0	425	4	11	19	13	0	43	9	16	1348	101	4	1469	11	376	2806	15	15	3212	0	5149	
6:00PM	25	6	50	0	81	2	6	4	9	0	19	1	7	327	24	0	358	0	73	637	7	2	719	0	1177	
6:15PM	28	4	73	0	105	1	12	13	9	0	34	2	3	294	42	1	340	3	84	592	5	0	681	0	1160	
6:30PM	29	6	57	0	92	2	9	7	7	0	23	6	3	290	36	0	329	2	92	592	1	0	685	0	1129	
6:45PM	28	0	50	0	78	3	5	8	2	0	15	1	5	255	28	2	290	1	92	696	7	0	795	0	1178	
Hourly Total	110	16	230	0	356	8	32	32	27	0	91	10	18	1166	130	3	1317	6	341	2517	20	2	2880	0	4644	
<b>Total</b>	2144	337	7938	2	10421	215	389	317	239	2	947	365	410	49488	2120	47	52065	288	6821	43343	390	857	51411	1	114844	
<b>% Approach</b>	20.6%	3.2%	76.2%	0%	-	-	41.1%	33.5%	25.2%	0.2%	-	-	0.8%	95.1%	4.1%	0.1%	-	-	13.3%	84.3%	0.8%	1.7%	-	-	-	
<b>% Total</b>	1.9%	0.3%	6.9%	0%	9.1%	-	0.3%	0.3%	0.2%	0%	0.8%	-	0.4%	43.1%	1.8%	0%	45.3%	-	5.9%	37.7%	0.3%	0.7%	44.8%	-	-	
<b>Motorcycles</b>	12	1	42	0	55	-	1	5	3	0	9	-	2	273	4	1	280	-	17	115	0	1	133	-	477	
<b>% Motorcycles</b>	0.6%	0.3%	0.5%	0%	0.5%	-	0.3%	1.6%	1.3%	0%	1.0%	-	0.5%	0.6%	0.2%	2.1%	0.5%	-	0.2%	0.3%	0%	0.1%	0.3%	-	0.4%	
<b>Lights</b>	2098	330	7801																							

Leg Direction	Renton Rd Eastbound						Renton Rd Westbound						Fort Weaver Rd Northbound						Fort Weaver Rd Southbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
<b>% Bicycles on Road</b>	0.4%	0%	0.1%	0%	<b>0.2%</b>	-	0.3%	0.6%	0.8%	0%	<b>0.5%</b>	-	1.0%	0.1%	0.1%	0%	<b>0.1%</b>	-	0%	0%	0.3%	0%	<b>0%</b>	-	0.1%
Pedestrians	-	-	-	-	-	185	-	-	-	-	-	280	-	-	-	-	-	237	-	-	-	-	-	-	1
% Pedestrians	-	-	-	-	-	- 86.0%	-	-	-	-	-	- 76.7%	-	-	-	-	-	- 82.3%	-	-	-	-	-	-	- 100%
Bicycles on Crosswalk	-	-	-	-	-	30	-	-	-	-	-	85	-	-	-	-	-	51	-	-	-	-	-	-	0
% Bicycles on Crosswalk	-	-	-	-	-	- 14.0%	-	-	-	-	-	- 23.3%	-	-	-	-	-	- 17.7%	-	-	-	-	-	-	0%

\*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

**Fort Weaver Rd Renton Rd - TMC**

Tue May 11, 2021

Full Length (5 AM-9 AM, 3 PM-7 PM (+1))

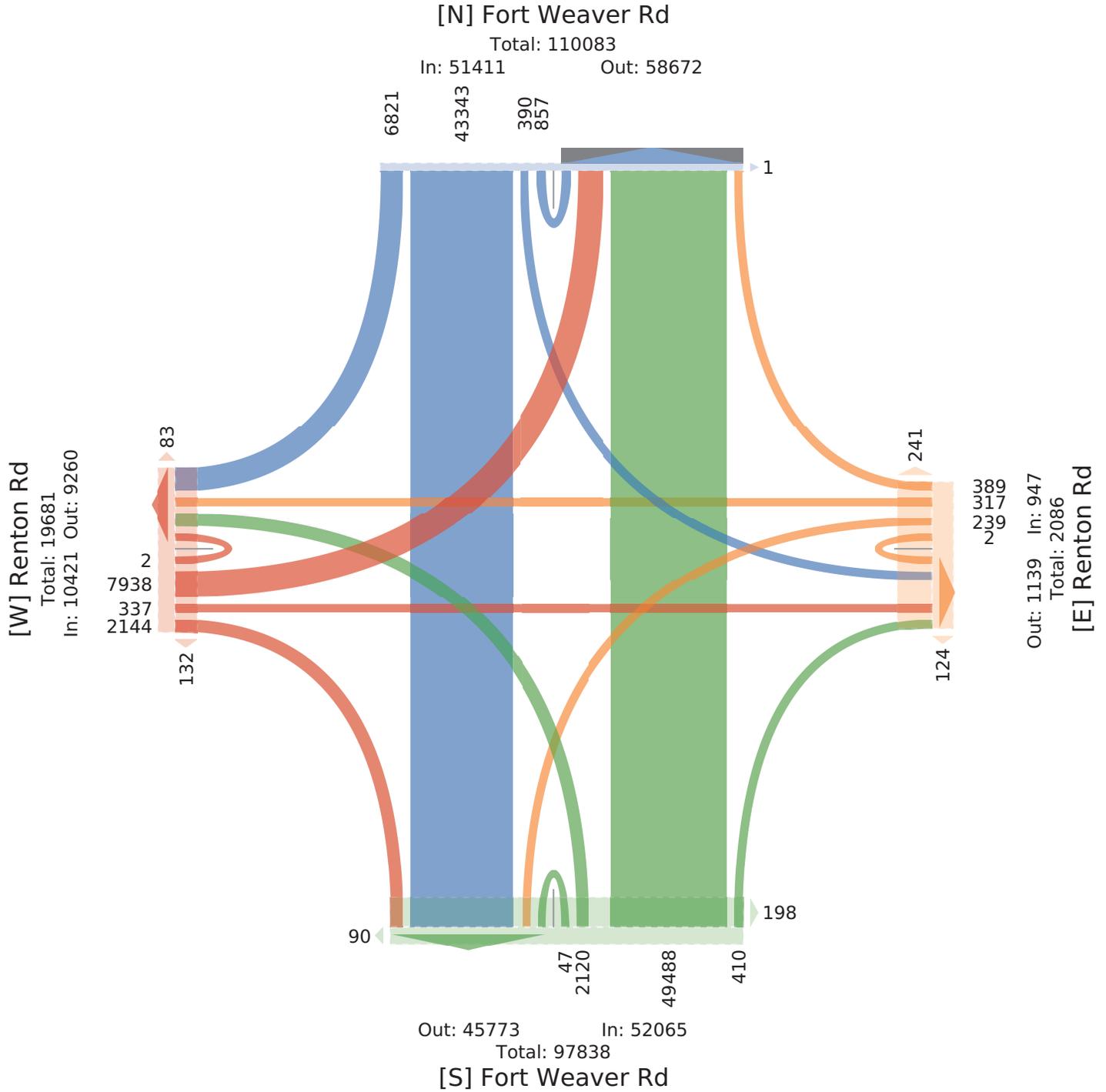
All Classes (Motorcycles, Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 836913, Location: 21.347931, -158.026889, Site Code: West Loch Hsg



Provided by: The Traffic Management Consultant  
 1188 Bishop Street, Suite 1907,  
 Honolulu, HI, 96813, US



**Fort Weaver Rd Renton Rd - TMC**

Tue May 11, 2021

AM Peak (May 11 2021 6:45AM - 7:45 AM)

All Classes (Motorcycles, Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 836913, Location: 21.347931, -158.026889, Site Code: West Loch Hsg



Provided by: The Traffic Management Consultant  
1188 Bishop Street, Suite 1907,  
Honolulu, HI, 96813, US

Leg Direction	Renton Rd Eastbound						Renton Rd Westbound						Fort Weaver Rd Northbound						Fort Weaver Rd Southbound						Int
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	
2021-05-11 6:45AM	20	1	149	0	170	2	0	1	0	0	1	2	0	774	14	1	789	3	41	258	5	32	336	0	1296
7:00AM	14	1	95	0	110	3	3	0	3	0	6	3	4	806	14	0	824	4	63	265	2	13	343	0	1283
7:15AM	21	1	114	0	136	3	2	0	0	0	2	7	2	801	25	1	829	7	64	317	2	15	398	0	1365
7:30AM	30	1	109	0	140	2	2	4	2	0	8	2	4	686	33	2	725	5	66	354	0	22	442	0	1315
<b>Total</b>	85	4	467	0	556	10	7	5	5	0	17	14	10	3067	86	4	3167	19	234	1194	9	82	1519	0	5259
<b>% Approach</b>	15.3%	0.7%	84.0%	0%	-	-	41.2%	29.4%	29.4%	0%	-	-	0.3%	96.8%	2.7%	0.1%	-	-	15.4%	78.6%	0.6%	5.4%	-	-	-
<b>% Total</b>	1.6%	0.1%	8.9%	0%	10.6%	-	0.1%	0.1%	0.1%	0%	0.3%	-	0.2%	58.3%	1.6%	0.1%	60.2%	-	4.4%	22.7%	0.2%	1.6%	28.9%	-	-
<b>PHF</b>	0.708	1.000	0.782	-	0.816	-	0.583	0.313	0.417	-	0.531	-	0.625	0.951	0.652	0.500	0.955	-	0.886	0.843	0.450	0.641	0.859	-	0.964
<b>Motorcycles</b>	0	0	1	0	1	-	0	0	0	0	0	-	0	8	0	0	8	-	0	0	0	0	0	-	9
<b>% Motorcycles</b>	0%	0%	0.2%	0%	0.2%	-	0%	0%	0%	0%	0%	-	0%	0.3%	0%	0%	0.3%	-	0%	0%	0%	0%	0%	-	0.2%
<b>Lights</b>	81	4	461	0	546	-	6	5	5	0	16	-	10	3039	83	4	3136	-	229	1167	7	82	1485	-	5183
<b>% Lights</b>	95.3%	100%	98.7%	0%	98.2%	-	85.7%	100%	100%	0%	94.1%	-	100%	99.1%	96.5%	100%	99.0%	-	97.9%	97.7%	77.8%	100%	97.8%	-	98.6%
<b>Single-Unit Trucks</b>	1	0	1	0	2	-	1	0	0	0	1	-	0	4	0	0	4	-	3	9	2	0	14	-	21
<b>% Single-Unit Trucks</b>	1.2%	0%	0.2%	0%	0.4%	-	14.3%	0%	0%	0%	5.9%	-	0%	0.1%	0%	0%	0.1%	-	1.3%	0.8%	22.2%	0%	0.9%	-	0.4%
<b>Articulated Trucks</b>	0	0	1	0	1	-	0	0	0	0	0	-	0	1	0	0	1	-	0	3	0	0	3	-	5
<b>% Articulated Trucks</b>	0%	0%	0.2%	0%	0.2%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0.3%	0%	0%	0.2%	-	0.1%
<b>Buses</b>	3	0	2	0	5	-	0	0	0	0	0	-	0	14	3	0	17	-	2	15	0	0	17	-	39
<b>% Buses</b>	3.5%	0%	0.4%	0%	0.9%	-	0%	0%	0%	0%	0%	-	0%	0.5%	3.5%	0%	0.5%	-	0.9%	1.3%	0%	0%	1.1%	-	0.7%
<b>Bicycles on Road</b>	0	0	1	0	1	-	0	0	0	0	0	-	0	1	0	0	1	-	0	0	0	0	0	-	2
<b>% Bicycles on Road</b>	0%	0%	0.2%	0%	0.2%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%
<b>Pedestrians</b>	-	-	-	-	-	10	-	-	-	-	-	11	-	-	-	-	-	18	-	-	-	-	-	0	
<b>% Pedestrians</b>	-	-	-	-	-	100%	-	-	-	-	-	78.6%	-	-	-	-	-	94.7%	-	-	-	-	-	-	
<b>Bicycles on Crosswalk</b>	-	-	-	-	-	0	-	-	-	-	-	3	-	-	-	-	-	1	-	-	-	-	-	0	
<b>% Bicycles on Crosswalk</b>	-	-	-	-	-	0%	-	-	-	-	-	21.4%	-	-	-	-	-	5.3%	-	-	-	-	-	-	

\*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

**Fort Weaver Rd Renton Rd - TMC**

Tue May 11, 2021

AM Peak (May 11 2021 6:45AM - 7:45 AM)

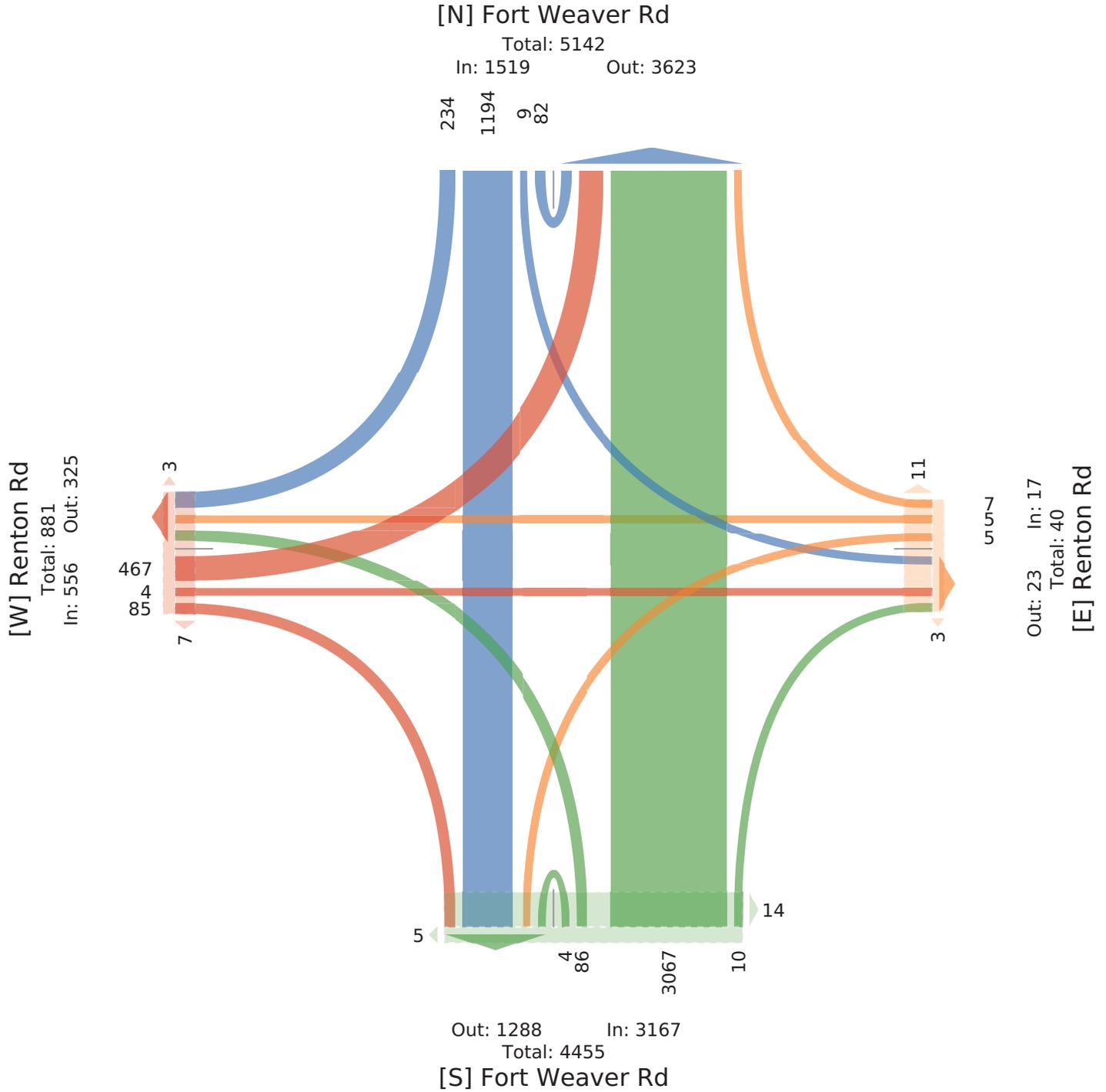
All Classes (Motorcycles, Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 836913, Location: 21.347931, -158.026889, Site Code: West Loch Hsg



Provided by: The Traffic Management Consultant  
1188 Bishop Street, Suite 1907,  
Honolulu, HI, 96813, US



**Fort Weaver Rd Renton Rd - TMC**

Tue May 11, 2021

PM Peak (May 11 2021 3:45PM - 4:45 PM) - Overall Peak Hour

All Classes (Motorcycles, Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 836913, Location: 21.347931, -158.026889, Site Code: West Loch Hsg



Provided by: The Traffic Management  
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Leg Direction	Renton Rd Eastbound						Renton Rd Westbound						Fort Weaver Rd Northbound						Fort Weaver Rd Southbound						Int
	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	
2021-05-11 3:45PM	32	3	98	0	133	1	6	3	1	0	10	3	7	432	18	1	458	1	108	753	4	3	868	0	1469
4:00PM	20	7	66	0	93	3	4	2	2	0	8	1	6	381	22	0	409	2	109	754	7	4	874	0	1384
4:15PM	23	17	77	0	117	3	5	7	6	0	18	1	15	427	36	0	478	1	119	637	9	2	767	0	1380
4:30PM	32	8	91	0	131	2	5	9	5	0	19	3	14	389	25	0	428	2	110	649	15	1	775	0	1353
<b>Total</b>	107	35	332	0	474	9	20	21	14	0	55	8	42	1629	101	1	1773	6	446	2793	35	10	3284	0	5586
<b>% Approach</b>	22.6%	7.4%	70.0%	0%	-	-	36.4%	38.2%	25.5%	0%	-	-	2.4%	91.9%	5.7%	0.1%	-	-	13.6%	85.0%	1.1%	0.3%	-	-	-
<b>% Total</b>	1.9%	0.6%	5.9%	0%	8.5%	-	0.4%	0.4%	0.3%	0%	1.0%	-	0.8%	29.2%	1.8%	0%	31.7%	-	8.0%	50.0%	0.6%	0.2%	58.8%	-	-
<b>PHF</b>	0.836	0.515	0.847	-	0.891	-	0.833	0.583	0.583	-	0.724	-	0.683	0.942	0.701	0.250	0.926	-	0.937	0.926	0.583	0.625	0.939	-	0.950
<b>Motorcycles</b>	1	0	2	0	3	-	0	0	1	0	1	-	1	5	0	0	6	-	0	7	0	0	7	-	17
<b>% Motorcycles</b>	0.9%	0%	0.6%	0%	0.6%	-	0%	0%	7.1%	0%	1.8%	-	2.4%	0.3%	0%	0%	0.3%	-	0%	0.3%	0%	0%	0.2%	-	0.3%
<b>Lights</b>	105	35	326	0	466	-	20	21	13	0	54	-	40	1600	100	1	1741	-	439	2767	35	10	3251	-	5512
<b>% Lights</b>	98.1%	100%	98.2%	0%	98.3%	-	100%	100%	92.9%	0%	98.2%	-	95.2%	98.2%	99.0%	100%	98.2%	-	98.4%	99.1%	100%	100%	99.0%	-	98.7%
<b>Single-Unit Trucks</b>	0	0	1	0	1	-	0	0	0	0	0	-	0	7	0	0	7	-	5	7	0	0	12	-	20
<b>% Single-Unit Trucks</b>	0%	0%	0.3%	0%	0.2%	-	0%	0%	0%	0%	0%	-	0%	0.4%	0%	0%	0.4%	-	1.1%	0.3%	0%	0%	0.4%	-	0.4%
<b>Articulated Trucks</b>	0	0	0	0	0	-	0	0	0	0	0	-	0	5	0	0	5	-	0	0	0	0	0	-	5
<b>% Articulated Trucks</b>	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0.3%	0%	0%	0.3%	-	0%	0%	0%	0%	0%	-	0.1%
<b>Buses</b>	1	0	3	0	4	-	0	0	0	0	0	-	0	11	1	0	12	-	2	12	0	0	14	-	30
<b>% Buses</b>	0.9%	0%	0.9%	0%	0.8%	-	0%	0%	0%	0%	0%	-	0%	0.7%	1.0%	0%	0.7%	-	0.4%	0.4%	0%	0%	0.4%	-	0.5%
<b>Bicycles on Road</b>	0	0	0	0	0	-	0	0	0	0	0	-	1	1	0	0	2	-	0	0	0	0	0	-	2
<b>% Bicycles on Road</b>	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	2.4%	0.1%	0%	0%	0.1%	-	0%	0%	0%	0%	0%	-	0%
<b>Pedestrians</b>	-	-	-	-	-	5	-	-	-	-	-	0	-	-	-	-	-	2	-	-	-	-	-	0	-
<b>% Pedestrians</b>	-	-	-	-	-	55.6%	-	-	-	-	-	0%	-	-	-	-	-	33.3%	-	-	-	-	-	-	-
<b>Bicycles on Crosswalk</b>	-	-	-	-	-	4	-	-	-	-	-	8	-	-	-	-	-	4	-	-	-	-	-	0	-
<b>% Bicycles on Crosswalk</b>	-	-	-	-	-	44.4%	-	-	-	-	-	100%	-	-	-	-	-	66.7%	-	-	-	-	-	-	-

\*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

**Fort Weaver Rd Renton Rd - TMC**

Tue May 11, 2021

PM Peak (May 11 2021 3:45PM - 4:45 PM) - Overall Peak Hour

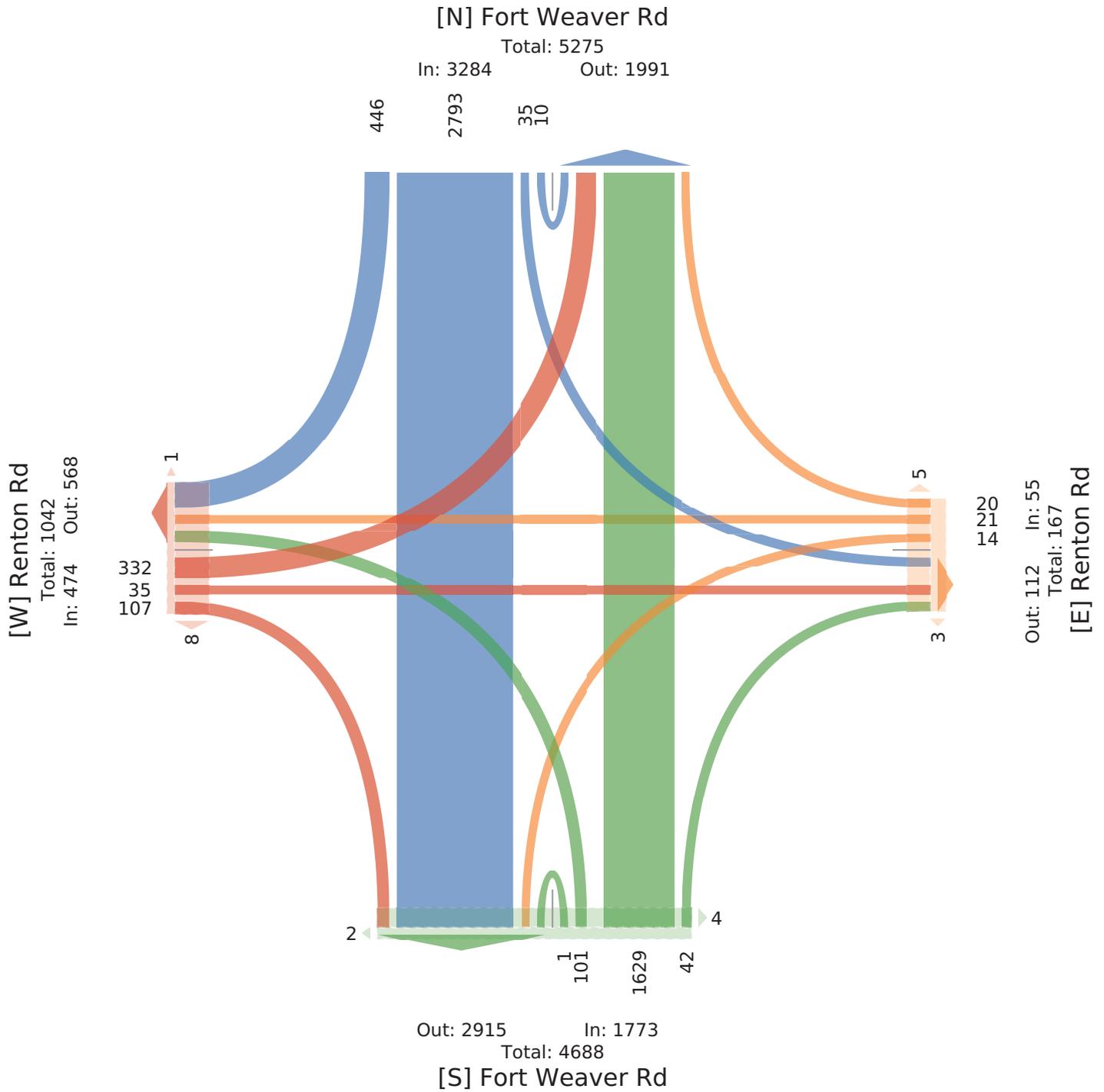
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All Movements

ID: 836913, Location: 21.347931, -158.026889, Site Code: West Loch Hsg



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**Study Name Renton Rd Easement**

**Start Date 05/11/2021**

**Start Time 6:00 AM**

**Site Code West Loch Hsg**

Channel Direction	Exit	Enter	Totals	
	Southbound	Northbound	Exit-Hourly	Enter-Hourly

Tuesday, May 11, 2021

6:00 AM	6	6	6	12
6:15 AM	0	4	0	7
6:30 AM	0	2	0	4
6:45 AM	0	0	<b>0</b>	<b>6</b>
7:00 AM	0	1	0	6
7:15 AM	0	1		
7:30 AM	0	4		
7:45 AM	0	0		

Tuesday, May 11, 2021

3:30 PM	0	3	2	10
3:45 PM	1	3	<b>2</b>	<b>8</b>
4:00 PM	0	3	1	7
4:15 PM	1	1		
4:30 PM	0	1		
4:45 PM	0	2		

Thursday, May 13, 2021

6:00 AM	4	4	4	10
6:15 AM	0	4	0	6
6:30 AM	0	1	0	3
6:45 AM	0	1	<b>0</b>	<b>4</b>
7:00 AM	0	0	1	5
7:15 AM	0	1		
7:30 AM	0	2		
7:45 AM	1	2		

Thursday, May 13, 2021

3:30 PM	0	3	1	5
3:45 PM	0	0	<b>1</b>	<b>3</b>
4:00 PM	0	1	1	4
4:15 PM	1	1	1	4
4:30 PM	0	1	0	4
4:45 PM	0	1	0	5
5:00 PM	0	1	0	5
5:15 PM	0	1	0	5
5:30 PM	0	2	1	9
5:45 PM	0	1		
6:00 PM	0	1		
6:15 PM	1	5		

AM Peak Hour Traffic

6:45 AM

Thursday, March 11, 2021

6

PM Peak Hour Traffic

3:45 PM

Thursday, March 11, 2021

8

**Study Name Fort Weaver Rd N of Old Fort Weaver Rd**  
**Start Date 05/11/2021**  
**Start Time 6:00 AM**

Channel Direction	Direction	Direction	Totals	
	Southbound	Northbound	15-Minute	Hourly
Tuesday, May 11, 2021				
6:00 AM	270	937	1207	5071
6:15 AM	344	894	1238	5163
6:30 AM	326	973	1299	<b>5223</b>
6:45 AM	314	1013	1327	5189
7:00 AM	363	936	1299	5087
7:15 AM	369	929	1298	
7:30 AM	414	851	1265	
7:45 AM	376	849	1225	
Tuesday, May 11, 2021				
3:30 PM	861	515	1376	<b>5467</b>
3:45 PM	838	535	1373	5356
4:00 PM	850	460	1310	5200
4:15 PM	921	487	1408	5066
4:30 PM	770	495	1265	4886
4:45 PM	815	402	1217	4812
5:00 PM	792	384	1176	4788
5:15 PM	802	426	1228	4844
5:30 PM	785	406	1191	4717
5:45 PM	856	337	1193	
6:00 PM	887	345	1232	
6:15 PM	750	351	1101	
Thursday, May 13, 2021				
6:00 AM	289	940	1229	4923
6:15 AM	269	885	1154	5013
6:30 AM	322	899	1221	<b>5151</b>
6:45 AM	345	974	1319	5125
7:00 AM	363	956	1319	5044
7:15 AM	396	896	1292	
7:30 AM	389	806	1195	
7:45 AM	412	826	1238	
Thursday, May 13, 2021				
3:00 PM	729	519	1248	5479
3:15 PM	832	544	1376	<b>5559</b>
3:30 PM	865	538	1403	5517
3:45 PM	931	521	1452	5400
4:00 PM	766	562	1328	5087
4:15 PM	834	500	1334	5099
4:30 PM	825	461	1286	5060
4:45 PM	720	419	1139	5024
5:00 PM	923	417	1340	5048
5:15 PM	827	468	1295	
5:30 PM	813	437	1250	
5:45 PM	796	367	1163	

**TRANSPORTATION ASSESSMENT REPORT**  
**FOR THE PROPOSED**  
**WEST LOCH AFFORDABLE HOUSING**  
**EWA BEACH, OAHU, HAWAII**  
**TAX MAP KEY: 9-1-122:004**

**APPENDIX B**  
**CAPACITY ANALYSIS WORKSHEETS**  
**EXISTING TRAFFIC CONDITIONS**

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	467	4	85	5	5	7	90	3067	10	82	9	1194	234
Future Volume (vph)	467	4	85	5	5	7	90	3067	10	82	9	1194	234
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100	0	0	0	0	0	650	340	0	0	0	0	1000
Storage Lanes	1	0	1	0	0	1	1	1	1	1	1	1	1
Taper Length (ft)	100	0	0	100	0	0	100	0	0	0	0	100	0
Satd. Flow (prot)	1698	1703	1538	0	1854	1417	1752	5136	1615	0	1768	5085	1583
Ft Permitted	0.950	0.953	0.950	0.976	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950
Satd. Flow (perm)	1698	1703	1473	0	1854	1417	1752	5136	1546	0	1768	5085	1514
Right Turn on Red	Yes												
Satd. Flow (RTOR)	77	77	77	77	77	77	77	77	77	77	77	77	77
Link Speed (mph)	25	25	25	25	25	25	25	25	25	25	25	25	25
Link Distance (ft)	598	598	598	382	382	382	800	800	800	800	800	1100	1100
Travel Time (s)	16.3	16.3	16.3	10.4	10.4	10.4	15.6	15.6	15.6	15.6	15.6	21.4	21.4
Confl. Peds. (#/hr)	19	19	19	14	14	14	14	14	14	14	14	14	10
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	1%	0%	5%	0%	0%	14%	3%	1%	0%	0%	22%	2%	2%
Shared Lane Traffic (%)	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Lane Group Flow (vph)	243	247	89	0	10	7	94	3195	10	0	94	1244	244
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Perm	Prot	Prot	NA	Perm
Protected Phases	8	8	8	4	4	4	5	2	2	1	1	6	6
Permitted Phases	8	8	8	4	4	4	5	2	2	1	1	6	6
Detector Phase	8	8	8	4	4	4	5	2	2	1	1	6	6
Switch Phase	8	8	8	4	4	4	5	2	2	1	1	6	6
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	3.0	15.0	15.0	3.0	3.0	15.0	15.0
Minimum Split (s)	50.0	50.0	50.0	13.0	13.0	13.0	7.0	38.0	38.0	7.0	7.0	28.0	28.0
Total Split (s)	50.0	50.0	50.0	13.0	13.0	13.0	25.0	159.0	159.0	18.0	18.0	152.0	152.0
Total Split (%)	20.8%	20.8%	20.8%	5.4%	5.4%	5.4%	10.4%	66.3%	66.3%	7.5%	7.5%	63.3%	63.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0	3.0	3.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	1.0	2.0	2.0	1.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0	4.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lead	Lag	Lag

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lead-Lag Optimize?													
Recall Mode	None	None	None	None	None	None	None	None	None	None	None	None	None
Act Effect Green (s)	39.1	39.1	39.1	7.0	7.0	7.0	17.5	161.6	161.6	15.5	159.6	159.6	0.0
Actuated g/C Ratio	0.16	0.16	0.16	0.03	0.03	0.03	0.07	0.67	0.67	0.06	0.66	0.66	0.66
v/c Ratio	0.88	0.89	0.29	0.19	0.06	0.74	0.92	0.01	0.82	0.37	0.22	0.22	0.22
Control Delay	127.6	129.4	21.4	121.7	1.0	140.4	40.7	0.0	152.6	19.6	2.2	2.2	2.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	127.6	129.4	21.4	121.7	1.0	140.4	40.7	0.0	152.6	19.6	2.2	2.2	2.2
LOS	F	F	C	F	A	F	D	A	F	B	A	A	A
Approach Delay	112.0												
Approach LOS	F												
Queue Length 50th (ft)	400	407	16	16	0	149	1742	0	150	345	0	0	0
Queue Length 95th (ft)	523	530	79	43	0	225	1749	0	#290	400	42	42	42
Internal Link Dist (ft)	518												
Turn Bay Length (ft)	100												
Base Capacity (vph)	311	312	332	54	116	153	3458	1060	114	3381	1088	1000	1000
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.78	0.79	0.27	0.19	0.06	0.61	0.92	0.01	0.82	0.37	0.22	0.22	0.22

**Intersection Summary**

Area Type: Other

Cycle Length: 240

Actuated Cycle Length: 240

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 45.4

Intersection Capacity Utilization 112.6%

ICU Level of Service H

Analysis Period (min) 15

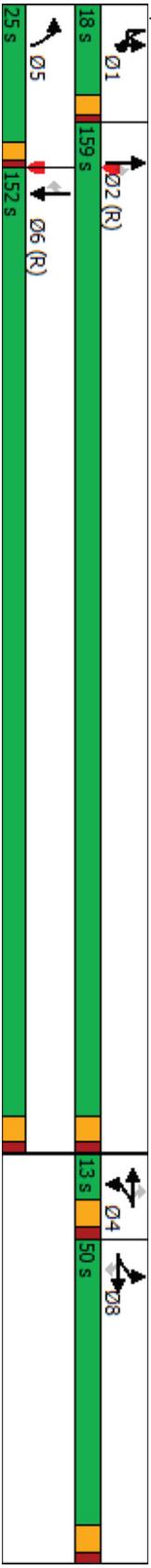
# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

West Loch Affordable Housing  
 1: Fort Weaver Rd & Renton Rd

Lanes, Volumes, Timings  
 Existing AM Peak Hour

Splits and Phases: 1: Fort Weaver Rd & Renton Rd



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	332	35	107	14	21	20	102	1629	42	10	35	2793	448
Future Volume (vph)	332	35	107	14	21	20	102	1629	42	10	35	2793	448
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100	1	1	0	0	1	1	1	340	1	1	400	1000
Storage Lanes	1	1	1	0	0	1	1	1	1	1	1	1	1
Taper Length (ft)	100			100			100				100		
Satd. Flow (prot)	1698	1721	1599	0	1862	1615	1787	5136	1615	0	1805	5136	1583
Ft Permitted	0.950	0.961		0.980		0.950				0.950			
Satd. Flow (perm)	1698	1721	1564	0	1856	1615	1787	5136	1567	0	1805	5136	1519
Right Turn on Red			Yes			Yes			Yes				Yes
Satd. Flow (RTOR)			113			77			59				472
Link Speed (mph)	25	25	25	25	25	25	25	25	25	25	25	25	25
Link Distance (ft)	598	598	598	382	382	800	800	800	800	800	800	800	1100
Travel Time (s)	16.3	16.3	16.3	10.4	10.4	15.6	15.6	15.6	15.6	15.6	15.6	15.6	21.4
Confl. Peds. (#/hr)	6	6	6	6	6	8	8	8	8	8	8	8	9
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	1%	0%	1%	0%	0%	0%	1%	1%	0%	0%	0%	0%	1%
Shared Lane Traffic (%)	45%												2%
Lane Group Flow (vph)	192	194	113	0	37	21	107	1715	44	0	48	2940	472
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Perm	Prot	Prot	NA	Perm
Protected Phases	8	8	8	4	4	4	5	2	2	1	1	6	6
Permitted Phases			8			4			2				6
Detector Phase	8	8	8	4	4	4	5	2	2	1	1	6	6
Switch Phase													
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	3.0	15.0	15.0	3.0	3.0	15.0	15.0
Minimum Split (s)	50.0	50.0	50.0	13.0	13.0	13.0	7.0	38.0	38.0	7.0	7.0	28.0	28.0
Total Split (s)	50.0	50.0	50.0	13.0	13.0	13.0	23.0	161.0	161.0	16.0	16.0	154.0	154.0
Total Split (%)	20.8%	20.8%	20.8%	5.4%	5.4%	5.4%	9.6%	67.1%	67.1%	6.7%	6.7%	64.2%	64.2%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0	3.0	3.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	1.0	2.0	2.0	1.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0	4.0	6.0	6.0
Lead/Lag				Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lead	Lag	Lag

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lead-Lag Optimize?													
Recall Mode	None	None	None	None	None	None	None	None	None	None	None	None	None
Act Effect Green (s)	33.1	33.1	33.1	7.0	7.0	18.7	169.5	169.5	11.0	161.8	161.8	0.67	0.67
Actuated g/C Ratio	0.14	0.14	0.14	0.03	0.03	0.08	0.71	0.71	0.05	0.67	0.67	0.85	0.40
v/c Ratio	0.82	0.82	0.36	0.69	0.17	0.77	0.47	0.04	0.59	0.85	0.40	0.85	0.40
Control Delay	126.3	125.8	14.4	164.7	3.1	140.0	17.3	1.3	138.9	35.2	2.2	35.2	2.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	126.3	125.8	14.4	164.7	3.1	140.0	17.3	1.3	138.9	35.2	2.2	35.2	2.2
LOS	F	F	B	F	A	F	B	A	F	D	A	D	A
Approach Delay	100.8			106.2			23.9					32.1	
Approach LOS	F			F			C					C	
Queue Length 50th (ft)	317	321	0	60	0	169	446	0	76	1339	0	1339	0
Queue Length 95th (ft)	411	416	69	#134	0	#275	547	10	134	1524	48	1524	48
Internal Link Dist (ft)		518		302			720					1020	
Turn Bay Length (ft)	100					650		340	400			1000	
Base Capacity (vph)	311	315	379	54	121	149	3627	1124	93	3463	1177	3463	1177
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.62	0.62	0.30	0.69	0.17	0.72	0.47	0.04	0.52	0.85	0.40	0.85	0.40

**Intersection Summary**

Area Type: Other

Cycle Length: 240

Actuated Cycle Length: 240

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 36.1

Intersection Capacity Utilization 93.3%

ICU Level of Service F

Analysis Period (min) 15

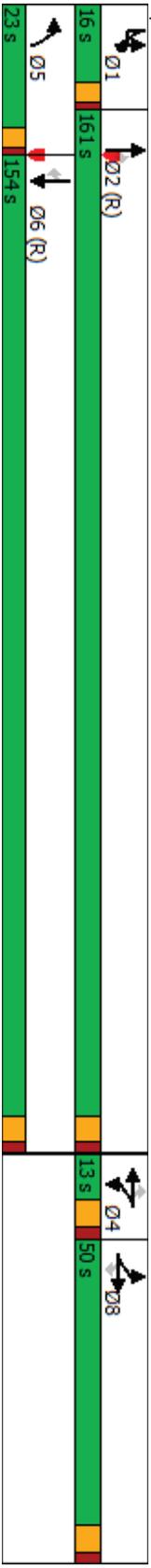
# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

West Loch Affordable Housing  
 1: Fort Weaver Rd & Renton Rd

Lanes, Volumes, Timings  
 Existing PM Peak Hour

Splits and Phases: 1: Fort Weaver Rd & Renton Rd



**TRANSPORTATION ASSESSMENT REPORT**  
**FOR THE PROPOSED**  
**WEST LOCH AFFORDABLE HOUSING**  
**EWA BEACH, OAHU, HAWAII**  
**TAX MAP KEY: 9-1-122:004**

**APPENDIX C**  
**CAPACITY ANALYSIS WORKSHEETS**  
**2025 PEAK HOUR TRAFFIC WITHOUT PROJECT**

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	480	4	87	5	5	7	92	3317	10	84	9	1275	241
Future Volume (vph)	480	4	87	5	5	7	92	3317	10	84	9	1275	241
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100	1	1	0	0	1	1	1	1	1	1	1	1
Storage Lanes	1	1	1	0	0	1	1	1	1	1	1	1	1
Taper Length (ft)	100			100			100			100		100	
Satd. Flow (prot)	1698	1703	1538	0	1854	1417	1752	5136	1615	0	1769	5085	1583
Ft Permitted	0.950	0.953		0.976		0.950	0.950			0.950			
Satd. Flow (perm)	1698	1703	1473	0	1854	1417	1752	5136	1546	0	1769	5085	1514
Right Turn on Red			Yes			Yes			Yes		Yes		Yes
Satd. Flow (RTOR)			77			77			59		59		251
Link Speed (mph)	25	25		25			25		35		35		35
Link Distance (ft)	598	598		382			800		800		1100		1100
Travel Time (s)	16.3	16.3		10.4			15.6		15.6		21.4		21.4
Confl. Peds. (#/hr)			19				14		14		10		10
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	1%	0%	5%	0%	0%	14%	3%	1%	0%	0%	22%	2%	2%
Shared Lane Traffic (%)	50%												
Lane Group Flow (vph)	250	254	91	0	10	7	96	3455	10	0	97	1328	251
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Perm	Prot	Prot	NA	Perm
Protected Phases	8	8	8	4	4	4	5	2	2	1	1	6	6
Permitted Phases			8			4			2				6
Detector Phase	8	8	8	4	4	4	5	2	2	1	1	6	6
Switch Phase													
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	3.0	15.0	15.0	3.0	3.0	15.0	15.0
Minimum Split (s)	50.0	50.0	50.0	13.0	13.0	13.0	7.0	38.0	38.0	7.0	7.0	28.0	28.0
Total Split (s)	50.0	50.0	50.0	13.0	13.0	13.0	26.0	160.0	160.0	17.0	17.0	151.0	151.0
Total Split (%)	20.8%	20.8%	20.8%	5.4%	5.4%	5.4%	10.8%	66.7%	66.7%	7.1%	7.1%	62.9%	62.9%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0	3.0	3.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	1.0	2.0	2.0	1.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0	4.0	6.0	6.0
Lead/Lag				Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lead	Lag	Lag



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lead-Lag Optimize?													
Recall Mode	None	None	None	None	None	None	None	None	None	None	None	None	None
Act Effect Green (s)	40.0	40.0	40.0	7.0	7.0	7.0	17.8	160.2	160.2	16.0	158.4	158.4	158.4
Actuated g/C Ratio	0.17	0.17	0.17	0.03	0.03	0.03	0.07	0.67	0.67	0.07	0.66	0.66	0.66
v/c Ratio	0.88	0.89	0.29	0.19	0.06	0.06	0.74	1.01	0.01	0.83	0.40	0.23	0.23
Control Delay	127.2	129.0	22.1	121.7	1.0	1.0	139.4	55.6	0.0	148.9	20.6	2.2	2.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	127.2	129.0	22.1	121.7	1.0	1.0	139.4	55.6	0.0	148.9	20.6	2.2	2.2
LOS	F	F	C	F	F	A	F	E	A	F	F	C	A
Approach Delay	111.9												
Approach LOS	F												
Queue Length 50th (ft)	408	415	19	16	0	0	152	~2170	0	157	387	0	0
Queue Length 95th (ft)	#553	#565	84	43	0	228	#2159	0	0	#315	439	43	43
Internal Link Dist (ft)	518												
Turn Bay Length (ft)	100												
Base Capacity (vph)	311	312	332	54	116	160	3427	1051	0	117	3355	1084	1000
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.80	0.81	0.27	0.19	0.06	0.60	1.01	0.01	0.01	0.83	0.40	0.23	0.23

**Intersection Summary**

Area Type: Other

Cycle Length: 240

Actuated Cycle Length: 240

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.01

Intersection Signal Delay: 53.9

Intersection Capacity Utilization 117.7%

ICU Level of Service H

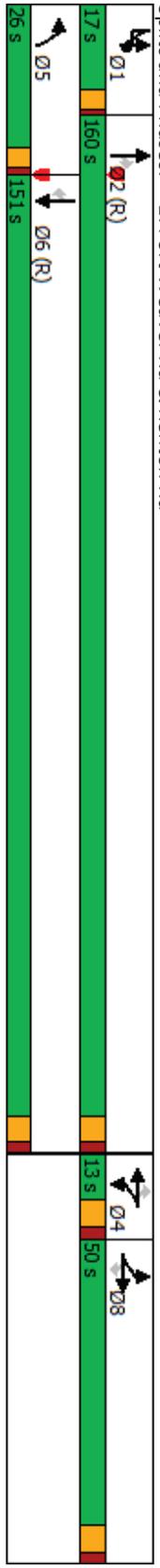
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Splits and Phases: 1: Fort Weaver Rd & Renton Rd



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations													
Traffic Volume (vph)	343	36	110	14	22	21	105	1783	43	10	36	3035	460
Future Volume (vph)	343	36	110	14	22	21	105	1783	43	10	36	3035	460
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100	0	0	0	0	0	650	340	340	0	400	400	1000
Storage Lanes	1	1	1	0	0	1	1	1	1	1	1	1	1
Taper Length (ft)	100	0	0	100	0	0	100	0	0	0	100	0	0
Satd. Flow (prot)	1698	1721	1599	0	1864	1615	1787	5136	1615	0	1805	5136	1583
Ft Permitted	0.950	0.961	0.950	0.981	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950
Satd. Flow (perm)	1698	1721	1564	0	1858	1615	1787	5136	1567	0	1805	5136	1519
Right Turn on Red	Yes												
Satd. Flow (RTOR)	106	106	106	0	59	59	59	59	59	59	59	59	484
Link Speed (mph)	25	25	25	25	25	25	25	25	25	25	25	25	35
Link Distance (ft)	598	598	598	382	800	800	800	800	800	800	800	800	1100
Travel Time (s)	16.3	16.3	16.3	10.4	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	21.4
Confl. Peds. (#/hr)	6	6	6	6	6	6	6	6	6	6	6	6	9
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	1%	0%	1%	0%	0%	0%	1%	1%	0%	0%	0%	0%	1%
Shared Lane Traffic (%)	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%
Lane Group Flow (vph)	199	200	116	0	38	22	111	1877	45	0	49	3195	484
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Perm	Prot	Prot	NA	Perm
Protected Phases	8	8	8	4	4	4	5	2	2	1	1	6	6
Permitted Phases	8	8	8	4	4	4	5	2	2	1	1	6	6
Detector Phase	8	8	8	4	4	4	5	2	2	1	1	6	6
Switch Phase													
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	3.0	15.0	15.0	3.0	3.0	15.0	15.0
Minimum Split (s)	50.0	50.0	50.0	13.0	13.0	13.0	7.0	38.0	38.0	7.0	7.0	28.0	28.0
Total Split (s)	50.0	50.0	50.0	13.0	13.0	13.0	19.0	160.0	160.0	17.0	17.0	158.0	158.0
Total Split (%)	20.8%	20.8%	20.8%	5.4%	5.4%	5.4%	7.9%	66.7%	66.7%	7.1%	7.1%	65.8%	65.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0	3.0	3.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	1.0	2.0	2.0	1.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0	4.0	6.0	6.0
Lead/Lag				Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lead	Lag	Lag

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lead-Lag Optimize?													
Recall Mode	None	None	None	None	None	None	None	None	None	None	None	None	None
Act Effect Green (s)	34.1	34.1	34.1	7.0	7.0	20.2	165.7	165.7	11.2	156.7	156.7	0.05	0.65
Actuated g/C Ratio	0.14	0.14	0.14	0.03	0.03	0.08	0.69	0.69	0.04	0.58	0.95	0.42	0.65
v/c Ratio	0.83	0.82	0.37	0.70	0.21	0.74	0.53	0.04	0.58	0.95	0.42	0.95	0.65
Control Delay	125.8	124.6	18.7	167.2	4.6	130.4	19.6	1.4	138.5	46.3	2.2	0.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	125.8	124.6	18.7	167.2	4.6	130.4	19.6	1.4	138.5	46.3	2.2	0.0	0.0
LOS	F	F	B	F	A	F	B	A	F	F	D	A	A
Approach Delay	101.2				107.6		25.3					41.8	
Approach LOS	F				F		C					D	
Queue Length 50th (ft)	329	330	14	61	0	173	521	0	78	1736	0	0	0
Queue Length 95th (ft)	426	427	85	#137	0	#341	633	11	137	1770	47	0	0
Internal Link Dist (ft)		518		302			720				1020		
Turn Bay Length (ft)	100					650		340	400		1000		
Base Capacity (vph)	311	315	373	54	104	150	3546	1100	98	3354	1159	0	0
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.64	0.63	0.31	0.70	0.21	0.74	0.53	0.04	0.50	0.95	0.42	0.95	0.42

**Intersection Summary**

Area Type: Other

Cycle Length: 240

Actuated Cycle Length: 240

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 42.0

Intersection Capacity Utilization 98.4%

ICU Level of Service F

Analysis Period (min) 15

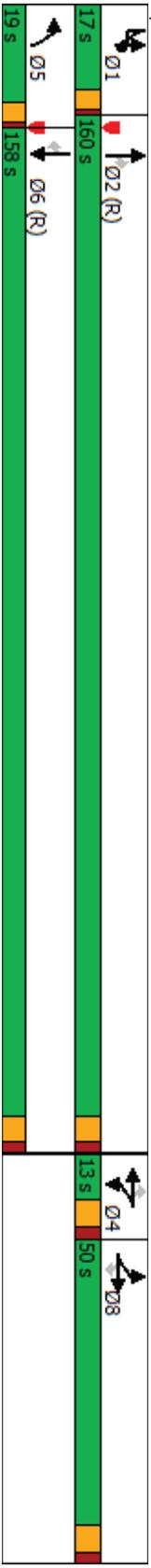
# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

West Loch Affordable Housing  
 1: Fort Weaver Rd & Renton Rd

Lanes, Volumes, Timings  
 PM Peak Hour W/O Project

Splits and Phases: 1: Fort Weaver Rd & Renton Rd



**TRANSPORTATION ASSESSMENT REPORT**  
**FOR THE PROPOSED**  
**WEST LOCH AFFORDABLE HOUSING**  
**EWA BEACH, OAHU, HAWAII**  
**TAX MAP KEY: 9-1-122:004**

**APPENDIX D**  
**CAPACITY ANALYSIS WORKSHEETS**  
**2025 PEAK HOUR TRAFFIC WITH PROJECT**

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	480	5	87	12	6	46	92	3317	14	84	19	1275	241
Future Volume (vph)	480	5	87	12	6	46	92	3317	14	84	19	1275	241
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100	0	0	0	0	0	650	340	400	1000			
Storage Lanes	1	1	1	1	1	1	1	1	1	1	1	1	1
Taper Length (ft)	100	100	100	100	100	100	100	100	100	100	100	100	100
Satd. Flow (prot)	1698	1703	1538	0	1837	1583	1752	5136	1615	0	1769	5085	1583
Flt Permitted	0.950	0.953	0.967	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950
Satd. Flow (perm)	1698	1703	1473	0	1837	1583	1752	5136	1546	0	1769	5085	1514
Right Turn on Red	Yes												
Satd. Flow (RTOR)	77	77	77	77	77	77	77	77	59	251	251	251	251
Link Speed (mph)	25	25	25	25	25	25	25	25	35	35	35	35	35
Link Distance (ft)	598	598	598	382	382	382	800	800	1100	1100	1100	1100	1100
Travel Time (s)	16.3	16.3	16.3	10.4	10.4	10.4	15.6	15.6	21.4	21.4	21.4	21.4	21.4
Confl. Peds. (#/hr)	19	19	19	19	19	19	19	19	14	10	10	10	10
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	1%	0%	5%	0%	0%	2%	3%	1%	0%	0%	11%	2%	2%
Shared Lane Traffic (%)	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
Lane Group Flow (vph)	250	255	91	0	19	48	96	3455	15	0	108	1328	251
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Perm	Prot	Prot	NA	Perm
Protected Phases	8	8	8	4	4	4	5	2	2	1	1	6	6
Permitted Phases	8	8	8	8	4	4	4	2	2	1	1	6	6
Detector Phase	8	8	8	4	4	4	5	2	2	1	1	6	6
Switch Phase													
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	3.0	15.0	15.0	3.0	3.0	15.0	15.0
Minimum Split (s)	50.0	50.0	50.0	13.0	13.0	13.0	7.0	38.0	38.0	7.0	7.0	28.0	28.0
Total Split (s)	50.0	50.0	50.0	13.0	13.0	13.0	26.0	159.0	159.0	18.0	18.0	151.0	151.0
Total Split (%)	20.8%	20.8%	20.8%	5.4%	5.4%	5.4%	10.8%	66.3%	66.3%	7.5%	7.5%	62.9%	62.9%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0	3.0	3.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	1.0	2.0	2.0	1.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0	4.0	6.0	6.0
Lead/Lag							Lead	Lag	Lag	Lead	Lead	Lag	Lag



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lead-Lag Optimize?													
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	None	C-Max	C-Max
Act Effct Green (s)	40.1	40.1	40.1	7.0	7.0	7.0	17.8	153.9	153.9	17.0	153.1	153.1	153.1
Actuated g/c Ratio	0.17	0.17	0.17	0.03	0.03	0.03	0.07	0.64	0.64	0.07	0.64	0.64	0.64
v/c Ratio	0.88	0.90	0.29	0.36	0.40	0.40	0.74	1.05	0.01	0.86	0.41	0.24	0.24
Control Delay	126.8	129.2	22.1	136.3	12.7	139.4	71.8	71.8	0.0	152.6	22.5	2.3	2.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	126.8	129.2	22.1	136.3	12.7	139.4	71.8	71.8	0.0	152.6	22.5	2.3	2.3
LOS	F	F	C	F	B	F	F	E	A	F	C	C	A
Approach Delay	111.8 47.8 73.4 27.8												
Approach LOS	F D E C												
Queue Length 50th (ft)	408	417	19	30	0	152	~2183	0	~176	388	0	0	0
Queue Length 95th (ft)	#553	#569	84	m68	m9	228	#2172	0	#346	439	43	0	0
Internal Link Dist (ft)	518 302 720 1020												
Turn Bay Length (ft)	100 650 340 1000												
Base Capacity (vph)	311	312	332	53	120	160	3293	1012	125	3243	1056	0	0
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.80	0.82	0.27	0.36	0.40	0.60	1.05	0.01	0.86	0.41	0.24	0.24	0.24

**Intersection Summary**

Area Type: Other

Cycle Length: 240

Actuated Cycle Length: 240

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.05

Intersection Signal Delay: 64.0 Intersection LOS: E

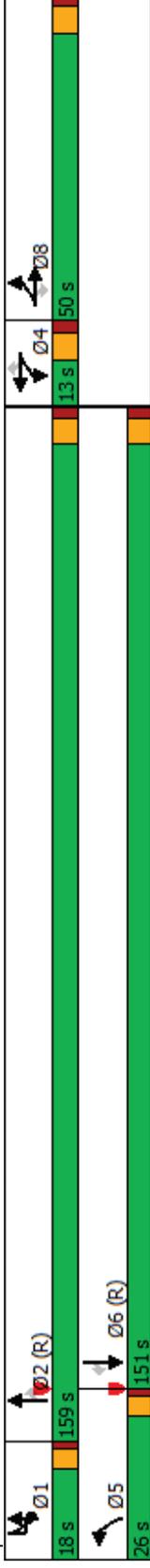
Intersection Capacity Utilization 118.3% ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.  
Queue shown is maximum after two cycles.

- # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Fort Weaver Rd & Renton Rd



**Intersection**

Int Delay, s/veh 3.6

Movement	SEL	SER	NEU	NEL	NET	SWT	SWR
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Lane Configurations							
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Traffic Vol, veh/h	0	16	6	15	28	17	0
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Future Vol, veh/h	0	16	6	15	28	17	0
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Conflicting Peds, #/hr	0	0	0	0	0	0	0
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Sign Control	Stop	Stop	Free	Free	Free	Free	Free
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RT Channelized	-	None	-	-	None	-	None
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Storage Length	0	-	-	80	-	-	-
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Veh in Median Storage, #0	-	-	-	-	0	0	-
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Grade, %	0	-	-	-	0	0	-
----------	---	---	---	---	---	---	---

Peak Hour Factor	96	96	96	96	96	96	96
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Heavy Vehicles, %	2	2	2	2	2	2	2
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Mvmt Flow	0	17	6	16	29	18	0
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Major/Minor	Minor2	Major1		Major2		
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Conflicting Flow All	77	9	18	18	0	-	0
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Stage 1	18	-	-	-	-	-	-
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Stage 2	59	-	-	-	-	-	-
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Critical Hdwy	6.84	6.94	6.44	4.14	-	-	-
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Critical Hdwy Stg 1	5.84	-	-	-	-	-	-
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Critical Hdwy Stg 2	5.84	-	-	-	-	-	-
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Follow-up Hdwy	3.52	3.32	2.52	2.22	-	-	-
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Pot Cap-1 Maneuver	917	1070	1392	1597	-	-	-
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Stage 1	1002	-	-	-	-	-	-
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Stage 2	956	-	-	-	-	-	-
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Platoon blocked, %					-	-	-
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Mov Cap-1 Maneuver	904	1070	1525	1525	-	-	-
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Mov Cap-2 Maneuver	904	-	-	-	-	-	-
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Stage 1	988	-	-	-	-	-	-
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Stage 2	956	-	-	-	-	-	-
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Approach	SE	NE	SW
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HCM Control Delay, s	8.4	3.2	0
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HCM LOS	A		
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Minor Lane/Major Mvmt	NEL	NET	SELn1	SWT	SWR
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Capacity (veh/h)	1525	-	1070	-	-
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HCM Lane V/C Ratio	0.014	-	0.016	-	-
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HCM Control Delay (s)	7.4	-	8.4	-	-
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HCM Lane LOS	A	-	A	-	-
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HCM 95th %tile Q(veh)	0	-	0	-	-
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**Intersection**

Int Delay, s/veh 1.2

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations		↗		↕↕	↕↕	
Traffic Vol, veh/h	0	16	0	39	48	6
Future Vol, veh/h	0	16	0	39	48	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #0	-	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	17	0	41	50	6

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	-	28	-	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-	-
Pot Cap-1 Maneuver	0	1041	0	-	-	-
Stage 1	0	-	0	-	-	-
Stage 2	0	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	1041	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	SE	NE	SW
HCM Control Delay, s	8.5	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NET SELn1	SWT	SWR
Capacity (veh/h)	- 1041	-	-
HCM Lane V/C Ratio	- 0.016	-	-
HCM Control Delay (s)	- 8.5	-	-
HCM Lane LOS	- A	-	-
HCM 95th %tile Q(veh)	- 0	-	-

**Intersection**

Int Delay, s/veh 2.3

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations		↗		↕↕	↕↔	
Traffic Vol, veh/h	0	16	0	25	17	0
Future Vol, veh/h	0	16	0	25	17	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #0	-	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	17	0	26	18	0

**Major/Minor**

	Minor2	Major1	Major2		
Conflicting Flow All	-	9	-	0	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-
Pot Cap-1 Maneuver	0	1070	0	-	-
Stage 1	0	-	0	-	-
Stage 2	0	-	0	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	-	1070	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

**Approach**

	SE	NE	SW
HCM Control Delay, s	8.4	0	0
HCM LOS	A		

**Minor Lane/Major Mvmt**

	NET SELn1	SWT	SWR
Capacity (veh/h)	- 1070	-	-
HCM Lane V/C Ratio	- 0.016	-	-
HCM Control Delay (s)	- 8.4	-	-
HCM Lane LOS	- A	-	-
HCM 95th %tile Q(veh)	- 0	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	343	37	110	21	23	41	104	1783	51	10	74	3035	460
Future Volume (vph)	343	37	110	21	23	41	104	1783	51	10	74	3035	460
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100	0	0	0	0	0	650	0	340	400	0	0	1000
Storage Lanes	1	1	1	0	1	1	1	1	1	1	1	1	1
Taper Length (ft)	100	100	100	100	100	100	100	100	100	100	100	100	100
Satd. Flow (prot)	1698	1721	1599	0	1856	1615	1787	5136	1615	0	1805	5136	1583
Flt Permitted	0.950	0.961	0.977	0.950	0.977	0.950	0.950	0.950	0.950	0.950	0.950	0.950	0.950
Satd. Flow (perm)	1698	1721	1564	0	1850	1615	1787	5136	1567	0	1805	5136	1519
Right Turn on Red	Yes												
Satd. Flow (RTOR)	114	114	114	77	77	77	77	77	77	77	77	77	484
Link Speed (mph)	25	25	25	25	25	25	25	35	35	35	35	35	35
Link Distance (ft)	598	598	598	382	382	382	382	800	800	800	800	800	1100
Travel Time (s)	16.3	16.3	16.3	10.4	10.4	10.4	10.4	15.6	15.6	15.6	15.6	15.6	21.4
Confl. Peds. (#/hr)	6	6	6	6	6	6	6	8	8	8	8	8	9
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	1%	0%	1%	0%	0%	0%	1%	1%	0%	0%	0%	1%	2%
Shared Lane Traffic (%)	45%												
Lane Group Flow (vph)	199	201	116	0	46	43	109	1877	54	0	89	3195	484
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Perm	Prot	Prot	NA	Perm
Protected Phases	8	8	8	4	4	4	5	2	2	1	1	6	6
Permitted Phases	8	8	8	8	4	4	4	2	2	1	1	6	6
Detector Phase	8	8	8	4	4	4	5	2	2	1	1	6	6
Switch Phase													
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	3.0	15.0	15.0	3.0	3.0	15.0	15.0
Minimum Split (s)	50.0	50.0	50.0	13.0	13.0	13.0	7.0	38.0	38.0	7.0	7.0	28.0	28.0
Total Split (s)	50.0	50.0	50.0	13.0	13.0	13.0	19.0	153.0	153.0	24.0	24.0	158.0	158.0
Total Split (%)	20.8%	20.8%	20.8%	5.4%	5.4%	5.4%	7.9%	63.8%	63.8%	10.0%	10.0%	65.8%	65.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0	3.0	3.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	1.0	2.0	2.0	1.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0	4.0	6.0	6.0
Lead/Lag							Lead	Lag	Lag	Lead	Lead	Lag	Lag



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Lead-Lag Optimize?													
Recall Mode	None	None	None	None	None	None	None	None	None	None	None	None	None
Act Effct Green (s)	34.3	34.3	34.3	7.0	0.03	7.0	0.03	7.0	0.03	7.0	0.03	7.0	0.03
Actuated g/c Ratio	0.14	0.14	0.14	0.85	0.36	0.85	0.36	0.85	0.36	0.85	0.36	0.85	0.36
v/c Ratio	0.82	0.82	0.36	0.85	0.36	0.85	0.36	0.85	0.36	0.85	0.36	0.85	0.36
Control Delay	125.1	124.4	14.9	196.1	9.0	196.1	9.0	132.1	22.6	1.0	139.4	45.9	2.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	125.1	124.4	14.9	196.1	9.0	196.1	9.0	132.1	22.6	1.0	139.4	45.9	2.2
LOS	F	F	B	F	F	A	F	C	A	F	F	D	A
Approach Delay	100.0 27.9 42.5												
Approach LOS	F C D												
Queue Length 50th (ft)	329	332	3	74	0	74	0	170	560	0	141	1727	0
Queue Length 95th (ft)	426	429	73	m#176	m3	#335	689	9	215	1770	47		
Internal Link Dist (ft)	518 720 1020												
Turn Bay Length (ft)	100 650 400												
Base Capacity (vph)	311	315	379	54	121	146	3429	1071	150	3360	1161		
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.64	0.64	0.31	0.85	0.36	0.75	0.55	0.05	0.59	0.95	0.42		

**Intersection Summary**

Area Type: Other

Cycle Length: 240

Actuated Cycle Length: 240

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 150

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 43.4

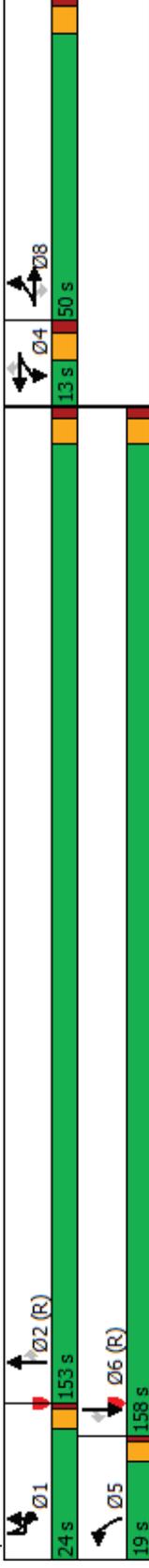
Intersection Capacity Utilization 98.4%

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Fort Weaver Rd & Renton Rd



**Intersection**

Int Delay, s/veh 2

Movement	SEL	SER	NEU	NEL	NET	SWT	SWR
----------	-----	-----	-----	-----	-----	-----	-----

Lane Configurations

Traffic Vol, veh/h	0	9	8	47	116	64	0
Future Vol, veh/h	0	9	8	47	116	64	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free	Free
RT Channelized	-	None	-	-	None	-	None
Storage Length	0	-	-	80	-	-	-
Veh in Median Storage, #0	-	-	-	-	0	0	-
Grade, %	0	-	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2
Mvmt Flow	0	9	8	49	122	67	0

Major/Minor	Minor2	Major1		Major2		
-------------	--------	--------	--	--------	--	--

Conflicting Flow All	242	34	67	67	0	-	0
Stage 1	67	-	-	-	-	-	-
Stage 2	175	-	-	-	-	-	-
Critical Hdwy	6.84	6.94	6.44	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.52	2.22	-	-	-
Pot Cap-1 Maneuver	725	1032	1297	1533	-	-	-
Stage 1	948	-	-	-	-	-	-
Stage 2	838	-	-	-	-	-	-
Platoon blocked, %					-	-	-
Mov Cap-1 Maneuver	697	1032	1491	1491	-	-	-
Mov Cap-2 Maneuver	697	-	-	-	-	-	-
Stage 1	911	-	-	-	-	-	-
Stage 2	838	-	-	-	-	-	-

Approach	SE	NE	SW
----------	----	----	----

HCM Control Delay, s	8.5	2.4	0
HCM LOS	A		

Minor Lane/Major Mvmt	NEL	NET	SELn1	SWT	SWR
-----------------------	-----	-----	-------	-----	-----

Capacity (veh/h)	1491	-	1032	-	-
HCM Lane V/C Ratio	0.039	-	0.009	-	-
HCM Control Delay (s)	7.5	-	8.5	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0.1	-	0	-	-

**Intersection**

Int Delay, s/veh 0.4

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations		↗		↕↕	↕↕	
Traffic Vol, veh/h	0	11	0	163	74	8
Future Vol, veh/h	0	11	0	163	74	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #0	-	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	12	0	172	78	8

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	-	43	-
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	6.94	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	3.32	-
Pot Cap-1 Maneuver	0	1018	0
Stage 1	0	-	0
Stage 2	0	-	0
Platoon blocked, %			-
Mov Cap-1 Maneuver	-	1018	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	SE	NE	SW
HCM Control Delay, s	8.6	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NET SELn1	SWT	SWR
Capacity (veh/h)	- 1018	-	-
HCM Lane V/C Ratio	- 0.011	-	-
HCM Control Delay (s)	- 8.6	-	-
HCM Lane LOS	- A	-	-
HCM 95th %tile Q(veh)	- 0	-	-

**Intersection**

Int Delay, s/veh 0.4

**Movement** SEL SER NEL NET SWT SWR

Lane Configurations		↗		↕↕	↕↔	
Traffic Vol, veh/h	0	9	0	116	54	0
Future Vol, veh/h	0	9	0	116	54	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #0	-	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	9	0	122	57	0

**Major/Minor** Minor2 Major1 Major2

Conflicting Flow All	-	29	-	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	-	-	-	-
Pot Cap-1 Maneuver	0	1039	0	-	-	-
Stage 1	0	-	0	-	-	-
Stage 2	0	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	1039	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

**Approach** SE NE SW

HCM Control Delay, s	8.5	0	0
HCM LOS	A		

**Minor Lane/Major Mvmt** NET SELn1 SWT SWR

Capacity (veh/h)	-	1039	-	-
HCM Lane V/C Ratio	-	0.009	-	-
HCM Control Delay (s)	-	8.5	-	-
HCM Lane LOS	-	A	-	-
HCM 95th %tile Q(veh)	-	0	-	-

## Appendix D

*91-1666 Renton Road West Loch Affordable Housing –  
HUD Site Noise Analysis (DLAA#20-044)*

D.L. Adams Associates



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Kailua, HI 96734  
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808.254.3318

June 30, 2021

Daniel Sandomire  
Komohale West Loch LLC  
1100 Alakea Street, 27<sup>th</sup> Floor  
Honolulu, Hawaii 96813

**Subject: 91-1666 Renton Road West Loch Affordable Housing – HUD Site Noise Analysis  
(DLAA #20-044)**

Dear Daniel,

DLAA has completed analysis of the 91-1666 Renton Road affordable housing apartments project in West Loch on the island of Oahu, Hawaii with respect to the sound isolation performance of the exterior wall and window assemblies. Analysis and recommendations are based on meeting the Department of Housing and Urban Development's requirements for exterior sound transmission to residential units.

DLAA's recommendations are based on meeting acoustical objectives only and should be reviewed for code compliance and non-acoustical project objectives by qualified personnel prior to implementation.

## **HUD STUDY**

### **Design Criteria**

The noise assessment evaluates the site based on the Site Acceptability Standards of the U.S. Department of House and Urban Development (HUD). The Site Acceptability Standards are given in the Code of Federal Regulations 24 CFR Part 51B. The standards regulate the acceptability of sites for residential buildings with HUD funding. The noise levels are expressed in terms of the Day-Night Average Sound Level (DNL). The DNL is the average sound level over a 24-hour period to which a 10-decibel penalty has been applied to sound levels occurring during the nighttime hours (10:00 PM to 7:00 AM). DNL level in decibels are A-weighted. The HUD Site Acceptability Standards for exterior sound levels are summarized in Table 1 below.

The intent of the 65 DNL outside criteria is to achieve DNL 45 dBA indoors. HUD typically allows upgrades to the building shell to meet an interior DNL of 45 dBA in Normally Unacceptable or Unacceptable areas. This can be accomplished by specifying building facades, windows, and doors with higher sound transmission class (STC) ratings than normal construction. Addressing windows is particularly important, as they are often the weak link in the building facade with respect to noise intrusion.

**Table 1.** HUD Site Acceptability Standards

Category	DNL	Comments
Acceptable	Less than or equal to 65 dBA	No special acoustical design consideration necessary
Normally Unacceptable	Greater than 65 dBA, but less than or equal to 70 dBA	5 dB additional attenuation required through the use of barriers or in design to ensure interior noise levels are acceptable
	Greater than 70 dBA, but less or equal to 75 dBA	10 dB additional attenuation required through the use of barriers or in design to ensure interior noise levels are acceptable
Unacceptable	Greater than 75 dBA	Attenuation measures must be submitted and approved on a case-by-case basis

**HUD Calculations**

DLAA analyzed noise levels at five (5) different noise assessment locations (NALs) on the 91-1666 Renton Road development site. The attached **Figure 1** illustrates the five NALs. Traffic data for nearby roadways were obtained from the Hawaii Department of Transportation (HDOT) Online Highways Program Status Traffic Volume GIS program and the Draft Transportation Assessment Report (TAR) provided by The Traffic Management Consultant. Traffic data was used to calculate noise from Fort Weaver Road and Renton Road. Annual Average Daily Traffic Volumes (AADT) data used for current DNL calculations were measured in 2019. Per the HUD Guidelines, DLAA calculated the predicted DNL in the build year (2025) and 10-years beyond the build year (2035) based on the estimated average annual growth rate provided in the Draft TAR. Table 2 below summarizes the calculated DNLs at each NAL. All HUD DNL calculator sheets are attached to this report.

**Table 2: Calculated DNL at Each NAL**

NAL	DNL Current (2019)	DNL Build Year Predicted (2025)	DNL 10-Year Predicted (2035)
NAL #1	69 L <sub>DN</sub>	69 L <sub>DN</sub>	69 L <sub>DN</sub>
NAL #2	69 L <sub>DN</sub>	69 L <sub>DN</sub>	69 L <sub>DN</sub>
NAL #3	66 L <sub>DN</sub>	66 L <sub>DN</sub>	66 L <sub>DN</sub>
NAL #4	64 L <sub>DN</sub>	65 L <sub>DN</sub>	65 L <sub>DN</sub>
NAL #5	61 L <sub>DN</sub>	61 L <sub>DN</sub>	62 L <sub>DN</sub>

Based on the worst-case results of 69 L<sub>DN</sub>, the site is considered “Normally Unacceptable”.

**Exterior Shell Review**

DLAA has reviewed the necessary composite STC (STC<sub>C</sub>) rating for the building shell to achieve the HUD required interior 45 L<sub>DN</sub> criteria. The STC<sub>C</sub> rating differs slightly from a normal STC rating in that it takes an area that is composed of multiple different assemblies (i.e. windows, exterior walls, or doors) and calculates a weighted average of the assemblies’ STC ratings. The STC<sub>C</sub> rating of the exterior assemblies were assessed at second and third floor units representing different window and wall combinations for each NAL of the complex exposed to DNL greater than 65 L<sub>DN</sub>. Only NAL #1, #2 and #3 were assessed

for STC<sub>C</sub> ratings, corresponding to Buildings A1 and B1. Units represented by NAL #4, corresponding to Buildings A2, B2, B3, C1 and C2, are not predicted to have exposure greater than 65 L<sub>DN</sub>, therefore STC<sub>C</sub> analysis is not necessary for these units. Table 3 below summarizes the calculated STC<sub>C</sub> ratings. Note that all STC<sub>C</sub> calculations assume minimum STC 30-rated windows, which is typical for windows with a 1” insulating glazing assembly comprised of 1/4” Lite - 1/2” air space – 1/4” Lite.

**Table 3: Calculated STC<sub>C</sub> Ratings at NALs**

NAL	Unit Type and Room Analyzed	Calculated STC <sub>C</sub>	DNL	Result Int. Noise Level
NAL #1	Building A1 3-BR Unit Corner Bedroom (A1_1)	30	69 L <sub>DN</sub>	39 dBA
	Building A1 3-BR Unit Center Bedroom (A1_2)	31	69 L <sub>DN</sub>	38 dBA
	Building A1 2-BR Unit Center Bedroom (A1_3)	30	69 L <sub>DN</sub>	39 dBA
	Building A1 2-BR Unit Living Room (A1_4)	31	69 L <sub>DN</sub>	38 dBA
NAL #2	Building A1 3-BR Unit Living Room (A1_5)	31	69 L <sub>DN</sub>	38 dBA
NAL #3	Building B1 1-BR Unit Corner Bedroom (B1_1)	30	66 L <sub>DN</sub>	36 dBA
	Building B1 2-BR Unit Center Bedroom (B1_2)	30	66 L <sub>DN</sub>	36 dBA
	Building B1 2-BR Unit Living Room (B1_3)	26	66 L <sub>DN</sub>	40 dBA

The attached floor plan markups highlight the units and rooms referenced in Table 3.

Based on the provided exterior wall assemblies and minimum STC 30-rated windows, each NAL achieves the HUD maximum interior noise level of 45 dBA and is considered “Acceptable”. We recommend selecting window assemblies with minimum STC 30 ratings. If windows with higher STC ratings are selected, expect interior noise levels to decrease.

NAL#5 is an outdoor location, therefore STC<sub>C</sub> does not apply. However, predicted noise levels at NAL #5 are considered “Acceptable” and no further mitigation is warranted at this time.

This concludes or comments at this time. Please let us know if you have any questions.

Sincerely,



Lucas Johnson  
 Senior Consultant

Encl.: Figure 1  
 DNL Calculator Sheets  
 STC<sub>C</sub> Unit Selections



1 RENDERED SITE PLAN  
1" = 50'-0"



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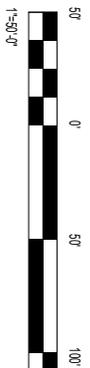
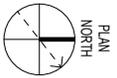
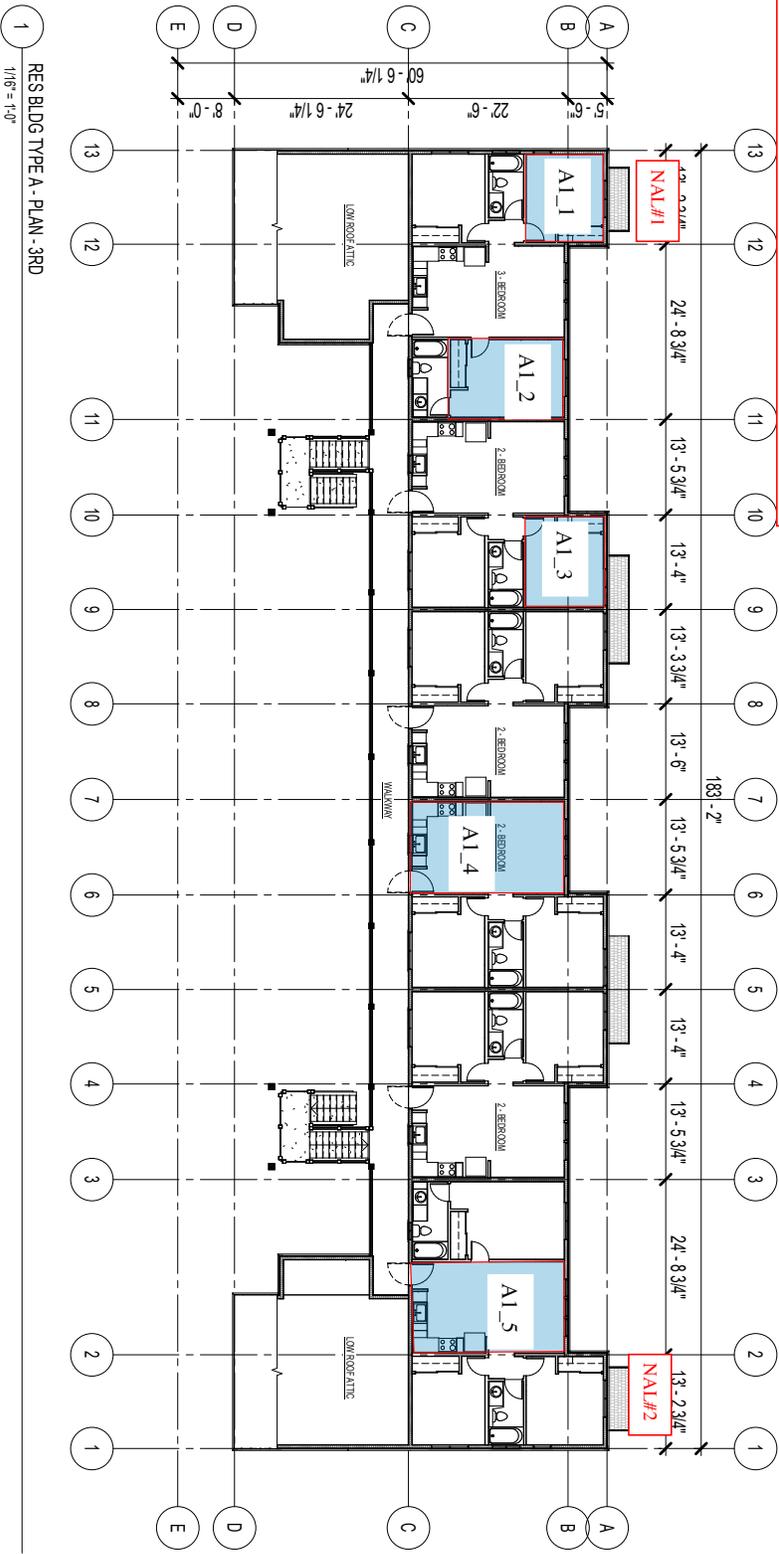


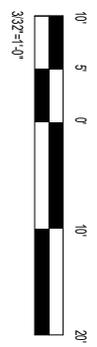
FIGURE 1 - NOISE ASSESSMENT LOCATIONS  
DLAA 20-044  
91-1666 Renton Road  
HUD Site Noise Analysis  
June 30, 2021

Date: 7/31/2019

HUD NOISE STUDY - COMPOSITE STC ASSESSMENT UNIT SELECTIONS  
 BUILDING A1  
 Plan View  
 DLAA 20-044  
 91-1666 Renton Road  
 HUD Site Noise Analysis  
 June 30, 2021

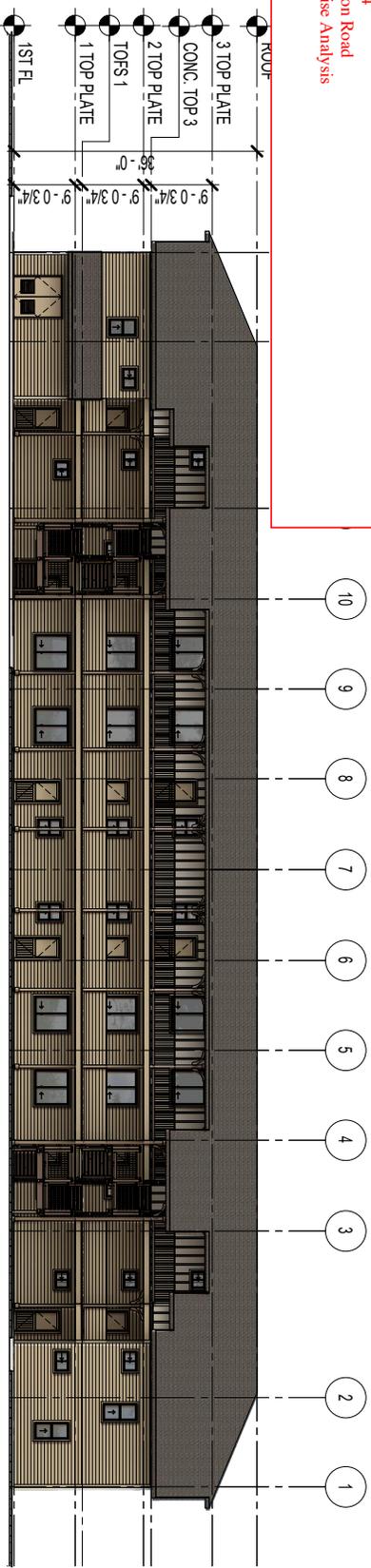


RES BLDG TYPE A - PLAN - 3RD  
 1/16" = 1'-0"

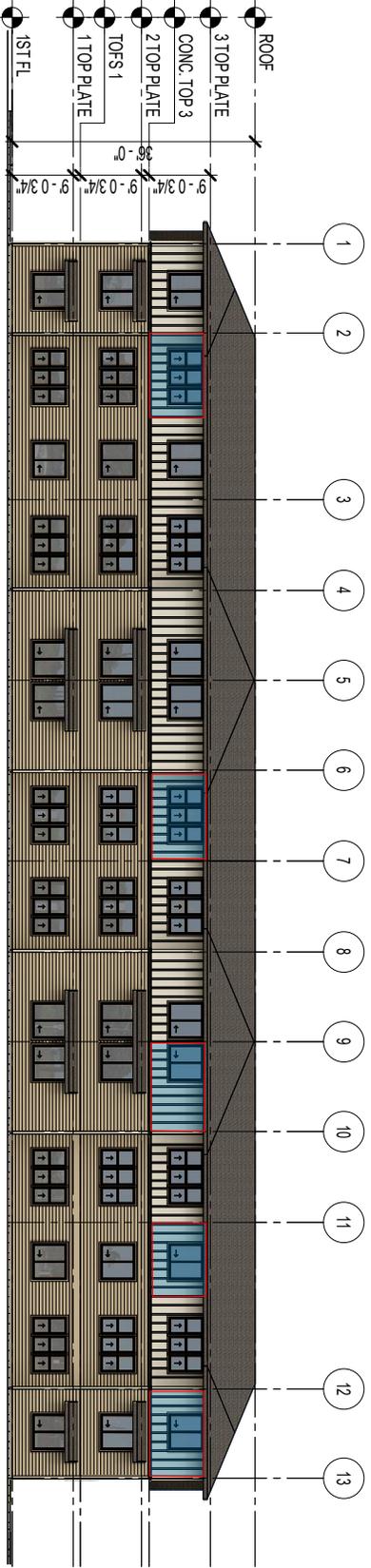


WEST LOCH AFFORDABLE RENTAL HOUSING  
 MULTI-FAM BLDG TYPE A - 3RD FLR PLN  
 AA-102  
 Date: 7/31/2019

HUD NOISE STUDY - COMPOSITE STC ASSESSMENT UNIT SELECTIONS  
 BUILDING A1  
 Elevation View  
 DLA A 20-044  
 91-1666 Remton Road  
 HUD Site Noise Analysis  
 June 30, 2021



1 RES BLDG TYPE A - ELEV - FRONT  
 1/16" = 1'-0"



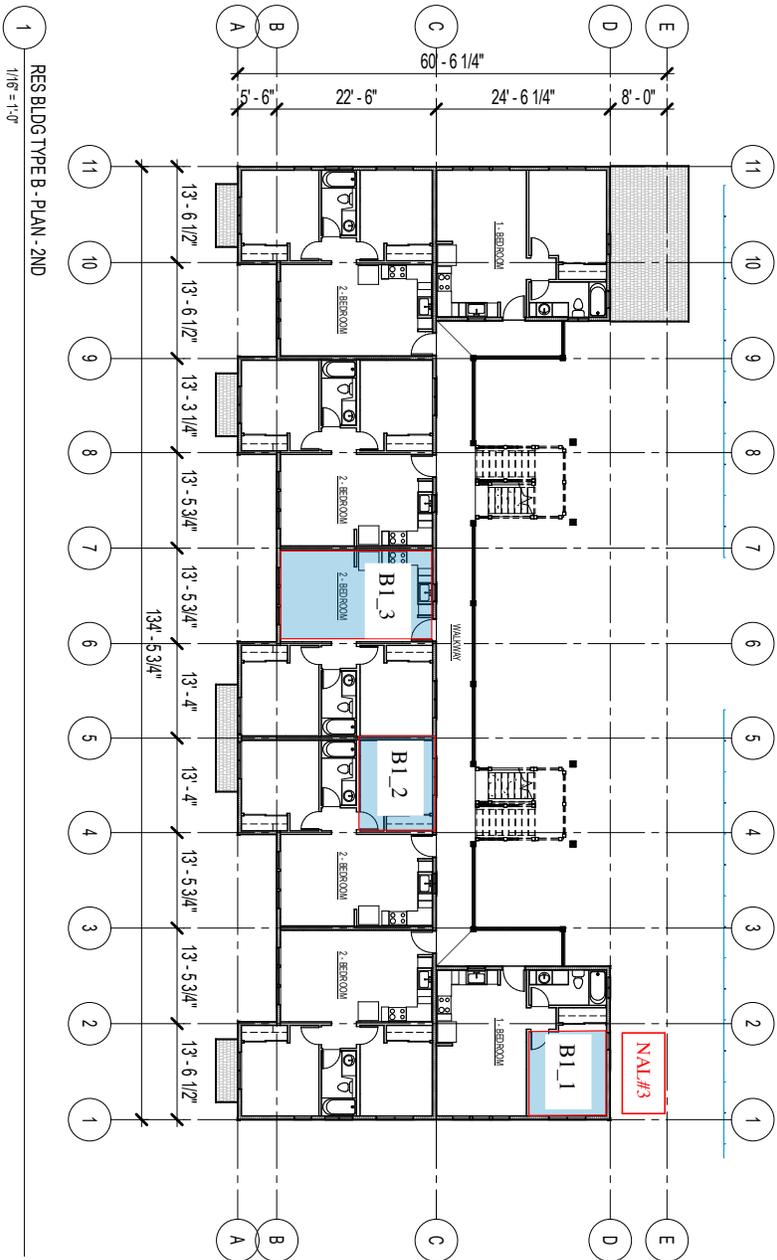
2 RES BLDG TYPE A - ELEV - BACK  
 1/16" = 1'-0"



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WEST LOCH AFFORDABLE RENTAL HOUSING  
 MULTI-FAM BLDG TYPE A - BLDG ELEV  
 AA-201  
 Date: 7/31/2019

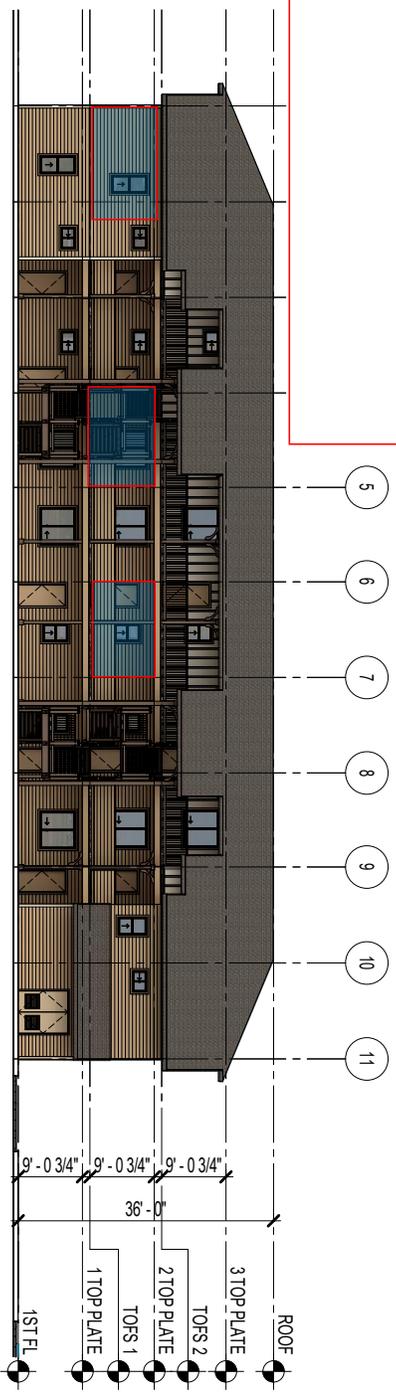
HUD NOISE STUDY - COMPOSITE STC ASSESSMENT UNIT SELECTIONS  
 BUILDING B1  
 Plan View  
 DLAA 20-044  
 91-1666 Renton Road  
 HUD Site Noise Analysis  
 June 30, 2021



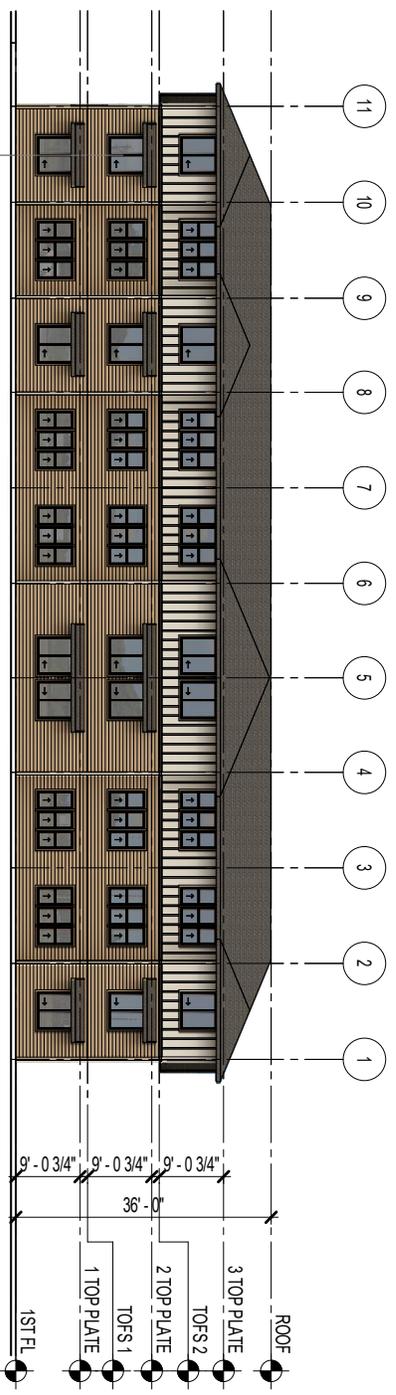
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WEST LOCH AFFORDABLE RENTAL HOUSING  
 MULTIFAM BLDG TYPE B - 2ND FLR PLN  
 AB-101  
 Date: 7/31/2019

HUD NOISE STUDY - COMPOSITE STC ASSESSMENT UNIT SELECTIONS  
 BUILDING B1  
 Elevation View  
 DL-AA 20-044  
 91-1666 Renton Road  
 HUD Site Noise Analysis  
 June 30, 2021

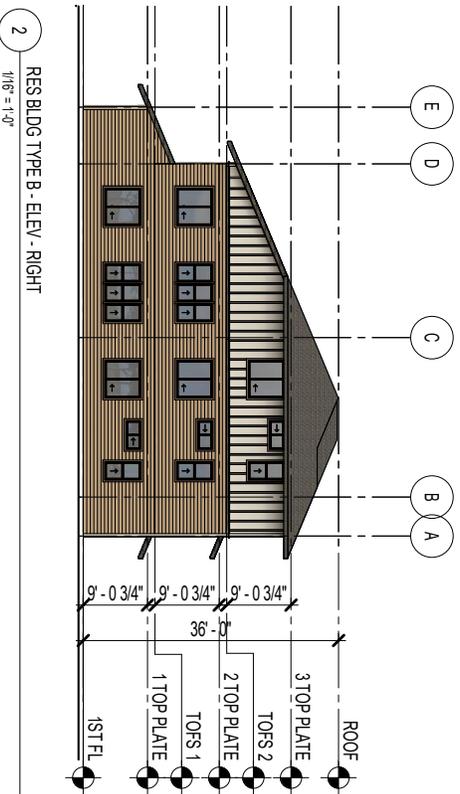
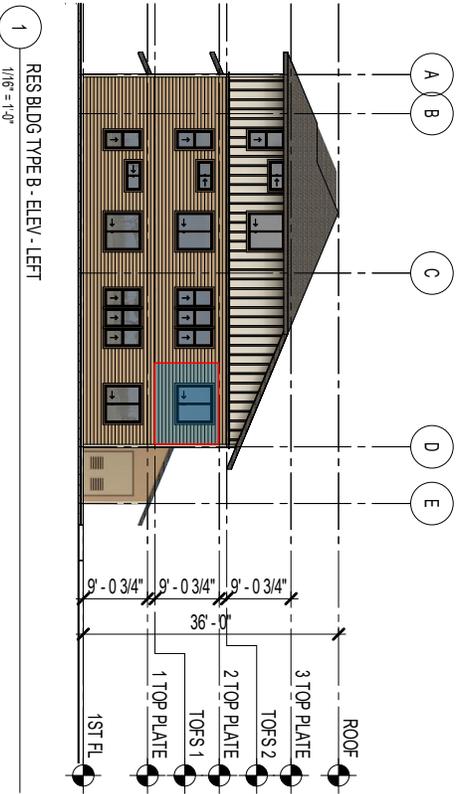


1 RES BLDG TYPE B - ELEV - FRONT  
 1/16" = 1'-0"



2 RES BLDG TYPE B - ELEV - BACK  
 1/16" = 1'-0"

HUD NOISE STUDY - COMPOSITE STC ASSESSMENT UNIT SELECTIONS  
 BUILDING B1  
 Elevation View  
 DLAA 20-044  
 91-1666 Renton Road  
 HUD Site Noise Analysis  
 June 30, 2021



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WEST LOCH AFFORDABLE RENTAL HOUSING  
 MULTIFAM BLDG TYPE B - BLDG ELEV  
 AB-202  
 Date: 7/31/2019

HUD NOISE STUDY - NAL#1  
2019 Traffic

Home (/) > Programs (/programs/) > Environmental Review (/program-review/) > DNL Calculator

DLAA 20-044  
91-1666 Renton Road  
HUD Site Noise Analysis  
June 30, 2021

## DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the [Day/Night Noise Level Calculator Electronic Assessment Tool Overview \(/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/\)](#).

## Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

## DNL Calculator

<b>Site ID</b>	91-1666 Renton Road - NAL#1
----------------	-----------------------------

<b>Record Date</b>	06/25/2021
--------------------	------------

<b>User's Name</b>	D. L. Adams Associates Ltd.
--------------------	-----------------------------

<b>Road # 1 Name:</b>	Fort Weaver Road - North Bound 2019 HDOT AADT
-----------------------	---

**Road #1**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="84"/>	<input type="text" value="84"/>	<input type="text" value="84"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="27899"/>	<input type="text" value="133"/>	<input type="text" value="215"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="65"/>	<input type="text" value="52"/>	<input type="text" value="63"/>
<input type="button" value="Calculate Road #1 DNL"/>	<input type="text" value="67"/>	<input type="button" value="Reset"/>	

**Road # 2 Name:**

**Road #2**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="143"/>	<input type="text" value="143"/>	<input type="text" value="143"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="24380"/>	<input type="text" value="163"/>	<input type="text" value="208"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="61"/>	<input type="text" value="49"/>	<input type="text" value="59"/>
<input type="button" value="Calculate Road #2 DNL"/>	<input type="text" value="63"/>	<input type="button" value="Reset"/>	

**Road # 3 Name:** Renton Road - East Bound 2019 HDOT AADT

**Road #3**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="95"/>	<input type="text" value="95"/>	<input type="text" value="95"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="495"/>	<input type="text" value="6"/>	<input type="text" value="10"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="47"/>	<input type="text" value="37"/>	<input type="text" value="49"/>
<span style="border: 1px solid black; padding: 2px;">Calculate Road #3 DNL</span>	<input type="text" value="51"/>	<input type="button" value="Reset"/>	

**Road # 4 Name:** Renton Road - West Bound 2019 HDOT AADT

**Road #4**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="62"/>	<input type="text" value="62"/>	<input type="text" value="62"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="409"/>	<input type="text" value="7"/>	<input type="text" value="9"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>

Road Gradient (%)			0
Vehicle DNL	49	41	51
<b>Calculate Road #4 DNL</b>	53	<b>Reset</b>	

**Add Road Source** **Add Rail Source**

Airport Noise Level	54
Loud Impulse Sounds?	<input type="radio"/> Yes <input checked="" type="radio"/> No

Combined DNL for all Road and Rail sources	69
Combined DNL including Airport	69
Site DNL with Loud Impulse Sound	

**Calculate** **Reset**

## Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative:** Cancel the project at this location

- **Other Reasonable Alternatives:** Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer** (</programs/environmental-review/hud-environmental-staff-contacts/>)
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See *The Noise Guidebook* (</resource/313/hud-noise-guidebook/>)
  - Construct noise barrier. See the **Barrier Performance Module** (</programs/environmental-review/bpm-calculator/>)

## Tools and Guidance

Day/Night Noise Level Assessment Tool User Guide (</resource/3822/day-night-noise-level-assessment-tool-user-guide/>)

Day/Night Noise Level Assessment Tool Flowcharts (</resource/3823/day-night-noise-level-assessment-tool-flowcharts/>)

HUD NOISE STUDY - NAL#2  
 2019 Traffic  
 DLAA 20-044  
 91-1666 Renton Road  
 HUD Site Noise Analysis  
 June 30, 2021

Home (/) > Programs (/programs/) > Environmental Review (/program review/) > DNL Calculator

## DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the [Day/Night Noise Level Calculator Electronic Assessment Tool Overview \(/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/\)](#).

### Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

## DNL Calculator

<b>Site ID</b>	91-1666 Renton Road - NAL#2
<b>Record Date</b>	06/25/2021
<b>User's Name</b>	D. L. Adams Associates Ltd.
<b>Road # 1 Name:</b>	<b>Fort Weaver Road - North Bound 2019 HDOT AADT</b>

**Road #1**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="84"/>	<input type="text" value="84"/>	<input type="text" value="84"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="27899"/>	<input type="text" value="133"/>	<input type="text" value="215"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="65"/>	<input type="text" value="52"/>	<input type="text" value="63"/>
<input type="button" value="Calculate Road #1 DNL"/>	<input type="text" value="67"/>	<input type="button" value="Reset"/>	

**Road # 2 Name:**

**Road #2**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="143"/>	<input type="text" value="143"/>	<input type="text" value="143"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="24380"/>	<input type="text" value="163"/>	<input type="text" value="208"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="61"/>	<input type="text" value="49"/>	<input type="text" value="59"/>
<input type="button" value="Calculate Road #2 DNL"/>	<input type="text" value="63"/>	<input type="button" value="Reset"/>	

**Road # 3 Name:**

**Road #3**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="206"/>	<input type="text" value="206"/>	<input type="text" value="206"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="495"/>	<input type="text" value="6"/>	<input type="text" value="10"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="42"/>	<input type="text" value="32"/>	<input type="text" value="44"/>
<input type="button" value="Calculate Road #3 DNL"/>	<input type="text" value="46"/>	<input type="button" value="Reset"/>	

**Road # 4 Name:**

**Road #4**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="173"/>	<input type="text" value="173"/>	<input type="text" value="173"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="409"/>	<input type="text" value="7"/>	<input type="text" value="9"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>

Road Gradient (%)			0
Vehicle DNL	42	34	44
<b>Calculate Road #4 DNL</b>	46	<b>Reset</b>	

**Add Road Source** **Add Rail Source**

Airport Noise Level	54
Loud Impulse Sounds?	<input type="radio"/> Yes <input checked="" type="radio"/> No

Combined DNL for all Road and Rail sources	69
Combined DNL including Airport	69
Site DNL with Loud Impulse Sound	

**Calculate** **Reset**

## Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative:** Cancel the project at this location

- **Other Reasonable Alternatives:** Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer** (</programs/environmental-review/hud-environmental-staff-contacts/>)
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See *The Noise Guidebook* (</resource/313/hud-noise-guidebook/>)
  - Construct noise barrier. See the **Barrier Performance Module** (</programs/environmental-review/bpm-calculator/>)

## Tools and Guidance

[Day/Night Noise Level Assessment Tool User Guide](/resource/3822/day-night-noise-level-assessment-tool-user-guide/) (</resource/3822/day-night-noise-level-assessment-tool-user-guide/>)

[Day/Night Noise Level Assessment Tool Flowcharts](/resource/3823/day-night-noise-level-assessment-tool-flowcharts/) (</resource/3823/day-night-noise-level-assessment-tool-flowcharts/>)

HUD NOISE STUDY - NAL#3  
2019 Traffic

DLAA 20-044  
91-1666 Renton Road  
HUD Site Noise Analysis  
June 30, 2021

Home (/) > Programs (/programs/) > Environmental Review (/program  
review/) > DNL Calculator

## DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the **Day/Night Noise Level Calculator Electronic Assessment Tool Overview (/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/)**.

### Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

## DNL Calculator

<b>Site ID</b>	91-1666 Renton Road - NAL#3
<b>Record Date</b>	06/25/2021
<b>User's Name</b>	D. L. Adams Associates Ltd.
<b>Road # 1 Name:</b>	<b>Fort Weaver Road - North Bound 2019 HDOT AADT</b>

**Road #1**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="147"/>	<input type="text" value="147"/>	<input type="text" value="147"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="27899"/>	<input type="text" value="133"/>	<input type="text" value="215"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="61"/>	<input type="text" value="48"/>	<input type="text" value="59"/>
<input type="button" value="Calculate Road #1 DNL"/>	<input type="text" value="63"/>	<input type="button" value="Reset"/>	

**Road # 2 Name:**

**Road #2**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="207"/>	<input type="text" value="207"/>	<input type="text" value="207"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="24380"/>	<input type="text" value="163"/>	<input type="text" value="208"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="58"/>	<input type="text" value="47"/>	<input type="text" value="57"/>
<input type="button" value="Calculate Road #2 DNL"/>	<input type="text" value="61"/>	<input type="button" value="Reset"/>	

**Road # 3 Name:**

**Road #3**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="255"/>	<input type="text" value="255"/>	<input type="text" value="255"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="495"/>	<input type="text" value="6"/>	<input type="text" value="10"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="40"/>	<input type="text" value="31"/>	<input type="text" value="42"/>
<input type="button" value="Calculate Road #3 DNL"/>	<input type="text" value="44"/>	<input type="button" value="Reset"/>	

**Road # 4 Name:**

**Road #4**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="221"/>	<input type="text" value="221"/>	<input type="text" value="221"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="409"/>	<input type="text" value="7"/>	<input type="text" value="9"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>

Road Gradient (%)			0
Vehicle DNL	40	33	43
<b>Calculate Road #4 DNL</b>	45	<b>Reset</b>	

**Add Road Source** **Add Rail Source**

Airport Noise Level	54
Loud Impulse Sounds?	<input type="radio"/> Yes <input checked="" type="radio"/> No

Combined DNL for all Road and Rail sources	<b>65</b>
Combined DNL including Airport	<b>66</b>
Site DNL with Loud Impulse Sound	

**Calculate** **Reset**

## Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative:** Cancel the project at this location

- **Other Reasonable Alternatives:** Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer** (</programs/environmental-review/hud-environmental-staff-contacts/>)
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See *The Noise Guidebook* (</resource/313/hud-noise-guidebook/>)
  - Construct noise barrier. See the **Barrier Performance Module** (</programs/environmental-review/bpm-calculator/>)

## Tools and Guidance

[Day/Night Noise Level Assessment Tool User Guide](/resource/3822/day-night-noise-level-assessment-tool-user-guide/) (</resource/3822/day-night-noise-level-assessment-tool-user-guide/>)

[Day/Night Noise Level Assessment Tool Flowcharts](/resource/3823/day-night-noise-level-assessment-tool-flowcharts/) (</resource/3823/day-night-noise-level-assessment-tool-flowcharts/>)

HUD NOISE STUDY - NAL#4  
 2019 Traffic  
 DLAA 20-044  
 91-1666 Renton Road  
 HUD Site Noise Analysis  
 June 30, 2021

Home (/) > Programs (/programs/) > Environmental Review (/program review/) > DNL Calculator

## DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the [Day/Night Noise Level Calculator Electronic Assessment Tool Overview \(/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/\)](#).

### Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

## DNL Calculator

<b>Site ID</b>	91-1666 Renton Road - NAL#4
<b>Record Date</b>	06/25/2021
<b>User's Name</b>	D. L. Adams Associates Ltd.
<b>Road # 1 Name:</b>	<b>Fort Weaver Road - North Bound 2019 HDOT AADT</b>

**Road #1**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="260"/>	<input type="text" value="260"/>	<input type="text" value="260"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="27899"/>	<input type="text" value="133"/>	<input type="text" value="215"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="58"/>	<input type="text" value="44"/>	<input type="text" value="55"/>
<input type="button" value="Calculate Road #1 DNL"/>	<input type="text" value="60"/>	<input type="button" value="Reset"/>	

**Road # 2 Name:**

**Road #2**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="316"/>	<input type="text" value="316"/>	<input type="text" value="316"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="24380"/>	<input type="text" value="163"/>	<input type="text" value="208"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="56"/>	<input type="text" value="44"/>	<input type="text" value="54"/>
<input type="button" value="Calculate Road #2 DNL"/>	<input type="text" value="58"/>	<input type="button" value="Reset"/>	

**Road # 3 Name:**

**Road #3**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="65"/>	<input type="text" value="65"/>	<input type="text" value="65"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="495"/>	<input type="text" value="6"/>	<input type="text" value="10"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="49"/>	<input type="text" value="40"/>	<input type="text" value="51"/>
<input type="button" value="Calculate Road #3 DNL"/>	<input type="text" value="53"/>	<input type="button" value="Reset"/>	

**Road # 4 Name:**

**Road #4**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="30"/>	<input type="text" value="30"/>	<input type="text" value="30"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="409"/>	<input type="text" value="7"/>	<input type="text" value="9"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>

Road Gradient (%)			0
Vehicle DNL	53	46	56
<b>Calculate Road #4 DNL</b>	58	<b>Reset</b>	

**Add Road Source** **Add Rail Source**

Airport Noise Level	54
Loud Impulse Sounds?	<input type="radio"/> Yes <input checked="" type="radio"/> No

Combined DNL for all Road and Rail sources	<b>64</b>
Combined DNL including Airport	<b>64</b>
Site DNL with Loud Impulse Sound	

**Calculate** **Reset**

## Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative:** Cancel the project at this location

- **Other Reasonable Alternatives:** Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer** (</programs/environmental-review/hud-environmental-staff-contacts/>)
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See *The Noise Guidebook* (</resource/313/hud-noise-guidebook/>)
  - Construct noise barrier. See the **Barrier Performance Module** (</programs/environmental-review/bpm-calculator/>)

## Tools and Guidance

Day/Night Noise Level Assessment Tool User Guide (</resource/3822/day-night-noise-level-assessment-tool-user-guide/>)

Day/Night Noise Level Assessment Tool Flowcharts (</resource/3823/day-night-noise-level-assessment-tool-flowcharts/>)

HUD NOISE STUDY - NAL#5  
2019 Traffic

DLAA 20-044  
91-1666 Renton Road  
HUD Site Noise Analysis  
June 30, 2021

Home (/) > Programs (/programs/) > Environmental Review (/program-review/) > DNL Calculator

## DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the [Day/Night Noise Level Calculator Electronic Assessment Tool Overview \(/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/\)](#).

### Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

## DNL Calculator

<b>Site ID</b>	91-1666 Renton Road - NAL#5
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<b>Record Date</b>	06/25/2021
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<b>User's Name</b>	D. L. Adams Associates Ltd.
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<b>Road # 1 Name:</b>	Fort Weaver Road - North Bound 2019 HDOT AADT
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**Road #1**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="335"/>	<input type="text" value="335"/>	<input type="text" value="335"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="27899"/>	<input type="text" value="133"/>	<input type="text" value="215"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="56"/>	<input type="text" value="43"/>	<input type="text" value="54"/>
<input type="button" value="Calculate Road #1 DNL"/>	<input type="text" value="58"/>	<input type="button" value="Reset"/>	

**Road # 2 Name:**

**Road #2**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="405"/>	<input type="text" value="405"/>	<input type="text" value="405"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="24380"/>	<input type="text" value="163"/>	<input type="text" value="208"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="54"/>	<input type="text" value="42"/>	<input type="text" value="52"/>
<input type="button" value="Calculate Road #2 DNL"/>	<input type="text" value="56"/>	<input type="button" value="Reset"/>	

**Road # 3 Name:**

**Road #3**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="267"/>	<input type="text" value="267"/>	<input type="text" value="267"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="495"/>	<input type="text" value="6"/>	<input type="text" value="10"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="40"/>	<input type="text" value="31"/>	<input type="text" value="42"/>
<input type="button" value="Calculate Road #3 DNL"/>	<input type="text" value="44"/>	<input type="button" value="Reset"/>	

**Road # 4 Name:**

**Road #4**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="247"/>	<input type="text" value="247"/>	<input type="text" value="247"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="409"/>	<input type="text" value="7"/>	<input type="text" value="9"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>

Road Gradient (%)			0
Vehicle DNL	40	32	42
<b>Calculate Road #4 DNL</b>	44	<b>Reset</b>	

**Add Road Source** **Add Rail Source**

Airport Noise Level	54
Loud Impulse Sounds?	<input type="radio"/> Yes <input checked="" type="radio"/> No

Combined DNL for all Road and Rail sources	60
Combined DNL including Airport	61
Site DNL with Loud Impulse Sound	

**Calculate** **Reset**

## Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative:** Cancel the project at this location

- **Other Reasonable Alternatives:** Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer** (</programs/environmental-review/hud-environmental-staff-contacts/>)
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See *The Noise Guidebook* (</resource/313/hud-noise-guidebook/>)
  - Construct noise barrier. See the **Barrier Performance Module** (</programs/environmental-review/bpm-calculator/>)

## Tools and Guidance

Day/Night Noise Level Assessment Tool User Guide (</resource/3822/day-night-noise-level-assessment-tool-user-guide/>)

Day/Night Noise Level Assessment Tool Flowcharts (</resource/3823/day-night-noise-level-assessment-tool-flowcharts/>)

Home (/) > Programs (/programs/) > Environmental Review (/p  
review/) > DNL Calculator

HUD NOISE STUDY - NAL#1  
2025 Traffic  
DLAA 20-044  
91-1666 Renton Road  
HUD Site Noise Analysis  
June 30, 2021

## DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the **Day/Night Noise Level Calculator Electronic Assessment Tool Overview (/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/)**.

### Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

## DNL Calculator

<b>Site ID</b>	91-1666 Renton Road - NAL#1
<b>Record Date</b>	06/25/2021
<b>User's Name</b>	D. L. Adams Associates Ltd.
<b>Road # 1 Name:</b>	<b>Fort Weaver Road - North Bound 2025 Predictions</b>

**Road #1**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="84"/>	<input type="text" value="84"/>	<input type="text" value="84"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="29221"/>	<input type="text" value="139"/>	<input type="text" value="225"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="65"/>	<input type="text" value="52"/>	<input type="text" value="63"/>
<input type="button" value="Calculate Road #1 DNL"/>	<input type="text" value="67"/>	<input type="button" value="Reset"/>	

**Road # 2 Name:**

**Road #2**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="143"/>	<input type="text" value="143"/>	<input type="text" value="143"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="25532"/>	<input type="text" value="170"/>	<input type="text" value="218"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="61"/>	<input type="text" value="49"/>	<input type="text" value="59"/>
<input type="button" value="Calculate Road #2 DNL"/>	<input type="text" value="63"/>	<input type="button" value="Reset"/>	

**Road # 3 Name:**

**Road #3**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="95"/>	<input type="text" value="95"/>	<input type="text" value="95"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="564"/>	<input type="text" value="7"/>	<input type="text" value="12"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="47"/>	<input type="text" value="38"/>	<input type="text" value="49"/>
<input type="button" value="Calculate Road #3 DNL"/>	<input type="text" value="52"/>	<input type="button" value="Reset"/>	

**Road # 4 Name:**

**Road #4**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="62"/>	<input type="text" value="62"/>	<input type="text" value="62"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="482"/>	<input type="text" value="8"/>	<input type="text" value="10"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>

Road Gradient (%)			0
Vehicle DNL	49	41	51
<b>Calculate Road #4 DNL</b>	54	<b>Reset</b>	

**Add Road Source** **Add Rail Source**

Airport Noise Level	54
Loud Impulse Sounds?	<input type="radio"/> Yes <input checked="" type="radio"/> No

Combined DNL for all Road and Rail sources	69
Combined DNL including Airport	69
Site DNL with Loud Impulse Sound	

**Calculate** **Reset**

## Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative:** Cancel the project at this location

- **Other Reasonable Alternatives:** Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer** (</programs/environmental-review/hud-environmental-staff-contacts/>)
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See *The Noise Guidebook* (</resource/313/hud-noise-guidebook/>)
  - Construct noise barrier. See the **Barrier Performance Module** (</programs/environmental-review/bpm-calculator/>)

## Tools and Guidance

[Day/Night Noise Level Assessment Tool User Guide \(/resource/3822/day-night-noise-level-assessment-tool-user-guide/\)](/resource/3822/day-night-noise-level-assessment-tool-user-guide/)

[Day/Night Noise Level Assessment Tool Flowcharts \(/resource/3823/day-night-noise-level-assessment-tool-flowcharts/\)](/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

HUD NOISE STUDY - NAL#2  
 2025 Traffic

DLAA 20-044  
 91-1666 Renton Road  
 HUD Site Noise Analysis  
 June 30, 2021

Home (/) > Programs (/programs/) > Environmental Review (/program-review/) > DNL Calculator

## DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the [Day/Night Noise Level Calculator Electronic Assessment Tool Overview \(/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/\)](#).

### Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

## DNL Calculator

<b>Site ID</b>	91-1666 Renton Road - NAL#2
<b>Record Date</b>	06/25/2021
<b>User's Name</b>	D. L. Adams Associates Ltd.
<b>Road # 1 Name:</b>	<b>Fort Weaver Road - North Bound 2025 Predictions</b>

**Road #1**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="84"/>	<input type="text" value="84"/>	<input type="text" value="84"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="29221"/>	<input type="text" value="139"/>	<input type="text" value="225"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="65"/>	<input type="text" value="52"/>	<input type="text" value="63"/>
<input type="button" value="Calculate Road #1 DNL"/>	<input type="text" value="67"/>	<input type="button" value="Reset"/>	

**Road # 2 Name:**

**Road #2**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="143"/>	<input type="text" value="143"/>	<input type="text" value="143"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="25532"/>	<input type="text" value="170"/>	<input type="text" value="218"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="61"/>	<input type="text" value="49"/>	<input type="text" value="59"/>
<input type="button" value="Calculate Road #2 DNL"/>	<input type="text" value="63"/>	<input type="button" value="Reset"/>	

**Road # 3 Name:**

**Road #3**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="206"/>	<input type="text" value="206"/>	<input type="text" value="206"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="564"/>	<input type="text" value="7"/>	<input type="text" value="12"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="42"/>	<input type="text" value="33"/>	<input type="text" value="44"/>
<input type="button" value="Calculate Road #3 DNL"/>	<input type="text" value="47"/>	<input type="button" value="Reset"/>	

**Road # 4 Name:**

**Road #4**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="173"/>	<input type="text" value="173"/>	<input type="text" value="173"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="482"/>	<input type="text" value="8"/>	<input type="text" value="10"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>

Road Gradient (%)			0
Vehicle DNL	43	35	45
<b>Calculate Road #4 DNL</b>	47	<b>Reset</b>	

**Add Road Source** **Add Rail Source**

Airport Noise Level	54
Loud Impulse Sounds?	<input type="radio"/> Yes <input checked="" type="radio"/> No

Combined DNL for all Road and Rail sources	<b>69</b>
Combined DNL including Airport	<b>69</b>
Site DNL with Loud Impulse Sound	

**Calculate** **Reset**

## Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative:** Cancel the project at this location

- **Other Reasonable Alternatives:** Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer** (</programs/environmental-review/hud-environmental-staff-contacts/>)
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See *The Noise Guidebook* (</resource/313/hud-noise-guidebook/>)
  - Construct noise barrier. See the **Barrier Performance Module** (</programs/environmental-review/bpm-calculator/>)

## Tools and Guidance

Day/Night Noise Level Assessment Tool User Guide (</resource/3822/day-night-noise-level-assessment-tool-user-guide/>)

Day/Night Noise Level Assessment Tool Flowcharts (</resource/3823/day-night-noise-level-assessment-tool-flowcharts/>)

HUD NOISE STUDY - NAL#3  
 2025 Traffic  
 DLAA 20-044  
 91-1666 Renton Road  
 HUD Site Noise Analysis  
 June 30, 2021

Home (/) > Programs (/programs/) > Environmental Review (/program-review/) > DNL Calculator

## DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the [Day/Night Noise Level Calculator Electronic Assessment Tool Overview \(/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/\)](#).

### Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

## DNL Calculator

<b>Site ID</b>	91-1666 Renton Road - NAL#3
<b>Record Date</b>	06/25/2021
<b>User's Name</b>	D. L. Adams Associates Ltd.
<b>Road # 1 Name:</b>	<b>Fort Weaver Road - North Bound 2025 Predictions</b>

**Road #1**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="147"/>	<input type="text" value="147"/>	<input type="text" value="147"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="29221"/>	<input type="text" value="139"/>	<input type="text" value="225"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="61"/>	<input type="text" value="48"/>	<input type="text" value="59"/>
<input type="button" value="Calculate Road #1 DNL"/>	<input type="text" value="64"/>	<input type="button" value="Reset"/>	

**Road # 2 Name:**

**Road #2**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="207"/>	<input type="text" value="207"/>	<input type="text" value="207"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="25532"/>	<input type="text" value="170"/>	<input type="text" value="218"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="59"/>	<input type="text" value="47"/>	<input type="text" value="57"/>
<input type="button" value="Calculate Road #2 DNL"/>	<input type="text" value="61"/>	<input type="button" value="Reset"/>	

**Road # 3 Name:** Renton Road - East Bound 2025 Predictions

**Road #3**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="255"/>	<input type="text" value="255"/>	<input type="text" value="255"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="564"/>	<input type="text" value="7"/>	<input type="text" value="12"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="41"/>	<input type="text" value="32"/>	<input type="text" value="43"/>
<span style="border: 1px solid black; padding: 2px;">Calculate Road #3 DNL</span>	<input type="text" value="45"/>	<input type="button" value="Reset"/>	

**Road # 4 Name:** Renton Road - West Bound 2025 Predictions

**Road #4**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="221"/>	<input type="text" value="221"/>	<input type="text" value="221"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="482"/>	<input type="text" value="8"/>	<input type="text" value="10"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>

Road Gradient (%)			0
Vehicle DNL	41	33	43
<b>Calculate Road #4 DNL</b>	45	<b>Reset</b>	

**Add Road Source** **Add Rail Source**

Airport Noise Level	54
Loud Impulse Sounds?	<input type="radio"/> Yes <input checked="" type="radio"/> No
Combined DNL for all Road and Rail sources	<b>66</b>
Combined DNL including Airport	<b>66</b>
Site DNL with Loud Impulse Sound	
<b>Calculate</b>	<b>Reset</b>

## Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative:** Cancel the project at this location

- **Other Reasonable Alternatives:** Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer** (</programs/environmental-review/hud-environmental-staff-contacts/>)
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See *The Noise Guidebook* (</resource/313/hud-noise-guidebook/>)
  - Construct noise barrier. See the **Barrier Performance Module** (</programs/environmental-review/bpm-calculator/>)

## Tools and Guidance

[Day/Night Noise Level Assessment Tool User Guide](/resource/3822/day-night-noise-level-assessment-tool-user-guide/) (</resource/3822/day-night-noise-level-assessment-tool-user-guide/>)

[Day/Night Noise Level Assessment Tool Flowcharts](/resource/3823/day-night-noise-level-assessment-tool-flowcharts/) (</resource/3823/day-night-noise-level-assessment-tool-flowcharts/>)

HUD NOISE STUDY - NAL#4  
 2025 Traffic  
 DLAA 20-044  
 91-1666 Renton Road  
 HUD Site Noise Analysis  
 June 30, 2021

Home (/) > Programs (/programs/) > Environmental Review (/program-review/) > DNL Calculator

## DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the [Day/Night Noise Level Calculator Electronic Assessment Tool Overview \(/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/\)](#).

### Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

## DNL Calculator

<b>Site ID</b>	91-1666 Renton Road - NAL#4
<b>Record Date</b>	06/25/2021
<b>User's Name</b>	D. L. Adams Associates Ltd.
<b>Road # 1 Name:</b>	<b>Fort Weaver Road - North Bound 2025 Predictions</b>

**Road #1**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="260"/>	<input type="text" value="260"/>	<input type="text" value="260"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="29221"/>	<input type="text" value="139"/>	<input type="text" value="225"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="58"/>	<input type="text" value="44"/>	<input type="text" value="56"/>
<input type="button" value="Calculate Road #1 DNL"/>	<input type="text" value="60"/>	<input type="button" value="Reset"/>	

**Road # 2 Name:**

**Road #2**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="316"/>	<input type="text" value="316"/>	<input type="text" value="316"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="25532"/>	<input type="text" value="170"/>	<input type="text" value="218"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="56"/>	<input type="text" value="44"/>	<input type="text" value="54"/>
<input type="button" value="Calculate Road #2 DNL"/>	<input type="text" value="58"/>	<input type="button" value="Reset"/>	

**Road # 3 Name:**

**Road #3**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="65"/>	<input type="text" value="65"/>	<input type="text" value="65"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="564"/>	<input type="text" value="7"/>	<input type="text" value="12"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="50"/>	<input type="text" value="41"/>	<input type="text" value="52"/>
<input type="button" value="Calculate Road #3 DNL"/>	<input type="text" value="54"/>	<input type="button" value="Reset"/>	

**Road # 4 Name:**

**Road #4**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="30"/>	<input type="text" value="30"/>	<input type="text" value="30"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="482"/>	<input type="text" value="8"/>	<input type="text" value="10"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>

Road Gradient (%)			0
Vehicle DNL	54	46	56
<b>Calculate Road #4 DNL</b>	58	<b>Reset</b>	

**Add Road Source** **Add Rail Source**

Airport Noise Level	54
Loud Impulse Sounds?	<input type="radio"/> Yes <input checked="" type="radio"/> No

Combined DNL for all Road and Rail sources	<b>64</b>
Combined DNL including Airport	<b>65</b>
Site DNL with Loud Impulse Sound	

**Calculate** **Reset**

## Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative:** Cancel the project at this location

- **Other Reasonable Alternatives:** Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer** (</programs/environmental-review/hud-environmental-staff-contacts/>)
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See *The Noise Guidebook* (</resource/313/hud-noise-guidebook/>)
  - Construct noise barrier. See the **Barrier Performance Module** (</programs/environmental-review/bpm-calculator/>)

## Tools and Guidance

[Day/Night Noise Level Assessment Tool User Guide](/resource/3822/day-night-noise-level-assessment-tool-user-guide/) (</resource/3822/day-night-noise-level-assessment-tool-user-guide/>)

[Day/Night Noise Level Assessment Tool Flowcharts](/resource/3823/day-night-noise-level-assessment-tool-flowcharts/) (</resource/3823/day-night-noise-level-assessment-tool-flowcharts/>)

HUD NOISE STUDY - NAL#5  
2025 Traffic

DLAA 20-044  
91-1666 Renton Road  
HUD Site Noise Analysis  
June 30, 2021

Home (/) > Programs (/programs/) > Environmental Review (/program review/) > DNL Calculator

## DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the **Day/Night Noise Level Calculator Electronic Assessment Tool Overview (/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/)**.

### Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

## DNL Calculator

<b>Site ID</b>	91-1666 Renton Road - NAL#5
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<b>Record Date</b>	06/25/2021
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<b>User's Name</b>	D. L. Adams Associates Ltd.
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<b>Road # 1 Name:</b>	<b>Fort Weaver Road - North Bound 2025 Predictions</b>
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**Road #1**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="335"/>	<input type="text" value="335"/>	<input type="text" value="335"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="29221"/>	<input type="text" value="139"/>	<input type="text" value="225"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="56"/>	<input type="text" value="43"/>	<input type="text" value="54"/>
<input type="button" value="Calculate Road #1 DNL"/>	<input type="text" value="58"/>	<input type="button" value="Reset"/>	

**Road # 2 Name:**

**Road #2**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="405"/>	<input type="text" value="405"/>	<input type="text" value="405"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="25532"/>	<input type="text" value="170"/>	<input type="text" value="218"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="54"/>	<input type="text" value="42"/>	<input type="text" value="53"/>
<input type="button" value="Calculate Road #2 DNL"/>	<input type="text" value="57"/>	<input type="button" value="Reset"/>	

**Road # 3 Name:**

**Road #3**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="267"/>	<input type="text" value="267"/>	<input type="text" value="267"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="564"/>	<input type="text" value="7"/>	<input type="text" value="12"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="40"/>	<input type="text" value="31"/>	<input type="text" value="43"/>
<input type="button" value="Calculate Road #3 DNL"/>	<input type="text" value="45"/>	<input type="button" value="Reset"/>	

**Road # 4 Name:**

**Road #4**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="247"/>	<input type="text" value="247"/>	<input type="text" value="247"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="482"/>	<input type="text" value="8"/>	<input type="text" value="10"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>

Road Gradient (%)			0
Vehicle DNL	40	32	42
<b>Calculate Road #4 DNL</b>	45	<b>Reset</b>	

**Add Road Source** **Add Rail Source**

Airport Noise Level	54
Loud Impulse Sounds?	<input type="radio"/> Yes <input checked="" type="radio"/> No

Combined DNL for all Road and Rail sources	61
Combined DNL including Airport	61
Site DNL with Loud Impulse Sound	

**Calculate** **Reset**

## Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative:** Cancel the project at this location

- **Other Reasonable Alternatives:** Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer** (</programs/environmental-review/hud-environmental-staff-contacts/>)
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See *The Noise Guidebook* (</resource/313/hud-noise-guidebook/>)
  - Construct noise barrier. See the **Barrier Performance Module** (</programs/environmental-review/bpm-calculator/>)

## Tools and Guidance

[Day/Night Noise Level Assessment Tool User Guide \(/resource/3822/day-night-noise-level-assessment-tool-user-guide/\)](/resource/3822/day-night-noise-level-assessment-tool-user-guide/)

[Day/Night Noise Level Assessment Tool Flowcharts \(/resource/3823/day-night-noise-level-assessment-tool-flowcharts/\)](/resource/3823/day-night-noise-level-assessment-tool-flowcharts/)

HUD NOISE STUDY - NAL#1  
2035 Traffic

DLAA 20-044  
91-1666 Renton Road  
HUD Site Noise Analysis  
June 30, 2021

Home (/) > Programs (/programs/) > Environmental Review (/program-review/) > DNL Calculator

## DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the [Day/Night Noise Level Calculator Electronic Assessment Tool Overview \(/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/\)](#).

### Guidelines

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- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

## DNL Calculator

<b>Site ID</b>	91-1666 Renton Road - NAL#1
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<b>Record Date</b>	06/25/2021
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<b>User's Name</b>	D. L. Adams Associates Ltd.
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<b>Road # 1 Name:</b>	<b>Fort Weaver Road - North Bound 2035 Predictions</b>
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**Road #1**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="84"/>	<input type="text" value="84"/>	<input type="text" value="84"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="30333"/>	<input type="text" value="144"/>	<input type="text" value="233"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="65"/>	<input type="text" value="52"/>	<input type="text" value="63"/>
<input type="button" value="Calculate Road #1 DNL"/>	<input type="text" value="68"/>	<input type="button" value="Reset"/>	

**Road # 2 Name:**

**Road #2**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="143"/>	<input type="text" value="143"/>	<input type="text" value="143"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="26504"/>	<input type="text" value="177"/>	<input type="text" value="226"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="61"/>	<input type="text" value="49"/>	<input type="text" value="60"/>
<input type="button" value="Calculate Road #2 DNL"/>	<input type="text" value="64"/>	<input type="button" value="Reset"/>	

**Road # 3 Name:** Renton Road - East Bound 2035 Predictions

**Road #3**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="95"/>	<input type="text" value="95"/>	<input type="text" value="95"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="585"/>	<input type="text" value="8"/>	<input type="text" value="12"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="47"/>	<input type="text" value="39"/>	<input type="text" value="49"/>
<span style="border: 1px solid black; padding: 2px;">Calculate Road #3 DNL</span>	<input type="text" value="52"/>	<input type="button" value="Reset"/>	

**Road # 4 Name:** Renton Road - West Bound 2035 Predictions

**Road #4**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="62"/>	<input type="text" value="62"/>	<input type="text" value="62"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="500"/>	<input type="text" value="9"/>	<input type="text" value="11"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>

Road Gradient (%)			0
Vehicle DNL	49	42	52
<b>Calculate Road #4 DNL</b>	54	<b>Reset</b>	

**Add Road Source** **Add Rail Source**

Airport Noise Level	54
Loud Impulse Sounds?	<input type="radio"/> Yes <input checked="" type="radio"/> No

Combined DNL for all Road and Rail sources	69
Combined DNL including Airport	69
Site DNL with Loud Impulse Sound	

**Calculate** **Reset**

## Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative:** Cancel the project at this location

- **Other Reasonable Alternatives:** Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer** (</programs/environmental-review/hud-environmental-staff-contacts/>)
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See *The Noise Guidebook* (</resource/313/hud-noise-guidebook/>)
  - Construct noise barrier. See the **Barrier Performance Module** (</programs/environmental-review/bpm-calculator/>)

## Tools and Guidance

[Day/Night Noise Level Assessment Tool User Guide](/resource/3822/day-night-noise-level-assessment-tool-user-guide/) (</resource/3822/day-night-noise-level-assessment-tool-user-guide/>)

[Day/Night Noise Level Assessment Tool Flowcharts](/resource/3823/day-night-noise-level-assessment-tool-flowcharts/) (</resource/3823/day-night-noise-level-assessment-tool-flowcharts/>)

HUD NOISE STUDY - NAL#2  
 2035 Traffic  
 DLAA 20-044  
 91-1666 Renton Road  
 HUD Site Noise Analysis  
 June 30, 2021

Home (/) > Programs (/programs/) > Environmental Review (/program-review/) > DNL Calculator

## DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the [Day/Night Noise Level Calculator Electronic Assessment Tool Overview \(/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/\)](#).

### Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

## DNL Calculator

<b>Site ID</b>	91-1666 Renton Road - NAL#2
<b>Record Date</b>	06/25/2021
<b>User's Name</b>	D. L. Adams Associates Ltd.
<b>Road # 1 Name:</b>	<b>Fort Weaver Road - North Bound 2035 Predictions</b>

**Road #1**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="84"/>	<input type="text" value="84"/>	<input type="text" value="84"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="30333"/>	<input type="text" value="144"/>	<input type="text" value="233"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="65"/>	<input type="text" value="52"/>	<input type="text" value="63"/>
<input type="button" value="Calculate Road #1 DNL"/>	<input type="text" value="68"/>	<input type="button" value="Reset"/>	

**Road # 2 Name:**

**Road #2**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="143"/>	<input type="text" value="143"/>	<input type="text" value="143"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="26504"/>	<input type="text" value="177"/>	<input type="text" value="226"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="61"/>	<input type="text" value="49"/>	<input type="text" value="60"/>
<input type="button" value="Calculate Road #2 DNL"/>	<input type="text" value="64"/>	<input type="button" value="Reset"/>	

**Road # 3 Name:**

**Road #3**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="206"/>	<input type="text" value="206"/>	<input type="text" value="206"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="585"/>	<input type="text" value="8"/>	<input type="text" value="12"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="42"/>	<input type="text" value="34"/>	<input type="text" value="44"/>
<input type="button" value="Calculate Road #3 DNL"/>	<input type="text" value="47"/>	<input type="button" value="Reset"/>	

**Road # 4 Name:**

**Road #4**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="173"/>	<input type="text" value="173"/>	<input type="text" value="173"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="500"/>	<input type="text" value="9"/>	<input type="text" value="11"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>

Road Gradient (%)			0
Vehicle DNL	43	35	45
<b>Calculate Road #4 DNL</b>	47	<b>Reset</b>	

**Add Road Source** **Add Rail Source**

Airport Noise Level	54
Loud Impulse Sounds?	<input type="radio"/> Yes <input checked="" type="radio"/> No

Combined DNL for all Road and Rail sources	69
Combined DNL including Airport	69
Site DNL with Loud Impulse Sound	

**Calculate** **Reset**

## Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative:** Cancel the project at this location

- **Other Reasonable Alternatives:** Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer** (</programs/environmental-review/hud-environmental-staff-contacts/>)
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See *The Noise Guidebook* (</resource/313/hud-noise-guidebook/>)
  - Construct noise barrier. See the **Barrier Performance Module** (</programs/environmental-review/bpm-calculator/>)

## Tools and Guidance

[Day/Night Noise Level Assessment Tool User Guide](/resource/3822/day-night-noise-level-assessment-tool-user-guide/) (</resource/3822/day-night-noise-level-assessment-tool-user-guide/>)

[Day/Night Noise Level Assessment Tool Flowcharts](/resource/3823/day-night-noise-level-assessment-tool-flowcharts/) (</resource/3823/day-night-noise-level-assessment-tool-flowcharts/>)

HUD NOISE STUDY - NAL#3  
 2035 Traffic  
 DLAA 20-044  
 91-1666 Renton Road  
 HUD Site Noise Analysis  
 June 30, 2021

Home (/) > Programs (/programs/) > Environmental Review (/program-review/) > DNL Calculator

## DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the [Day/Night Noise Level Calculator Electronic Assessment Tool Overview \(/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/\)](#).

### Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

## DNL Calculator

<b>Site ID</b>	91-1666 Renton Road - NAL#3
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<b>Record Date</b>	06/25/2021
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<b>User's Name</b>	D. L. Adams Associates Ltd.
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<b>Road # 1 Name:</b>	<b>Fort Weaver Road - North Bound 2035 Predictions</b>
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**Road #1**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="147"/>	<input type="text" value="147"/>	<input type="text" value="147"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="30333"/>	<input type="text" value="144"/>	<input type="text" value="233"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="62"/>	<input type="text" value="48"/>	<input type="text" value="59"/>
<input type="button" value="Calculate Road #1 DNL"/>	<input type="text" value="64"/>	<input type="button" value="Reset"/>	

**Road # 2 Name:**

**Road #2**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="207"/>	<input type="text" value="207"/>	<input type="text" value="207"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="26504"/>	<input type="text" value="177"/>	<input type="text" value="226"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="59"/>	<input type="text" value="47"/>	<input type="text" value="57"/>
<input type="button" value="Calculate Road #2 DNL"/>	<input type="text" value="61"/>	<input type="button" value="Reset"/>	

**Road # 3 Name:**

**Road #3**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="255"/>	<input type="text" value="255"/>	<input type="text" value="255"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="585"/>	<input type="text" value="8"/>	<input type="text" value="12"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="41"/>	<input type="text" value="32"/>	<input type="text" value="43"/>
<input type="button" value="Calculate Road #3 DNL"/>	<input type="text" value="45"/>	<input type="button" value="Reset"/>	

**Road # 4 Name:**

**Road #4**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="221"/>	<input type="text" value="221"/>	<input type="text" value="221"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="500"/>	<input type="text" value="9"/>	<input type="text" value="11"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>

Road Gradient (%)			0
Vehicle DNL	41	34	44
<b>Calculate Road #4 DNL</b>	46	<b>Reset</b>	

**Add Road Source** **Add Rail Source**

Airport Noise Level	54
Loud Impulse Sounds?	<input type="radio"/> Yes <input checked="" type="radio"/> No

Combined DNL for all Road and Rail sources	<b>66</b>
Combined DNL including Airport	<b>66</b>
Site DNL with Loud Impulse Sound	

**Calculate** **Reset**

## Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative:** Cancel the project at this location

- **Other Reasonable Alternatives:** Choose an alternate site
- **Mitigation**
  - Contact your Field or Regional Environmental Officer (</programs/environmental-review/hud-environmental-staff-contacts/>)
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See *The Noise Guidebook* (</resource/313/hud-noise-guidebook/>)
  - Construct noise barrier. See the **Barrier Performance Module** (</programs/environmental-review/bpm-calculator/>)

## Tools and Guidance

Day/Night Noise Level Assessment Tool User Guide (</resource/3822/day-night-noise-level-assessment-tool-user-guide/>)

Day/Night Noise Level Assessment Tool Flowcharts (</resource/3823/day-night-noise-level-assessment-tool-flowcharts/>)

HUD NOISE STUDY - NAL#4  
2035 Traffic

DLAA 20-044  
91-1666 Renton Road  
HUD Site Noise Analysis  
June 30, 2021

Home (/) > Programs (/programs/) > Environmental Review (/program review/) > DNL Calculator

## DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the [Day/Night Noise Level Calculator Electronic Assessment Tool Overview \(/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/\)](#).

### Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

## DNL Calculator

<b>Site ID</b>	91-1666 Renton Road - NAL#4
<b>Record Date</b>	06/25/2021
<b>User's Name</b>	D. L. Adams Associates Ltd.
<b>Road # 1 Name:</b>	<b>Fort Weaver Road - North Bound 2035 Predictions</b>

**Road #1**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="260"/>	<input type="text" value="260"/>	<input type="text" value="260"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="30333"/>	<input type="text" value="144"/>	<input type="text" value="233"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="58"/>	<input type="text" value="45"/>	<input type="text" value="56"/>
<input type="button" value="Calculate Road #1 DNL"/>	<input type="text" value="60"/>	<input type="button" value="Reset"/>	

**Road # 2 Name:**

**Road #2**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="316"/>	<input type="text" value="316"/>	<input type="text" value="316"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="26504"/>	<input type="text" value="177"/>	<input type="text" value="226"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="56"/>	<input type="text" value="44"/>	<input type="text" value="54"/>
<input type="button" value="Calculate Road #2 DNL"/>	<input type="text" value="58"/>	<input type="button" value="Reset"/>	

**Road # 3 Name:**

**Road #3**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="65"/>	<input type="text" value="65"/>	<input type="text" value="65"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="585"/>	<input type="text" value="8"/>	<input type="text" value="12"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="50"/>	<input type="text" value="41"/>	<input type="text" value="52"/>
<input type="button" value="Calculate Road #3 DNL"/>	<input type="text" value="54"/>	<input type="button" value="Reset"/>	

**Road # 4 Name:**

**Road #4**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="30"/>	<input type="text" value="30"/>	<input type="text" value="30"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="500"/>	<input type="text" value="9"/>	<input type="text" value="11"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>

Road Gradient (%)			0
Vehicle DNL	54	47	57
<b>Calculate Road #4 DNL</b>	59	<b>Reset</b>	

**Add Road Source** **Add Rail Source**

Airport Noise Level	54
Loud Impulse Sounds?	<input type="radio"/> Yes <input checked="" type="radio"/> No

Combined DNL for all Road and Rail sources	<b>64</b>
Combined DNL including Airport	<b>65</b>
Site DNL with Loud Impulse Sound	

**Calculate** **Reset**

## Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative:** Cancel the project at this location

- **Other Reasonable Alternatives:** Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer** (</programs/environmental-review/hud-environmental-staff-contacts/>)
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See *The Noise Guidebook* (</resource/313/hud-noise-guidebook/>)
  - Construct noise barrier. See the **Barrier Performance Module** (</programs/environmental-review/bpm-calculator/>)

## Tools and Guidance

Day/Night Noise Level Assessment Tool User Guide (</resource/3822/day-night-noise-level-assessment-tool-user-guide/>)

Day/Night Noise Level Assessment Tool Flowcharts (</resource/3823/day-night-noise-level-assessment-tool-flowcharts/>)

HUD NOISE STUDY - NAL#5  
2035 Traffic

DLAA 20-044  
91-1666 Renton Road  
HUD Site Noise Analysis  
June 30, 2021

Home (/) > Programs (/programs/) > Environmental Review (/program  
review/) > DNL Calculator

## DNL Calculator

The Day/Night Noise Level Calculator is an electronic assessment tool that calculates the Day/Night Noise Level (DNL) from roadway and railway traffic. For more information on using the DNL calculator, view the **Day/Night Noise Level Calculator Electronic Assessment Tool Overview (/programs/environmental-review/daynight-noise-level-electronic-assessment-tool/)**.

## Guidelines

- To display the Road and/or Rail DNL calculator(s), click on the "Add Road Source" and/or "Add Rail Source" button(s) below.
- All Road and Rail input values must be positive non-decimal numbers.
- All Road and/or Rail DNL value(s) must be calculated separately before calculating the Site DNL.
- All checkboxes that apply must be checked for vehicles and trains in the tables' headers.
- **Note #1:** Tooltips, containing field specific information, have been added in this tool and may be accessed by hovering over all the respective data fields (site identification, roadway and railway assessment, DNL calculation results, roadway and railway input variables) with the mouse.
- **Note #2:** DNL Calculator assumes roadway data is always entered.

## DNL Calculator

<b>Site ID</b>	91-1666 Renton Road - NAL#5
<b>Record Date</b>	06/25/2021
<b>User's Name</b>	D. L. Adams Associates Ltd.
<b>Road # 1 Name:</b>	<b>Fort Weaver Road - North Bound 2035 Predictions</b>

**Road #1**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="335"/>	<input type="text" value="335"/>	<input type="text" value="335"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="30333"/>	<input type="text" value="144"/>	<input type="text" value="233"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="56"/>	<input type="text" value="43"/>	<input type="text" value="54"/>
<input type="button" value="Calculate Road #1 DNL"/>	<input type="text" value="58"/>	<input type="button" value="Reset"/>	

**Road # 2 Name:**

**Road #2**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="405"/>	<input type="text" value="405"/>	<input type="text" value="405"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="26504"/>	<input type="text" value="177"/>	<input type="text" value="226"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="54"/>	<input type="text" value="43"/>	<input type="text" value="53"/>
<input type="button" value="Calculate Road #2 DNL"/>	<input type="text" value="57"/>	<input type="button" value="Reset"/>	

**Road # 3 Name:** Renton Road - East Bound 2035 Predictions

**Road #3**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="267"/>	<input type="text" value="267"/>	<input type="text" value="267"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="585"/>	<input type="text" value="8"/>	<input type="text" value="12"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>
Road Gradient (%)	<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>
Vehicle DNL	<input type="text" value="41"/>	<input type="text" value="32"/>	<input type="text" value="43"/>
<span style="border: 1px solid black; padding: 2px;">Calculate Road #3 DNL</span>	<input type="text" value="45"/>	<input type="button" value="Reset"/>	

**Road # 4 Name:** Renton Road - West Bound 2035 Predictions

**Road #4**

Vehicle Type	Cars <input checked="" type="checkbox"/>	Medium Trucks <input checked="" type="checkbox"/>	Heavy Trucks <input checked="" type="checkbox"/>
Effective Distance	<input type="text" value="247"/>	<input type="text" value="247"/>	<input type="text" value="247"/>
Distance to Stop Sign	<input type="text"/>	<input type="text"/>	<input type="text"/>
Average Speed	<input type="text" value="35"/>	<input type="text" value="35"/>	<input type="text" value="35"/>
Average Daily Trips (ADT)	<input type="text" value="500"/>	<input type="text" value="9"/>	<input type="text" value="11"/>
Night Fraction of ADT	<input type="text" value="15"/>	<input type="text" value="15"/>	<input type="text" value="15"/>

Road Gradient (%)			0
Vehicle DNL	40	33	43
<b>Calculate Road #4 DNL</b>	45	<b>Reset</b>	

**Add Road Source** **Add Rail Source**

Airport Noise Level	54
Loud Impulse Sounds?	<input type="radio"/> Yes <input checked="" type="radio"/> No

Combined DNL for all Road and Rail sources	61
Combined DNL including Airport	62
Site DNL with Loud Impulse Sound	

**Calculate** **Reset**

## Mitigation Options

If your site DNL is in Excess of 65 decibels, your options are:

- **No Action Alternative:** Cancel the project at this location

- **Other Reasonable Alternatives:** Choose an alternate site
- **Mitigation**
  - **Contact your Field or Regional Environmental Officer** (</programs/environmental-review/hud-environmental-staff-contacts/>)
  - Increase mitigation in the building walls (only effective if no outdoor, noise sensitive areas)
  - Reconfigure the site plan to increase the distance between the noise source and noise-sensitive uses
  - Incorporate natural or man-made barriers. See *The Noise Guidebook* (</resource/313/hud-noise-guidebook/>)
  - Construct noise barrier. See the **Barrier Performance Module** (</programs/environmental-review/bpm-calculator/>)

## Tools and Guidance

Day/Night Noise Level Assessment Tool User Guide (</resource/3822/day-night-noise-level-assessment-tool-user-guide/>)

Day/Night Noise Level Assessment Tool Flowcharts (</resource/3823/day-night-noise-level-assessment-tool-flowcharts/>)

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## Sound Transmission Classification Assessment (STraCAT)

### Overview

The Sound Transmission Classification Assessment Tool (STraCAT) is an electronic version of Figures 17 and 19 in The HUD Noise Guidebook. The purpose of this tool is to document sound attenuation performance of wall systems. Based on wall, window, and door Sound Transmission Classification (STC) values, the STraCAT generates a composite STC value for the wall assembly as a whole. Users can enter the calculated noise level related to a specific Noise Assessment Location in front of a building façade and STraCAT will generate a target required attenuation value for the wall assembly in STC. Based on wall materials, the tool will state whether the composite wall assembly STC meets the required attenuation value.

### How to Use This Tool

#### Location, Noise Level and Wall Configuration to Be Analyzed

STraCAT is designed to calculate the attenuation provided by the wall assembly for one wall of one unit. If unit exterior square footage and window/door configuration is identical around the structure, a single STraCAT may be sufficient. If units vary, at least one STraCAT should be completed for each different exterior unit wall configuration to document that all will achieve the required attenuation. Additionally, if attenuation is not based on a single worst-case NAL, but there are multiple NALs which require different levels of attenuation around the structure, a STraCAT should be completed for each differing exterior wall configuration associated with each NAL.

Exterior wall configurations associated with an NAL include those with parallel (facing) or near-parallel exposure as well as those with perpendicular exposure. When a façade has parallel or perpendicular exposure to two or more NALs, you should base the required attenuation on the NAL with the highest calculated noise level. For corner units where the unit interior receives exterior noise through two facades, the STraCAT calculation should incorporate the area of wall, window and door materials pertaining to the corner unit's total exterior wall area (i.e., from both walls).

#### Information to Be Entered

Users first enter basic project information and the NAL noise level that will be used as the basis for required attenuation. This noise level must be entered in whole numbers. STraCAT users then enter information on wall, window and door component type and area. Again, as noted above, the wall, window and door entries are based on one unit, and one wall (except for corner units as discussed above). The tool sums total wall square footage based on the combined area of walls, doors and windows for the façade being evaluated.

Users may input STC values for materials in one of two ways. The tool includes a dropdown menu

of common construction materials with STC values prefilled. If selected construction materials are not included in this dropdown menu, the user may also enter the STC for a given component manually. Verification of the component STC must be included in the ERR. Documentation includes the architect or construction manager's project plans showing wall material specifications. For new construction or for components that will be newly installed in an existing wall, documentation also includes the manufacturer's product specification sheet (cut sheet) documenting the STC rating of selected doors and windows.

*Required STC Rating and Determination of Compliance*

Finally, based on project information entered the tool will indicate the required STC rating for the wall assembly being evaluated and whether or not the materials specified will produce a combined rating that meets this requirement. Note that for noise levels above 75 dB DNL, either HUD (for 24 CFR Part 50 reviews) or the Responsible Entity (for 24 CFR Part 58 reviews) must approve the level and type of attenuation, among other processing requirements. Required attenuation values generated by STraCAT for NALs above 75 dB DNL should therefore be considered tentative pending approval by HUD or the RE.

**Part I - Description**

Part I - Description	
<b>Project</b>	
91-1666 Renton Road A1_1	
<b>Sponsor/Developer</b>	
West Loch LLC	
<b>Location</b>	
West Loch, Kapolei, HI	
<b>Prepared by</b>	
D. L. Adams Associates	
<b>Noise Level</b>	
69	
<b>Date</b>	
6/25/2021	
<b>Primary Source(s)</b>	
Fort Weaver Road	

**Part II - Wall Components**

**Part II - Wall Components**

Wall Construction Detail	Area	STC
FRONT WALL - 2x4 with 3/4" plywood sheathing, 5/8" gypsum interior, and 3.0" R-13 insulation, Hardie panel siding	94	30
PTAC - Chigo CPS-CNR1	6	32
SIDE WALL - 2x4 with 3/4" plywood sheathing, 5/8" gypsum interior, and 3.0" R-13 insulation, Hardie Panel Siding	87	30
<input type="button" value="Add new wall"/>		
<b>187 Sq. Feet</b>		<b>30.05</b>

Window Construction Detail	Quantity	Sq Ft/Unit	STC
WINDOWS - Sliding 1" IGU (1/4" - 1/2" AS - 1/4")	1	29	32
WINDOWS - Double Hung 1" IGU (1/4" - 1/2" AS - 1/4")	1	16	32
<input type="button" value="Add new window"/>			

Door Construction Detail	Quantity	Sq Ft/Unit	STC
<input type="button" value="Add new door"/>			

**Part III - Results**

<b>Part III - Results</b>			
<b>Wall Statistics</b>			
<b>Stat</b>		<b>Value</b>	
Area:		187 ft <sup>2</sup>	
Wall STC:		30.05	
<b>Aperture Statistics</b>			
<b>Aperture</b>	<b>Count</b>	<b>Area</b>	<b>% of wall</b>
Windows:	2	45 ft <sup>2</sup>	24.06%
Doors:	0	0 ft <sup>2</sup>	0%
<b>Evaluation Criteria</b>			
<b>Criteria</b>			<b>Value</b>
Noise source sound level (dB):			69
Combined STC for wall assembly:			30.45
Required STC rating:			27
Does wall assembly meet requirements?			<b>Yes</b>
			<b>Print</b>

**Part 4 - Tips**

**Part 4 - Tips**

What do you do if the preferred wall design is not sufficient to achieve the required attenuation? Another wall design with more substantial materials will work, but may not be the most cost-effective solution. Try adding some other elements for just a little more attenuation.

For example:

- Staggering the studs in a wall offers approximately 4dB of additional protection.
- Increasing the stud spacing from 16" on center to 24" can increase the STC from 2-5dB.
- Adding a 2" air space can provide 3dB more attenuation.
- Increasing a wall's air space from 3" to 6" can reduce noise levels by an additional 5dB.
- Adding a layer of ½" gypsum board on "Z" furring channels adds 2dB of attenuation.
- Using resilient channels and clips between wall panels and studs can improve the STC from 2-5dB.
- Adding a layer of ½" gypsum board on resilient channels adds 5dB of attenuation.
- Adding acoustical or isolation blankets to a wall's airspace can add 4-10dB of attenuation.
- A 1" rockwool acoustical blanket adds 3dB to the wall's STC.
- Filling the cells of lightweight concrete masonry units with expanded mineral loose-fill insulation adds 2dB to the STC.

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## Sound Transmission Classification Assessment (STraCAT)

### Overview

The Sound Transmission Classification Assessment Tool (STraCAT) is an electronic version of Figures 17 and 19 in The HUD Noise Guidebook. The purpose of this tool is to document sound attenuation performance of wall systems. Based on wall, window, and door Sound Transmission Classification (STC) values, the STraCAT generates a composite STC value for the wall assembly as a whole. Users can enter the calculated noise level related to a specific Noise Assessment Location in front of a building façade and STraCAT will generate a target required attenuation value for the wall assembly in STC. Based on wall materials, the tool will state whether the composite wall assembly STC meets the required attenuation value.

### How to Use This Tool

#### Location, Noise Level and Wall Configuration to Be Analyzed

STraCAT is designed to calculate the attenuation provided by the wall assembly for one wall of one unit. If unit exterior square footage and window/door configuration is identical around the structure, a single STraCAT may be sufficient. If units vary, at least one STraCAT should be completed for each different exterior unit wall configuration to document that all will achieve the required attenuation. Additionally, if attenuation is not based on a single worst-case NAL, but there are multiple NALs which require different levels of attenuation around the structure, a STraCAT should be completed for each differing exterior wall configuration associated with each NAL.

Exterior wall configurations associated with an NAL include those with parallel (facing) or near-parallel exposure as well as those with perpendicular exposure. When a façade has parallel or perpendicular exposure to two or more NALs, you should base the required attenuation on the NAL with the highest calculated noise level. For corner units where the unit interior receives exterior noise through two facades, the STraCAT calculation should incorporate the area of wall, window and door materials pertaining to the corner unit's total exterior wall area (i.e., from both walls).

#### Information to Be Entered

Users first enter basic project information and the NAL noise level that will be used as the basis for required attenuation. This noise level must be entered in whole numbers. STraCAT users then enter information on wall, window and door component type and area. Again, as noted above, the wall, window and door entries are based on one unit, and one wall (except for corner units as discussed above). The tool sums total wall square footage based on the combined area of walls, doors and windows for the façade being evaluated.

Users may input STC values for materials in one of two ways. The tool includes a dropdown menu

HUD NOISE STUDY  
Composite STC A1\_2

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91-1666 Renton Road  
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of common construction materials with STC values prefilled. If selected construction materials are not included in this dropdown menu, the user may also enter the STC for a given component manually. Verification of the component STC must be included in the ERR. Documentation includes the architect or construction manager's project plans showing wall material specifications. For new construction or for components that will be newly installed in an existing wall, documentation also includes the manufacturer's product specification sheet (cut sheet) documenting the STC rating of selected doors and windows.

*Required STC Rating and Determination of Compliance*

Finally, based on project information entered the tool will indicate the required STC rating for the wall assembly being evaluated and whether or not the materials specified will produce a combined rating that meets this requirement. Note that for noise levels above 75 dB DNL, either HUD (for 24 CFR Part 50 reviews) or the Responsible Entity (for 24 CFR Part 58 reviews) must approve the level and type of attenuation, among other processing requirements. Required attenuation values generated by STraCAT for NALs above 75 dB DNL should therefore be considered tentative pending approval by HUD or the RE.

**Part I - Description**

Part I - Description	
<b>Project</b>	
91-1666 Renton Road A1_2	
<b>Sponsor/Developer</b>	
West Loch LLC	
<b>Location</b>	
West Loch, Kapolei, HI	
<b>Prepared by</b>	
D. L. Adams Associates	
<b>Noise Level</b>	
69	
<b>Date</b>	
6/25/2021	
<b>Primary Source(s)</b>	
Fort Weaver Road	

**Part II - Wall Components**

**Part II - Wall Components**

Wall Construction Detail	Area	STC
FRONT WALL - 2x4 with 3/4" plywood sheathing, 5/8" gypsum interior, and 3.0" R-13 insulation, Hardie panel siding	<input type="text" value="84"/>	<input type="text" value="30"/>
PTAC - Chigo CPS-CNR1	<input type="text" value="6"/>	<input type="text" value="32"/>
<input type="button" value="Add new wall"/>		
<b>90 Sq. Feet</b>		<b>30.11</b>

Window Construction Detail	Quantity	Sq Ft/Unit	STC
WINDOWS - Sliding 1" IGU (1/4" - 1/2" AS - 1/4")	<input type="text" value="1"/>	<input type="text" value="32"/>	<input type="text" value="32"/>
<input type="button" value="Add new window"/>			

Door Construction Detail	Quantity	Sq Ft/Unit	STC
<input type="button" value="Add new door"/>			

**Part III - Results**

<b>Part III - Results</b>			
<b>Wall Statistics</b>			
<b>Stat</b>		<b>Value</b>	
Area:		90 ft <sup>2</sup>	
Wall STC:		30.11	
<b>Aperture Statistics</b>			
<b>Aperture</b>	<b>Count</b>	<b>Area</b>	<b>% of wall</b>
Windows:	1	32 ft <sup>2</sup>	35.56%
Doors:	0	0 ft <sup>2</sup>	0%
<b>Evaluation Criteria</b>			
<b>Criteria</b>			<b>Value</b>
Noise source sound level (dB):			69
Combined STC for wall assembly:			30.69
Required STC rating:			27
Does wall assembly meet requirements?			<b>Yes</b>
			<b>Print</b>

**Part 4 - Tips**

**Part 4 - Tips**

What do you do if the preferred wall design is not sufficient to achieve the required attenuation? Another wall design with more substantial materials will work, but may not be the most cost-effective solution. Try adding some other elements for just a little more attenuation.

For example:

- Staggering the studs in a wall offers approximately 4dB of additional protection.
- Increasing the stud spacing from 16" on center to 24" can increase the STC from 2-5dB.
- Adding a 2" air space can provide 3dB more attenuation.
- Increasing a wall's air space from 3" to 6" can reduce noise levels by an additional 5dB.
- Adding a layer of ½" gypsum board on "Z" furring channels adds 2dB of attenuation.
- Using resilient channels and clips between wall panels and studs can improve the STC from 2-5dB.
- Adding a layer of ½" gypsum board on resilient channels adds 5dB of attenuation.
- Adding acoustical or isolation blankets to a wall's airspace can add 4-10dB of attenuation.
- A 1" rockwool acoustical blanket adds 3dB to the wall's STC.
- Filling the cells of lightweight concrete masonry units with expanded mineral loose-fill insulation adds 2dB to the STC.

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## Sound Transmission Classification Assessment (STraCAT)

### Overview

The Sound Transmission Classification Assessment Tool (STraCAT) is an online tool described in Figures 17 and 19 in The HUD Noise Guidebook. The purpose of this tool is to document sound attenuation performance of wall systems. Based on wall, window, and door Sound Transmission Classification (STC) values, the STraCAT generates a composite STC value for the wall assembly as a whole. Users can enter the calculated noise level related to a specific Noise Assessment Location in front of a building façade and STraCAT will generate a target required attenuation value for the wall assembly in STC. Based on wall materials, the tool will state whether the composite wall assembly STC meets the required attenuation value.

### How to Use This Tool

#### Location, Noise Level and Wall Configuration to Be Analyzed

STraCAT is designed to calculate the attenuation provided by the wall assembly for one wall of one unit. If unit exterior square footage and window/door configuration is identical around the structure, a single STraCAT may be sufficient. If units vary, at least one STraCAT should be completed for each different exterior unit wall configuration to document that all will achieve the required attenuation. Additionally, if attenuation is not based on a single worst-case NAL, but there are multiple NALs which require different levels of attenuation around the structure, a STraCAT should be completed for each differing exterior wall configuration associated with each NAL.

Exterior wall configurations associated with an NAL include those with parallel (facing) or near-parallel exposure as well as those with perpendicular exposure. When a façade has parallel or perpendicular exposure to two or more NALs, you should base the required attenuation on the NAL with the highest calculated noise level. For corner units where the unit interior receives exterior noise through two facades, the STraCAT calculation should incorporate the area of wall, window and door materials pertaining to the corner unit's total exterior wall area (i.e., from both walls).

#### Information to Be Entered

Users first enter basic project information and the NAL noise level that will be used as the basis for required attenuation. This noise level must be entered in whole numbers. STraCAT users then enter information on wall, window and door component type and area. Again, as noted above, the wall, window and door entries are based on one unit, and one wall (except for corner units as discussed above). The tool sums total wall square footage based on the combined area of walls, doors and windows for the façade being evaluated.

Users may input STC values for materials in one of two ways. The tool includes a dropdown menu

HUD NOISE STUDY  
Composite STC A1\_3

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of common construction materials with STC values prefilled. If selected construction materials are not included in this dropdown menu, the user may also enter the STC for a given component manually. Verification of the component STC must be included in the ERR. Documentation includes the architect or construction manager’s project plans showing wall material specifications. For new construction or for components that will be newly installed in an existing wall, documentation also includes the manufacturer’s product specification sheet (cut sheet) documenting the STC rating of selected doors and windows.

*Required STC Rating and Determination of Compliance*

Finally, based on project information entered the tool will indicate the required STC rating for the wall assembly being evaluated and whether or not the materials specified will produce a combined rating that meets this requirement. Note that for noise levels above 75 dB DNL, either HUD (for 24 CFR Part 50 reviews) or the Responsible Entity (for 24 CFR Part 58 reviews) must approve the level and type of attenuation, among other processing requirements. Required attenuation values generated by STraCAT for NALs above 75 dB DNL should therefore be considered tentative pending approval by HUD or the RE.

**Part I - Description**

Part I - Description	
<b>Project</b>	
91-1666 Renton Road A1_3	
<b>Sponsor/Developer</b>	
West Loch LLC	
<b>Location</b>	
West Loch, Kapolei, HI	
<b>Prepared by</b>	
D. L. Adams Associates	
<b>Noise Level</b>	
69	
<b>Date</b>	
6/25/2021	
<b>Primary Source(s)</b>	
Fort Weaver Road	

**Part II - Wall Components**

**Part II - Wall Components**

Wall Construction Detail	Area	STC
FRONT WALL - 2x4 with 3/4" plywood sheathing, 5/8" gypsum interior, and 3.0" R-13 insulation, Hardie panel siding	<input type="text" value="105"/>	<input type="text" value="30"/>
PTAC - Chigo CPS-CNR1	<input type="text" value="6"/>	<input type="text" value="32"/>
SIDE WALL - 2x4 with 3/4" plywood sheathing, 5/8" gypsum interior, and 3.0" R-13 insulation, Hardie panel siding	<input type="text" value="50"/>	<input type="text" value="30"/>
<input type="button" value="Add new wall"/>		
<b>161 Sq. Feet</b>		<b>30.06</b>

Window Construction Detail	Quantity	Sq Ft/Unit	STC
WINDOWS - Sliding 1" IGU (1/4" - 1/2" AS - 1/4")	<input type="text" value="1"/>	<input type="text" value="31"/>	<input type="text" value="32"/>
<input type="button" value="Add new window"/>			

Door Construction Detail	Quantity	Sq Ft/Unit	STC
<input type="button" value="Add new door"/>			

**Part III - Results**

<b>Part III - Results</b>			
<b>Wall Statistics</b>			
<b>Stat</b>		<b>Value</b>	
Area:		161 ft <sup>2</sup>	
Wall STC:		30.06	
<b>Aperture Statistics</b>			
<b>Aperture</b>	<b>Count</b>	<b>Area</b>	<b>% of wall</b>
Windows:	1	31 ft <sup>2</sup>	19.25%
Doors:	0	0 ft <sup>2</sup>	0%
<b>Evaluation Criteria</b>			
<b>Criteria</b>			<b>Value</b>
Noise source sound level (dB):			69
Combined STC for wall assembly:			30.37
Required STC rating:			27
Does wall assembly meet requirements?			<b>Yes</b>
			<b>Print</b>

**Part 4 - Tips**

**Part 4 - Tips**

What do you do if the preferred wall design is not sufficient to achieve the required attenuation? Another wall design with more substantial materials will work, but may not be the most cost-effective solution. Try adding some other elements for just a little more attenuation.

For example:

- Staggering the studs in a wall offers approximately 4dB of additional protection.
- Increasing the stud spacing from 16" on center to 24" can increase the STC from 2-5dB.
- Adding a 2" air space can provide 3dB more attenuation.
- Increasing a wall's air space from 3" to 6" can reduce noise levels by an additional 5dB.
- Adding a layer of ½" gypsum board on "Z" furring channels adds 2dB of attenuation.
- Using resilient channels and clips between wall panels and studs can improve the STC from 2-5dB.
- Adding a layer of ½" gypsum board on resilient channels adds 5dB of attenuation.
- Adding acoustical or isolation blankets to a wall's airspace can add 4-10dB of attenuation.
- A 1" rockwool acoustical blanket adds 3dB to the wall's STC.
- Filling the cells of lightweight concrete masonry units with expanded mineral loose-fill insulation adds 2dB to the STC.

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Composite STC A1\_4

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## Sound Transmission Classification Assessment (STraCAT)

### Overview

The Sound Transmission Classification Assessment Tool (STraCAT) is an electronic version of Figures 17 and 19 in The HUD Noise Guidebook. The purpose of this tool is to document sound attenuation performance of wall systems. Based on wall, window, and door Sound Transmission Classification (STC) values, the STraCAT generates a composite STC value for the wall assembly as a whole. Users can enter the calculated noise level related to a specific Noise Assessment Location in front of a building façade and STraCAT will generate a target required attenuation value for the wall assembly in STC. Based on wall materials, the tool will state whether the composite wall assembly STC meets the required attenuation value.

### How to Use This Tool

#### Location, Noise Level and Wall Configuration to Be Analyzed

STraCAT is designed to calculate the attenuation provided by the wall assembly for one wall of one unit. If unit exterior square footage and window/door configuration is identical around the structure, a single STraCAT may be sufficient. If units vary, at least one STraCAT should be completed for each different exterior unit wall configuration to document that all will achieve the required attenuation. Additionally, if attenuation is not based on a single worst-case NAL, but there are multiple NALs which require different levels of attenuation around the structure, a STraCAT should be completed for each differing exterior wall configuration associated with each NAL.

Exterior wall configurations associated with an NAL include those with parallel (facing) or near-parallel exposure as well as those with perpendicular exposure. When a façade has parallel or perpendicular exposure to two or more NALs, you should base the required attenuation on the NAL with the highest calculated noise level. For corner units where the unit interior receives exterior noise through two facades, the STraCAT calculation should incorporate the area of wall, window and door materials pertaining to the corner unit's total exterior wall area (i.e., from both walls).

#### Information to Be Entered

Users first enter basic project information and the NAL noise level that will be used as the basis for required attenuation. This noise level must be entered in whole numbers. STraCAT users then enter information on wall, window and door component type and area. Again, as noted above, the wall, window and door entries are based on one unit, and one wall (except for corner units as discussed above). The tool sums total wall square footage based on the combined area of walls, doors and windows for the façade being evaluated.

Users may input STC values for materials in one of two ways. The tool includes a dropdown menu

of common construction materials with STC values prefilled. If selected construction materials are not included in this dropdown menu, the user may also enter the STC for a given component manually. Verification of the component STC must be included in the ERR. Documentation includes the architect or construction manager's project plans showing wall material specifications. For new construction or for components that will be newly installed in an existing wall, documentation also includes the manufacturer's product specification sheet (cut sheet) documenting the STC rating of selected doors and windows.

*Required STC Rating and Determination of Compliance*

Finally, based on project information entered the tool will indicate the required STC rating for the wall assembly being evaluated and whether or not the materials specified will produce a combined rating that meets this requirement. Note that for noise levels above 75 dB DNL, either HUD (for 24 CFR Part 50 reviews) or the Responsible Entity (for 24 CFR Part 58 reviews) must approve the level and type of attenuation, among other processing requirements. Required attenuation values generated by STraCAT for NALs above 75 dB DNL should therefore be considered tentative pending approval by HUD or the RE.

**Part I - Description**

Part I - Description	
<b>Project</b>	
91-1666 Renton Road A1_4	
<b>Sponsor/Developer</b>	
West Loch LLC	
<b>Location</b>	
West Loch, Kapolei, HI	
<b>Prepared by</b>	
D. L. Adams Associates	
<b>Noise Level</b>	
69	
<b>Date</b>	
6/25/2021	
<b>Primary Source(s)</b>	
Fort Weaver Road	

**Part II - Wall Components**

**Part II - Wall Components**

Wall Construction Detail	Area	STC	
FRONT WALL - 2x4 with 3/4" plywood sheathing, 5/8" gypsum interior, and 3.0" R-13 insulation, Hardie panel siding	<input type="text" value="99"/>	<input type="text" value="30"/>	
PTAC - Chigo CPS-CNR1	<input type="text" value="6"/>	<input type="text" value="32"/>	
<input type="button" value="Add new wall"/>			
	<b>105 Sq. Feet</b>	<b>30.09</b>	
Window Construction Detail	Quantity	Sq Ft/Unit	STC
WINDOWS - Sliding 1" IGU (1/4" - 1/2" AS - 1/4")	<input type="text" value="1"/>	<input type="text" value="46"/>	<input type="text" value="32"/>
<input type="button" value="Add new window"/>			
Door Construction Detail	Quantity	Sq Ft/Unit	STC
<input type="button" value="Add new door"/>			

**Part III - Results**

<b>Part III - Results</b>			
<b>Wall Statistics</b>			
<b>Stat</b>		<b>Value</b>	
Area:		105 ft <sup>2</sup>	
Wall STC:		30.09	
<b>Aperture Statistics</b>			
<b>Aperture</b>	<b>Count</b>	<b>Area</b>	<b>% of wall</b>
Windows:	1	46 ft <sup>2</sup>	43.81%
Doors:	0	0 ft <sup>2</sup>	0%
<b>Evaluation Criteria</b>			
<b>Criteria</b>			<b>Value</b>
Noise source sound level (dB):			69
Combined STC for wall assembly:			30.83
Required STC rating:			27
Does wall assembly meet requirements?			<b>Yes</b>
			<b>Print</b>

**Part 4 - Tips**

**Part 4 - Tips**

What do you do if the preferred wall design is not sufficient to achieve the required attenuation? Another wall design with more substantial materials will work, but may not be the most cost-effective solution. Try adding some other elements for just a little more attenuation.

For example:

- Staggering the studs in a wall offers approximately 4dB of additional protection.
- Increasing the stud spacing from 16" on center to 24" can increase the STC from 2-5dB.
- Adding a 2" air space can provide 3dB more attenuation.
- Increasing a wall's air space from 3" to 6" can reduce noise levels by an additional 5dB.
- Adding a layer of ½" gypsum board on "Z" furring channels adds 2dB of attenuation.
- Using resilient channels and clips between wall panels and studs can improve the STC from 2-5dB.
- Adding a layer of ½" gypsum board on resilient channels adds 5dB of attenuation.
- Adding acoustical or isolation blankets to a wall's airspace can add 4-10dB of attenuation.
- A 1" rockwool acoustical blanket adds 3dB to the wall's STC.
- Filling the cells of lightweight concrete masonry units with expanded mineral loose-fill insulation adds 2dB to the STC.

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Composite STC A1\_5

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## Sound Transmission Classification Assessment (STraCAT)

### Overview

The Sound Transmission Classification Assessment Tool (STraCAT) is an electronic version of Figures 17 and 19 in The HUD Noise Guidebook. The purpose of this tool is to document sound attenuation performance of wall systems. Based on wall, window, and door Sound Transmission Classification (STC) values, the STraCAT generates a composite STC value for the wall assembly as a whole. Users can enter the calculated noise level related to a specific Noise Assessment Location in front of a building façade and STraCAT will generate a target required attenuation value for the wall assembly in STC. Based on wall materials, the tool will state whether the composite wall assembly STC meets the required attenuation value.

### How to Use This Tool

#### Location, Noise Level and Wall Configuration to Be Analyzed

STraCAT is designed to calculate the attenuation provided by the wall assembly for one wall of one unit. If unit exterior square footage and window/door configuration is identical around the structure, a single STraCAT may be sufficient. If units vary, at least one STraCAT should be completed for each different exterior unit wall configuration to document that all will achieve the required attenuation. Additionally, if attenuation is not based on a single worst-case NAL, but there are multiple NALs which require different levels of attenuation around the structure, a STraCAT should be completed for each differing exterior wall configuration associated with each NAL.

Exterior wall configurations associated with an NAL include those with parallel (facing) or near-parallel exposure as well as those with perpendicular exposure. When a façade has parallel or perpendicular exposure to two or more NALs, you should base the required attenuation on the NAL with the highest calculated noise level. For corner units where the unit interior receives exterior noise through two facades, the STraCAT calculation should incorporate the area of wall, window and door materials pertaining to the corner unit's total exterior wall area (i.e., from both walls).

#### Information to Be Entered

Users first enter basic project information and the NAL noise level that will be used as the basis for required attenuation. This noise level must be entered in whole numbers. STraCAT users then enter information on wall, window and door component type and area. Again, as noted above, the wall, window and door entries are based on one unit, and one wall (except for corner units as discussed above). The tool sums total wall square footage based on the combined area of walls, doors and windows for the façade being evaluated.

Users may input STC values for materials in one of two ways. The tool includes a dropdown menu

of common construction materials with STC values prefilled. If selected construction materials are not included in this dropdown menu, the user may also enter the STC for a given component manually. Verification of the component STC must be included in the ERR. Documentation includes the architect or construction manager's project plans showing wall material specifications. For new construction or for components that will be newly installed in an existing wall, documentation also includes the manufacturer's product specification sheet (cut sheet) documenting the STC rating of selected doors and windows.

*Required STC Rating and Determination of Compliance*

Finally, based on project information entered the tool will indicate the required STC rating for the wall assembly being evaluated and whether or not the materials specified will produce a combined rating that meets this requirement. Note that for noise levels above 75 dB DNL, either HUD (for 24 CFR Part 50 reviews) or the Responsible Entity (for 24 CFR Part 58 reviews) must approve the level and type of attenuation, among other processing requirements. Required attenuation values generated by STraCAT for NALs above 75 dB DNL should therefore be considered tentative pending approval by HUD or the RE.

**Part I - Description**

Part I - Description	
<b>Project</b>	
91-1666 Renton Road A1_5	
<b>Sponsor/Developer</b>	
West Loch LLC	
<b>Location</b>	
West Loch, Kapolei, HI	
<b>Prepared by</b>	
D. L. Adams Associates	
<b>Noise Level</b>	
69	
<b>Date</b>	
6/25/2021	
<b>Primary Source(s)</b>	
Fort Weaver Road	

**Part II - Wall Components**

**Part II - Wall Components**

Wall Construction Detail	Area	STC
FRONT WALL - 2x4 with 3/4" plywood sheathing, 5/8" gypsum interior, and 3.0" R-13 insulation, Hardie panel siding	<input type="text" value="93"/>	<input type="text" value="30"/>
PTAC - Chigo CPS-CNR1	<input type="text" value="6"/>	<input type="text" value="32"/>
<input type="button" value="Add new wall"/>		
<b>99 Sq. Feet</b>		<b>30.1</b>

Window Construction Detail	Quantity	Sq Ft/Unit	STC
WINDOWS - Sliding 1" IGU (1/4" - 1/2" AS - 1/4")	<input type="text" value="1"/>	<input type="text" value="45"/>	<input type="text" value="32"/>
<input type="button" value="Add new window"/>			

Door Construction Detail	Quantity	Sq Ft/Unit	STC
<input type="button" value="Add new door"/>			

**Part III - Results**

<b>Part III - Results</b>			
<b>Wall Statistics</b>			
<b>Stat</b>	<b>Value</b>		
Area:	99 ft <sup>2</sup>		
Wall STC:	30.1		
<b>Aperture Statistics</b>			
<b>Aperture</b>	<b>Count</b>	<b>Area</b>	<b>% of wall</b>
Windows:	1	45 ft <sup>2</sup>	45.45%
Doors:	0	0 ft <sup>2</sup>	0%
<b>Evaluation Criteria</b>			
<b>Criteria</b>	<b>Value</b>		
Noise source sound level (dB):	69		
Combined STC for wall assembly:	30.86		
Required STC rating:	27		
Does wall assembly meet requirements?	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Yes</div>		
	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Print</div>		

**Part 4 - Tips**

**Part 4 - Tips**

What do you do if the preferred wall design is not sufficient to achieve the required attenuation? Another wall design with more substantial materials will work, but may not be the most cost-effective solution. Try adding some other elements for just a little more attenuation.

For example:

- Staggering the studs in a wall offers approximately 4dB of additional protection.
- Increasing the stud spacing from 16" on center to 24" can increase the STC from 2-5dB.
- Adding a 2" air space can provide 3dB more attenuation.
- Increasing a wall's air space from 3" to 6" can reduce noise levels by an additional 5dB.
- Adding a layer of ½" gypsum board on "Z" furring channels adds 2dB of attenuation.
- Using resilient channels and clips between wall panels and studs can improve the STC from 2-5dB.
- Adding a layer of ½" gypsum board on resilient channels adds 5dB of attenuation.
- Adding acoustical or isolation blankets to a wall's airspace can add 4-10dB of attenuation.
- A 1" rockwool acoustical blanket adds 3dB to the wall's STC.
- Filling the cells of lightweight concrete masonry units with expanded mineral loose-fill insulation adds 2dB to the STC.

HUD NOISE STUDY  
Composite STC B1\_1

DLAA 20-044  
91-1666 Renton Road  
HUD Site Noise Analysis  
June 30, 2021

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# Sound Transmission Classification Assessment (STraCAT)

## Overview

The Sound Transmission Classification Assessment Tool (STraCAT) is an electronic version of Figures 17 and 19 in The HUD Noise Guidebook. The purpose of this tool is to document sound attenuation performance of wall systems. Based on wall, window, and door Sound Transmission Classification (STC) values, the STraCAT generates a composite STC value for the wall assembly as a whole. Users can enter the calculated noise level related to a specific Noise Assessment Location in front of a building façade and STraCAT will generate a target required attenuation value for the wall assembly in STC. Based on wall materials, the tool will state whether the composite wall assembly STC meets the required attenuation value.

## How to Use This Tool

### Location, Noise Level and Wall Configuration to Be Analyzed

STraCAT is designed to calculate the attenuation provided by the wall assembly for one wall of one unit. If unit exterior square footage and window/door configuration is identical around the structure, a single STraCAT may be sufficient. If units vary, at least one STraCAT should be completed for each different exterior unit wall configuration to document that all will achieve the required attenuation. Additionally, if attenuation is not based on a single worst-case NAL, but there are multiple NALs which require different levels of attenuation around the structure, a STraCAT should be completed for each differing exterior wall configuration associated with each NAL.

Exterior wall configurations associated with an NAL include those with parallel (facing) or near-parallel exposure as well as those with perpendicular exposure. When a façade has parallel or perpendicular exposure to two or more NALs, you should base the required attenuation on the NAL with the highest calculated noise level. For corner units where the unit interior receives exterior noise through two facades, the STraCAT calculation should incorporate the area of wall, window and door materials pertaining to the corner unit's total exterior wall area (i.e., from both walls).

### Information to Be Entered

Users first enter basic project information and the NAL noise level that will be used as the basis for required attenuation. This noise level must be entered in whole numbers. STraCAT users then enter information on wall, window and door component type and area. Again, as noted above, the wall, window and door entries are based on one unit, and one wall (except for corner units as discussed above). The tool sums total wall square footage based on the combined area of walls, doors and windows for the façade being evaluated.

Users may input STC values for materials in one of two ways. The tool includes a dropdown menu

of common construction materials with STC values prefilled. If selected construction materials are not included in this dropdown menu, the user may also enter the STC for a given component manually. Verification of the component STC must be included in the ERR. Documentation includes the architect or construction manager's project plans showing wall material specifications. For new construction or for components that will be newly installed in an existing wall, documentation also includes the manufacturer's product specification sheet (cut sheet) documenting the STC rating of selected doors and windows.

*Required STC Rating and Determination of Compliance*

Finally, based on project information entered the tool will indicate the required STC rating for the wall assembly being evaluated and whether or not the materials specified will produce a combined rating that meets this requirement. Note that for noise levels above 75 dB DNL, either HUD (for 24 CFR Part 50 reviews) or the Responsible Entity (for 24 CFR Part 58 reviews) must approve the level and type of attenuation, among other processing requirements. Required attenuation values generated by STraCAT for NALs above 75 dB DNL should therefore be considered tentative pending approval by HUD or the RE.

**Part I - Description**

Part I - Description	
<b>Project</b>	
91-1666 Renton Road B1_1	
<b>Sponsor/Developer</b>	
West Loch LLC	
<b>Location</b>	
West Loch, Kapolei, HI	
<b>Prepared by</b>	
D. L. Adams Associates	
<b>Noise Level</b>	
66	
<b>Date</b>	
6/25/2021	
<b>Primary Source(s)</b>	
Fort Weaver Road	

**Part II - Wall Components**

<b>Part II - Wall Components</b>			
<b>Wall Construction Detail</b>	<b>Area</b>	<b>STC</b>	
FRONT WALL - 2x4 with 3/4" plywood sheathing, 5/8" gypsum interior, and 3.0" R-13 insulation, Hardie panel siding	139	30	
PTAC - Chigo CPS-CNR1	6	32	
SIDE WALL - 2x4 with 3/4" plywood sheathing, 5/8" gypsum interior, and 3.0" R-13 insulation, Hardie panel siding	102	30	
<input type="button" value="Add new wall"/>			
<b>247 Sq. Feet</b>		<b>30.04</b>	
<b>Window Construction Detail</b>	<b>Quantity</b>	<b>Sq Ft/Unit</b>	<b>STC</b>
WINDOWS - Sliding 1" IGU (1/4" - 1/2" AS - 1/4")	1	33	32
WINDOWS - Double Hung 1" IGU (1/4" - 1/2" AS - 1/4")	1	17	32
<input type="button" value="Add new window"/>			
<b>Door Construction Detail</b>	<b>Quantity</b>	<b>Sq Ft/Unit</b>	<b>STC</b>
<input type="button" value="Add new door"/>			

**Part III - Results**

<b>Part III - Results</b>			
<b>Wall Statistics</b>			
<b>Stat</b>		<b>Value</b>	
Area:		247 ft <sup>2</sup>	
Wall STC:		30.04	
<b>Aperture Statistics</b>			
<b>Aperture</b>	<b>Count</b>	<b>Area</b>	<b>% of wall</b>
Windows:	2	50 ft <sup>2</sup>	20.24%
Doors:	0	0 ft <sup>2</sup>	0%
<b>Evaluation Criteria</b>			
<b>Criteria</b>			<b>Value</b>
Noise source sound level (dB):			66
Combined STC for wall assembly:			30.37
Required STC rating:			25
Does wall assembly meet requirements?			Yes
			Print

**Part 4 - Tips**

**Part 4 - Tips**

What do you do if the preferred wall design is not sufficient to achieve the required attenuation? Another wall design with more substantial materials will work, but may not be the most cost-effective solution. Try adding some other elements for just a little more attenuation.

For example:

- Staggering the studs in a wall offers approximately 4dB of additional protection.
- Increasing the stud spacing from 16" on center to 24" can increase the STC from 2-5dB.
- Adding a 2" air space can provide 3dB more attenuation.
- Increasing a wall's air space from 3" to 6" can reduce noise levels by an additional 5dB.
- Adding a layer of ½" gypsum board on "Z" furring channels adds 2dB of attenuation.
- Using resilient channels and clips between wall panels and studs can improve the STC from 2-5dB.
- Adding a layer of ½" gypsum board on resilient channels adds 5dB of attenuation.
- Adding acoustical or isolation blankets to a wall's airspace can add 4-10dB of attenuation.
- A 1" rockwool acoustical blanket adds 3dB to the wall's STC.
- Filling the cells of lightweight concrete masonry units with expanded mineral loose-fill insulation adds 2dB to the STC.

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## Sound Transmission Classification Assessment (STraCAT)

### Overview

The Sound Transmission Classification Assessment Tool (STraCAT) is an electronic version of Figures 17 and 19 in The HUD Noise Guidebook. The purpose of this tool is to document sound attenuation performance of wall systems. Based on wall, window, and door Sound Transmission Classification (STC) values, the STraCAT generates a composite STC value for the wall assembly as a whole. Users can enter the calculated noise level related to a specific Noise Assessment Location in front of a building façade and STraCAT will generate a target required attenuation value for the wall assembly in STC. Based on wall materials, the tool will state whether the composite wall assembly STC meets the required attenuation value.

### How to Use This Tool

#### Location, Noise Level and Wall Configuration to Be Analyzed

STraCAT is designed to calculate the attenuation provided by the wall assembly for one wall of one unit. If unit exterior square footage and window/door configuration is identical around the structure, a single STraCAT may be sufficient. If units vary, at least one STraCAT should be completed for each different exterior unit wall configuration to document that all will achieve the required attenuation. Additionally, if attenuation is not based on a single worst-case NAL, but there are multiple NALs which require different levels of attenuation around the structure, a STraCAT should be completed for each differing exterior wall configuration associated with each NAL.

Exterior wall configurations associated with an NAL include those with parallel (facing) or near-parallel exposure as well as those with perpendicular exposure. When a façade has parallel or perpendicular exposure to two or more NALs, you should base the required attenuation on the NAL with the highest calculated noise level. For corner units where the unit interior receives exterior noise through two facades, the STraCAT calculation should incorporate the area of wall, window and door materials pertaining to the corner unit's total exterior wall area (i.e., from both walls).

#### Information to Be Entered

Users first enter basic project information and the NAL noise level that will be used as the basis for required attenuation. This noise level must be entered in whole numbers. STraCAT users then enter information on wall, window and door component type and area. Again, as noted above, the wall, window and door entries are based on one unit, and one wall (except for corner units as discussed above). The tool sums total wall square footage based on the combined area of walls, doors and windows for the façade being evaluated.

Users may input STC values for materials in one of two ways. The tool includes a dropdown menu

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Composite STC B1\_2

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of common construction materials with STC values prefilled. If selected construction materials are not included in this dropdown menu, the user may also enter the STC for a given component manually. Verification of the component STC must be included in the ERR. Documentation includes the architect or construction manager's project plans showing wall material specifications. For new construction or for components that will be newly installed in an existing wall, documentation also includes the manufacturer's product specification sheet (cut sheet) documenting the STC rating of selected doors and windows.

*Required STC Rating and Determination of Compliance*

Finally, based on project information entered the tool will indicate the required STC rating for the wall assembly being evaluated and whether or not the materials specified will produce a combined rating that meets this requirement. Note that for noise levels above 75 dB DNL, either HUD (for 24 CFR Part 50 reviews) or the Responsible Entity (for 24 CFR Part 58 reviews) must approve the level and type of attenuation, among other processing requirements. Required attenuation values generated by STraCAT for NALs above 75 dB DNL should therefore be considered tentative pending approval by HUD or the RE.

**Part I - Description**

Part I - Description	
<b>Project</b>	
91-1666 Renton Road B1_2	
<b>Sponsor/Developer</b>	
West Loch LLC	
<b>Location</b>	
West Loch, Kapolei, HI	
<b>Prepared by</b>	
D. L. Adams Associates	
<b>Noise Level</b>	
66	
<b>Date</b>	
6/25/2021	
<b>Primary Source(s)</b>	
Fort Weaver Road	

**Part II - Wall Components**

**Part II - Wall Components**

Wall Construction Detail	Area	STC
FRONT WALL - 2x4 with 3/4" plywood sheathing, 5/8" gypsum interior, and 3.0" R-13 insulation, Hardie panel siding	<input type="text" value="126"/>	<input type="text" value="30"/>
<input type="button" value="Add new wall"/>		
	<b>126 Sq. Feet</b>	<b>30</b>

Window Construction Detail	Quantity	Sq Ft/Unit	STC
WINDOWS - Sliding 1" IGU (1/4" - 1/2" AS - 1/4")	<input type="text" value="1"/>	<input type="text" value="29"/>	<input type="text" value="32"/>
<input type="button" value="Add new window"/>			

Door Construction Detail	Quantity	Sq Ft/Unit	STC
<input type="button" value="Add new door"/>			

**Part III - Results**

<b>Part III - Results</b>			
<b>Wall Statistics</b>			
<b>Stat</b>		<b>Value</b>	
Area:		126 ft <sup>2</sup>	
Wall STC:		30	
<b>Aperture Statistics</b>			
<b>Aperture</b>	<b>Count</b>	<b>Area</b>	<b>% of wall</b>
Windows:	1	29 ft <sup>2</sup>	23.02%
Doors:	0	0 ft <sup>2</sup>	0%
<b>Evaluation Criteria</b>			
<b>Criteria</b>			<b>Value</b>
Noise source sound level (dB):			66
Combined STC for wall assembly:			30.39
Required STC rating:			25
Does wall assembly meet requirements?			<b>Yes</b>
			<b>Print</b>

**Part 4 - Tips**

**Part 4 - Tips**

What do you do if the preferred wall design is not sufficient to achieve the required attenuation? Another wall design with more substantial materials will work, but may not be the most cost-effective solution. Try adding some other elements for just a little more attenuation.

For example:

- Staggering the studs in a wall offers approximately 4dB of additional protection.
- Increasing the stud spacing from 16" on center to 24" can increase the STC from 2-5dB.
- Adding a 2" air space can provide 3dB more attenuation.
- Increasing a wall's air space from 3" to 6" can reduce noise levels by an additional 5dB.
- Adding a layer of ½" gypsum board on "Z" furring channels adds 2dB of attenuation.
- Using resilient channels and clips between wall panels and studs can improve the STC from 2-5dB.
- Adding a layer of ½" gypsum board on resilient channels adds 5dB of attenuation.
- Adding acoustical or isolation blankets to a wall's airspace can add 4-10dB of attenuation.
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## Sound Transmission Classification Assessment (STraCAT)

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### How to Use This Tool

#### Location, Noise Level and Wall Configuration to Be Analyzed

STraCAT is designed to calculate the attenuation provided by the wall assembly for one wall of one unit. If unit exterior square footage and window/door configuration is identical around the structure, a single STraCAT may be sufficient. If units vary, at least one STraCAT should be completed for each different exterior unit wall configuration to document that all will achieve the required attenuation. Additionally, if attenuation is not based on a single worst-case NAL, but there are multiple NALs which require different levels of attenuation around the structure, a STraCAT should be completed for each differing exterior wall configuration associated with each NAL.

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#### Information to Be Entered

Users first enter basic project information and the NAL noise level that will be used as the basis for required attenuation. This noise level must be entered in whole numbers. STraCAT users then enter information on wall, window and door component type and area. Again, as noted above, the wall, window and door entries are based on one unit, and one wall (except for corner units as discussed above). The tool sums total wall square footage based on the combined area of walls, doors and windows for the façade being evaluated.

Users may input STC values for materials in one of two ways. The tool includes a dropdown menu

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Composite STC B1\_3

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of common construction materials with STC values prefilled. If selected construction materials are not included in this dropdown menu, the user may also enter the STC for a given component manually. Verification of the component STC must be included in the ERR. Documentation includes the architect or construction manager's project plans showing wall material specifications. For new construction or for components that will be newly installed in an existing wall, documentation also includes the manufacturer's product specification sheet (cut sheet) documenting the STC rating of selected doors and windows.

*Required STC Rating and Determination of Compliance*

Finally, based on project information entered the tool will indicate the required STC rating for the wall assembly being evaluated and whether or not the materials specified will produce a combined rating that meets this requirement. Note that for noise levels above 75 dB DNL, either HUD (for 24 CFR Part 50 reviews) or the Responsible Entity (for 24 CFR Part 58 reviews) must approve the level and type of attenuation, among other processing requirements. Required attenuation values generated by STraCAT for NALs above 75 dB DNL should therefore be considered tentative pending approval by HUD or the RE.

**Part I - Description**

Part I - Description	
<b>Project</b>	
91-1666 Renton Road B1_3	
<b>Sponsor/Developer</b>	
West Loch LLC	
<b>Location</b>	
West Loch, Kapolei, HI	
<b>Prepared by</b>	
D. L. Adams Associates	
<b>Noise Level</b>	
66	
<b>Date</b>	
6/25/2021	
<b>Primary Source(s)</b>	
Fort Weaver Road	

**Part II - Wall Components**

**Part II - Wall Components**

Wall Construction Detail	Area	STC
FRONT WALL - 2x4 with 3/4" plywood sheathing, 5/8" gypsum interior, and 3.0" R-13 insulation, Hardie panel siding	118	30
<input type="button" value="Add new wall"/>		
<b>118 Sq. Feet</b>		<b>30</b>

Window Construction Detail	Quantity	Sq Ft/Unit	STC
WINDOWS - Sliding 1" IGU (1/4" - 1/2" AS - 1/4")	1	11	32
<input type="button" value="Add new window"/>			

Door Construction Detail	Quantity	Sq Ft/Unit	STC
3'x7' hollow-core wood door 1 3/4" thick	1	21	20
<input type="button" value="Add new door"/>			

**Part III - Results**

<b>Part III - Results</b>			
<b>Wall Statistics</b>			
<b>Stat</b>	<b>Value</b>		
Area:	118 ft <sup>2</sup>		
Wall STC:	30		
<b>Aperture Statistics</b>			
<b>Aperture</b>	<b>Count</b>	<b>Area</b>	<b>% of wall</b>
Windows:	1	11 ft <sup>2</sup>	9.32%
Doors:	1	21 ft <sup>2</sup>	17.8%
<b>Evaluation Criteria</b>			
<b>Criteria</b>	<b>Value</b>		
Noise source sound level (dB):	66		
Combined STC for wall assembly:	25.91		
Required STC rating:	25		
Does wall assembly meet requirements?	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Yes</div>		
	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Print</div>		

**Part 4 - Tips**

**Part 4 - Tips**

What do you do if the preferred wall design is not sufficient to achieve the required attenuation? Another wall design with more substantial materials will work, but may not be the most cost-effective solution. Try adding some other elements for just a little more attenuation.

For example:

- Staggering the studs in a wall offers approximately 4dB of additional protection.
- Increasing the stud spacing from 16" on center to 24" can increase the STC from 2-5dB.
- Adding a 2" air space can provide 3dB more attenuation.
- Increasing a wall's air space from 3" to 6" can reduce noise levels by an additional 5dB.
- Adding a layer of ½" gypsum board on "Z" furring channels adds 2dB of attenuation.
- Using resilient channels and clips between wall panels and studs can improve the STC from 2-5dB.
- Adding a layer of ½" gypsum board on resilient channels adds 5dB of attenuation.
- Adding acoustical or isolation blankets to a wall's airspace can add 4-10dB of attenuation.
- A 1" rockwool acoustical blanket adds 3dB to the wall's STC.
- Filling the cells of lightweight concrete masonry units with expanded mineral loose-fill insulation adds 2dB to the STC.

## Appendix E

*End of Field Work Letter for an Investigation of  
Potential Sinkholes Documented During a LRFI for the  
West Loch Affordable Housing Project,  
Honouliuli Ahupua'a, 'Ewa District, O'ahu Island, TMK: (1) 9-1-122: 004*  
Honua Consulting



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February 16, 2022

Susan Lebo  
Archaeology Branch Chief  
State Historic Preservation Division  
Kakuhihewa Building  
601 Kamokila Blvd., Suite 555  
Kapolei, HI 96707  
Ph: (808) 692-8026  
[Susan.lebo@hawaii.gov](mailto:Susan.lebo@hawaii.gov)

**SUBJECT: End of Fieldwork Letter for an Investigation of Potential Sinkholes Documented During a LRFI for the West Loch Affordable Housing Project, Honouliuli Ahupua`a, `Ewa District, O`ahu Island, TMK: [1] 9-1-122:004**

Aloha Dr. Susan Lebo,

This letter is regarding an investigation of two potential sinkholes previously documented during a literature review and field inspection (LRFI) for the West Loch Affordable Housing Project, Honouliuli Ahupua`a, `Ewa District, O`ahu Island, TMK: [1] 9-1-122:004. The project area, street address 91-1666 Fort Weaver Road, consists of 3.704 acres (292,026 square feet [sq. ft.] or 27,130 sq. meters [m.]) and is owned by the City and County of Honolulu. The project area is shown on a USGS topographic map (Figure 1), an aerial photo (Figure 2), and a TMK (Figure 3). A preliminary site plan for the West Loch Affordable Housing Project is included as Figure 4

The proposed project plans to construct the West Loch Affordable Housing Project which will consist of 123 rental units divided between seven buildings with an associated community center and community garden. The remainder of the property will be paved for 132 parking stalls and modified for landscaped vegetation and sidewalks. Subsurface excavations will include grading and excavation for foundations and trenching between 1-6 ft below ground surface to connect to existing utilities.

Three archaeological studies have been conducted that included the project area or portions of the project area and include an archaeological inventory survey for the West Loch Estates residential development in 1987, a historic properties assessment for a cell tower facility in 2009, and a literature review and field inspection in support of the current project in November of 2021 (Rosendahl 1987, Macak et al. 2009, and DiVito et al. 2021). No historic properties were documented within the project area during the AIS or cell tower facility investigations, and the lack of historic properties was attributed to previous disturbances from historic cattle ranching and subsequent use of the area for commercial sugar cane production.

Background research from the recent LRFI indicated that the property had been used for cattle ranching in the mid to late 19<sup>th</sup> century, commercial sugar cane cultivation throughout much of the 20<sup>th</sup> century and was cleared and graded during construction of the West Loch Elderly Villages in the early 1990's. Easements were constructed through the project area in 2000 and a cell tower lease facility was built along the western boundary in 2011. The LRFI determined that it was likely that these activities would have displaced or destroyed any surface features or cultural deposits present in the project area. Although no deposits or surface features were documented within the project area, an area of potential sinkholes was documented. The potential sinkholes were assigned field designation Honua 1 and consisted of 6 depressions in the ground surface in an approximately 30 by 30 meter area. Two of the depressions were filled with concrete fragments and were recorded as Features A and B (Figure 5 and Figure 6). It was recommended that the potential sinkholes be investigated prior to development as sinkholes within the region have been found to contain significant cultural deposits and materials, including human burials. (DiVito et al, 2021:92).

### **Fieldwork Methods and Results**

Testing of the two potential sinkholes, Features A and B, was conducted on November 19, 2021, by Nathan J. DiVito, B.A., under the supervision of Rosanna Thurman, M.A. (principal investigator). Fieldwork required approximately 6 hours to complete and was conducted under archaeological permit number 21-24, issued to Honua Consulting by the SHPD/DLNR in accordance with HAR § 13-282. Testing consisted of the removal of fill material from the potential sinkholes and the excavation of a 50 x 50 cm shovel test pit at the base of each. Shovel tests were excavated to a depth of 50 cm below the bottom of Features A and B. Material from shovel tests was passed through 1/8 inch wire mesh to facilitate the collection of possible faunal remains or any other cultural materials. No cultural materials or samples were collected during the investigation.

Feature A was almost circular in plan and following the removal of fill material measured approximately 80 cm (E-W) by 75 cm (N-S) and extended to a depth of 45 cmbs (Figure 8 and Figure 9). The hole had been filled with concrete chunks and modern rubbish consisting of food wrappers, a plastic straw, and tile fragments. A natural crevice was observed running east to west along the length of the bottom of the hole. A 50 x 50 cm shovel test was excavated in the bottom of Feature A and extended 50 cm below the bottom of hole to a depth of 95 cmbs (Figure 10).

Feature B was irregular in plan and following the removal of fill material measured approximately 210 cm (N-S) by 120 cm (E-W) and extended to a depth of 65 cmbs (Figure 11 and Figure 12). The hole had also been filled with concrete chunks and modern rubbish consisting of food wrappers, a plastic drink container, rubber tire pieces, and tile fragments. A natural crevice was observed running north to south along the length of the bottom of the hole. A 50 x 50 cm shovel test was excavated in the bottom of Feature A and extended 50 cm below the bottom of hole to a depth of 115 cmbs (Figure 13).

A single soil type was observed to the base of excavation in both shovel tests and consisted of dark reddish brown Honouliuli clay documented as Layer I (Figure 14 and Table 1). No cultural materials or faunal remains were encountered during excavation and no coral karst was observed in either shovel test making it likely that the holes are not sinkholes but rather large cracks in the ground that have formed by natural processes.

## Summary and Recommendations

The absence of cultural materials and faunal remains documented during the investigation is attributed to the features being formed by natural processes. The lack of vegetation on the property and the dryness of the area has caused shrinking and swelling of the Honouliuli clay soil which has created several large natural crevices and depressions. Later, the two largest holes were filled with modern concrete and rubbish likely so that people wouldn't damage their cars while parking in the gravel area to the north along the fence with the West Loch Elderly Villages. Based on the results of excavations at Features A and B, Honua 1 is assessed as having been formed by natural processes and lacks the integrity or significance to be designated a historic property. Therefore, the West Loch Affordable Housing Project will have "no effect" historic properties as none are present within the project area. Based on the background research and results of the current investigation archaeological monitoring is recommended for the project on an on-call basis.

If you have any questions or recommendations, please feel free to notify either Dodge Watson at (808) 392-1617 or Rosanna Thurman at (808) 927-9920.

Sincerely,

*Rosanna Thurman*

Rosanna Thurman, M.A.  
Principal Investigator  
Honua Consulting

## References Cited

**DiVito, Nathan J., Frederick LaChance IV, Rossanna M.R. Thurman, and Trisha Kehaulani Watson**

2021 *Archaeological Literature Review and Field Inspection for the West Loch Affordable Housing Project, Honouliuli Ahupua'a, 'Ewa District, O'ahu Island TMK: [1] 9-1-122:004.* Honua Consulting LLC., Honolulu, HI

**Macak, Kristin M., Elaine H.R. Jourdane, and Thomas S. Dye**

2009 *Historic Properties Assessment for the Proposed Verizon Wireless Hon Fernandez Village Cell Site (VZW ID 20007255596), 91-1472 Renton Road, 'Ewa District, O'ahu Island, TMK: (1) 9-1-122:004 .* T.S. Dye and Colleagues, Archaeologists Inc., Honolulu, HI.

**Rosendahl, Paul H.**

2009 *Archaeological Reconnaissance Survey for Environmental Impact Statement West Loch Estates – Residential Increments I and II Land of Honouliuli Ewa District, Island of Oahu.* Paul H. Rosendahl Ph.D., Inc., Hilo, HI.



Figure 1. Portion of a 2013 U.S. Geographical Survey (USGS) topographic quadrangle map showing the location of the project area



Figure 2. Aerial photo showing the location of the project area and the area of potential sinkholes recorded as Honua 1

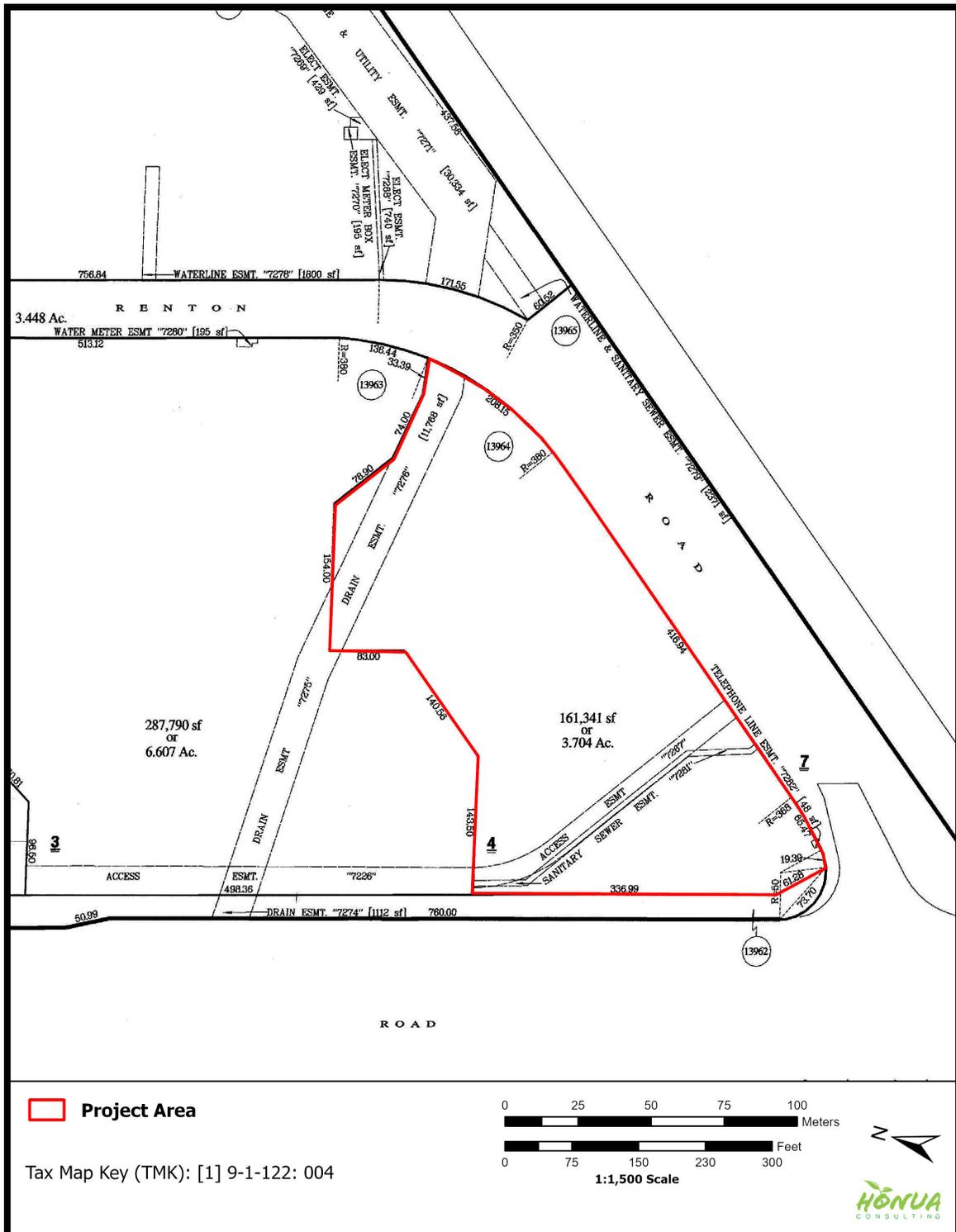


Figure 3. Portion of Tax Map Key (TMK) [1] 9-1-122:004 showing the location of the project area

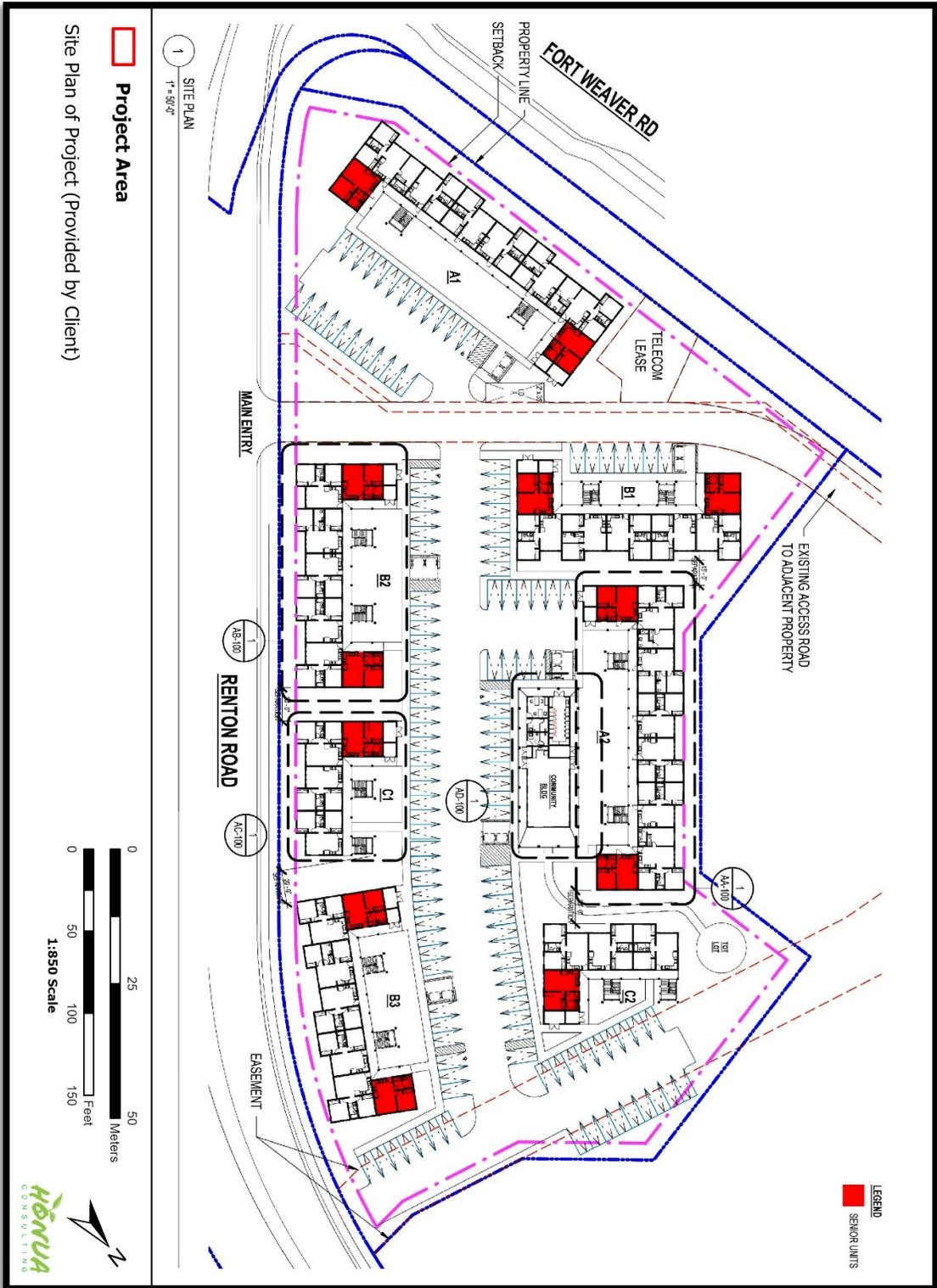


Figure 4. Preliminary construction plan for the West Loch Affordable Housing Project (Provided by Client)

Investigation of Potential Sinkholes at the West Loch Affordable Housing Project



Figure 5. Overview photo of Feature A of Honua 1 prior to excavation looking to the south



Figure 6. Overview photo of Feature B of Honua 1 prior to excavation looking southeast



Figure 8. Overview photo of Feature A of Honua 1 following excavation looking south

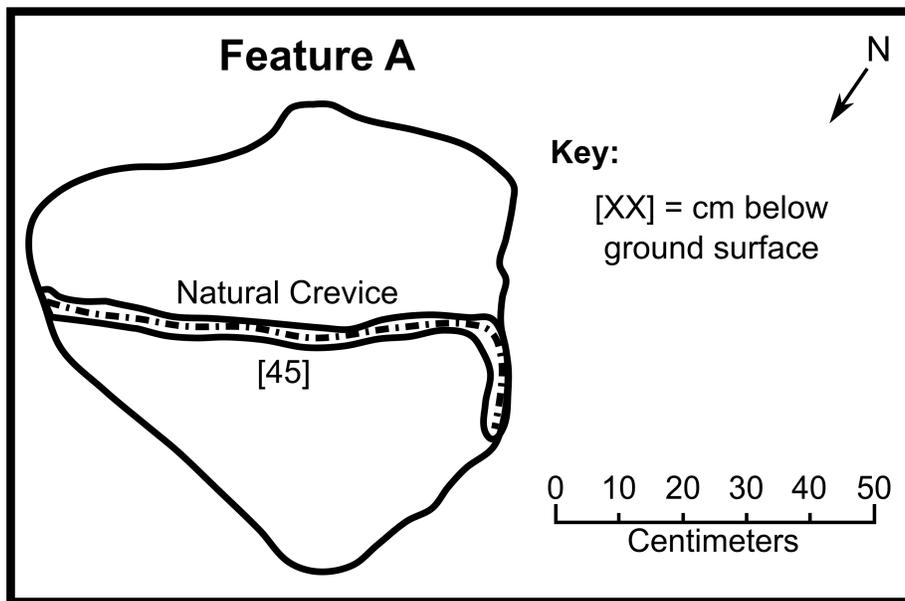


Figure 9. Plan view drawing of Feature A of Honua 1



Figure 10. Overview photo of the 50 x 50 cm shovel test pit excavated at Feature A of Honua 1 looking south



Figure 11. Overview photo of Feature B of Honua 1 following excavation looking southeast

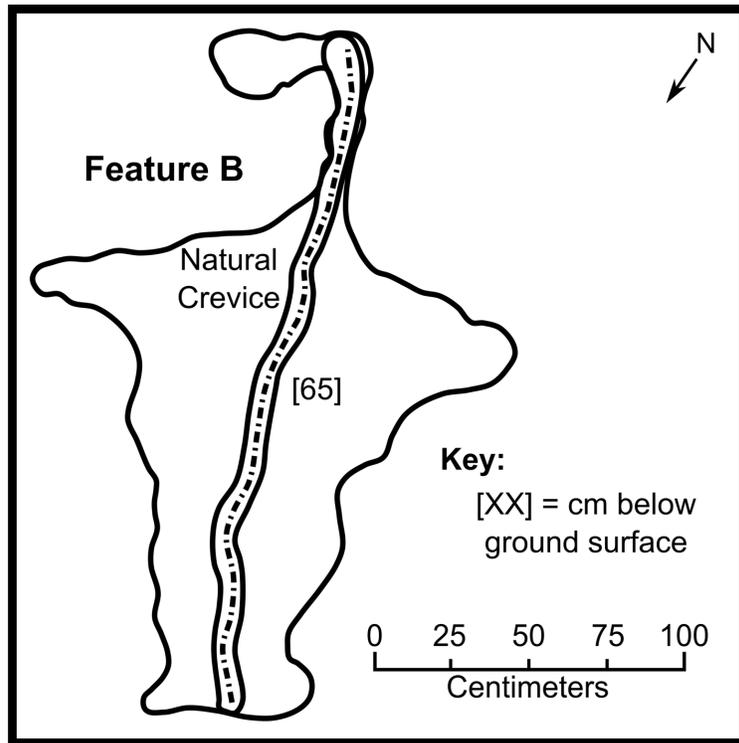


Figure 12. Plan view drawing of Feature B of Honua 1



Figure 13. Overview photo of the 50 x 50 cm shovel test pit excavated at Feature A of Honua 1 looking south

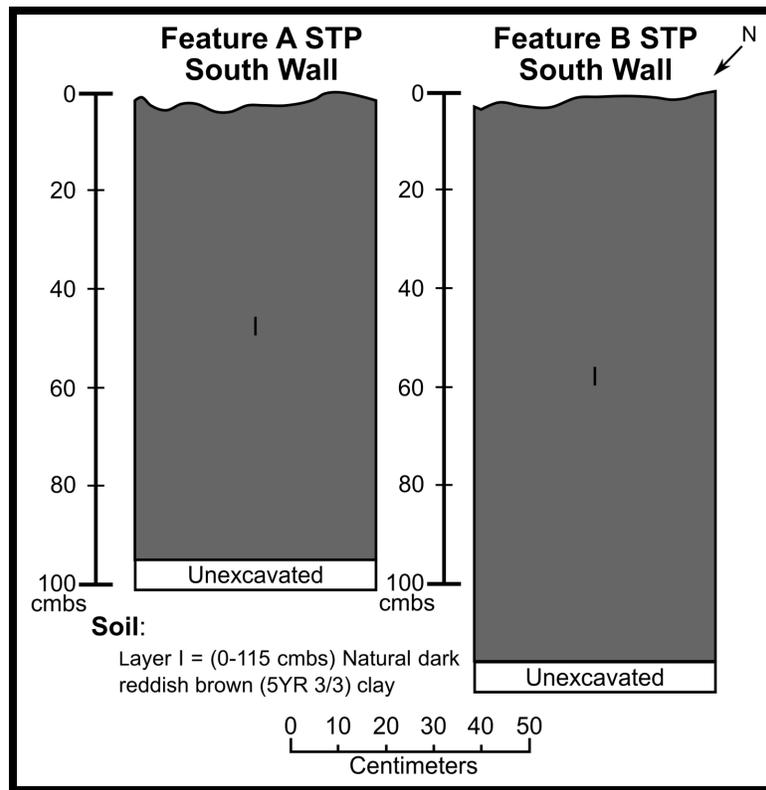


Figure 14. Stratigraphic profile drawing showing the stratigraphy of shovel tests at Features A and B

Table 1. Soil Description of Features A and B

Layer	Depth (cmbs)	Description
I	0-95 (BOE) 0-115 (BOE)	5YR 3/3 (dark reddish brown), clay; moderate, blocky structure; friable, moist, hard consistence; sticky; plastic, lower boundary not observed, natural Honouliuli clay



## Appendix F

*West Loch Affordable Housing Rental-  
Utility Due Dilligence Summary*  
Wilson Okamoto Corporation



**WILSON OKAMOTO**  
CORPORATION  
INNOVATORS • PLANNERS • ENGINEERS

10548-01  
January 20, 2022

**MEMORANDUM**

TO: Mr. Daniel Sandomire, Stanford Carr Development, LLC  
FROM: Kevin Goto, PE, LEED AP  
SUBJECT: West Loch Affordable Housing Rental – Utility Due Diligence Summary

Stanford Carr Development, LLC is proposing to build 7 low rise buildings containing 127 residential units and 1 community building located at TMK: 9-1-122: 004 in Ewa Beach, Oahu.

Sewer:

A sewer connection application request letter was sent to Wastewater Branch on August 04, 2021. Wastewater Branch approved the application confirming system capacity on August 09, 2021. See the attached approved application.

A new connection will be made to the existing 8-inch sewer lateral branching up the middle driveway on Renton Road.

Water:

A water availability request letter was sent to Board of Water Supply dated August 04, 2021. Board of Water Supply confirmed system adequacy on August 18, 2021. See the attached response.

A new potable domestic water connection will be made to an existing 8-inch lateral in Renton Road, while a new non-potable irrigation connection will be made to an existing 6-inch lateral from Fort Weaver Road fronting the adjacent Ewa Elderly Housing development.

Storm Drainage:

Record as-built plans received from the City and County of Honolulu Department of Planning and Permitting dated June 08, 1991 indicate that all storm drainage runoff shall discharge to an existing 10'x6' box drain through a 24-inch lateral within an easement on the eastern face of the property. The record plans state that 20.1 CFS of proposed runoff is allowed into the lateral.

10548-01  
Letter to Daniel Sandomire  
Page 2  
January 20, 2022

Electrical:

Electrical (power) service to customers in the project area is provided by the Hawaiian Electric Company (HECO) and distributed underground along Renton Road. New underground primary (12 kV) electrical infrastructure, consisting of ductlines and handholes, will be extended from the existing HECO primary underground distribution system. The underground infrastructure will extend from an existing handhole within the Renton Road right of way to new, single phase HECO pad mounted transformers on the project site. One pad mounted transformer will be provided for each building. Underground 120/240 volt, single phase three wire, secondary electrical ductlines and conductors will be provided from the pad mounted transformers to each respective building. The pad mounted transformers and underground primary cables will be provided by HECO. The construction contractor will be responsible to provide all ductlines, handholes and secondary conductors.

Hawaiian Telecom and Spectrum:

Telephone, cable television and related telecommunications services are provided to customers in the project area by Hawaiian Telcom (HT) and Spectrum. Customers have the option to contract with HT, Spectrum or both for their telecommunications services. Both HT and Spectrum are capable of providing voice, internet and other telecommunications services to their customers. The existing HT and Spectrum cables are run underground and follow the same path as the existing HECO underground distribution system. New underground HT and Spectrum infrastructure, consisting of ductlines and handholes, will be extended from existing HT and Spectrum handholes located with the Renton Road right of way and routed on site in a similar alignment as the new HECO infrastructure, to support telecommunications services for each building. All exterior telecommunications utility cables and cabling terminations will be the responsibility of HT and Spectrum. The construction contractor will be responsible to provide all ductlines and handholes.

Gas:

Email correspondence was sent to Hawaiian Gas on February 09, 2021. Hawaii Gas confirmed system adequacy on February 09, 2021. See the attached response.

A new gas connection will be made to an existing 4-inch PE gas lateral located off of Fort Weaver Road in the West Loch Elderly Village property.

Enclosures: Sewer Connection Application No: 2021/SCA-1129  
West Loch Affordable Housing Rental – BWS Response Letter  
West Loch Affordable Housing Rental – Hawaiian Electric Company Will Serve Letter  
West Loch Affordable Housing Rental – Hawaiian Telecom Email Correspondence  
West Loch Affordable Housing Rental – Hawaii Gas Email Correspondence



DEPARTMENT OF PLANNING AND PERMITTING  
**CITY AND COUNTY OF HONOLULU**  
 650 SOUTH KING STREET \* HONOLULU, HAWAII 96813  
 Phone: (808) 768-8209 \* Fax: (808) 768-4210

# SEWER CONNECTION APPLICATION

APPLICATION NO.: **2021/SCA-1129** STATUS: **Approved**  
 DATE RECEIVED: **08/05/2021** IWDP APP. NO.:  
 PROJECT NAME: **2021/SCA-1129 West Loch Affordable Rental Housing - 127 New MFD**

<b>\$588,162.40</b>
Estimated Wastewater System Facility Charge*

LOCATION:

Zone	Section	Plat	Parcel
<b>9</b>	<b>1</b>	<b>122</b>	<b>004</b>

**91-1400 RENTON RD**

SPECIFIC LOCATION: **91-1666 Fort Weaver Road**

APPLICANT: **Kevin Goto**  
 1907 South Beretania Street, Suite 400  
 Honolulu, Hawaii 96826-1301

DEVELOPMENT TYPE: **Dwelling, Multi-family** SEWER CONNECTION WORK DESIRED: **Existing**

OTHER USES:

NON-RESIDENTIAL AREA: **s.f.** APPROXIMATE DATE OF CONNECTION:

<u>PROPOSED UNITS</u>	<u>EXISTING UNITS</u>	<u>UNITS TO BE DEMOLISHED</u>
No. of New Units: <b>127</b>	No. of Existing Units: <b>0</b>	No. of Units to be Demolished: <b>0</b>
Studios:	Studios:	Studios:
1-Bedroom: <b>28</b>	1-Bedroom:	1-Bedroom:
2-Bedroom: <b>87</b>	2-Bedroom:	2-Bedroom:
3-Bedroom: <b>12</b>	3-Bedroom:	3-Bedroom:
4-Bedroom:	4-Bedroom:	4-Bedroom:
5-Bedroom:	5-Bedroom:	5-Bedroom:
6-Bedroom:	6-Bedroom:	6-Bedroom:

REMARKS

APPROVAL DATE: **08/09/2021**

EXPIRATION DATE: **08/09/2023**

*Valid 2-years after approval date. Construction plans shall be completed and approved within this 2-year period. Construction shall commence within 1-year after approval of plans.*

*\* Applicable WSFC shall be collected at the prevailing rate in accordance with ROH 1990, Chapter 14, Sections 14-10.3, 14-10.4, 14-10.5 and Appendix 14-D.*

REVIEWED BY: **Jing Meng**

Site Development Division, Wastewater Branch

## BOARD OF WATER SUPPLY

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



August 18, 2021

RICK BLANGIARDI, MAYOR

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

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

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

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

Mr. Kevin Goto  
Wilson Okamoto Corporation  
1907 South Beretania Street, Suite 400  
Honolulu, Hawaii 96826



Dear Mr. Goto:

Subject: Your Letter Dated August 4, 2021 Regarding Availability of Water and Flow and Pressure Data for West Loch Affordable Rental Housing off Renton Road – Tax Map Key: 9-1-122: 004

Thank you for your letter regarding the proposed 127-unit affordable housing rental project.

The existing water system is adequate to accommodate the proposed low-rise development. However, please be advised that this information is based upon current data, and therefore, the Board of Water Supply (BWS) reserves the right to change any position or information stated herein up until the final approval of the building permit application. The final decision on the availability of water will be confirmed when the building permit application is submitted for approval.

When water is made available, the applicant will be required to pay our Water System Facilities Charges (WSFC) for resource development, transmission, and daily storage.

Water conservation measures are required for all proposed developments. These measures include utilization of nonpotable water for irrigation using rain catchment, drought tolerant plants, xeriscape landscaping, efficient irrigation systems, such as a drip system and moisture sensors, and the use of Water Sense labeled ultra-low flow water fixtures and toilets.

The BWS Rules and Regulations require the use of nonpotable water for the irrigation of large, landscaped areas if a suitable supply is available. The proposed affordable housing rental development is in close proximity to the BWS Recycled Water System. Thus, nonpotable water in the form of recycled water, designated R-1, must be used and the BWS agrees to provide R-1 recycled water to the development.

Mr. Kevin Goto  
August 18, 2021  
Page 2

The availability of recycled water will be confirmed when the Recycled Water Service Agreement (RWSA) between the BWS and the user is executed, and construction plans have been approved by the BWS. BWS reserves the right to change any position or information stated herein up until the execution of the RWSA and approval of the construction plans. When recycled water is made available the user shall be required to pay any applicable costs for its use.

There is an existing 6-inch R-1 recycled water fronting the adjacent Ewa Elderly Housing development on Fort Weaver Road that the development may use as the connection to the BWS Recycled Water System. A variable speed booster may be needed to pressurize the R-1 recycled water.

In order to use recycled water, the user shall comply with Chapter 11-62, Hawaii Administrative Rules, Wastewater Systems and Department of Health (DOH) Guidelines for the Treatment and Use of Recycled Water, dated May 15, 2002, and as amended, which is published by the State DOH Wastewater Branch. The user shall be required to prepare and submit the DOH Recycled Water Project application form to the BWS for review and concurrence prior to submittal to DOH for review and approval. The DOH Recycled Water Project application should identify the Best Management Practices that will be implemented to minimize contact between the general public and the use of recycled water. The user shall be responsible for any permitting, training, and on-site improvements, and any associated costs, as may be required by the DOH. The delivery of recycled water is contingent on the user obtaining DOH approval to use recycled water at the subject project and submitting a copy of the DOH approval to BWS. Once the application is reviewed and deemed satisfactory, the DOH will issue an approval to construct. The user must send the approval to construct letter to BWS before the plans can be approved.

The BWS R-1 Recycled Water System is an on-demand system that utilizes a variable speed pumping system with no elevated storage reservoirs currently. Therefore, pump running times and water pressures will vary depending on climate, water demand, and efficient pumping operation strategies and time of day. The Customer shall be placed on a time schedule, usually at night, and shall make reasonable accommodations to allow for a defined range of system pressures. A receiving tank and booster pump may be required to supply adequate pressures to the irrigation system; however, this should be verified with the BWS.

The proposed project is subject to BWS Cross-Connection Control and Backflow Prevention requirements prior to the issuance of the Building Permit Applications.

The construction drawings should be submitted for our approval, and the construction schedule should be coordinated to minimize impact to the water system.

Mr. Kevin Goto  
August 18, 2021  
Page 3

BWS may waive the WSFC and new meter costs for qualified on-site affordable and homeless dwelling units, up to 500 dwelling units per year. The waivers will be granted when the building permit is submitted for approval. To qualify, the dwelling units must be certified as either affordable or homeless dwelling units by the appropriate agency of the City and County of Honolulu and the certification provided when the building permit application is submitted for review and approval. For non-qualifying units, the applicant will be required to pay our WSFC for resource development, transmission, and daily storage.

The BWS has suspended fire flow tests on fire hydrants as a water conservation measure. However, you may use the following calculated flow data for Fire Hydrant No. L04795 and L04796:

<u>Fire Hydrant Number</u>	<u>Location</u>	<u>Static Pressure (psi)</u>	<u>Residual Pressure (psi)</u>	<u>Flow (gpm)</u>
L04795	Renton Road	73	64	1,500
L04796	Renton Road	72	63	1,500

The data is based on the existing water system, and the static pressure represents the theoretical pressure at the point of calculation with the reservoir full and no demands on the water system. The static pressure is not indicative of the actual pressure in the field. Therefore, to determine the flows that are available to the site, you will have to determine the actual field pressure by taking on-site pressure readings at various times of the day and correlating that field data with the above hydraulic design data.

The map showing the location of the fire hydrants is attached.

The on-site fire protection requirements should be coordinated with the Fire Prevention Bureau of the Honolulu Fire Department.

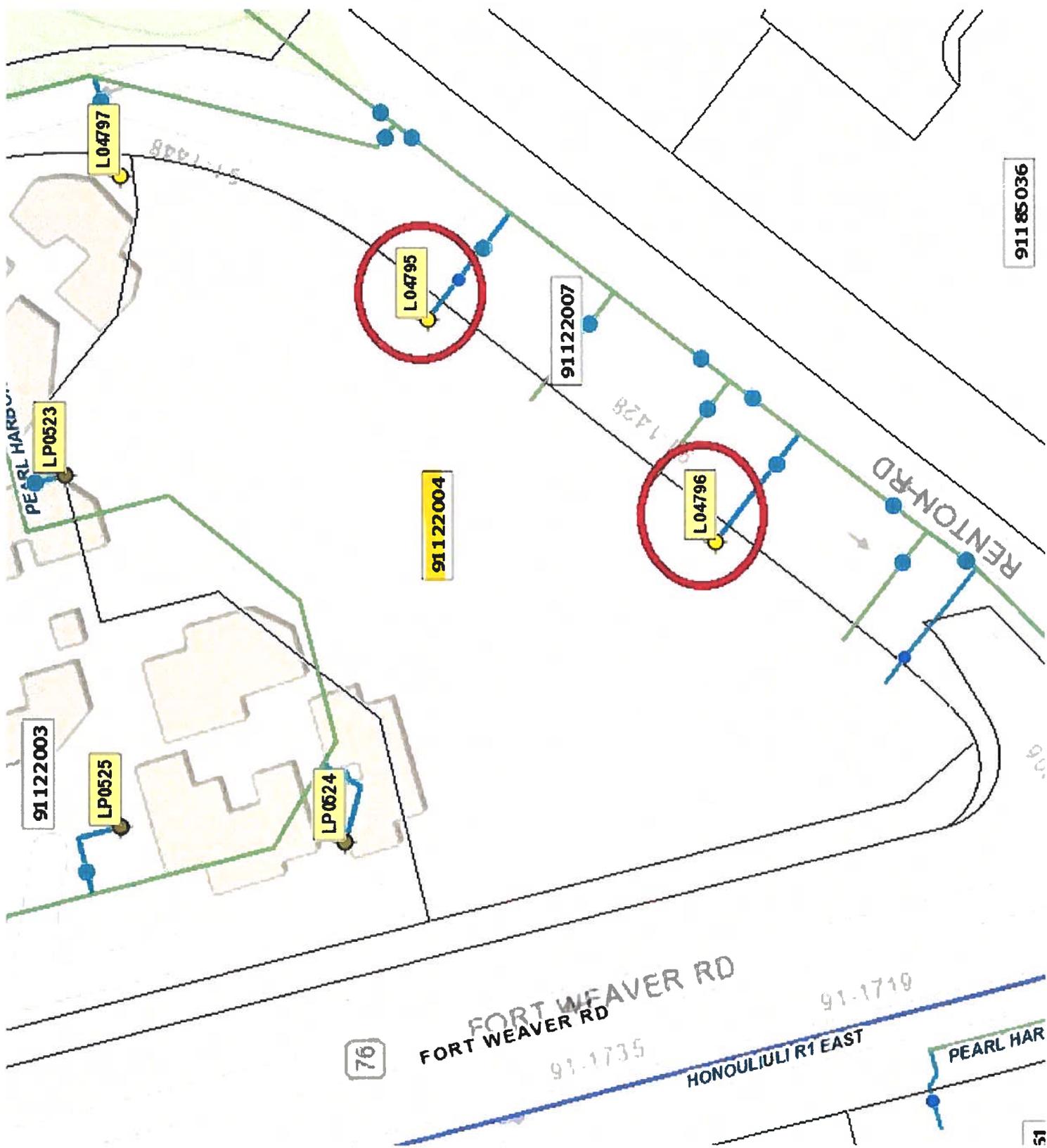
If you have any questions, please contact Robert Chun, Project Review Branch of our Water Resources Division at 748-5443.

Very truly yours,



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

Attachment





February 20, 2021

Mr. Daniel M. Sandomire, AIA  
Stanford Carr Development, LLC  
1100 Alakea Street, 27<sup>th</sup> Floor  
Honolulu, Hawaii 96813

Dear Mr. Sandomire:

Re: West Loch Affordable Rental Housing  
91-1666 Renton Road, Ewa Beach

This is in response to your request for a "Will Serve" letter for the above project location.

We have existing distribution circuits along Renton Road that could potentially be used to serve the future development. Please keep in mind that these circuits may need to be upgraded or new circuits may need to be installed depending on the ultimate size of this project's load. At this time we do not have sufficient information and detailed plans to make this determination.

We request that you keep us informed on the status of your project. As soon as you have detailed plans, please create a Service Request with us, and be sure to allow sufficient time for us to work on the project.

Please let us know if we can be of assistance in any other way. Should you have any questions, call me at 543-7590.

Sincerely,

Shimono,  
Eric

Digitally signed by  
Shimono, Eric  
Date: 2021.02.20  
22:35:38 -10'00'

Eric Shimono  
Engineer III  
Transmission and Distribution Engineering Department  
Engineering Division

ES:es

**Michele Adolpho**

---

**From:** Nicole Roberts <Nicole.Roberts@hawaiiantel.com>  
**Sent:** Tuesday, August 24, 2021 12:22 PM  
**To:** Michele Adolpho  
**Cc:** Desiree Kaiawe; HT-Plan Reviews  
**Subject:** RE: West Loch Affordable Rental Housing - Information Request

Hi Michele,

HT has adequate underground infrastructure (3-4" conduits) along Renton Rd (see blue markup below). There is a 4x6 HH facing the property which could serve as a meet point. At the corner edge of the property is a MH (still in blue) and a Pole 1/156 (in green). There is another MH across Fort Weaver.

Let me know if you need any additional information around our infrastructure.



Thanks,

**Nicole Roberts**  
Network Engineer

**Hawaiian Telcom**  
O: (808) 546-4858  
C: (808) 799-8680  
[Nicole.Roberts@HawaiianTel.com](mailto:Nicole.Roberts@HawaiianTel.com)



---

**From:** HT-Plan Reviews <[HT-PlanReviews@hawaiiantel.com](mailto:HT-PlanReviews@hawaiiantel.com)>  
**Sent:** Tuesday, August 24, 2021 11:08 AM  
**To:** Nicole Roberts <[Nicole.Roberts@hawaiiantel.com](mailto:Nicole.Roberts@hawaiiantel.com)>  
**Cc:** Desiree Kaiawe <[Desiree.Kaiawe@hawaiiantel.com](mailto:Desiree.Kaiawe@hawaiiantel.com)>; HT-Plan Reviews <[HT-PlanReviews@hawaiiantel.com](mailto:HT-PlanReviews@hawaiiantel.com)>  
**Subject:** FW: West Loch Affordable Rental Housing - Information Request

Aloha Nicole,

Are you handling all Oahu request? If so, can you please review plans and provide any comments/feedback to Michele? Let me know if this needs to be redirected as well. Thank you!

**Greg Kawachi**  
*Specialist – Structure Engineer*  
O: 808.546.7666  
C: 808.779.8324



NOTICE: This message is intended only for the person or entity to which it is addressed and may contain confidential and/or privileged information. If you are not the intended recipient, any review, retransmission, dissemination, copying or other use of this message is strictly prohibited. If you received this message in error, please contact the sender immediately by reply email, delete this message from all computers, and destroy any printed copies.

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**From:** HT-Plan Reviews <[HT-PlanReviews@hawaiiantel.com](mailto:HT-PlanReviews@hawaiiantel.com)>  
**Sent:** Friday, August 6, 2021 3:47 PM  
**To:** Desiree Kaiawe <[Desiree.Kaiawe@hawaiiantel.com](mailto:Desiree.Kaiawe@hawaiiantel.com)>  
**Cc:** HT-Plan Reviews <[HT-PlanReviews@hawaiiantel.com](mailto:HT-PlanReviews@hawaiiantel.com)>  
**Subject:** FW: West Loch Affordable Rental Housing - Information Request

Hi Miharua,

Can you let me know who I can assign the below MDU to?

Thank you,

Jeff Okuhara  
Engineering Specialist - Network Planning & Engineering  
Hawaiian Telcom  
[Jeffrey.Okuhara@hawaiiantel.com](mailto:Jeffrey.Okuhara@hawaiiantel.com)



---

**From:** Michele Adolpho <[MAdolpho@ecshawaii.com](mailto:MAdolpho@ecshawaii.com)>  
**Sent:** Friday, August 6, 2021 1:55 PM  
**To:** HT-Plan Reviews <[HT-PlanReviews@hawaiiantel.com](mailto:HT-PlanReviews@hawaiiantel.com)>

Cc: Greg Kawachi <[Greg.Kawachi@hawaiiantel.com](mailto:Greg.Kawachi@hawaiiantel.com)>

Subject: West Loch Affordable Rental Housing - Information Request

Greg,

Would like to obtain information on the availability of Hawaiian Telcom facilities that can be utilized to support the proposed West Loch Affordable Rental Housing project. Attached is a project location map and Tax Map Key for your reference.

We would also like assistance to identify the likely off-site connection point for Hawaiian Telcom service to the development.

Thanks,  
Michele

Michele Adolpho, P.E.



**ECS, Inc.**

615 Piikoi Street, Suite 207  
Honolulu, Hawaii 96814  
(808) 591-8181 Fax: (808) 591-9098

---

**From:** Daniel Sandomire <daniel@stanfordcarr.com>  
**Sent:** Friday, July 30, 2021 8:58 AM  
**To:** Kevin Goto; Cara Itai  
**Subject:** FW: Gas service- West Loch Affordable Rental Housing project  
**Attachments:** 91-1666 Renton-274042-HG-APPPS-P.pdf

---

**From:** Ching, Lawrence <LCHING@hawaiigas.com>  
**Sent:** Tuesday, February 9, 2021 9:25 AM  
**To:** Daniel Sandomire <daniel@stanfordcarr.com>  
**Subject:** RE: Gas service- West Loch Affordable Rental Housing project

Dan,  
Yes, we have a 6" PE gas main located on Fort Weaver approx. 11' from the property line. We will be able to provide gas service to the property. Is there sewer easements on property? See the attached gas map.

Thank you,  
Lawrence

**Lawrence Ching - Senior Account Executive**

Ph: (808) 594-5517 | Mobile: (808) 237-9503  
515 Kamake'e St. Honolulu, HI 96814  
[www.hawaiigas.com](http://www.hawaiigas.com)



---

**From:** Daniel Sandomire <daniel@stanfordcarr.com>  
**Sent:** Tuesday, February 9, 2021 9:18 AM  
**To:** Ching, Lawrence <LCHING@hawaiigas.com>  
**Subject:** RE: Gas service- West Loch Affordable Rental Housing project

Yes- that is the correct location.

Just checked the address- yeah, it doesn't match where google says, but that's the land we have. I've been there.

Thanks!

---

**From:** Ching, Lawrence <[LCHING@hawaiigas.com](mailto:LCHING@hawaiigas.com)>  
**Sent:** Tuesday, February 9, 2021 9:14 AM  
**To:** Daniel Sandomire <[daniel@stanfordcarr.com](mailto:daniel@stanfordcarr.com)>  
**Subject:** RE: Gas service- West Loch Affordable Rental Housing project

Hi Dan,

Just to confirm, is this project located on the corner of Renton Rd. and Fort Weaver?

Thank you,  
Lawrence

**Lawrence Ching - Senior Account Executive**

Ph: (808) 594-5517 | Mobile: (808) 237-9503

515 Kamake'e St. Honolulu, HI 96814

[www.hawaiigas.com](http://www.hawaiigas.com)



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**From:** Daniel Sandomire <[daniel@stanfordcarr.com](mailto:daniel@stanfordcarr.com)>  
**Sent:** Tuesday, February 9, 2021 9:01 AM  
**To:** Ching, Lawrence <[LCHING@hawaiigas.com](mailto:LCHING@hawaiigas.com)>  
**Subject:** Gas service- West Loch Affordable Rental Housing project

Hi Lawrence-

Is gas service available for this site?

**West Loch Affordable Rental Housing**

91-1666 Renton Rd

Ewa Beach, HI 96706.

The project has 8 three-story buildings and 123 units total comprised of:

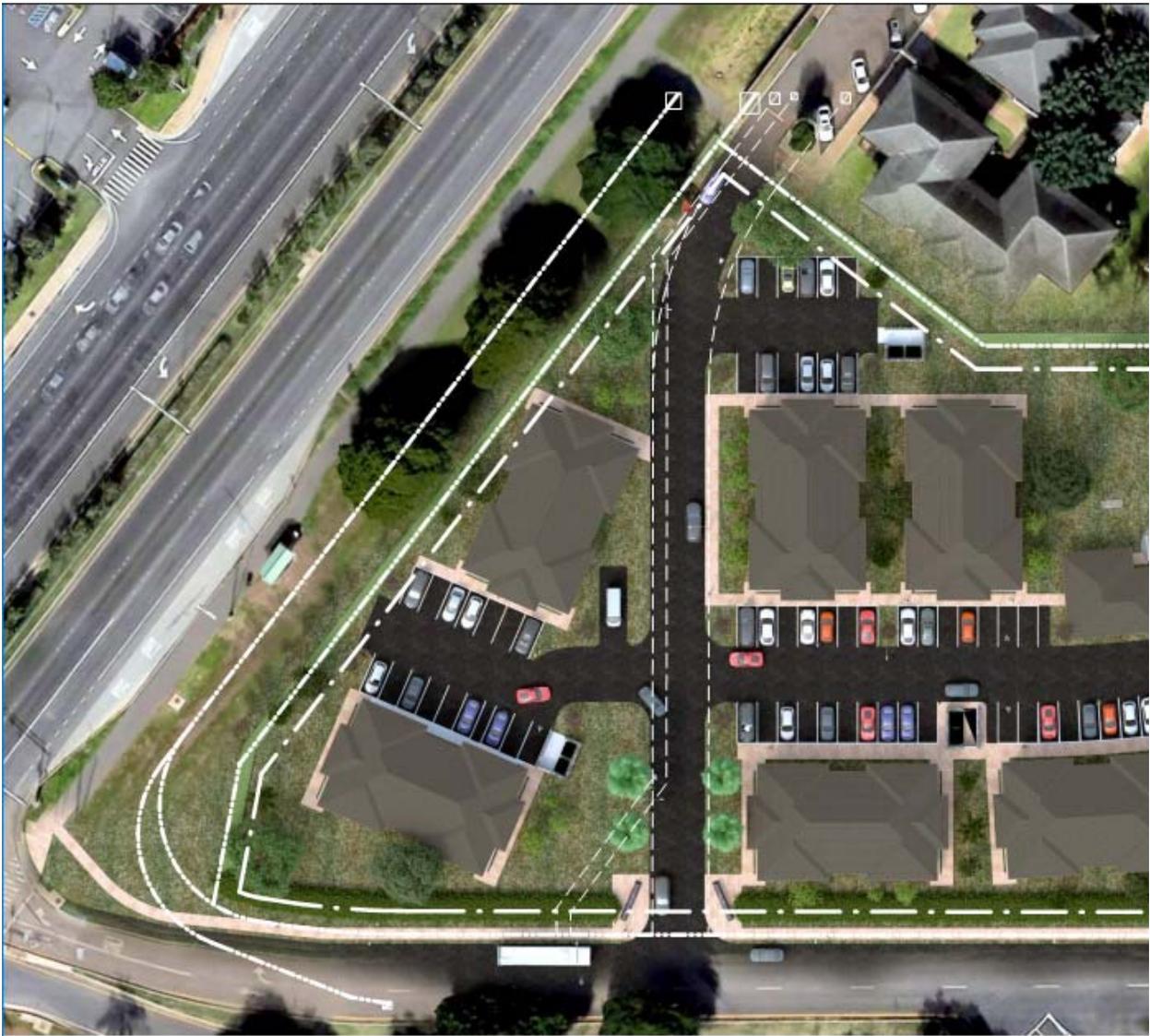
- 24 one-bedroom units
- 87 two-bedroom units
- 12 three-bedroom units

In addition, there is a 3,500sf community center with an office, two toilets, a meeting area, and 7 each washers and dryers (gas).

Please let me know if you need any further information or have any questions.

Thanks-

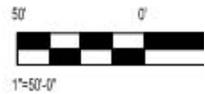
Dan



1 RENDERED SITE PLAN  
1" = 50'-0"



**ALAKEA DESIGN GROUP, LLC**  
ARCHITECTURE, PLANNING, INTERIORS  
1100 Alakea Street, Suite 1500  
Honolulu, Hawaii 96813



[Daniel M. Sandomire, AIA](#)  
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1100 Alakea Street, 27<sup>th</sup> Floor  
Honolulu, HI 96813  
T: 808-547-2293 | M:808-520-5276



6/9/2021

11:27:59 AM



